2015

COOK ISLANDS

National Infrastructure Investment Plan

Cook Islands Government

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The National Infrastructure Investment Plan 2015 was endorsed and adopted by the Cook Islands Cabinet on April 14, 2015, as the guide to infrastructure investment over the next ten years and as such is a "living document".

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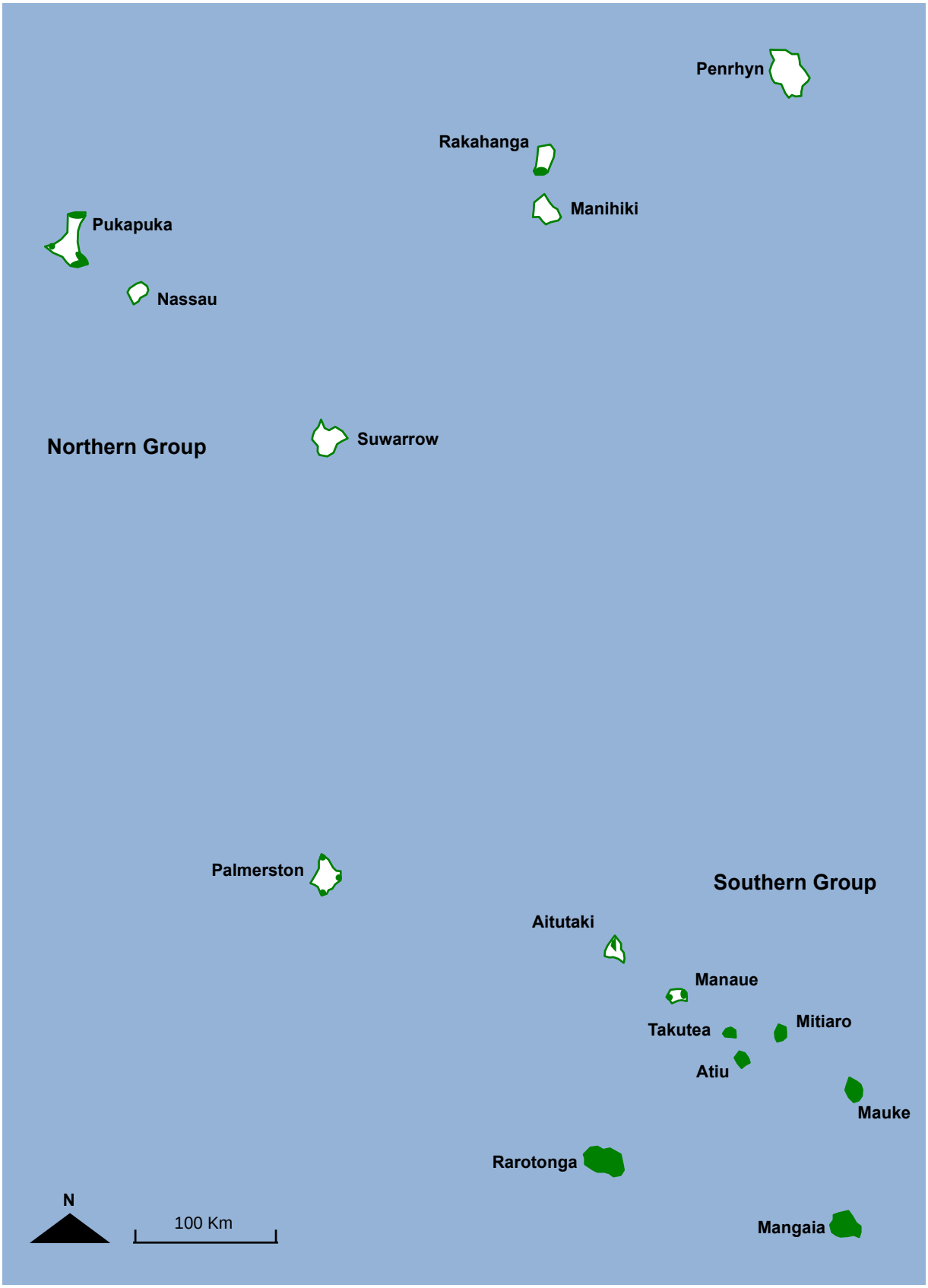
Abbreviations

ADB	Asian Development Bank
ASL	Above Sea Level
AUD	Australian Dollar
BOO	Build Own Operate
BOOT	Build Own Operate Transfer
BOT	Build Operate Transfer
BSG	Budget Support Group
CAPEX	Capital Expenditure
CCA	Climate Change Adaptation
CCAIRR	Climate change adaptation through integrated risk reduction
CCCI	Climate Change Cook Islands
CEO	Chief Executive Officer
CI NIIP	Cook Islands National Infrastructure Investment Plan
CIAA	Cook Island Airports Authority
CIG	Cook Islands Government
CIIC	Cook Islands Investment Corporation
CIPA	Cook Islands Ports Authority
CIREC	Cook Islands Renewable Energy Chart
CLIMAP	Climate Change Adaptation Project for the Pacific
CPPO	Central Policy and Planning Office
CPU	Coastal Protection Units
DCD	Development Coordination Department
DCD	Development Coordination Division
DRM	Disaster Risk Management
EBITDA	Earnings before Interest, Taxes, Depreciations, and Amortisations
EC	European Commission
EDF	European Development Fund
EIB	European Investment Bank
EMC	Emergency Management Centre
EMCI	Emergency Management Cook Islands
EU	European Union
GCCA	Global Climate Change Alliance
GCM	Global Circulation Models
GDP	Gross Domestic Product
GEF	Global Environment Facility
HOM	Head of Ministry
IC	Infrastructure Committee
ICI	Infrastructure Cook Islands
ICT	Information and Communication Technologies
IDA	International Development Association
IFC	International Finance Corporation (of the World Bank Group)
IPCC	Intergovernmental Panel on Climate Change
JICA	Japan International Cooperation Agency
JNAP DRM CCA	Joint National Action Plan for Disaster Risk Management and Climate Change Adaptation
kW	Kilowatt
LO	Likelihood of occurrence
MCA	Multi-Criteria Analysis
MDGs	Millennium Development Goals
MFAI	Ministry of Foreign Affairs and Immigration
MFEM	Ministry of Finance and Economic Management
MOE	Ministry of Education
MOH	Ministry of Health
MOIA	Ministry of Internal Affairs
MW	Megawatt
NCD	Non-Communicable Disease
NDRMCCC	National Disaster Risk Management and Climate Change Council
NES	National Environment Service
NGO	Non-Governmental Organisation
NSDC	Nationals Sustainable Development Commission
NSDP	National Sustainable Development Plan
NSWMS	National Solid Waste Management Strategy
NZ MFAT	New Zealand Ministry of Foreign Affairs and Trade
NZD	New Zealand Dollar
ODA	Official Development Assistance

OPM	Office of the Prime Minister
PACC	Pacific Adaptation to Climate Change
PASAP	Pacific Adaptation Strategy Assistance Programme
PCCSP	Pacific Climate Change Science Programme
PCRAFI	Pacific Catastrophe Risk and Financing Initiative
PIMP	Preventative Infrastructure Master Plan
PMC	Project Management Committee
PPP	Public Private Partnership
PRC	Peoples' Republic of China
PRIF	Pacific Region Infrastructure Facility
PV	Photovoltaic
RE	Renewable Energy
ROBOC	Revenue on Behalf of the Crown
SCCF	Special Climate Change Fund
SOE	State-Owned Enterprise
SPC	Secretariat of the Pacific Community
SPCZ	South Pacific Convergence Zone
SPREP	Secretariat of the Pacific Regional Environment Programme
SRES	Special Report : Emission Scenarios
SRIC	Strengthening Resilience in Island Communities
TA	Technical Assistance
TAU	Te Aponga Uira (Power company)
TMV	Te Mato Vai
UNDP	United Nations Development Programme
UNITAR	United Nations Institute for Training and Research
USP	University of the South Pacific
WATSAN	Water and Sanitation Programme
WB	World Bank Group

Cook Islands



Map prepared by TA Consultants

Preface

The initial fieldwork for this plan was undertaken between February and April 2014 and the Draft Report was submitted in May 2014. There was then an interval in the work due to the national elections in July 2014. In response to comments received and a request to include additional social infrastructure sub-sectors (Health, Education and 'Other Infrastructure') further work was undertaken in December 2014 and January 2015. The reader should note therefore that data on the original sub-sectors has not been updated since May 2014, and activities on ongoing and proposed projects since that time have not been recorded. The CI NIIP will be regularly monitored, and fully updated every three years (starting May 2014).

Executive Summary

A Programme of Infrastructure Investment

The Cook Islands National Infrastructure Investment Plan (CI NIIP) outlines the Cook Islands' priorities and plans for major infrastructure over the next 10 years. The plan focuses on strategic investments important to Cook Islands' future. CI NIIP was assembled through a consultative process involving a wide range of stakeholders, including government, international agencies, civil society and the private sector. CI NIIP covers the following infrastructure sub-sectors:

- Air transport
- Marine transport
- Road transport
- Water supply
- Sanitation
- Solid waste management
- Energy
- Telecommunications and information technology
- Education
- Health
- Other infrastructure (such as government offices)

The aim of CI NIIP is to identify and prioritise the package of infrastructure investments which best meets Cook Islands' needs in coming years, and to plan for the funding and implementation of these investments. CI NIIP also recommends actions for consideration by Cook Islands Government (CIG) regarding the long-term sustainability of infrastructure assets, and identifies the implications of climate change and disaster risk for these types of infrastructure.

CI NIIP takes account of ongoing and committed projects and includes proposed projects in nine sub-sectors, as well as multi-sector projects. The information on proposed projects has been drawn from a variety of sources, and the level of detail available varies widely between projects. A summary of the major ongoing, committed and proposed investments by sub-sector included in the CI NIIP is shown in Table ES.1.

Table ES.1 Summary of CI NIIP Investments by Infrastructure Sub-sector

Sector	Ongoing	Proposed	Total
Air Transport	-	3	3
Marine Transport	1	2	3
Road Transport	1	3	4
Water Supply	2	2	4
Sanitation	2	1	3
Solid Waste Management	-	1	1
Energy	3	6	9
ICT	-	1	1
Multi-sector	-	2	2
Education	-	3	3
Total	**9**	**24**	**33**

The Need for CI NIIP

The national development agenda is framed by the National Sustainable Development Plan (NSDP).[1] The overarching national vision is:

> *'To enjoy the highest quality of life consistent with the aspirations of our people, and in harmony with our culture and environment'.*

The NSDP sets out eight priority areas and identifies strategies and actions under each. These are summarised in Table ES.2 below.

Table ES.2 NSDP Priority Areas and Goals

Priority Areas	Goals
Priority Area 1: Economic Development	A vibrant Cook Island economy. 'A Cook Islands where ingenuity and connection to our culture and environment underpins the ability of our people to build business and enterprise to contribute to national economic growth'
Priority Area 2: Infrastructure	Infrastructure for economic growth, Sustainable Livelihoods and Resilience 'Our investment in infrastructure will maximise economic return, improve our peoples livelihoods and build resilience'
Priority Area 3: Energy	Energy security 'Renewable energy for energy security to enhance our economic growth, social development and environmental integrity'
Priority Area 4: Social Development	Opportunity for all people who reside in the Cook Islands. "A Cook Islands where all people who reside in our islands can enjoy opportunities to fulfil their potential, prosper and participate in the social, economic, political and cultural life of our communities and nation."
Priority Area 5: Resilience	Resilient and sustainable communities. 'A Cook Islands where our people are resilient to disasters and climate change to achieve sustainable livelihoods'
Priority Area 6: Ecological Sustainability	Environment for living. 'A Cook Islands where we sustain our ecosystem and use our natural resources efficiently'
Priority Area 7: Governance	Good governance. "A Cook Islands that thrives on good governance principles."
Priority Area 8: Law and Order	A safe secure, just, and stable society. "A Cook Islands where the rule of law ensures safe, secure, just, stable and sustainable communities."

Four of these, numbers 2, 3, 5 and 6, are of particular relevance for the CI NIIP as they relate to the provision of infrastructure, and environmental management. Accordingly the CI NIIP responds directly to the goals and strategies for these priority areas. At the same time, the provision of infrastructure also responds in various ways to the other priority areas, for instance by improving access to social services, and facilitating economic development.

Cook Islands faces many challenges in the provision of infrastructure. While income levels are relatively high, the economy is small and open, and economic performance is vulnerable to changes in international markets (particularly tourism source markets). Alongside the economic constraints other issues include the small, decreasing population, dispersed islands, fragile natural environment vulnerable to climate change and natural hazards, and dependence on imported fuel and other goods.

In many countries population growth and rural-urban drift are major factors in the demand for improvement and extension of infrastructure, particularly in urban areas. In Cook Islands this is not the case as the resident population has shown a slow decline over the last decade. The principal drivers of demand are the need to support increasing high-quality tourism, plus the need to provide an adequate level of services to a population dispersed over a vast area of the Pacific Ocean.

In the light of these challenges, there is a clear need for a systematic, rational and strategic approach to the prioritisation, planning, implementation and management of infrastructure. Cook Islands National Infrastructure Investment Plan (CI NIIP) is the Government's response to this need. As mentioned above, the CI NIIP builds on the Government's existing policy and planning agenda as established in its National Sustainable Development Plan. It also takes account of other CIG planning documents such as sector plans, corporate plans and the national budget. It has been prepared in close liaison with the planning and budgeting teams in the Ministry of Finance and Economic Management (MFEM) and it is intended that the process becomes integrated in to the regular procedures of CIG.

[1] The Cook Islands, Te Kavenga Nui, National Sustainable Development Plan 2011-2015, Office of the Prime Minister, 2011

It is important that the preparation of CI NIIP should not be seen as a 'one off' exercise, as it should be monitored, reviewed and updated as necessary in future years. The success of the CI NIIP will therefore depend on its integration into the processes of the CI Government and support from policy makers.

Methodology

The preparation of CI NIIP has involved five key activities:

- Review of the current state of infrastructure in the various sub-sectors, and an analysis of future needs.
- Listing of proposed investment projects in each sub-sector, together with on-going and committed projects.
- Assessing priority projects, through participatory multi-criteria analysis.
- Preparing a potential funding strategy for CI NIIP.
- Consideration of the means by which climate change/resilience planning can be integrated into the CI NIIP process.
- Identification of complementary activities to support infrastructure planning and management.

Sub-Sector Analyses

The CI NIIP process included the analysis of issues, needs and priorities by infrastructure sub-sector. The key issues and priorities in each of the sub-sectors are summarised in Table ES.3 below.

Table ES.3 Summary of Infrastructure Issues by Sub-Sector

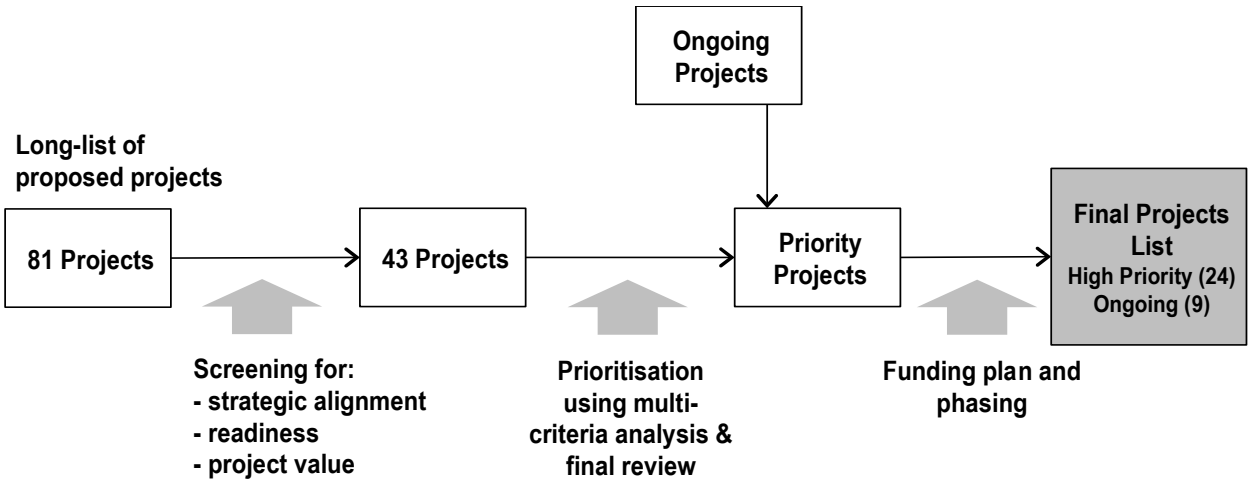
Sub-sector	Issues
Air Transport	Limited maintenance of existing airstrips Land ownership issues Reducing populations in outer islands and economic viability of operations Very high cost of air fares particularly to Northern islands Fragmented institutional responsibilities
Marine Transport	Limited maintenance of existing wharves and jetties Vessels not able to travel to remote islands because it is uneconomical
Road Transport	Limited maintenance on existing unsealed and sealed roads Inadequate recurrent budget for government to maintain all roads and to build new ones Institutional capacity of Infrastructure Cook Islands (ICI) needs to be strengthened. Narrow road reserves (land issues are an obstacle to widening) Overweight vehicles with no controls or monitoring
Water Supply	Limited maintenance of existing infrastructure Old pipe network Poor or non-existent filtration Minimal storage Major network losses (estimated at between 20% and 70%)
Sanitation	Old septic tanks Low public awareness of environmental health risks Recent cases of contamination of lagoons
Solid Waste Management	Minimal coordination and regulation of solid waste collection and disposal Shortage of land and potentially adverse impacts for landfills on small islands Indiscriminate burning of (often toxic) rubbish by householders and others Difficulties and cost to ship recyclable materials off the islands Minimal means to handle hazardous waste Increasing volumes of waste generation
Energy	High cost of electricity to consumers High cost of diesel for generation Vulnerability of fuel storage facilities Overhead networks open to cyclone damage
ICT	Monopoly operation High consumer costs Uneconomic outer islands services
Education	High cost of decentralised provision of school facilities Inadequate maintenance of schools MOE feels constrained in planning for infrastructure as it does not own the schools Power costs and water security in schools
Health	Achieving adequate service provision in Pa Enua High cost of providing specialised services Inadequate maintenance of health centres and residence Emerging issues – aged care facilities, mental health facilities
Other Infrastructure	Lack of disability access in public buildings and business premises Road furniture including footpaths and other transport systems do not cater for people with disabilities Emerging issues – aged care facilities, mental health facilities Future of the government housing stock Some ministries occupying sub-standard office accommodation

Preparation of the Project Long-list

From consultations with a wide range and large number of stakeholders a long-list of projects was assembled. The list included all projects that were either ongoing, committed or being considered within each sub-sector and amounted to over 80 projects. All of these projects may be important and could contribute to the national economic and social objectives. However, it is very unlikely that they can all be funded and implemented in the ten-year time frame of CI NIIP.

Prior to prioritisation the list was reduced by removing those projects with a value of less than $NZ0.5m (considered to be not 'strategic'), and also those that are already ongoing, or are committed with funding in place. An allocation for small projects was later included in the funding strategy. Ultimately a total of 43 projects were submitted for prioritisation. The overall process is summarised in Figure ES.1.

Figure ES.1 Project Identification and Prioritisation Process



Prioritisation

A multi-criteria analysis was used for the prioritisation. It was agreed with CIG and other stakeholders that the criteria should be closely aligned to the eight priority areas in the NSDP (see Table ES.2). The criteria and the percentages thereby attributed to each were discussed several times with stakeholders before being finalised.

Table ES.4 CI NIIP Criteria

Headline criteria	Sub-criteria	Cross-ref. to NSDP Goals	Key questions to aid scoring
Economic	Impact on costs and efficiency of infrastructure users	1,2,3	Will the project result in lower costs for infrastructure users through lower tariffs or slower growth in tariffs, time savings, reduced operating costs?
	Impact on economic growth and employment	1,2,3	Will the project facilitate expansion of industries e.g. tourism, fisheries, agriculture?
	Project viability	1,2,7	Is there evidence that the benefits of the project to the economy will exceed the costs by a sufficient margin?
Social	Support for improved social services	2,3,4,5,8	Will the project facilitate the delivery of health and education services?
	Service coverage	2,3,4,5,8	Will the project extend basic infrastructure service coverage to new areas and/or more people, or prevent loss of coverage?
	Other social benefits	2,4,5,7,8	Will the project have other benefits for the community e.g. improving the lives of women and children, assisting vulnerable/disadvantaged groups, alleviating poverty, responding to rural/urban drift, improved safety?
Environmental	Impact on land and water resources	2,5,6	Will the project have any positive or negative impacts on the environment e.g. land, water resources, coastal and marine environments?
	Degree of resilience to climate variability or climate change	2,5,6	How vulnerable is the project to the potential effects of climate variability, climate change, and disasters?
	Disaster risk management or climate change adaptation function	2,5,6	Will the project provide benefits or positive inputs for disaster risk management or climate change adaptation?

Headline criteria	Sub-criteria	Cross-ref. to NSDP Goals	Key questions to aid scoring
Project sustainability	Financial	1,2,7	Will the project be able to support the ongoing costs of operation and maintenance through user charges etc.?
	Technical	1,2,7	Will the technology used in the project be appropriate, and able to be operated and maintained?
	Institutional	1,2,7	Will the institution responsible for the project have sufficient capacity for implementation, operation and maintenance?

The scoring system used in project prioritisation involved scoring sub-criteria on a scale of 0 to 5, with scores of 0 and 1 representing weak performance against the sub-criteria, scores of 2 and 3 representing moderate performance, and scores of 4 and 5 representing strong performance. Scoring was undertaken against the base case of the project not going ahead (thus, for example, avoiding a cost or loss of a benefit was considered as well as generating a benefit). Weights were applied to scores for headline criteria and sub-criteria, based on the perceived importance of these criteria. Headline criteria were weighted as follows:

- Economic 30%
- Social 25%
- Environmental 25%
- Project sustainability 20%

A first round of scoring was undertaken on by a Working Group comprising representation from the Infrastructure Committee (IC)[2], facilitated by the consulting team. These initial scores were reviewed by a workshop attended by representatives from a wide variety of stakeholders. Following discussion of suggested revisions to scores, the outcome of the workshop was recorded and presented to participants. The recommendations of the workshop were then presented to a meeting of the Infrastructure Committee, and final scores were discussed and agreed. A summary of the results is shown in Table ES.5 below.[3]

Table ES.5 Results of Prioritisation (Full Descriptions of the Top 24 projects are given in Appendix C)

Top 24	Next 19
Te Mato Vai (TMV) intakes, reservoirs, treatment, meters etc.	Northern Group Sanitation Upgrades
Long term sanitation upgrades Rarotonga	Atiu Water Reticulation System
TAU control & Generation - Rarotonga	Mangaia water upgrade
Outer Islands Community Water Tanks	Pukupuka Hospital and doctors' residence
Outer Islands Cyclone shelters	Rarotonga hazardous waste handling upgrade, and outer islands waste resource recovery centres
Undersea Fibre-optic Cable	Manihiki Airport Upgrade (Part 139)
Orongo Marina and Town Centre	Mitiaro - upgrade water network system
Avarua Bridges	Remodelling classrooms for modern learning
Aitutaki Solar PV Mini-Grid System	Muri area upgrade with footpaths
Re-build national College (Tereora)	Penrhyn Airport Repairs and Improvements
Atiu Airport Upgrade	Mauke Airport Repairs and Improvements
Apii Nikao School reconstruction	Mitiaro Airport Repairs and Improvements
Bridges including Avatiu Valley Bridge	Aroko Road Widening Project
Penrhyn Port Facilities and Fuel Depot	Pukapuka Jetty, Channel and Causeway
Fitting schools with water harvesting systems	Sanitation upgrades - onsite Southern group (not Ait/Rar)
Rarotonga Airport Instrument landing	Vaikapuangi Government office complex
Rarotonga Airport Terminal Improvement	Mangaia Road Rehabilitation: town area (3km)
Road sealing project for Aitutaki	Mauke Road Rehabilitation: town area and plantation roads
Atiu Solar PV Mini-Grid System	Atiu & Mitiaro Roads Rehabilitation
Mauke Solar PV and powerhouse	
Mitiaro Solar PV Mini-Grid System	
Rutaki Foreshore Rock Revetment	
Incinerator for Rarotonga	
Mangaia Solar PV Mini-Grid System	

Funding Strategy

The funding strategy for CI NIIP has been developed in close cooperation with MFEM. This has entailed analysis of CIG's own funding projections. On this basis an overall capital expenditure of $NZ288m for economic and social infrastructure over the next 10 years was set as a target. Once ongoing and committed projects are included, along with allowances for small projects and climate change adaptation costs, the overall funding envelope provides for 24 of the prioritised projects to be included. The 24 priority projects are shown in Table ES.6.

[2] The Infrastructure Committee includes members from ICI, MFEM, Office of the Prime Minister (OPM), and the private sector

[3] Note: A second round of prioritisation was undertaken for education, health and other infrastructure projects. This process was overseen and ratified by the Infrastructure Committee with representatives of other agencies in attendance.

Table ES.6 Proposed Priority Projects

Sub Sector	Project	Estimated Cost ($NZm)	Estimated timing
Air Transport	Rarotonga Airport Terminal Improvement	9.3	2024
	Rarotonga Airport instrument landing system upgrade	3.2	2016-2018
	Atiu Airport sealing and upgrade to CAA certification (Part 139)	3.9	2017-2019
Marine Transport	Aitutaki, Orongo Marina and Town Centre Development	15.0	2017-2020
	Penrhyn Coastal Protection – Te Tautua and Omoka Port Facilities and Fuel Depot	4.0	2015-2017
Road Transport	Avarua bridges	5.0	2021-2023
	Bridges upgrade including Avatiu Valley bridge	1.5	2016-2018
	Road sealing Aitutaki	0.8	2018
Water Supply	Te Mato Vai – Trunk, Intakes, Reservoirs, Treatment, Meters etc.	36.3	2014-2018
	Outer Islands Community Water Tank Rehabilitation	1.5	2014-2016
Sanitation	Rarotonga long-term sanitation upgrade	37.0	2024
Solid Waste Management	Incinerator for Rarotonga	3.0	2021
Energy	TAU control & Generation - Rarotonga	45.2	2016-2023
	Aitutaki Solar PV Mini-Grid System	16.0	2015-2017
	Atiu Solar PV Mini-Grid System	3.1	2014-2016
	Mauke Solar PV Mini-Grid System, and generators, powerhouse, distribution upgrade	3.2	2014-2016
	Mitiaro Solar PV Mini-Grid System	1.9	2014-2016
	Mangaia Solar PV Mini-Grid System	3.5	2014-2016
ICT	Fibre-optic Cable for international communications	35.0	2019-2021
Multi-sector	Rutaki Foreshore Rock Revetment	2.6	2017-2019
	Outer islands cyclone shelters	2.0	2016-2018
Education	Apii Nikao School Reconstruction	11.4	2014-2017
	Re-build National College (Tereora)	30.0	2018-2023
	Fitting Schools with Water Harvesting Systems (pilot)	0.5	2016-2017

Capital investment requirements for economic infrastructure over the period 2014/15 to 2023/24 derive from projects ongoing or committed at the commencement of the plan period, high priority proposed projects of strategic importance which can be accommodated within the level of funding availability assumed for CI NIIP, an allowance for smaller projects below the capital cost threshold set for CI NIIP, and provision for any additional climate-proofing required for CI NIIP investments. These requirements are summarised below:

Table ES.7 CI NIIP Capital Investment Requirements

Component	Capital investment requirement 2014/15 to 2023/24 ($NZ million)
Ongoing and committed projects	35.4
High priority proposed projects	237.6
Allocation for smaller projects	10.0
Allocation for climate-proofing of CI NIIP projects	5.0
Total capital investment	**288.0**

The overall CI NIIP investment plan (including ongoing and proposed projects) will be funded from a combination of Government Budget (CAPEX), ODA, concessional loans, SOE self-financing, and private finance. Funding for ongoing projects is already secured, while funding for most proposed projects is yet to be determined. Table ES.8 identifies the funding modality (or combination of modalities) that might be appropriate for each CI NIIP project.

Table ES.8 Potential Funding Modalities for CI NIIP

Sector/Project	Status	Est. Cost	CAPEX	ODA	Concessional loans	SOE self-financing	Private
		($NZm)	($NZm)	($NZm)	($NZm)	($NZm)	($NZm)
Air Transport							
Atiu Upgrade to Civil Aviation Authority Part 139 Regional Turbo Prop runway	Proposed	3.9					
Rarotonga Airport Instrument landing upgrade	Proposed	3.2					
Rarotonga Airport Terminal Improvement (phase 2)	Proposed	9.3					
Marine Transport							
Manihiki Tukao & Tauhunu Harbour Upgrade	Ongoing	2.8					
Orongo Marina and Town Centre Development	Proposed	15.0					
Penrhyn Coastal Protection - TeTautua & Omoka Port Facilities and Fuel Depot relocation.	Proposed	4.0					
Road Transport							
Road sealing - Aquarius to Tupapa	Ongoing	5.0					
Avarua Bridges	Proposed	5.0					
Bridges upgrade including Avatiu Valley Bridge	Proposed	1.5					
Road sealing project for Aitutaki (6km)	Proposed	0.8					
Water Supply							
Aitutaki Domestic Water Tanks	Ongoing	0.6					
TMV Ringmain	Ongoing	20.3					
TMV Trunk, Intakes, reservoirs, treatment, meters etc	Proposed	36.3					
Outer Islands Community Water Tank rehabilitation	Proposed	1.5					
Sanitation							
Sanitation upgrades - onsite Aitutaki	Ongoing	2.4					
Sanitation upgrades onsite - scale up pilot to Rarotonga, Phase 2	Ongoing	11.2					
Long term sanitation upgrades Rarotonga	Proposed	37.0					
Solid Waste							
Incinerator for Rarotonga	Proposed	3.0					
Energy							
Palmerston Solar PV Mini-Grid System	Ongoing	0.6					
Penrhyn Solar PV Mini-Grid System	Ongoing	1.7					
Airport Solar PV Installation	Ongoing	3.5					
TAU control & Generation - Rarotonga	Proposed	45.2					
Aitutaki Solar PV Mini-Grid System	Proposed	16.0					
Atiu Solar PV Mini-Grid System	Proposed	3.1					
Mauke Solar PV Mini-Grid System, and generators, powerhouse, distribution upgrade	Proposed	3.2					
Mitiaro Solar PV Mini-Grid System	Proposed	1.9					
Mangaia Solar PV Mini-Grid System	Proposed	3.5					
ICT							
Fibre-optic Cable for international Communications	Proposed	35.0					
Multi-sector							
Outer Islands Cyclone shelters	Proposed	2.0					
Rutaki Foreshore Rock Revetment Development	Proposed	2.6					
Education							
Apii Nikao School Reconstruction	Proposed	11.4					
Re-build National College (Tereora)	Proposed	30.0					
Fitting Schools with Water Harvesting Systems (Pilot)	Proposed	0.5					
Nominal allocation for projects below the NIIP threshold value		10.0					
Nominal allocation for climate-proofing of projects vulnerable to climate change		5.0					
Total			50.0	180.0	28.0	10.0	20.0

Notes:

1. Totals represent the estimates used for planning purposes in developing the NIIP funding strategy
2. Shaded areas indicate potential range of funding sources for each project. For many projects, the final mix of funding modalities is yet to be determined.
3. Some project costs fall outside of the ten year timeframe of NIIP (i.e. in earlier or later years)

Whole of Life Project Costs

Historically expenditure on maintenance of existing infrastructure in Cook Islands has not been sufficient to adequately maintain the assets. Rehabilitation and ongoing maintenance must therefore be a fundamental part of future infrastructure investment. A number of the projects in the CI NIIP are not new construction, but comprise the repair and rehabilitation of existing infrastructure facilities and will therefore contribute to the task of improving the condition of existing assets (analysis presented in Appendix G shows that 45 percent of CI NIIP projects by number and 35 percent by value represent new investment, while the balance represent upgrading or deferred maintenance of existing infrastructure).

Clearly, Cook Islands has a substantial maintenance task in relation to existing infrastructure, and this will increase as CI NIIP is implemented. This will be most evident in the case of new infrastructure. However, as mentioned above, many CI NIIP projects involve deferred maintenance and/or upgrading of existing infrastructure. Also, the prioritisation process used in the selection of projects for CI NIIP has a bias towards containing the maintenance task, with the inclusion of criteria relating to the ability of projects to meet on-going costs of operation and maintenance. The CI NIIP discusses the

principles involved in 'whole of life costing' of infrastructure investments, and provides estimates of the ongoing maintenance costs associated with the plan.

Financial Sustainability

As SOEs manage much of the economic infrastructure, the financial health of these entities is important to the financial sustainability of the infrastructure investment program. Progress is being made in improving the efficiency and financial performance of SOEs, supported by the oversight role of the Cook Islands Investment Corporation. While SOEs are responsible for managing their own activities, some general points can be made in relation to further strengthening financial performance:

- Ensuring that the range of expertise needed to run SOEs is available.
- Retaining the clear commercial focus of SOEs, and the transparent identification of community service obligations and their funding.
- Encouraging a maintenance culture in SOEs driven by the Boards and Chief Executives, supported by the gradual strengthening of asset management systems.
- Continuing the monitoring of financial performance undertaken by CIIC (including the provision of clear guidelines to SOEs on expectations in relation to financial performance), and the dissemination of information on the financial performance of SOEs to the community.

In relation to infrastructure which is managed directly by Government, financial sustainability is currently low. There is a need to strengthen management in areas such as:

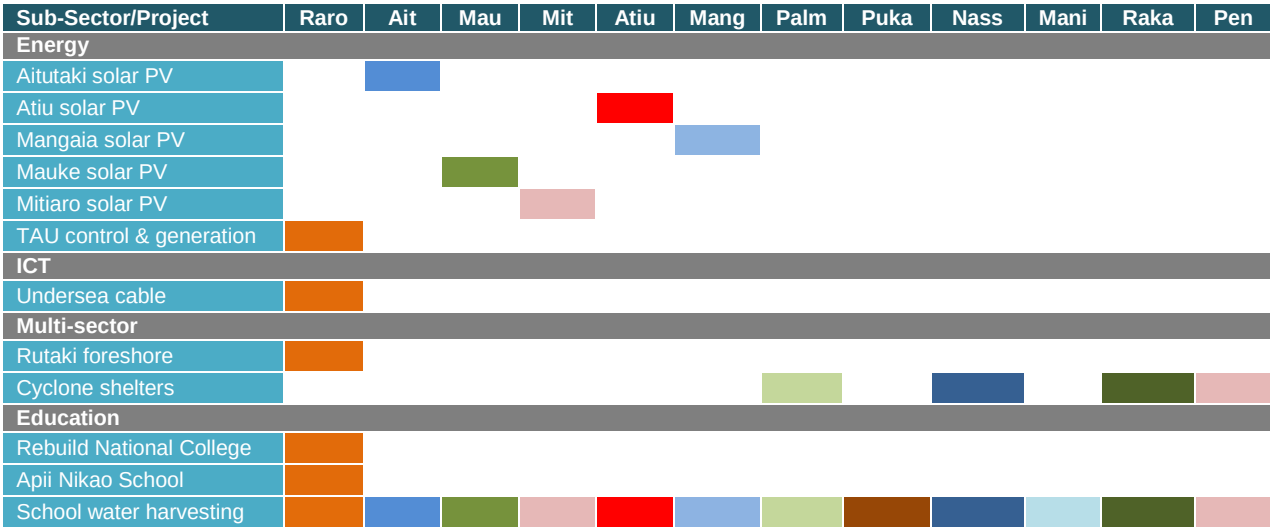
- Stronger asset management systems with an emphasis on developing a stronger maintenance culture.
- Improved cost recovery, with regular review of fees and charges (taking into account the financial and economic impact of fees and charges), and efforts to strengthen the efficiency of collection systems.
- More systematic and reliable funding for maintenance and operations, premised on better performance in utilising funding and in reporting on performance.
- Ongoing review of institutional arrangements in relation to this infrastructure, with the aim of improving the efficiency of operations.

Outer Island Investment

The distribution of priority projects by island is shown in Table ES.9 below. This shows that, while Rarotonga accounts for around half of the projects, in general terms the priority projects include some investments in all islands. If compared to population distribution there is a positive bias towards the outer islands. When considering island balance it should also be noted that if the picture was completed with projects below the $NZ0.5m cut off the distribution would be more even.

Table ES.9 Top Priority Projects by Island (Not including ongoing and committed projects)

Sub-Sector/Project	Raro	Ait	Mau	Mit	Atiu	Mang	Palm	Puka	Nass	Mani	Raka	Pen
Air												
Atiu airport												
Raro airport terminal												
Raro landing instruments												
Marine												
Penrhyn port												
Orongo marina etc.												
Road												
Road sealing Aitutaki												
Avatiu valley bridges												
Avarua bridges												
Water												
Community water tanks												
Te Mato Vai (not ringmain)												
Sanitation												
Raro long-term sanitation												
Solid Waste												
Incinerator												



Climate Change and Disaster Risk Management

An integral part of the CI NIIP was an assessment of the potential impacts of climate change and natural hazards on the infrastructure sub-sectors being considered and in particular on the priority projects. The incorporation of climate change and disaster risk assessment into the CI NIIP process is summarised below:

- Review of current and future climate conditions in the Cook Islands
- Identification of the vulnerability of different types of infrastructure, provincial variations in potential risk, and the possible adaptation strategies that can be employed
- Inclusion of climate risk criteria for project prioritisation
- Overall assessment of priority projects' vulnerability to climate change and natural hazards
- Evaluation of the enabling environment for climate change adaptation and disaster risk management
- Detailed assessments for those proposed priority projects most susceptible to climate change and natural hazards in order to identify potential measures (and costs of integrating them) to mitigate impacts and increase their resilience
- Identification of potential CC/DRM funding sources.

Table ES.10 Summary of Projected Climate Change in Cook Islands

Temperature	Temperatures have warmed and will continue to warm with more very hot days in the future.
Rainfall	Annual rainfall since 1960 has increased at Penrhyn in the Northern Cook Islands, but there are no clear trends in rainfall at Rarotonga in the Southern Cook Islands. Rainfall patterns are projected to change over this century with more extreme rainfall days and less frequent droughts.
Cyclone	By the end of this century, projections suggest decreasing number of tropical cyclones but a possible shift towards more intense categories.
Sea Level	Sea level near Cook Islands has risen and will continue to rise throughout this century.
Ocean acidification	Ocean acidification has been increasing in Cook Islands' waters. It will continue to increase and threaten coral and reef ecosystems.

NATURAL HAZARDS

Tropical cyclones are most likely the single most predominant natural hazard affecting Cook Islands between November and April. In the 41-year period between 1969 and 2010 a total of 47 tropical cyclones passed within 400km of Rarotonga, an average of just over one cyclone per season. The number of cyclones varies widely from year to year, with none in some seasons, but up to six in others. Over the period 1969 to 2010, cyclones occurred more frequent in El Niño years.

According to the earthquake hazard predictions, Cook Islands are situated in a relatively quiet seismic area and have low chance of experiencing a strong earthquake in the next 50 years. Nonetheless, the larger tectonic area of Pacific "Ring of Fire" can in the future generate tsunamis that may affect Cook Islands' shores (PCRAFI, 2011). Disasters like tsunamis can pose threats to human lives and infrastructure of Cook Islands in the future. In 1909, a tsunami with waves up to three meters high caused damage to roads, bridges and crops in Rarotonga. Recent major under-sea earthquake events in the Pacific Region – Samoa (2009) and Japan (2011) – have resulted in none or minor waves in Cook Islands (EMCI, personal communication).

RISK ASSESSMENT OF PRIORITY PROJECTS

Those CI NIIP priority projects that were found to have high risks at present day or in the future were selected for further evaluation of preliminary climate change adaptation needs. This process was carried out for 9 out of the 23 shortlisted CI NIIP projects, namely:

- TMV Trunk, Intakes, reservoirs, treatment, meters etc.
- Outer Islands Community Water Tank rehabilitation
- Outer Islands Cyclone shelters
- Orongo Marina and Town Centre Development
- Avarua Bridges
- Penrhyn Coastal Protection - TeTautua & Omoka Port Facilities and Fuel Depot relocation
- Rutaki Foreshore Rock Revetment Development
- Apii Nikao School reconstruction
- Water harvesting systems in schools

Moving CI NIIP Forward

The preparation of this CI NIIP report is only the first step. Government should assign CI NIIP a clear position and role within its existing framework of operations, planning and decision-making. A wide spectrum of stakeholders must view CI NIIP as the key guide to infrastructure investment. This will require a clear communication strategy to effectively share information with diverse external stakeholders and all parts of Government.

MEASURING PROGRESS OF CI NIIP

Assessing the progress of CI NIIP will use a blend of qualitative and quantitative M&E methods. Central to the process will be some measurable indicators. Suggested indicators are shown in Table ES.11.

Table ES.11 Indicators for Monitoring the CI NIIP

Indicator	Target	Suggested Target Date	Source/ Responsibility
CI NIIP is widely available in electronic form	Available on MFEM website	2nd ¼ 2015	MFEM
A CI NIIP summary is widely available in printed form	Summary prepared and printed	3rd ¼ 2015	MFEM
Percentage of projects with identified funding within 3 years	More than 50%	4th ¼ 2017	IC/MFEM
Institutional arrangement for monitoring CI NIIP agreed and in place	Completed and adopted	3rd ¼ 2015	IC/PMO
Regularised system of project assessment and basic cost benefit analysis is established	Completed	4th ¼ 2015	IC/MFEM
Regularised system for CCA/DRM assessment of projects is established	Completed	4th ¼ 2015	IC/OPM
Annual review of CI NIIP	Completed	1st ¼ 2016 (and annually thereafter)	IC
Full update of CI NIIP every 3 years	Completed	1st ¼ 2018	IC

The CI NIIP monitoring will be undertaken by the Infrastructure Committee (IC) and reported to the NSDC. The IC already reports directly to the NSDC so this will just be a natural extension of its current tasks.

Capacity Building

Undertaking this major programme of investments in infrastructure will stretch the capabilities of CIG. There are a number of areas of planning, implementation and management in which capacity building will be required. These complementary activities include a variety of supporting mechanisms varying from technical outputs such as plans and regulations, to institutional strengthening. The needs and opportunities for institutional strengthening are highlighted in the CI NIIP, particularly at the strategic level. A summary of the complementary activities is shown in Table ES.12, along with indications of which CIG agencies will be involved and whether or not the activity would require (or benefit from) external technical assistance.

Table ES.12 Capacity Building and other Complementary Activities

Sector	Complementary Activities	CIG	TA?
General	Prepare land-use development plans for Rarotonga and Aitutaki	ICI	Yes
	Prepare integrated coastal zone management and zoning plan to minimise ecological damage, particularly in areas of development pressure such as Rarotonga and Aitutaki	CCCI, ICI	Yes
	Undertake land-titling project to formalise and digitise all boundaries	MOJ	Yes
	Improve digital mapping and GIS systems and coordinate across all ministries	OPM, ICI	
	Establish comprehensive monitoring system for NSDP	OPM	
	Support to MFEM to enable implementation and monitoring of the CI NIIP including improved project analysis (cost benefit analysis) and integration of CCA/DRM assessments	MFEM, CCCI	Yes
	Support to ICI for improved planning and management of infrastructure projects	ICI	Yes
	SOE monitoring and reform study	CIIC	Yes
Air Transport	Development strategy and scoping for all outer islands airports including airport classification	MOT	Yes
Marine Transport	Prepare integrated coastal zone management and zoning plan to minimise ecological damage, particularly in areas of development pressure such as Rarotonga and Aitutaki (same as under 'General')	CCCI, ICI	Yes
	Inter-island shipping study to explore feasibility of improving services	MOT, CIPA	Yes
Road Transport Water Supply	Develop and publish road standards manual	ICI	
	Establish independent regulator to monitor service standards and tariffs	OPM	
	Groundwater investigations	ICI	
	Corporatisation of water supply – SOE to be established	OPM	
	A number of suggested further studies as listed in the Master Plan (Priority and needs will be determined as the Master Plan is implemented)	ICI	Yes
Sanitation	Environmental health awareness campaign in all islands	MOH	
Solid Waste Management	Building on existing broad policy documents, develop plan and programme for SWM facilities and management throughout Cook Islands including assessment of potential for developing commercial recycling opportunities	ICI	Yes
Energy	Review and develop the role of the Energy Commissioner (to include price regulation and the management of solar energy providers)		
ICT	Prepare ICT sub-sector plan setting out national strategy and needs and priorities for each island		
	Establish independent regulator to monitor and uphold service standards	OPM	
Education	Preparation of a long term infrastructure strategy for the Education Sector (including options to rationalise the school network)	MOE, CIIC	Yes
Health	Development of policy on aged care (including infrastructure requirements)	MOH, MOIA	
	Development of policy on mental health (including infrastructure requirements)	MOH, MOIA	
	Preparation of a long term infrastructure strategy for the Health Sector	MOH, CIIC	Yes
Other Infrastructure	Review of building code and transport systems to address disability access	MOIA, ICI, CIAA, CIPA	
	Study on future of Government housing	CIIC	
	Study on potential for use of Government buildings for solar PV installations	CIIC	Yes

Key to CIG Agencies: CCCI – Climate Change Cook Islands, CIAA – Cook Islands Airports Authority, CIIC – Cook Islands Investment Corporation, CIPA – Cook Islands Ports Authority, ICI - Infrastructure Cook Islands, MFEM – Ministry of Finance and Economic Management, MOE – Ministry of Education, MOH – Ministry of Health, MOIA – Ministry of Internal Affairs, MOJ – Ministry of Justice, MOT – Ministry of Transport, OPM – Office of the Prime Minister.

1 Introduction

1.1 About the CI NIIP

1.1.1 ROLE AND OBJECTIVES

1 The Cook Islands National Infrastructure Investment Plan (CI NIIP) outlines the priorities and plans for major infrastructure investments over the next ten years. CI NIIP was assembled through a consultative process involving a wide range of stakeholders, including government, international agencies, civil society and the private sector. The Plan covers the following infrastructure sub-sectors:

- Air transport
- Marine Transport
- Road transport
- Water supply
- Sanitation
- Solid waste management
- Energy
- Information and communications technology
- Education
- Health
- Other infrastructure

2 The Plan should be seen as a framework for priority investments rather than a fixed blueprint, as situations and priorities will change over the next ten years. For this reason proposals for the first few years of the Plan period are put forward with greater detail and certainty than those in the later years.

3 CI NIIP identifies actions for consideration by Government regarding the long-term sustainability of infrastructure assets, and identifies the implications of climate change and disaster risk for the types of infrastructure covered by the Plan. It also includes recommendations for a range of complementary activities to support the planning and management of infrastructure.

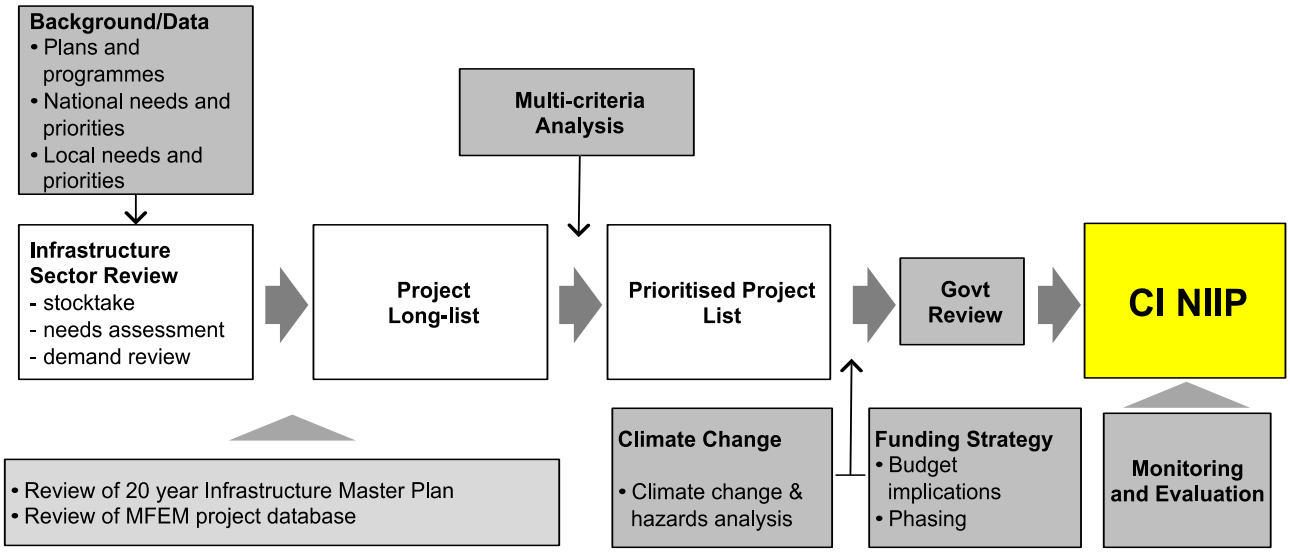
1.1.2 THE CI NIIP PROCESS

4 The process of preparing the CI NIIP has been tailored to fit the situation in the Cook Islands, drawing on lessons learned from CI NIIPs for other Pacific island countries. The methodology involved the following key activities:

- Review of the current state of infrastructure in the various sub-sectors, and an analysis of future needs.
- Listing of proposed investment projects in each sub-sector, together with on-going and committed projects.
- Assessing priority projects, through participatory multi-criteria analysis.
- Estimating capital and recurrent costs of priority investments
- Preparing a potential funding strategy for CI NIIP.
- Consideration of the means by which climate change/resilience planning can be integrated into the CI NIIP process.
- Identification of complementary activities to support infrastructure planning and management.

5 An outline of the CI NIIP process is shown in Figure 1.1.

Figure 1.1 The CI NIIP Process



6 The CI NIIP consolidated planning work being undertaken by CIG in the various economic and social infrastructure sub-sectors, and developed a methodology for project prioritisation. It was essentially a coordination exercise, with little primary survey, analysis, or project identification work involved. As described later in the report, the CI NIIP will be subject to periodic review to address emerging issues and recent developments and a full update every three years starting from May 2014.

1.2 Consultation, Participation and Communication

7 The CI NIIP has been prepared with extensive consultation and participation of stakeholders in Government, State Owned Enterprises (SOEs), development partners, the private sector and civil society. This included dozens of individual meetings, two workshops and a number of meetings with the Infrastructure Committee (IC), the steering group for the CI NIIP. Going forward it is proposed that all formal communications are made through regular communication channels on behalf of the IC and Cook Islands Investment Corporation (CIIC). The consultation process is summarised in Table 1.1 below, and a list of people consulted is given in Appendix A.

8 During the consultation process the team endeavoured to ensure representation by women. Whilst overall the process involved far more males than females, women were present and made their views known at each of the key participatory events – the two workshops, the prioritisation working groups, and the meeting with representatives of non-governmental organisations (NGOs). At the prioritisation workshop there was at least one woman in every breakout group. It has to be recognised however that in Cook Islands women are not well represented in the planning and design of infrastructure and this is discussed later in this report.

Table 1.1 Summary of Consultation and Communications Programme

Project Stage	Consultations and Communications
Conceptualisation and preparation	Meetings with key Government agencies Meetings with private sector representatives Meetings with development partners
Inception	Presentation to Development Partners' Meeting Meetings with government, SOE, private sector, development partners and other stakeholders to introduce CI NIIP and to gather information on sector issues and programmes Presentation to Infrastructure Committee Inception Workshop Inception Report circulated to key stakeholders and posted on Ministry of Finance and Economic Management (MFEM) website and on Facebook
Project long-list and Infrastructure Status	Continuation of stakeholder meetings for long-list preparation and update of infrastructure status NGO presentation
Project prioritisation	Working group for initial prioritisation Prioritisation Workshop TV coverage (about 10 minutes) of Prioritisation Workshop Meeting with infrastructure committee to discuss prioritisation outcomes
Draft CI NIIP	Funding strategy meetings with MFEM Meetings with key stakeholders to discuss prioritisation outcomes Briefings to Cabinet and the Opposition Draft CI NIIP posted on MFEM website

Project Stage	Consultations and Communications
	Further consultations for education, health and other infrastructure sectors Infrastructure Committee meetings to review final list of priority projects
Revised CI NIIP	Prepared on the basis of comments received
Addition of education, health and other infrastructure projects	Meetings with Ministry of Education (MOE), Ministry of Health (MOH) and Ministry of Internal Affairs (MOIA) and other agencies Infrastructure Committee meeting to agree new projects for prioritisation Infrastructure Committee meeting to confirm prioritisation scores
Final CI NIIP	Prepared following consultations on additional projects

2 Infrastructure Provision

2.1 General Situation

9 This chapter outlines the context within which infrastructure provision takes place. This includes the geographic and economic conditions, the status of existing infrastructure, and the drivers of demand for new and improved infrastructure.

2.1.1 POPULATION

10 The total population of Cook Islands peaked at 21,322 in 1971, declining by 17 percent to 17,794 in 2011 (the resident population, excluding visitors in the country at the time of the Census, declined at a faster rate). Over the same period, the total population of Rarotonga grew by 14 percent, while that of all other islands declined (Aitutaki by 29 percent, Mangaia by 73 percent, Atiu by 67 percent, Manihiki by 47 percent, Penrhyn by 65 percent, and Pukapuka by 38 percent, for example). At the time of the 2011 Census, the total population of Southern Group islands (other than Rarotonga and Aitutaki) was just over 1,500, while the total population of Northern Group Islands (including Palmerston) was just over 1,100.

2.1.2 GEOGRAPHIC AND ISLAND CONTEXT

11 The total area of the Cook Islands territory is over 2 million km^2, but land comprises only about 240km^2 of this or about 0.01%. There are 15 islands of which 12 have permanent populations. These islands are spread over a distance of some 800 km. The islands other than Rarotonga are often referred to as the 'Pa Enua'. Meaning literally 'Sister Islands', this term has been used in some places in this report. A summary of the islands' characteristics is given in Table 2.1.

Table 2.1 Island Characteristics

Island	Land Area km^2 (% of total)	Population (% of total)	Characteristics
Rarotonga	67.1 (28.3)	13,095 (73.6)	Rarotonga – the most populated island and seat of government in the Cook Islands is a dominant rugged volcanic up thrust, with an outlying reef system and varying width lagoons. The population is generally spread around the lowlands and lower slopes of the island. The main township Avarua is the capital of the Cooks and its main commercial centre. Tourism is the predominant industry, followed by offshore banking agriculture and fishing.
Aitutaki	18.3 (7.7)	2,038 (11.5)	Aitutaki is 140 nautical miles from Rarotonga. The island is of atoll makeup with the population concentrated on the major land mass in its north-western corner. The land here reaches to 260 metres above sea level. A large lagoon makes up approx 70% of its area. The island is serviced daily by a regular air service and usually receives two overseas cargo ships a month. Second most popular tourism island, many years ago Aitutaki was a major exporter of bananas.

Island	Land Area km^2 (% of total)	Population (% of total)	Characteristics
Mauke	18.4 (7.8)	307 (1.7)	Mauke is 150 nautical miles from Rarotonga. A small island mass made up of makatea (coral reef) with the community generally spread along the south western coast. It has an airfield and recently (2012) its harbour was upgraded. Maire eis (flower garlands) are its main export (to Hawaii).
Mitiaro	22.3 (9.4)	189 (1.0)	Mitiaro is 142 nautical miles from Rarotonga. A small island mass made up of makatea with the community located generally in the one village known as Atai. It has an airfield and recently (2012) its harbour was upgraded.
Manaue	6.2 (2.6)	Nil	Manaue is 124 nautical miles from Rarotonga, located between Atiu and Aitutaki (24 nautical miles). This island is made up of two separate land masses and a fringing coral reef with no easy passage to its lagoon. Once a thriving copra industry and a small airstrip operated on Manaue.
Atiu	26.9 (11.4)	480 (2.7)	Atiu is 116 nautical miles from Rarotonga. A small harbour and airfield are located on the north-western low lands while the interior rises up to 80 metres above sea level. The majority of the population and commercial activity operates on this higher land about the village of Areora in the centre of the island. Coffee is the main crop of Atiu grown in the valleys. Third most popular tourism island by visitor numbers.
Mangaia	51.8 (21.9)	572 (3.2)	Mangaia is 110 nautical miles from Rarotonga. This island is the most southern of the Cooks group located to the south east of Rarotonga, also the oldest island in the Pacific being an upraised coral mass. Oneroa the main village is located on the western side of the island close to the small harbour (presently being upgraded) and airfield. The interior sits up to 70 metres above sea level and offers good agriculture land.
Palmerston	2.1 (0.9)	60 (0.3)	Palmerston is 270 nautical miles from Rarotonga. A large coral atoll with fringing land scattered about its outer reef system. Its small population is located on one of the land masses on the south western corner. Access is by irregular shipping service from Aitutaki or Rarotonga. Subsistence living and fish exports to Rarotonga.
Pukapuka	1.3 (0.6)	451 (2.5)	Pukapuka is 715 nautical miles from Rarotonga. An atoll with a number of separate land masses and a deep lagoon. The majority of the population resides on the northern land mass. A passage from the open sea to the lagoon enables supplies to be landed on the island. At the southern end of the island some 8 N miles, is a small airstrip. An open boat and barge operates to facilitate passengers to the main northern island. This island is the most western of the Cook islands.
Nassau	1.3 (0.6)	73 (0.4)	Nassau is 673 nautical miles from Rarotonga. A small island mass with the community located generally in one village area on the south western corner. The closest island is Pukapuka a distance of 48 nautical miles away.
Manihiki	5.4 (2.3)	239 (1.3)	Manihiki is 650 nautical miles from Rarotonga. An atoll with two separate land masses and a very deep lagoon. Each land mass has its own Village with the population being split equally between the two. The Village of Tukao on the north side supports a small airstrip and both Villages have their own respective harbours (recent contract for upgrading has been let). This island is the central of black pearl production for the Cook Islands.
Rakahanga	4.1 (1.7)	77 (0.4)	Rakahanga is 674 nautical miles from Rarotonga. A small island with the population centralised in one area. This island's access is by way of motor launch from Manihiki - a distance of 24 nautical miles. Some time ago the airport was destroyed by a cyclone and has never been rebuilt due to the need to re-site it to a more secure location.
Penrhyn	9.8 (4.1)	213 (1.2)	Penrhyn is 737 nautical miles from Rarotonga. A large coral atoll with fringing land scattered about its outer reef system. The main village of Omoka is situated on the southern side and supports the majority of the population. The airfield and a deep water port within the lagoon are located in the Omoka village area. The deep water port is often used by fishing vessels that call to refuel.
Suwarrow	0.4 (0.1)	NIL	Suwarrow is 513 nautical miles from Rarotonga. This island is a pure atoll with entry to its lagoon available through a large opening in the reef. The island is registered as a World Heritage Park. Many visiting international yachts stop here on their south Pacific ventures between April and October at which time two caretakers are positioned on the island.
Total	**236.7**	**17,794**	

Notes:
The populations are from the 2011 National Census and are the total enumerated populations including visitors and excluding family members temporarily away.
In addition to the 14 islands listed above there is one more unpopulated island, Takutea, which is a bird sanctuary just off the coast of Atiu.

2.1.3 ECONOMIC OVERVIEW

12 The Cook Islands is a middle income economy,[4] which has made strong progress in measures of human development in education and health. The economy can be characterised as small, open, narrowly based but relatively affluent.[5] The economy is largely dependent on tourism. Flows of official development assistance also make a significant contribution to the economy, while remittances from Cook Islanders overseas are thought to be less significant (though difficult to measure).

13 Marine resources (fish and pearls) and agriculture make smaller contributions to the economy.[6] Exports of agricultural products and pearls have declined in recent years, while there has been growth in fish exports from a low base due to the transhipment of some offshore catch through Rarotonga. The major contribution to the economy from the fisheries sector continues to be fees associated with the licensing of offshore fishing vessels, while prospects exist for expansion of the local fishery, high value exports of fresh fish by air freight, and transhipment of frozen fish caught offshore. The large exclusive economic zone of the Cook Islands (1.8 million square kilometres) provides potential for new industries such as extraction of sea-bed minerals, though realisation of this potential may be well into the future.

14 Tourism is concentrated on the islands of Rarotonga and Aitutaki, while source markets are becoming concentrated on New Zealand and Australia as longer haul markets have declined (possibly due to a combination of the global financial crisis, and security concerns in the international arena encouraging potential visitors to holiday closer to home). MFEM forecasts visitor arrivals to reach 123,000 in 2013/14 (having reached the 100,000 level for the first time in 2009), with annual visitor numbers now more than nine times current estimates of the resident population. Visitor numbers are forecast to grow by 1.7 to 1.8 percent per annum over the next few years. Visitor expenditure is forecast to reach $NZ231 million in 2013/14, equivalent to 57 percent of forecast nominal Gross Domestic Product (GDP).

15 While income levels are relatively high, the economy is small and open. Economic performance is vulnerable to changes in international markets (particularly tourism source markets), and to natural disasters including cyclones and associated storm surges.

Table 2.2 Economic Indicators

Indicator	2011/12 actual	2012/13 estimate	2013/14 projected	2014/15 projected	2015/16 projected	2016/17 projected
Nominal GDP ($NZm)	371	390	409	425	433	444
Growth in real GDP (%)	0.7	2.5	2.4	-0.7	-1.1	-0.4
Inflation (% increase in CPI)	2.8	2.6	2.3	4.6	3.1	3.1
Public works ($NZm)	34	34	39	32	29	
Visitor arrivals (thousands)	117	121	123	125	127	130
Visitor expenditures ($NZm)	209	222	231	247	259	272
Pearl exports ($NZm)	0.6	0.3	0.2	0.2	0.2	0.2
Fish exports ($NZm)	3	8	12	12	12	12
Merchandise trade bal. ($NZm)	-138	-126	-128	-126	-127	-128
Services trade balance ($NZm)	209	222	231	247	259	272

Source: Pre-election Economic and Fiscal Update 2014, MFEM, 30 April 2014

16 MFEM estimates that annual growth in real GDP slowed from 2.5 percent in 2011/12 to 2.4 percent in 2012/13. Real GDP is forecast to decline by 0.7 percent in 2014/15, 1.1 percent in 2015/16, and 0.4 percent in 2016/17. MFEM attributes this decline to slower forecast growth in tourism and decreases in aid commitments.

17 The balance on merchandise trade is strongly negative (due to high levels of merchandise imports and limited merchandise exports), but more than offset by a strongly positive balance on trade in services (driven by tourism receipts), leading to a positive trade balance overall.

18 Expenditure on public works amounted to $NZ34 million in 2011/12, and is estimated to average just over $NZ33 million per annum over the following four years. This expenditure on public works includes economic infrastructure, but also includes expenditure on other public works including social infrastructure and public buildings.

2.1.4 OPPORTUNITIES AND CHALLENGES

19 The Cook Islands faces many challenges in the provision of infrastructure. Alongside the economic constraints set out above, other issues include:

[4] GDP per capita per year was estimated to be $NZ26,898 in 2013.
[5] Cook Islands: Macroeconomic Assessment, ADB Technical Assistance Consultant's Report, RETA 7681, June 2013
[6] Though the macroeconomic assessment cited above notes that the contribution of agriculture and fisheries to the economy is under-valued due to the exclusion of household production from GDP estimates.

- Small, decreasing population.
- Dispersed islands.
- Fragile natural environment vulnerable to climate change and natural hazards.
- Dependence on imported fuel and other goods.

20 At the same time the country is strengthening its reputation as a tourism destination, is fairly well advanced towards renewable energy providing the majority of its power, and may benefit significantly in the medium to long-term from seabed mineral extraction. The provision of infrastructure will play a major role in enabling the country to maximise its opportunities against quite significant obstacles.

2.2 National, Sector and Sub-sector Planning

2.2.1 NATIONAL DEVELOPMENT AGENDA

21 The national development agenda is framed by the National Sustainable Development Plan (NSDP).[7] The overarching national vision is 'To enjoy the highest quality of life consistent with the aspirations of our people, and in harmony with our culture and environment'. The NSDP sets out eight priority areas and identifies strategies and actions under each of these. The priority areas and the strategies relevant to CI NIIP area summarised in Table 2.3. The prioritisation process adopted by this CI NIIP reflects the aims within all of the priority areas (see Chapter 3).

Table 2.3 NSDP Goals and Strategies

Priority Area and Goal	Strategies Relevant to CI NIIP
Priority Area 1: Economic Development Goal: A vibrant Cook Island economy. 'A Cook Islands where ingenuity and connection to our culture and environment underpins the ability of our people to build business and enterprise to contribute to national economic growth'	Ensure our tourism destination excellence Unlock our potential from our marine resources Unlock our potential from our agricultural production
Priority Area 2: Infrastructure Goal: Infrastructure for economic growth, Sustainable Livelihoods and Resilience 'Our investment in infrastructure will maximise economic return, improve our peoples livelihoods and build resilience'	Improve access to and quality of water to our communities Improve our facilities to waste management Improve our transport infrastructure Improve telecommunications Strengthen our asset management Enable robust construction Build capacity in the infrastructure sector
Priority Area 3: Energy Goal: Energy security 'Renewable energy for energy security to enhance our economic growth, social development and environmental integrity'	Strengthen the institutional framework of the energy sector Utilise only proven renewable energy technologies Provide incentives for renewable energy Upgrade existing energy infrastructure
Priority Area 4: Social Development Goal: 'Opportunity for all people who reside in the Cook Islands. "A Cook Islands where all people who reside in our islands can enjoy opportunities to fulfil their potential, prosper and participate in the social, economic, political and cultural life of our communities and nation."	Ensure optimum health of our children and young people Provide quality health services for all Ensure gender equity and empower our women
Priority Area 5: Resilience Goal: Resilient and sustainable communities. 'A Cook Islands where our people are resilient to disasters and climate change to achieve sustainable livelihoods'	Ensure strong governance arrangements for disaster risk management and climate change adaptation Ensure that high quality risk information is available to inform planning and implementation Enhance effective preparedness, response and recovery Build resilience through effective disaster risk reduction and climate change adaptation
Priority Area 6: Ecological Sustainability Goal: Environment for living. 'A Cook Islands where we sustain our ecosystem and use our natural resources efficiently'	Improve the management and quality of our water resources through an integrated approach Improve water quality through better sanitation measures Implement waste minimisation programmes and provide appropriate facilities and incentives to support these with the purpose of achieving zero waste Implement an ecosystem approach to the management of marine resources Develop and implement interventions to ensure that land use is sustainable Protect our biodiversity and ecosystems

[7] The Cook Islands, Te Kavenga Nui, National Sustainable Development Plan 2011-2015, Office of the Prime Minister, 2011

Priority Area and Goal	Strategies Relevant to CI NIIP
Priority Area 7: Governance Goal: Good governance. "A Cook Islands that thrives on good governance principles."	Ensure that Government service delivery is efficient and effective Promote partnerships with civil society and the private sector Strengthen information and data collection, analysis and management for informed decision making Ensure access to information Improve accountability and transparency of public financial management
Priority Area 8: Law and Order Goal: A safe secure, just, and stable society. "A Cook Islands where the rule of law ensures safe, secure, just, stable and sustainable communities."	Improve our land management and land information systems

22 The NSDP is currently under review and a new version will be published in 2015. The revised version is expected to represent a significant overhaul of the document. In particular it is intended that the NSDP will be more closely linked with regular planning, budgeting and monitoring activities within Cook Islands Government (CIG). The indicators for monitoring NSDP will be revised to ensure that only those indicators that can be readily measured will be included. (For reference, the existing NSDP indicators are shown in Appendix J).

23 It is also expected that the 2015 NSDP will reflect a change of emphasis in development strategy that has occurred since the current version was prepared. This is a shift in emphasis towards development of the key economic centres of Rarotonga and Aitutaki. This is based on the premise that by supporting the growth of economic centres the benefits will spread to the whole country. This policy shift has been supported and promoted by major development partners such as New Zealand and ADB. Whilst CIG will continue to support investment in the outer islands it is likely that the share of funding will be more closely related to the distribution of population than in the recent past.

24 An indication of current strategy is provided in the ADB's Country Operations and Business Plan 2014-2016, which was agreed with CIG in 2013. This reports that the four priority areas identified by CIG are water and sanitation, renewable energy, governance, and ICT.

2.2.2 INFRASTRUCTURE MASTER PLAN

25 In 2007 a Preventative Infrastructure Master Plan (PIMP) for Cook Islands was prepared under the ADB's TA 4605-COO, Strengthening Disaster Management and Mitigation. The PIMP identified needs and project proposals throughout the country for transport, water supply, energy, sanitation, solid waste management, and telecommunications, as well as projects aimed at emergency management and climate change responses. Progress on implementation of the PIMP has been mixed and it has been used as more of a checklist rather than a guiding strategy.

26 A review of the PIMP undertaken in 2012[8] found slow progress and a number of shortcomings with the Plan itself and with the preparation process. These included:

- The format of the document is not easily digestible – over 500 pages
- There was only limited consultation outside the agencies responsible for infrastructure
- The Plan was not widely publicised when in draft or final version
- There was no clear champion for dissemination and coordination of the Plan
- The Plan is not well linked to other national strategies

27 From the point of view of CIG, one of the objectives of the CI NIIP is to address the weaknesses of the PIMP. The PIMP has therefore been one of the key reference points for the CI NIIP. The progress of projects by sub-sector is shown in Chapter 3.

2.2.3 ABSENCE OF SPATIAL DEVELOPMENT PLANS

28 Rarotonga is one of the few national capitals in the world with no urban development plan or zoning plan. Whilst the small scale of the urban area does not present some of the acute issues faced by larger capital cities, increasing pressure on land and increasing vehicle numbers will gradually create problems in the future. Experience in other Pacific islands shows that traffic congestion can occur with quite low volumes simply because of the limited road network, and as urban areas grow marginal land becomes increasingly attractive to developers. This marginal land includes wetlands that are essential as flood retention areas during cyclones and heavy rain. Most importantly in Cook Islands development controls are needed to protect the natural environment on which tourism and therefore the national economy are based.

29 The effectiveness of infrastructure planning will be hindered until national, island and urban spatial development plans have been prepared. These would highlight such things as focal points for urban growth, key areas for

[8] A First Quarter Review of the Cook Islands Infrastructure Master Plan (2007-2012), MOIP in association with Cook islands Tourism Corporation, 2011.

commercial and industrial activities, productive agricultural areas, tourism zones and ecologically sensitive areas to be protected. Such plans would enable infrastructure planners to identify high priority areas where investment will bring rapid and widespread results. They would also facilitate the assessment of opportunities for integrated infrastructure provision, or 'connectivity' – locations where multi-sector investments will complement each other and increase the effectiveness of the individual facilities. In addition, properly planned and coordinated infrastructure development outside the urban areas will go some way to checking rural to urban migration.

2.2.4 LAND ISSUES

30 Most infrastructure uses land. Disputes over land ownership are a common feature of projects throughout the Pacific islands where traditional land tenure systems do not gel well with modern approaches to development. Cook Islands is no exception and during consultations on CI NIIP land issues have been mentioned frequently and specifically in relation to several ongoing projects, including outer island airfields and solar installations. Due to the sensitivity of customary land, Government is reluctant to use its powers of compulsory acquisition (or 'warrant' as it is known in Cook Islands). This results in long delays in project implementation.

31 There is no quick fix for the land issue, but a legislative review would help. It is also apparent that land titles would benefit from review and modernisation. Existing records are not digitised and are often found to be inaccurate. A programme of digitised land titling would enable verification of all plot boundaries and streamlining of the system. It would also complement the land use planning process mentioned above.

2.2.5 INSTITUTIONS INVOLVED IN INFRASTRUCTURE PROVISION

32 Responsibilities for policy/planning, provision, and regulation of infrastructure are summarised in Table 2.4. As can be seen from the Table, the provision of infrastructure in the Cook Islands involves a large number of agencies, a surprisingly large number given the small population size of the country. This inevitably results in fragmentation of effort and investment, and limited coordination.

33 At the same time there is little regulation and oversight of services provision. Energy is currently the only infrastructure sub-sector with a regulating commissioner overseeing the performance of the service provider. Equally, the legislative background is patchy and out of date. A study of infrastructure service delivery undertaken under ADB technical assistance[9] recommends the establishment of a 'One Stop Shop' regulatory agency for the infrastructure sector, and a comprehensive review and update of the laws relating to infrastructure and development.

Table 2.4 Institutional Responsibilities

Sector	Scope of Services	Institution Providing Services	Regulation/ Monitoring	Planning/ Policy
National Planning	Development Economic Land	Policy & Planning OPM MFEM ICI/MOJ	National Sustainable Development Committee MFEM ICI/MOJ	Policy & Planning OPM MFEM OPM NB: No zoning plans
Air Transport	Airports (Pa Enua) International Airports (2)	Island Govt CIAA	MOT/Island Govt NZ Civil Aviation Organisation/MOT	Island Govt/OPM CIAA/CIIC
Road Transport	Roads Rarotonga Roads outer islands	ICI ICI	ICI/Police Island Govt/OPM	ICI/Police/MOT Island Govt
Marine Transport	Inter-Island Rarotonga & Aitutaki Ports Outer islands Ports	Private CIPA Island Govt/ICI	Min of Transport CIPA Not regulated	OPM CIPA/CIIC Island Govt/OPM
Water Supply	Rarotonga Outer islands	ICI Island Govt	Environment/MOH/ ICI Health	ICI Island Govt/OPM
Sanitation	National	Private	Public Health	Health/ICI
Solid Waste	Rarotonga Pa Enua	ICI Island Govt	Environment/Health Environment	ICI Island Govt/OPM
Energy	Rarotonga	Te Aponga Uira (TAU)	TAU Board	TAU/Energy Commission

[9] ADB TA-7287, Infrastructure Services Delivery Improvement, Mid-Term Report, September 2010, AECOM

Sector	Scope of Services	Institution Providing Services	Regulation/ Monitoring	Planning/ Policy
	Aitutaki	Aitutaki Power Supply	Island Govt	Energy Commission
	Outer islands excluding Aitutaki	Island Govt	Island Govt/ICI	Energy Commission
ICT	National	Telecom Cook Islands	Telecom Act No regulatory body	OPM
Education	Taku Ipukarea Kia Rangatira (strengthening Cook Islander identity)	MOE	MOE	MOE
	Learning & teaching	MOE, Private schools, USP	MOE	MOE
	Learning & the community	MOE, Private schools, USP	MOE	MOE
	Infrastructure & support services	MOE, CIIC. Private schools, USP	MOE	MOE
Health	Community Health Services	MOH, private doctors, private dentists NGOs, community health clinics	MOH	MOH
	Hospital Health Services	MOH, including referrals to Rarotonga and overseas	MOH	MOH
Other Infrastructure	Asset management / infrastructure services	CIIC, Private contractors	CIIC	CIIC
	Social policy and services (children and families, youth, people with disabilities, and women)	MOIA manages welfare payments, NGOs, families	MOIA	MOIA

Key to institutions: CIAA – Cook Islands Airports Authority, CIIC – Cook Islands Investment Corporation, CIPA – Cook Islands Ports Authority, ICI – Infrastructure Cook Islands, MOE – Ministry of Education, MOH – Ministry of Health, MOIA – Ministry of Internal Affairs, MOT – Ministry of Transport, OPM – Office of the Prime Minister, USP – University of the South Pacific

2.2.6 SECTOR AND SUB-SECTOR PLANS

34 Existing sector/sub-sector plans, strategies and studies are summarised in Table 2.5. The status of sector plans and strategies varies across infrastructure sub-sectors. For the sub-sectors without existing comprehensive investment strategies the team has assembled information from corporate plans, business plans, and other policy statements.[10]

[10] Note: The prioritisation process in CI NIIP has been designed to allow for the different levels of information available between sub-sectors. This will require a careful balancing act to ensure some commonality between sub-sectors but also not losing significant information available in the sub-sectors with more extensive data.

Table 2.5 Existing Sector Plans and Studies

Sector/Sub-sector	Sector Plans and Studies
Air Transport	NSDP 2011-2015 Priority Area 2 prioritises improvements to airstrips and terminals on Aitutaki, Atiu, Manihiki and Mangaia. PIMP 2007 prioritised international and domestic airstrip and terminal upgrade projects on Rarotonga, Penrhyn and Manihiki, and recommended a comprehensive transport policy study. ADB TA7287 Infrastructure Services Improvement Mid-Term Report September 2010 includes a draft transport policy (yet to be adopted). Airport Authority Statement of Corporate Intent 2013/14-2015/16 outlines plans to develop and upgrade airport infrastructure on Rarotonga and Aitutaki. Airport Feasibility Study Project Aitutaki, Atiu, Manihiki and Mangaia in the Cook Islands Report July 2013 outlines the scope of improvements and cost estimates. Ministry of Transport Business Plan 2013/14 key deliverables includes the development of a 10-year Transport Plan to provide guidance for planned initiatives.
Marine Transport	NSDP 2011-2015 Priority Area 2 identifies priority port development projects to be implemented. Ports Authority Statement of Corporate Intent 2013/14-2015/16 outlines plans to develop and upgrade port infrastructure on Rarotonga and Aitutaki. Ministry of Infrastructure and Planning / Infrastructure Cook Islands Business Plan 2013/14 (Output 2) includes completion of and designs for new harbour developments in the outer islands.
Road Transport	Te Kaveinga Nui National Sustainability Development Plan (NSDP) 2011-2015 Priority Area 2 provides in broad statements the strategy for improving transport infrastructure and road management. Strengthening Disaster Management and Mitigation (Component 2: Preventative Infrastructure Master Plan) (PIMP) 2007 identifies priority projects for implementation over the short and long term. Ministry of Infrastructure and Planning / Infrastructure Cook Islands Business Plan 2013/14 (Output 2) includes the development of a 3-year road sector plan for Rarotonga, plans and designs for upgrading 15 roads on Rarotonga, and the completion of 5 kilometres of road improvements in Avarua (Project City).
Water Supply	NSDP 2011-2015 Priority Area 2 outlines the strategy for improving community access to water. CI National Integrated Water Resources Policy 2013 (draft) establishes policies that will guide planning, actions and efforts in ensuring the sustainable management of water resources in the Cook Islands. Water Supply Master Plan for Rarotonga (draft) sets out the overall objectives of the Te Mato Vai water partnership project and defines the design scope and standards, level of water treatment, and total project cost estimates. Cook Islands Sanitation Policy 2013 establishes the principles and objectives that form the framework for future sanitation strategies, plans and solutions that will address the sanitation needs of the Cook Islands.
Sanitation	Rarotonga and Aitutaki Sanitation Assessment Prepared for Cook Islands Ministry of Infrastructure and Planning (now ICI) by Beca International Consultants Ltd (Beca), September 2012 Sanitation in the Cook Islands 3-year Plan 2013-2016 outlines the activities to be undertaken to improve sanitation systems and monitoring on Rarotonga and Aitutaki, and to scope the upgrades on other outer islands. Public Health (Sewage) Regulations 2008 and Public Health Sewage Code 2008 sets out the minimum standards for domestic and commercial sanitation systems. Ministry of Infrastructure and Planning / Infrastructure Cook Islands Business Plan 2013/14 (Output 4) supports the delivery of water and sanitation improvement initiatives.
Solid Waste Management	NSDP 2011-2015 Priority Area 2 sets the policy for the National Solid Waste Management Strategy (NSWMS). NSWMS 2013-2016 outlines the priority areas and key objectives, and sets the way forward. It includes putting in place the legal and funding framework to support waste management and control. Ministry of Infrastructure and Planning / Infrastructure Cook Islands Business Plan 2013/14 (Output 4) includes implementation of the NSWMS priority activities.
Energy	NSDP 2011-2015 Priority Area 3 sets out government's policy, goals and key objectives for transforming the country's electricity sector, from fossil fuel to renewable energy sources. The CI Renewable Energy Chart (CIREC), CIREC Implementation Plan and CIREC Implementation Plan Island Specific sets the strategy and approach on energy transformation targets. The Plans were due to be reviewed in 2013/14 to reflect the revised timeframes and financing plans for each island.

Sector/Sub-sector	Sector Plans and Studies
Energy	Te Aponga Uira Statement of Corporate Intent 2013-14-2015/16 outlines plans to develop and upgrade energy generation and grid infrastructure on Rarotonga, to meet 100% renewable energy targets set out in the Renewable Energy Chart. Office of the Prime Minister Business Plan 2013/14 outlines the timeframe for renewable energy developments on each island and energy efficiency programmes, and its plans for reducing energy demand. Aitutaki Power Supply Business Plan 2013/14 includes plans to maintain and upgrade the reticulation network system on Aitutaki (transfer from overhead to underground).
Information and Communication Technologies (ICT)	NSDP 2011-2015 Priority Area 2 outlines the strategy for improving telecommunications, including strengthening regulatory frameworks that result in better infrastructure and services. National ICT Policy 2010 is the policy document with the objective of providing an ICT strategic framework to facilitate the socio-economic development of the Cook Islands. Office of the Prime Minister Business Plan 2013/14 outlines its plans to develop an ICT Strategic Action Plan to effectively implement the National ICT Policy, with appropriate Monitoring and Evaluation framework in place. The plan will be implemented from 2014/15 onwards.
Multi-sector	Joint National Action Plan on Disaster Risk Management and Climate Change Adaptation 2011-2015 (JNAP DRM CCA) outlines the policy, strategies and financing plans for strengthening key coastal infrastructure, promoting long term water security and strengthening sanitation infrastructure, and strengthening energy transportation, supply and storage systems in the outer islands (Strategic Area 4). Tourism Master Plan 2005-2015 Destination Development Strategy
Education	NSDP 2011-2015 Priority Area 4 prioritises increasing access to and participation in Early Childhood Education, ensuring that every child is literate and numerate by the end of Year 8, implementing the Inclusive Education Policy, improving the use of online education for Pa Enua students, providing information on career opportunities, enhancing tertiary training, and supporting Community Education Programs and Life Skills Programs in communities. The Education Master Plan (2008-23) identifies the strategic vision for Education as: …to build the skills, knowledge, attitudes and values of Cook Islanders to put their capabilities to best use in all areas of their lives. It addresses four focus areas: Taku Ipukarea Kia Rangatira (strengthening a learner's identity as a Cook Islander), learning and teaching, learning and the community, and infrastructure support. Ministry of Education Business Plan 2014/15 key deliverables with direct implications for social infrastructure include: Equitable access for all learners to quality learning programmes Increased enrolment in Early Childhood Education Centres Increased access to vocational courses at senior level Significantly increased participation in tertiary education Increased number of accredited institutions and courses available in-country High quality buildings, grounds and facilities Ministry of Education's infrastructure is robust, fit for purpose and stakeholder accessible
Health	NSDP 2011-2015 Priority Area 4 prioritises ensuring the optimal health of children and young people (through measures including quality ante-natal and maternity care, maintaining high rates of immunisation, and reducing teenage pregnancy), providing quality health services for all (through measures such as use of telemedicine, engaging with New Zealand for specialist services, and re-opening the Nursing School to improve training and capacity), and combatting Non-Communicable Diseases (through implementing a national strategy and action plan, and promoting healthy lifestyles). The Cook Islands National Health Strategy 2012-2016 has the following priorities: enhancing the infrastructure of the health system and supporting on-going health governance and organisational reforms; promoting partnerships for institutional capacity development; strengthening health sector policy, planning and regulations, improve data collection, monitoring and evaluation; promoting gender sensitive research and analysis; strengthening community capacity and capability on social determinants of health; and improving information, communication and technology systems and strategies, to provide accessible and accurate health information. Ministry of Health Business Plan 2014/15 key deliverables with direct implications for social infrastructure include: Maintain and improve partnerships to address mental illness, disabilities, elderly and palliative services Strengthen patient referral processes Strengthen infrastructure and healthcare systems to encourage healthier lifestyles and safer environments Reopen the Cook Islands Nursing School to increase the number of Cook Islands qualified nurses to sustain the long term delivery of nursing care.

Sector/Sub-sector	Sector Plans and Studies
Other Infrastructure	NSDP 2011-2015 Priority Area 4 prioritises ensuring gender equality and empowering women; guaranteeing that children are safe and well cared for; that youth are given the opportunity to grow as valuable members of society, that persons with disabilities are valued and included in development, and that the aged are acknowledged for their contribution to society and looked after; ensuring strong families and communities; access to opportunities for leisure, recreation and sports; and preserving and promoting culture, language and social heritage. Ministry of Internal Affairs Business Plan 2014/15 key deliverables with direct implications for social infrastructure include: Ensuring compliance with the Disability Act 2008 Implementation of the Cook Islands National Policy on Disability Inclusive Development 2014-2015 Implementation of the National Policy on Gender Equity and Women's Empowerment The National Youth Policy is in place to guide investment and development in the youth sector CIIC Business Plan 2014/15 key deliverables with direct implications for social infrastructure include: Staff across government (including CIIC, ICI, SOEs, MFEM and Island Councils) equipped to operate, maintain and update asset management registers, plans and software. Asset registers and assets effectively maintained. Government buildings and houses meet the minimum levels of service. Rationalised land requirements. Reduced land costs and landowner complaints/grievances. Rationalised decisions for retention and disposal of assets. Minimise waste and ensure consistency in decision making. Rationalised, timely and coordinated delivery of infrastructure projects. Duplication and waste eliminated or minimised.

2.3 Demand for Infrastructure

2.3.1 THE DRIVERS OF DEMAND FOR INFRASTRUCTURE

35 The demand for infrastructure is driven by a range of factors. In Cook Islands these include:

- Increasing economic activity, particularly tourism
- The overarching goal to improve quality of life of Cook Island citizens
- The trend for increased business and social connectivity through improved and expanded technology
- The need to prepare for climate change and disaster management
- The aim to achieve increased sustainability, particularly through renewable energy

36 In many countries population growth and rural-urban drift are major factors in the need for improvement and extension of infrastructure, particularly in urban areas. In Cook Islands this is not the case as the resident population has shown a slow decline over the last decade. Nevertheless one driver of investment in economic infrastructure is the need to provide an adequate level of services to a population dispersed over a vast area of the Pacific Ocean.

37 To some extent demand is also driven by Government policy. For instance its commitment to developing the country as a tourist destination calls for the provision of services and facilities beyond those that would be required just for the resident population, particularly large scale infrastructure in Rarotonga and Aitutaki.

38 Key drivers and indicators of demand are summarised in Table 2.6.

Table 2.6 Drivers of Demand

Driver	Factors
National Goals for Infrastructure	Overriding goal in the NSDP: "Our investment in infrastructure will maximise economic return, improve livelihoods and build resilience" Specific aims: Improve access to and quality of water to our communities Improve facilities for waste management Improve transportation infrastructure Improve telecommunications
Visitor Numbers	116,844 in 2011/12 forecast to grow to 129,700 2016/17 April 2014 saw the second highest ever number of arrivals for that month[11] .
Economic activity	Real GDP: Around 2.5% average annual growth over the last 2 years Forecast average growth of -0.7% in GDP in next 3 years Visitor Spending: $209.3m in 2011/12 forecast to grow to $272.0m in 2016/17 Pearl Exports: $0.6m in 2011/12 forecast to decline to $0,.2m in 2016/17 Fish Exports: $2.6m in 2011/12 forecast to grow to $12.1m in 2016/17
Access to Basic Services	Relatively high levels of access to services for majority of population, but varies significantly between Rarotonga and other islands. Strong demand for improved quality (e.g. water), and reduced costs (e.g. electricity and internet). Ambitious national targets for renewable energy.
Compliance with standards	International safety standards for Rarotonga airport. Airline requirements for outer island runways and safety equipment. International maritime standards for hydrographical data. Water quality standards for drinking water. Environmental water quality standards for lagoons.
Climate Change, Disaster Risk	Infrastructure design adaptations to cater for expected climate change: increase in average air temperature and sea surface temperature of 0.5-0.9°C in the Northern Group and 0.4-1.0°C in the Southern Group by 2030 average annual and seasonal rainfall projected to increase, for the Southern Group average rainfall during the wet season is expected to increase, droughts become less frequent, extreme rainfall days are likely to occur more often decrease in the number of tropical cyclones but increase in maximum wind speeds by 2-11% and an increase in rainfall intensity of about 20% within 100km of the cyclone centre sea level rise of 4-15 cm by 2030

2.4 Infrastructure Status

39 This section describes the status of infrastructure by sub-sector is provided in A. A summary is shown in Table 2.7.

Table 2.7 Summary of Key Infrastructure

Sub-sector	Summary of Infrastructure Performance
Transport - Land	**Rarotonga** Service Provider: Infrastructure Cook Islands (ICI) Total road network 295 km of which 70% sealed 2.7 km hot mix finish, remainder chip seal. **Outer Islands:** Service Provider: Outer Island Governments Other than Aitutaki, roads on most outer islands are unsealed
Transport - Aviation	**Rarotonga and Aitutaki** Service Provider: Cook Islands Airports Authority **Rarotonga** International Airport (concrete paved) 2013 Movements:* International aircraft 2,398 International passengers 266,516 Domestic movements 5,663 Domestic passengers 69,266 **Aitutaki** Airport (chip sealed) 2013 movements : Aircraft 3,214 Passengers 55,573 **Outer Islands:** Service Provider: Outer Islands Councils, Administrations, Community Groups with technical support from MOIP and CIAA. Airports in Atiu, Mangaia, Mauke and Mitiaro in the Southern Group (coral runways) Airports and Manihiki, Penrhyn and Pukapuka in the Northern Group (coral runways *Movements include both in and out flights

[11] Cook Island News, Saturday 17th May 2014

Sub-sector	Summary of Infrastructure Performance
Transport - Maritime	**Rarotonga** Service Provider: CI Ports Authority (for Rarotonga and Aitutaki) 1 International Port and 1 Cruise Jetty (for adverse weather conditions) 2013 Rarotonga Port Statistics Ship movements 50 Tonnage 58,230 tonnes Number of containers 2,376 **Aitutaki** Number of containers 373 **Outer Islands:** Service Provider: Outer Island Governments (with technical support of ICI and CIPA) Varying condition of wharves, anchorages, and jetties in outer islands
Water supply	**Rarotonga:** Service Provider: Infrastructure Cook Islands Number of connections: 5,400 Population served: 8,400 Volume of water produced: 7.20 m3/day/connection Coverage in service area: 92 % Hours per day service: 24 Water tariff: Nil **Outer Islands** Service Provider: Outer Island Governments Small distribution systems in some islands Some rainwater tanks
Sanitation	Septic tank systems on all islands with treated wastewater disposal to subsurface soakage Septic tanks generally not well maintained In Rarotonga septic sludge is collected and deposited at the landfill site. There is no sludge collection on the other islands.
Solid Waste Management	**Rarotonga**: Service Provider: Infrastructure Cook Islands - WATSAN Unit Rarotonga Landfill and settling ponds in Rarotonga Collection by private contractors: Approximately 320 tonne per month in Bales. Tipping fees at the landfill Car Boot & small truck $ 10 Utility & commercial Bin/Skip $ 20 Truck Load $ 40 Liquid Waste (4,000 Litres) $ 50 **Outer Islands** Service Provider: Outer Island Governments Managed landfill site in Aitutaki Dump sites at Outer Islands
Energy	**Rarotonga** Service Provider: Te Aponga Uira (100% CIG) Generation Capacity 12.7 MW, (Service provider Te Aponga Uira – 100%) Actual Capacity 10.25 MW, Peak Demand 4.49 MW Customers: 4,631 Average tariff: NZD 0.78 per kWh Solar Input to grid 700 kW Currently renewable sources provide about 6-7% of total, and is expected to reach around 20% by mid-2015 **Outer Islands** Service Provider: Outer Island governments with technical support of ICI/TAU Generators and small distribution systems on some islands Solar PV being introduced starting with Northern Group
ICT	**Cook Islands** Service Provider: Telecom CI (40% CIG/60% Telecom NZ). Mobile subscribers 11,500 Landlines, 7,800 available to 98% of the population Broadband connections, 2,700 available to 98% of the population Underground fibre cable loop around Rarotonga 3G mobile internet service started 1st March 2014. Internet speed 2mb/s – 12mb/s on Rarotonga and 256kb/s – 1mb/s in Pa Enua
Education	25 Early Childhood Centres (1 stand-alone, and 24 combined with other schools), catering for 460 students and 33 teachers (2014) 11 Primary Schools, 4 Secondary Schools, and 15 Area Schools, catering for 1843 primary students, 111 primary teachers, 1718 secondary students and 124 secondary teachers (2014) 2 Tertiary Education Facilities (Cook Islands Tertiary Training Institute, USP Centre)
Health	2 Hospitals (Rarotonga and Aitutaki), providing 144 beds 6 Health Centres 9 Outpatient clinics 14 Dental clinics

Sub-sector	Summary of Infrastructure Performance
	51 Child Welfare Clinics MOH employs 296 health care and administrative professionals (including 25 medical officers and 7 dentists), with 77 working in Pa Enua
Other Infrastructure	Government housing stock (47) Government offices (various)

2.5 Sub-sector Assessments

40 This section provides an analysis of the current situation in each infrastructure sub-sector, the key issues and any existing strategies. This includes an analysis of the progress made on the projects proposed by the 2007 Preventative Infrastructure Master Plan (PIMP), and their status in the current list of proposed projects held by CIIC. The CI NIIP priority projects and complementary activities for each sub-sector are shown in Chapter 3.

2.5.1 AIR TRANSPORT

Current Situation

41 Rarotonga has an international airport with a 2,400 metre concrete strip opened in 1974. Improvements including instrument landing system, new navigation aids, enlarged arrivals, departure and baggage areas have evolved over time. Aitutaki the next busiest airport has a 1,800 metre chip-sealed surface strip serviced regularly by Air Rarotonga's 36 seater Saab aircraft.

42 Each of the other islands have their own loose surfaced airstrips, generally managed by land owners, and poorly maintained as insufficient funds are put back into maintenance. A 12-seater Bandarantie aircraft operated by Air Rarotonga services the Northern and Southern Groups. These services are rather irregular to the north, with relatively expensive airfares and severe freight restrictions, while more regular services with freight capacity operate to southern group.

43 Air Rarotonga has a policy of operating the turboprop Saab aircraft only into sealed strips in line with Pacific-wide policy for turbo prop aircraft operation. This therefore restricts use of this aircraft to the Rarotonga and Aitutaki services at this time.

44 The growth in tourism with passenger movements reaching over 250,000 per year continues to strain the facilities at the Rarotonga International Airport and terminal upgrading is needed. A review and master plan was ongoing at the time of preparing the CI NIIP.

45 The upgrade of each island's airstrip to provide a sealed surface has been a consideration over many years. The highest priority strip for upgrade is Atiu given the island's increasing tourism growth. Other southern group strips should be considered for sealing while the Mangaia strip needs to be relocated to provide sufficient length for operations.

46 There has been strong demand from residents of the Northern Group for operation by Saab aircraft. However, recent population decreases mean that such a system would be economically marginal at best, and it would be difficult to sustain even taking into account opportunities for increased freight carriage resulting from a larger aircraft. Services to the Northern Group by Saab would require a minimum of two suitable airports so as to provide alternates in case of bad weather and other emergencies, in accordance with Civil Aviation rules. Air Rarotonga has advised that it would operate the Saab into an upgraded sealed airstrip at Manihiki, using the loose surface airstrip at Penrhyn as the alternate.

47 The sealing of all airstrips would provide consistent operating surfaces and reduced maintenance costs. In the longer term talk of an international facility in Aitutaki is very much dependant on growth in accommodation and room stocks and is more probably a consideration in 20 plus years.

Table 2.8 Air Transport Projects Proposed by the 20-Year PIMP, 2007

Term	Proposed PIMP Projects	Completed	Modified	Ongoing	On CIIC list
1-5 Years	Penrhyn Airport Improvement				■
	Manihiki Airport Improvement				■
	Pukapuka Airport Improvement				■
	Rarotonga Airport Passenger Terminal Improvement				■
6-20 Years	Rarotonga Airport Cyclone Protection Works				■
	Atiu Airport Improvement				■
	Mauke Airport Improvement				■

Term	Proposed PIMP Projects	Completed	Modified	Ongoing	On CIIC list
	Mitiaro Airport Improvement				■
	Mangaia Airport Development				■
	Aitutaki Airport Improvement for International Operations				a
Note: a – Beyond 20-year programme					

Strategies

48 The sub-sector strategy in the PIMP included the following:

- Provide the necessary standard of safety, aircraft and passenger handling capacity, and levels of service at Rarotonga to meet the requirements of international civil aviation.
- Increase the passenger and cargo capacity and frequency of air service provided to the Outer Islands.
- Increase the reliability of service so that flights are not cancelled through fuel shortages or runway damage
- Reduce the operating costs of air transport services.
- Ensure airport facilities satisfy MOT and International Civil Aviation Organisation (ICAO) safety requirements through repair, upgrading, operation and maintenance of airport facilities to prescribed standards.
- Implement the necessary climate change adaptation measures to ensure airports are not made inoperable by extreme weather events.

49 The NSDP calls for the improvement of airports, terminals and airstrips beginning with Aitutaki, Atiu, Manihiki and Mangaia.

50 There has been little progress on any of the PIMP or NSDP proposals.

51 At the time of preparing this CI NIIP a study funded by the European Investment Bank (EIB) was being undertaken – 'Technical Assistance for the Development of the Cook Islands Airports Upgrade Project'. The findings of the TA are likely to influence the strategy for aviation investments as the study includes the following: (a) Rarotonga aiport navigational aids, (b) Rarotonga airport upgrade, (c) feasibility study into the use of renewable energy for the electricity requirements of the Cook Islands Airport Authority, (d) a strategic plan for Cook Islands Airport Authority, and (e) a business plan for Rarotonga airport.

Table 2.9 Summary of Issues and Strategies, Air Transport

Sub-sector	Issues	Strategies
Transport - Aviation	Poor maintenance Land ownership issues Reducing populations in outer islands and economic viability of operations High cost of fares especially to Northern islands Fragmented institutional responsibilities	Improved maintenance All weather sealed strips for key islands Review institutional options Reduce the operating costs of air transport services Implement the necessary climate change adaptation measures to ensure airports are not made inoperable by extreme weather events

Table 2.10 Air Transport Projects on the Long List

Project	Estimated Cost ($NZm)*
Aitutaki Upgrade of airport to international standard	27.3
Aitutaki Airport 2nd aircraft pad	0.06
Atiu Airport Upgrade (Part 139)	3.9
Atiu Airport repairs	0.02
Manihiki Airport Upgrade (Part 139)	4.3
Mauke Airport Repairs and Improvements	1.0
Mitiaro Airport Repairs and Improvements	1.0
Penrhyn Airport Repairs and Improvements	1.0
Rarotonga Airport Terminal Improvement (phase 2)	9.3
Rarotonga Airport Instrument landing upgrade	3.2
Rarotonga Runway Repairs (joints)	1.0
*Note: Estimated costs for projects on the long list were not fully verified unless the project qualified for prioritisation	

2.5.2 MARINE TRANSPORT

Current Situation

52 Following recent major reconstruction of Avatiu Port together with climate proofing and extension to storage and operational areas, the principal port on Rarotonga is adequate for the next 20 years or so. Berthing for larger container vessels and small cruise ships is possible within Avatiu harbour. Height restrictions apply due to the airport approach and take-off clearance requirements, restricting certain vessels from berthing. The completion of the cruise ship jetty on the western side of Rarotonga offers an alternative for cruise ship operators to allow visitors to venture ashore when conditions at Avatiu would otherwise force these ships to bypass Rarotonga.

53 The works at Avatiu also provided for local marine/fishing operators but is operating at capacity. A Japanese funded, jetty and concrete launching ramp is presently under construction at the Avana Harbour in the Muri area.

54 The first stage of improvements in Orongo port on Aitutaki have recently been completed. In the other islands in the Southern Group Recent works have included the upgrade and climate proofing of harbours in Mauke, Mitiaro, and Mangaia. Other outer islands have basic harbour facilities that require climate proofing and or refurbishment.

55 The growth of the fishing industry particularly in the area of the Northern Group islands offers opportunities for refuelling and resupplying in the 'in lagoon port' at Penrhyn. The upgrade of this facility together with increased fuel storage could provide greater economic gains in the north. There are presently concerns about the location of the 60,000 litre fuel storage tank and the need for secure cyclone protection works.

56 The 'Orongo' project that includes a marina in Aitutaki will provide an opportunity to grow the cruise yacht business, an area of activity on which the Cook Islands largely misses out due to lack of facilities. Estimates are that up to 1,000 yachts traverse the South Pacific from French Polynesia through the Cook Islands waters on their way to Fiji and Tonga every season, with the Cook Islands receiving small numbers due to the lack of facilities and good berths. This project will have considerable benefits to island trading ships, fishing vessels and barge operators, by offering passage into the harbour with tie up berthage. Most trading ships presently have to be offloaded onto small barges for transfer to shore.

57 Increased berthage for local fishing boats and visiting yachts is planned by Cook Islands Ports Authority (CIPA) through improvements at the 'western access' small boat facility in Avatiu. A similar project at the Avana harbour would also meet the demand created by visiting yachts and local boats.

Table 2.11 Marine Transport Projects Proposed by the 20-Year PIMP, 2007

Term	Proposed PIMP Projects	Completed	Modified	Ongoing	On CIIC list
1-5 Years	Atiu Harbour Repairs		■		
	Manihiki Harbours Reconstruction			■	
	Nassau Harbour Development		■		
	Mangaia Harbour Reconstruction	■			
	Mauke Harbour Reconstruction	■			
	Mitiaro Harbour Reconstruction	■			
	Penrhyn Harbour Rehabilitation				■
	Avatiu Harbour Western Basin Development Completion				
6-20 Years	Avatiu Container Facilities Development	■			
	Avarua Waterfront Protection				
	Pukapuka Jetty Development				■
	Rakahanga Harbour Improvement				■
	Avatiu Harbour Waterfront Development				
	Avatiu Harbour Expansion	■			
	Aitutaki Harbour Development			■	

Strategies

58 The sub-sector strategy in the PIMP included the following:

- Provide the necessary harbour, berth and cargo handling capacity required to meet traffic requirements in terms of size and draught of vessels, number of vessels and volume and type of cargo.
- Provide operational efficiencies and level of service at Avatiu and Aitutaki Harbours to minimise shipping and facilities operating costs.

- Provide fit-for-purpose harbours which remain sufficiently calm to allow boats to operate in most sea conditions.
- Provide robust, durable harbour structures able to survive damage in all but the most extreme weather conditions.
- Increase safety for seamen and reduce damage and losses of vessels, cargoes and equipment
- Increase the frequency of inter-island shipping service.
- Reduce the operating cost of inter-island shipping service.
- Increase the level of service provide for passengers on inter-island shipping services.
- Minimise adverse impacts on the marine environment.

59 The NSDP calls for the continued upgrade of ports beginning with Manihiki, Rakahanga and Aitutaki.

Table 2.12 Summary of Issues and Strategies, Marine Transport

Sub-sector	Issues	Strategies
Transport - Marine	Poor maintenance Vessels not able to travel to remote islands because it is uneconomical.	Repair and rehabilitation Support for uneconomic local shipping routes

Table 2.13 Marine Transport Projects on the Long List

Project	Estimated Cost ($NZm)
Orongo Marina and Town Centre Development	15.0
Manihiki Tukao & Tauhunu Harbour Upgrade	2.8
Penrhyn Port Facilities and Fuel Depot relocation.	4.0
Pukapuka Jetty, Channel and Causeway	0.7
Rakahanga Harbour Improvement	0.15
Tuituikaimoana Marina Development	35.0
Avana harbour upgrades	0.7

2.5.3 ROAD TRANSPORT

Current Situation

60 On Rarotonga a ring road circles the island close to the beach and lagoon. An inner ring road, ranging from about 300m to 1km inland from the main ring, provides about 70 percent of a complete circle. Both these road networks are chip sealed. The inner road is quite narrow along much of its length. A 2012 programme of resurfacing using asphaltic concrete wearing course runs from the airport entrance around the western end of the airport for a distance of 2.7 kilometres on the main road.

61 A significant factor in road damage is the lack of control of axle weights and the operation of overweight vehicles on the road system. Increased traffic on Rarotonga together with tourist traffic, including an increase in cycling, has created the need for a substantially improved foundation and road surface. Constraints to improvement are the limited right of way (about 10m), and the minimal roadside drainage. The target is to provide asphaltic concrete surfacing to the majority of the main ring road particularly through major villages with the inland and connecting roads finished with a chip seal.

62 Project City is set to start at the end of the 2014 financial year. This will provide for 4.5 km of road reconstruction between the airport entrance into Avarua and through Tupapa and surrounding roads recently damaged during the laying of new water mains.

63 The Muri area carries some of the highest pedestrian traffic outside of the main township due to the high density of tourist numbers. Road widening and the provision of footpaths is needed here.

64 Aitutaki has a considerable length of good width sealed road on main distributors with loose clay elsewhere. The southern group outer islands have minimal lengths of sealed road within their main villages. All northern group roads are coral sand based with loose surfacing, while much of the southern group is clay-based with loose surface.

Table 2.14 Road Transport Projects Proposed by the 20-Year PIMP, 2007

Term	Proposed PIMP Projects	Completed	Modified	Ongoing	On CIIC list
1-5 Years	Inner Ring Road Improvement Nikao-Takuvaine		■		
	Rarotonga Road Safety Program		■		
	Outer Islands Road Improvement Program				■
	Rarotonga Traffic Management Improvements		■		
	Aitutaki Road Improvements				■
6-20 Years	Rarotonga Main Ring Road Rehabilitation				■
	Rarotonga Inner Ring Road Development				■

Strategies

65 The sub-sector strategy in the PIMP included the following:

- Reduce the number of road accidents, serious injuries and deaths.
- Introduce effective traffic and parking management measures to maintain the physical environment and village ambience in the Avarua area.
- Ensure the integrity of the main road network in Rarotonga in providing access to key infrastructure and services even with the occurrence of cyclones and other extreme weather events.
- Rehabilitate, strengthen and maintain road pavements and drainage structures to preserve road assets and minimise total road transport cost (combined road user and agency costs)
- Provide all-weather road access to key infrastructure and services in each of the Outer Islands.

66 The NSDP identifies two actions:

- NSDP: Improve our roads in conjunction with improvements of water, energy and telecommunications distribution networks.
- Establish PPP in road management and take into consideration road safety and the impacts of disasters and climate change in all engineering specifications.

Table 2.15 Summary of Issues and Strategies, Road Transport

Sub-sector	Issues	Strategies
Transport - Land	Poor maintenance on existing unsealed and sealed roads Inadequate recurrent budget for government to maintain all roads and to build new ones Institutional capacity of ICI needs to be strengthened. Narrow road rights of way (land issues are an obstacle to widening) Overweight vehicles with no controls or monitoring	Repair and rehabilitation of the road network. Improve operation and maintenance systems and standards Improve resilience of the transport network to the effects of climate change by improving design and protecting networks

Table 2.16 Road Transport Projects on the Long List

Project	Estimated Cost ($NZm)
Road sealing project for Aitutaki	0.8
Mangaia Road Rehabilitation: town area (3km)	0.6
Atiu & Mitiaro Roads Rehabilitation	2.0
Mauke Road Rehabilitation: town & and plantation roads	0.9
Aroko Road Widening Project	0.4
Avatiu Valley Bridge Upgrade	1.5
Avarua Bridges	5.0
Muri area upgrade with footpaths	1.5
Project City Stage 3 - sealing Aquarius to Tupapa	5.0

2.5.4 WATER SUPPLY

Current Situation

67 The ability of ICI to guarantee clean water 24 hours a day is hampered by old pipe networks, minimal storage, poor filtration, and significant network losses. In the recent past supply on Rarotonga has regularly been interrupted for at least 50 percent of its population. Residents in higher elevations lose pressure regularly while distribution and availability to lower lying areas continues to be erratic as gallery intake pressures reduce.

68 In 2013 upgrading including new mains and laterals was undertaken from the airport entrance in Nikao to the village of Tupapa and surrounding areas. Included in these works was the upgrading of the Takuvaine intake and trunk line.

69 A major project, Te Mato Vai (TMV), recently commenced on Rarotonga. This is an endeavour to provide a clean, reliable water supply to Rarotonga by 2016. Initial works involve the refurbishment and replacement of all intakes, trunk mains, and round island mains, with the exception of Takuvaine intake that was completed as part of the 2013 upgrades.

70 Further works will include:

- Treatment works and storage reservoirs required at each of the 12 intakes.
- Installation of pressure return valves on the intake lines, flow meters, and backflow prevention devices is being recommended to facilitate effective management of the network.

71 Smaller and peripheral projects have been identified and include:

- The continuation of the subsidised private water tank project
- Detailed investigation into Rarotonga's groundwater resources
- Installation of booster pumps to supply properties over 30metres above mean sea level
- Initiatives to address customer side leakage across Rarotonga
- The implementation of supervisory control and data acquisition systems.

72 The islands in the Northern and Southern Groups experience limited water availability, which is typical of small islands. Recent water tank programmes have improved the situation but usage continues to outstrip storage capacity. All islands require further investment increased storage capacity, upgraded and refurbished galleries and better reticulation.

Table 2.17 Water Supply Projects Proposed by the 20-Year PIMP, 2007

Term	Proposed PIMP Projects	Completed	Modified	Ongoing	On CIIC list
1-5 Years	Replacement of old sections of the distribution sub-main on Rarotonga			■	
	Installation of distribution system isolation valves on Rarotonga			■	
	Mauke water supply distribution system upgrade	■			
	Mangaia water supply distribution system upgrade				■
	Northern islands community rainwater catchment & storage refurbishment				■
	Supply and installation of household rainwater systems for northern islands			■	
	Aitutaki water supply headworks upgrade				■
	Atiu water supply system upgrade				■
	Mitiaro water supply system upgrade				■
6-20 Years	Rarotonga distribution network rehabilitation			■	
	Supply and installation of property connection meters on Rarotonga				■
	Construction of Rarotonga water treatment facilities				■
	Construction of disinfection facilities on the southern islands				■
	Construction of Aitutaki water treatment plants				■
	Northern islands EMC water storages rehabilitation/construction				■
	Rarotonga water loss reduction program			■	
	Southern islands EMC water storages rehabilitation/reconstruction		■		
	Installation of property service meters southern islands		■		

Strategies

73 The sub-sector strategy in the PIMP included the following:

- Short term - Focus on service delivery by upgrading supply capacity and capability through rehabilitation of the headworks on most of the islands and provision of new rainwater tanks for the islands in the Northern Group.
- Medium Term - Focus on improving water quality in the southern islands where a reticulated water supply system is in place.
- Long Term - Focus on the period 2017-2027 on asset maintenance and upgrade and system expansion. Also consideration of a reticulated system for non-potable water on the northern islands in order to improve the quality of life and service.

74 The NSDP identifies a number of actions:

- Develop a national policy and plan for the management of water resources
- Develop the legislative and regulatory framework for the management of water resources
- Improve data collection and analysis for water resource management
- Rehabilitation of water intakes
- Upgrade water galleries
- Work on the ringmain and distribution lines
- Increase water harvesting and storage
- Promote and implement most viable options to ensure safety and quality of water
- Implement cost recovery measures for the delivery of water.

Table 2.18 Summary of Issues and Strategies, Water Supply

Sub-sector	Issues	Strategies
Water Supply	In summary, the main issues in the water sector are corroded and leaking pipelines leading to high losses and inefficient operation of the distribution systems, unmanaged demand, and the lack of awareness of the need for water conservation or of the public health risks that come from a non-treated water supply. Poor maintenance Old pipe network Poor to non-existent filtration Minimal storage Major network losses (guessed at between 20% and 70%	Reliable, safe and good quality drinking water for all Reduce leakage and other losses Provide increased storage Improve filtration using sand filters Major network replacement Meter and charge Possible fluoridation

Table 2.19 Water Supply Projects on the Long List

Project	Estimated Cost ($NZm)
Aitutaki Domestic Water Tanks	0.6
Refurbishment of Vaimaru water galleries	0.2
Aitutaki Community Water Tanks	0.06
4 Water pumps for gallery at Vaipeka, Tautu, Vaipae	0.05
Atiu Water Reticulation System	1.5
Atiu Household Water Tanks	0.25
Atiu Community Water Storage	0.1
Mangaia water upgrade	1.0
Mitiaro - Upgrade water network system	0.25
Mitiaro Water pumps (Vaiuti Gallery)	0.02
Outer Islands Community Water Tanks rehabilitation	1.5
Palmerston Water Tanks upgrade	0.06
Pukapuka Water Gallery Improvement	0.3
TMV Ringmain	30.0
TMV Trunk, Intakes, reservoirs, treatment, meters etc	36.3
IWRM Demonstration Project Rarotonga	0.5

2.5.5 SANITATION

Current Situation

75 The Cook Islands has no central sewerage system. Generally both grey and black waters from domestic, smaller commercial properties, and businesses run to individual septic tanks, or into poor distribution soakage systems.

Sludge receiving ponds were constructed in 2010 in both Rarotonga and Aitutaki for the disposal of sludge from septic tanks. No such facility is available on any of the other islands.

76 A recent project funded by New Zealand has seen the setting up of a monitoring body 'WATSAN' under ICI. Monitoring requirements and policing have been strengthened through the passing of the Public Health (Sewage) Regulations 2008, and Public Health Sewage Code 2008. The latter sets out the minimum standards for domestic and commercial sanitation systems.

77 WATSAN has overseen the replacement of over 100 septic tanks to private residential properties, within a 100 metre zone of the mean high water mark in the Muri Beach area, the most densely populated tourism zone on Rarotonga. This area was selected due to the extent of the lagoon in this location, and the deterioration of lagoon water quality.

78 The threat to lagoon waters from untreated sewage effluent is increasing in other locations also, primarily due to growing tourism numbers. Similar improvements to those implemented in Muri are required around the island of Rarotonga in the short term. In the longer term one major central treatment facility or a few smaller treatment stations will be required to allow total reticulation and appropriate treatment/disposal of liquid waste.

79 Aitutaki with significantly increasing tourism numbers will require similar short and long term treatment as described for Rarotonga. The low resident numbers in other islands means that the sanitation issues there are not as acute as in Rarotonga and Aitutaki. However, with tourism being promoted in several islands, improved septic tanks and some form of disposal will be required in due course.

Table 2.20 Sanitation Projects Proposed by the 20-Year PIMP, 2007

Term	Proposed PIMP Projects	Completed	Modified	Ongoing	On CIIC list
1-5 Years	Construction of Rarotonga village sewerage networks – Stage 1	■			
	Rehabilitation of Tereora/Tepuka neighbourhood sewerage system	■			
6-20 Years	Construction of Rarotonga village sewerage networks – Stage 2			■	
	Construction of Aitutaki village sewerage networks				■
	Construction of waste water treatment facilities on the northern islands				■
	Improvement of effluent disposal systems in foreshore areas of Rarotonga			■	
	Review adequacy & upgrade sanitation facilities at EMC on southern islands		■		
	Construction of waste water treatment facilities on the southern islands		■		
	Review adequacy & upgrade sanitation facilities at EMC on northern islands		■		

Strategies

80 The sub-sector strategy in the PIMP included the following:

- Short term - Focus on improving the environment in the most densely populated villages on Rarotonga by the installation of centralised wastewater collection, treatment and disposal systems. These projects will alleviate some of the urgent sanitation-related issues on the island, notably the pollution of the lagoon and the Tereora-Tepuka system.
- Medium Term - Focus on mitigating environmental impacts on the outer islands by constructing improved wastewater management facilities such as simplified septage ponds, as well as upgrading the sanitation facilities at the emergency management centres (EMCs) on each island to reduce the potential health risks associated with extended stay in crowded areas.
- Long Term - Focus on the period 2017-2027 on upgrading and expanding the village sewerage schemes on Rarotonga and Aitutaki.

81 The NSDP calls for the upgrade of poor sanitation systems and installation more efficient domestic and commercial systems, improvement of the sanitation and wastewater treatment systems, and changes in farming practices.

Table 2.21 Summary of Issues and Strategies, Sanitation

Sub-sector	Issues	Strategies
Sanitation	Poor maintenance Older septic tanks Poor quality lagoon waters Environmental issues Low public awareness of environmental health risks Limited regulation/enforcement Lack of investment	Repair and rehabilitation Improve wastewater management in urban centres Improve water and sanitation facilities in rural communities Replacement and upgrade of septic tanks Long term reticulated outfalls

Table 2.22 Sanitation Projects on the Long List

Project	Estimated Cost ($NZm)
Sanitation upgrades - onsite Aitutaki	2.4
Sanitation upgrades - onsite Northern group	4.0
Long term sanitation upgrades Rarotonga	37.0
Sanitation upgrades onsite - scale up pilot to Rarotonga Phase 2	11.2
Sanitation upgrades - onsite Southern group except AIT/RAR	9.6

2.5.6 SOLID WASTE MANAGEMENT

Current Situation

82 A purpose designed solid waste facility for the island of Rarotonga was constructed in a valley system close by the village of Arorangi in 2010. Coupled with this facility is a recycling centre with compaction equipment that compresses and bundles recyclables. A managed landfill site was provided in Aitutaki around the same time.

83 A project manager has been appointed under the WATSAN programme to carry out a 'Strategic Assessment' of waste coupled with economic analysis and waste audit on Rarotonga.

84 Outer island disposal continues on the basis of open pit disposal. Recycling is not widespread and the issue of how to deal with waste on the small islands is becoming critical.

Table 2.23 Solid Waste Management Projects Proposed by the 20-Year PIMP, 2007

Term	Proposed PIMP Projects	Completed	Modified	Ongoing	On CIIC list
1-5 Years	Construction of Rarotonga solid waste transfer station	■			
	Rarotonga hazardous waste handling facilities upgrade				■
6-20 Years	Construction of new landfill sites on the southern islands				■
	Construction of Rarotonga compost facilities				■
	Construction of new landfill sites on the northern islands				■

Strategies

85 The sub-sector strategy in the PIMP included the following:

- Short Term - Focus on the second stage of waste management on Rarotonga – waste separation and processing of the non-landfill waste streams. Construction of a transfer station and waste separation facility to reduce the amount of waste going to the landfill site; procurement of equipment to improve the operation of the hazardous waste recycling plant; and establishment of a central composting plant.
- Medium Term - Focus on provision of proper landfill facilities on the outer islands.
- Long Term - Focus in 2017-2027 on construction of a new landfill facility on Rarotonga and replacement of plant and equipment for the recycling operations. Similarly, landfill operations on the southern islands may also need to be expanded.

86 The NSDP includes several actions:

- Review the institutional arrangements to manage waste including public-private partnerships
- Develop and implement the national waste management policy

- Develop necessary legislative and regulatory frameworks to better manage waste
- Enhance education and awareness in waste management
- Transform waste facilities in Rarotonga and Aitutaki to resource recovery centres Implement the National Waste Strategy.

87 The National Solid Waste Management Strategy 2013-2016 provides a policy background and institutional programme but requires further detailing in order to set out clear implementation targets.

Table 2.24 Summary of Issues and Strategies, Solid Waste Management

Sub-sector	Issues	Strategies
Solid Waste Management	Lack of effective detailed all-encompassing solid waste policy and legislative framework to manage and control disposal of waste Shortage of land and potentially adverse impacts for landfills on small islands Indiscriminate burning of (often toxic) rubbish by householders and others Public separation of rubbish (recycling) Storage of recyclable materials Difficulties and cost to ship recyclable materials off the islands Minimal means to handle hazardous waste Increases in volumes that continue to outstrip ability to place waste.	Develop a comprehensive solid waste policy and legislative framework to effectively manage and control waste Continue public awareness of the need to recycle Find alternative options to the removal of recyclables from the country

Table 2.25 Solid Waste Management Projects on the Long List

Project	Estimated Cost ($NZm)
Rarotonga hazardous waste handling facilities upgrade	0.6
Incinerator for Rarotonga	3.0

2.5.7 ENERGY

Current Situation

88 Currently diesel-fuelled generation units provide power requirements in all islands. Rarotonga and Aitutaki are the only two islands with 24-hour operation. Other islands operate on restrictive generation times generally meeting morning and evening demands with closedowns from late evening through to about 6am.

89 The private sector has been active in taking up opportunities for solar panel installations. The intention is that surplus power from all these systems will be fed into the general grid. Notable in this is Rarotonga Airport where a recently installed large solar array is already contributing significantly to the island's power supply. Upgrading at the main power station in Rarotonga is being planned in order to accommodate the input of solar power from the individual suppliers.

90 A programme is underway to provide solar systems to the Northern Group, and a similar programme is proposed for the Southern Group. Further investigation and data recording continues in assessing the desirability/viability of wind energy.

Table 2.26 Energy Projects Proposed by the 20-Year PIMP, 2007

Term	Proposed PIMP Projects	Completed	Modified	Ongoing	On CIIC list
1-5 Years	Aitutaki electricity generator replacement	■			
	Rakahanga stand-by generator repair	■			
	Rakahanga wind power generator erection		■		
	Atiu electricity supply distribution system upgrade				■
	Exchange of Penrhyn generators		■		
	Outer islands electrical wiring standardisation program				■
	Pukapuka electricity supply upgrade		■		
6-20 Years	Construction of second Rarotonga power station				■
	Southern islands electricity supply systems rehabilitation program		■		
	Northern islands electricity supply systems rehabilitation program		■		

Term	Proposed PIMP Projects	Completed	Modified	Ongoing	On CIIC list
	Electricity supply system upgrades on Manihiki and Rakahanga		■		
	Mangaia electricity supply system upgrade		■		
	Aitutaki high voltage electricity supply distribution system upgrade				■

Strategies

91 The Government's target is for reaching 50 percent of the country to have renewable energy by 2015 and 100 percent by 2020.

92 The sub-sector strategy in the PIMP included the following:

- Short term - Focus on service delivery improvements through repair or optimisation of the performance of the power generating capacity on the outer islands and increasing the safety through standardisation of the wiring. Replacement of the generators on Aitutaki and upgrading the distribution system on Atiu.
- Medium Term – Improvement of the power distribution capacity on the outer islands and the construction of a new power station in Rarotonga.
- Long Term – 2017-2027 a national program to replace generators on the outer islands with fuel-efficient models.

93 The NSDP proposes the following actions:

- NSDP: Implement the Cook Islands Renewable Energy Chart.[12]
- Transform energy organisational mechanisms to better coordinate implementation of renewable energy.
- Adopt and utilise technologically, commercially and environmentally sound proven technologies.
- Implement renewable energy rollout in the Northern Pa Enua.
- Implement renewable energy rollout in the Southern Pa Enua.
- Encourage studies into renewable energy and storage options.
- Build on TAU's metering policy to encourage renewable energy uptake for potential expansion to the Pa Enua Investigate and implement appropriate business models for the changing energy landscape.
- Strengthen policy and regulatory frameworks, financial management, raising awareness, building capacity and increasing participation of our communities in the achievement of renewable energy targets.
- Explore and implement sound incentives to encourage renewable energy uptake encourage renewable energy. uptake Continually upgrade and maintain energy infrastructure.
- Build capacity and expertise in renewable energy systems.
- Implement awareness and educational programmes for renewable energy, energy conservation and efficiency.

Table 2.27 Summary of Issues and Strategies, Energy

Sub-sector	Issues	Strategies
Energy	High cost of electricity to consumers Fuel costs Fuel transportation and storage Demand variations on 24/7 operations in outer islands Overhead networks open to cyclone damage	To provide safe, reliable and affordable supply of energy Repair and rehabilitation of generation and distribution systems Renewable energy implementation Need to balance RE with 24/7 generation requirements

Table 2.28 Energy Projects on the Long List

Project	Estimated Cost ($NZm)
Aitutaki Solar PV Mini-Grid System	16.0
Aitutaki Fuel Storage Facility	0.1
Aitutaki Underground Cable Laying	0.08
Atiu Solar PV Mini-Grid System	3.1
Mangaia Solar PV Mini-Grid System	3.5
Manihiki Solar PV Mini-Grid System (cost updated by RED)	2.2
Mauke Solar PV Mini-Grid System	3.2
Mitiaro Solar PV Mini-Grid System	1.9
Mitiaro generator, power house relocation and grid upgrade	0.28

[12] The CI Renewable Energy Chart is a policy and programme. The Chart does not specify confirmed technologies for each island nor final design capacities.

Project	Estimated Cost ($NZm)
Nassau Solar PV Project	0.86
Palmerston Solar PV Mini-Grid System	0.64
Penrhyn Solar PV Mini-Grid System	1.69
Pukapuka Solar PV Mini-Grid System	2.83
Pukapuka Bio fuel	0.08
Rakahanga Solar PV Mini-Grid System	0.96
Rakahanga generator control panels and powerhouse	0.1
Rarotonga airport solar PV installation	-
Tau control & Generation	45.2

2.5.8 ICT

Current Situation

94 ICT coverage to 98 percent of the population has been achieved, and internet recently improved with the introduction of an O3B satellite broadband service. However prices are high and are likely to remain so while there is a single operator monopoly. An undersea cable connection would reduce the Cook Islands' dependence on satellites. A feasibility study for an undersea connection was commissioned by ADB in 2013.[13] This showed that there is sound justification for such a scheme.

95 There is significant pressure from the private sector for an undersea fibre optics cable. Business owners suggest that it is crucial that first-world standard communications is provided to the Cook Islands to allow the development and maintenance of existing and new enterprises, connected in real-time, at reasonable prices, to the rest of the world.

96 There were no ICT projects proposed in the PIMP 2007.

Strategies

97 The sub-sector strategy in the PIMP included the following:

- Short term - Improve internet service to support government operations, education and health services and private sector commercial activities.
- Medium-long term - National program to upgrade facilities from time to time.

98 The NSDP calls for three areas of action:

- NSDP: Increase speed and quality of our telecommunications service.
- Strengthen our telecommunications regulatory framework to support improved telecommunication infrastructure and services.
- Establish appropriate and relevant institutional arrangements for the telecommunications sector.

Table 2.29 Summary of Issues and Strategies, ICT

Sub-sector	Issues	Strategies
ICT	Monopoly operation High consumer costs Uneconomic outer islands services	Review legislation to open up market and allow competition Increase fibre optics coverage Subsidise outer island operations

Table 2.30 ICT Projects on the Long List

Project	Estimated Cost ($NZm)
Fibre-optic Cable for international Communications	35.0

2.5.9 ASSESSMENT OF MULTI-SECTOR ISSUES

99 The NSDP identifies several general areas to be addressed. Those of relevance to the CI NIIP are as follows:

[13] TA-7787 REG: Report on the Feasibility of an International Submarine Cable System for the Cook Islands, ADB May 2013.

- Strengthen and integrate governance arrangements for Disaster Risk Management (DRM) and Climate Change Adaptation (CCA)
- Build resilience through effective Disaster Risk Reduction (DRR) and CCA
- Mainstream DRM and CCA into national and sector planning, policies, legislation and budgeting
- Monitor and assess risks and vulnerabilities using both modern technology and traditional knowledge systems
- Invest in DRR measures across all sectors
- Strengthen infrastructure and safeguarding essential services
- Anticipate other forms of hazards
- Collaborate across all sectors and in partnership with private sector and communities.

100 The key multi sector issues relate to the planning and coordination of development. As discussed in Chapter 2, there are no land use zoning or development plans in Cook Islands. These are urgently needed in Rarotonga and Aitutaki in order to manage the development of land. The drive to further expand the tourism industry will increase the pressure for development and will threaten marginal land such as wetlands and beachfronts. The protection of the lagoons in Rarotonga and Aitutaki is particularly critical and this can be achieved through proper zoning and enforcement. Plans are needed for all areas but the priorities are the urban centres and the coastal zones.

101 Whilst CIG has taken positive steps to address climate change and the management of natural hazards, these activities are carried out as supplementary services to the general process of planning infrastructure. These need to become fully integrated into the standard processes of all agencies in government and climate proofing should be included in all project designs.

Table 2.31 Summary of Issues and Strategies, Multi-sector

Sub-sector	Issues	Strategies
Multi-sector	No zoning, land-use or urban development plans Minimal development control Sea rise Severe erosion Potential for larger cyclones	Improve planning and land-use controls Integrate CCA and DRM into project designs and assessments Protection, repair and rehabilitation Purpose built structures for the public use during times of cyclones

Table 2.32 Multi-sector Projects on the Long List

Project	Estimated Cost ($NZm)
Rutaki Foreshore Rock Revetment Development	2.6
Aluminium roofing/building material	1.5
Outer island cyclone shelters	2.0

2.5.10 EDUCATION

Current Situation

102 Schools in Cook Islands are dispersed over 12 islands, with 15 schools on Rarotonga (including 7 church and other private schools), 8 schools on Southern Group islands (including 1 church school), and 8 schools on Northern Group islands. The education system provides for Early Childhood Education to Year 13. It caters for 4,021 students (of which 50 percent are female), and employs 268 teachers (of which 69 percent are female). MOE notes that enrolments have not declined at the same rate as the total population of Cook Islands.

103 Tertiary level education is provided through the Cook Islands Tertiary Training Institute (which delivers vocational courses including fulltime hospitality and trade courses in Rarotonga and on some outer islands) and the University of the South Pacific centre in Rarotonga. Some overseas scholarships are also available for tertiary education.

104 The Education Master Plan (2008-23) identifies the strategic vision for Education as “to build the skills, knowledge, attitudes and values of Cook Islanders to put their capabilities to best use in all areas of their lives”. It addresses four focus areas: Taku Ipukarea Kia Rangatira (strengthening a learner’s identity as a Cook Islander), learning and teaching, learning and the community, and infrastructure support.

105 School buildings have suffered from lack of maintenance, and many are in need of replacement. In planning this replacement, consideration needs to be given to the potential to rationalise facilities and to create modern learning environments.

106 A Public Expenditure Review of education expenditure reporting to the Cook Islands and New Zealand Governments in April 2013 recommended that CIG should establish a permanent funding allocation for maintenance of school property at a level equivalent to 5 percent of the value of school buildings at an estimated additional cost of approximately $400,000 per annum.

107 There were no Education sector projects in the 2007 PIMP.

Strategies

108 The NSDP identifies a number of actions, while Table 2.33 below focuses on issues and strategies related more specifically to infrastructure:

- Short term - Improve internet service to support government operations, education and health services and private sector commercial activities.
- Medium-long term - National program to upgrade facilities from time to time.
- Increase access and participation in Early Childhood Education.
- Improve literacy and numeracy rates in schools.
- Implement the Inclusive Education Policy.
- Develop enterprise and entrepreneurship in schools.
- Increase the subject scope to meet the interest of students including the implementation of Dual Pathways and Alternative Pathways Programmes.
- Improve the use of online learning programmes for Pa Enua students.
- Enhance support and provision of information relating to career choices.
- Enhance tertiary training to meet the priority needs of the country and learners.
- Maintain accreditation standards with recognised institutions and improve training facilities in-country.
- Implement second chance learning for 'at risk' and 'in risk' young people.
- Increase the scope of Community Education Programmes.
- Improve the provision of Life Skills Programmes in communities.

Table 2.33 Summary of Issues and Strategies, Education

Sub-sector	Issues	Strategies
Education	High cost of decentralised provision of school facilities Inadequate maintenance of schools MOE feels constrained in planning for infrastructure as it does not own the schools Power costs and water security in schools	Proposed study of education infrastructure (including options to rationalise the school network) Public expenditure review in 2013 recommended increased allocation to school maintenance (subject to budgetary constraints) Close working relationship with CIIC in planning education infrastructure Installation of solar PV and water supply systems in schools

Table 2.34 Education Projects on the Long List

Project	Estimated Cost ($NZm)
Apii Nikao School reconstruction	11.4
Re-build National College (Tereora)	30.0
Re-modelling classrooms for Modern Learning Environment (pilot project)	0.5
Fitting schools with water harvesting systems (pilot project)	0.5

2.5.11 HEALTH

Current Situation

109 The Ministry of Health is the main provider of health care in the Cook Islands. Health services range from public health (inclusive of primary care) to secondary and tertiary care. Overall, Cook Islands is relatively well equipped to provide basic primary and secondary level care. The Cook Islands delivers an adequate range of general clinical services in the core areas of anaesthetics, general outpatients and emergency, obstetrics and gynaecology, ophthalmology, paediatrics and surgery. These services are supplemented by visiting specialist teams and access to tertiary services through a referral process to overseas providers. There are a small number of private health providers.

110 Cook Islanders have a good standard of health, compared to the health status of other populations in the Pacific region. There is adequate health coverage in each island, high immunization rates throughout the country, nil maternal and low infant mortality rates, and basic resources to meet the needs of the population.

111 However, there are growing problems facing Cook Islands in relation to non-communicable diseases (NCDs) such as diabetes, cardiovascular diseases, hypertension, obesity, and associated risk factors (smoking, excessive alcohol consumption, physical inactivity and poor diet).

112 Hospitals, health centres and clinics have suffered from lack of maintenance, and some are in need of replacement. In planning this replacement, consideration needs to be given to the potential to rationalise facilities to improve efficiency and cut costs.

113 There were no Health sector projects in the 2007 PIMP.

Strategies

114 The NSDP identifies a number of actions, while Table 2.35 below focuses on issues and strategies related more specifically to infrastructure:

- Maintain accessibility to quality ante-natal and maternity care.
- Maintain high coverage of immunisation protection for children.
- Maintain low infant and maternal mortality rates.
- Reduce rate of teenage pregnancy.
- Reduce rate of sexually transmitted infections.
- Reduce smoking, alcohol and drug use rate.
- Enhance the use of telemedicine for equitable health services.
- Engage with New Zealand to provide specialist health programmes.
- Implement Men's Health and Women's Health clinics program.
- Improve partnerships to address mental illness, disabilities, elderly and palliative services.
- Target services to encourage healthy living with children to minimise future NCD risks.
- Improve training and capacity with emphasis on re-opening the Nursing School and retention of Cook Islands doctors.
- Implement the Cook Islands National Strategy and Action Plan to Prevent and Control NCDs.
- Promote healthier lifestyles through physical activity, nutrition and healthy living to reduce NCDs.

Table 2.35 Summary of Issues and Strategies, Health

Sub-sector	Issues	Strategies
Health	Adequate service provision in Pa Enua High cost of providing specialised services Inadequate maintenance of health centres and residence Cost of medical equipment Emerging issues – aged care facilities, mental health facilities Road access to Rarotonga Hospital	Preparation of a long term infrastructure strategy for health Engagement with New Zealand in relation to specialist services, and close management of referral system Work with CIIC on regular maintenance of buildings Source through CAPEX or ODA Development of policy (including identification of infrastructure requirements), and coordination with MOIA Consultation with ICI on options to maintain and improve road access

Table 2.36 Health Projects on the Long List

Project	Estimated Cost ($NZm)
Pukapuka Hospital and doctors residence reconstruction	0.5

2.5.12 OTHER INFRASTRUCTURE

Current Situation

115 In this context, 'other infrastructure' addresses the social policy responsibilities of the Ministry of Internal Affairs and the property management responsibilities of the Cook Islands Investment Corporation. This aligns with the feedback received following the circulation of the Draft CI NIIP Report, and in particular in relation to the inclusion of social infrastructure in the coverage of the plan. Feedback came from these organisations, in addition to the Ministry of Education and the Ministry of Health.

Strategies

116 The NSDP identifies a number of actions, while Table 2.37 below focuses on issues and strategies related more specifically to infrastructure:

- Develop gender responsive programmes and policies.
- Promote the equitable participation of women and men in decision making and governance.

- Create an enabling environment for the full participation of women in economic development.
- Improve the capacity of men and women to contribute to disaster risk management and climate change adaptation strategies.
- Improve the capacity of women and men to address health issues.
- Eliminate violence against women.
- Develop and implement policies that address the needs of children, youth, persons with disabilities and the aged that will protect their human rights and wellbeing.
- Mainstream concerns of children, youth, persons with disabilities, mentally ill, the displaced in our communities, and the elderly, into national policy environment.
- Fulfil regional and international obligations to ensure that children, youth, persons with disabilities and elderly are valuable members of our society.
- Work in collaboration to build strong families and communities.
- Pass the Family Law Bill.
- Identify ways to provide family support to those who need it.
- Develop and implement a comprehensive national policy to promote encourage and support physical activity, recreation and competitive sports.
- Work in collaboration with key stakeholders to promote and preserve our culture, language and social heritage

117 CIIC Business Plan 2014/15 key deliverables with direct implications for social infrastructure include:

- Staff across government (including CIIC, ICI, SOEs, MFEM and Island Councils) equipped to operate, maintain and update asset management registers, plans and software. Asset registers and assets effectively maintained.
- Government buildings and houses meet the minimum levels of service.
- Rationalised land requirements. Reduced land costs and landowner complaints/grievances.
- Rationalised decisions for retention and disposal of assets. Minimise waste and ensure consistency in decision making.
- Rationalised, timely and coordinated delivery of infrastructure projects. Duplication and waste eliminated or minimised.

Table 2.37 Summary of Issues and Strategies, Other Infrastructure

Sub-sector	Issues	Strategies
Health	Lack of disability access in public buildings and business premises Road furniture including footpaths and other transport systems do not cater for people with disabilities Emerging issues – aged care facilities, mental health facilities Future of the government housing stock Some ministries occupying sub-standard office accommodation	Review of building code and transport systems to address disability access MOIA to play supporting role to MOH in addressing Study of options incl. sale, refurbishing Study to define and assess options

Table 2.38 Other Infrastructure Projects on the Long List

Project	Estimated Cost ($NZm)
Vaikapuangi Government Office Complex Redevelopment	3.3

3 Priorities for Infrastructure Development

3.1 Assembling the Long-list of Projects

118 The process of starting with the long-list and deriving the priority projects is described below and in the following sections. The transition between the stages can be seen in Table 3.1 including the progress of individual projects.

119 The initial long-list of potential projects for consideration under CI NIIP (as shown under each sub-sector in Chapter 2) was assembled with help from CIIC and through consultations with various CIG agencies and other stakeholders. The primary source was the database maintained by CIIC in its role as secretariat to the Infrastructure Committee. Other projects were added to this list as they arose in discussions. Reference was also made to the list of projects from the PIMP.

120 An initial task was to extract the projects from the database for the sub-sectors covered by CI NIIP. (The database includes other items such as buildings for social welfare, Government offices etc.). An update was also undertaken to eliminate any projects completed since the last review of the database.

121 Ongoing and committed projects automatically form part of the infrastructure investment plan, and these were put aside prior to undertaking the prioritisation. (They were added back in later to complete the funding envelope).

Table 3.1 From Long-list to Priorities

Key to symbols: ■ - included and taken forward, ✕ - removed from active list, ➔ - carried forward for later inclusion

Original Long-list	Minus long-term & 2014 completion	Minus ongoing/ committed	Revised List >$NZ0.5m	Top 24	Top 24 + ongoing/ committed
AIR TRANSPORT					
Aitutaki Upgrade of airport to international standard	✕				
Aitutaki Airport 2nd aircraft pad	■	■	✕		
Atiu Airport Upgrade (Part 139)	■	■	■	■	■
Atiu Airport repairs	■	■	✕		
Manihiki Airport Upgrade (Part 139)	■	➔			■
Mauke Airport Repairs and Improvements	■	■	■		
Mitiaro Airport Repairs and Improvements	■	■	■		
Penrhyn Airport Repairs and Improvements	■	■	■		
Rarotonga Airport Terminal Improvement (phase 2)	■	■	■	■	■
Rarotonga Airport Instrument landing upgrade	■	■	■	■	■
Rarotonga Runway Repairs (joints)	✕				
MARINE TRANSPORT					
Orongo Marina and Town Centre Development	■	■	■	■	■

Original Long-list	Minus long-term & 2014 completion	Minus ongoing/ committed	Revised List >$NZ0.5m	Top 24	Top 24 + ongoing/ committed
Manihiki Tukao & Tauhunu Harbour Upgrade	■	■	■	■	■
Penrhyn Port Facilities and Fuel Depot relocation.	■	■	■	■	■
Pukapuka Jetty, Channel and Causeway	■	■	■		
Rakahanga Harbour Improvement	■	■	✕		
Tuituikaimoana Marina Development	✕				
Avana harbour upgrades	✕				
ROAD TRANSPORT					
Road sealing project for Aitutaki	■	■	■		
Mangaia Road Rehabilitation: town area (3km)	■	■	■		
Atiu & Mitiaro Roads Rehabilitation	■	■	■		
Mauke Road Rehabilitation: town & and plantation roads	■	■	■		
Aroko Road Widening Project	■	■	■		
Avatiu Valley Bridge Upgrade	■	■	■	■	■
Avarua Bridges	■	■	■	■	■
Muri area upgrade with footpaths	■	■	■		
Project City Stage 3 - sealing Aquarius to Tupapa	■	➔			■
WATER SUPPLY					
Aitutaki Domestic Water Tanks	■	➔			■
Refurbishment of Vaimaru water galleries	■	■	✕		
Aitutaki Community Water Tanks	■	■	✕		
4 Water pumps for gallery at Vaipeka, Tautu, Vaipae	■	■	✕		
Water Reticulation System	■	■	■		
Atiu Household Water Tanks	■	■	✕		
Atiu Community Water Storage	■	■	✕		
Mangaia water upgrade	■	■	■		
Mitiaro - Upgrade water network system	■	■	✕		
Mitiaro Water pumps (Vaiuti Gallery)	■	■	■		
Outer Islands Community Water Tanks rehabilitation	■	■	■	■	■
Palmerston Water Tanks upgrade	■	■	✕		
Pukapuka Water Gallery Improvement	■	■	✕		
TMV Ringmain	■	➔			■
TMV Trunk, Intakes, reservoirs, treatment, meters etc	■	■	■	■	■
IWRM Demonstration Project Rarotonga	✕				
SANITATION					
Sanitation upgrades - onsite Aitutaki	■	➔			■
Sanitation upgrades - onsite Northern group	■	■	■		
Long term sanitation upgrades Rarotonga	■	■	■	■	■
Sanitation upgrades onsite - scale up pilot to Rarotonga Phase 2	■	➔			■
Sanitation upgrades - onsite Southern group except AIT/RAR	■	■	■		
SOLID WASTE					
Rarotonga hazardous waste handling facilities upgrade	■	■	■		
Incinerator for Rarotonga	■	■	■	■	■
ENERGY					
Aitutaki Solar PV Mini-Grid System	■	■	■	■	■
Aitutaki Fuel Storage Facility	■	■	✕		
Aitutaki Underground Cable Laying	■	■	✕		
Atiu Solar PV Mini-Grid System	■	■	■	■	■
Mangaia Solar PV Mini-Grid System	■	■	■	■	■
Manihiki Solar PV Mini-Grid System (cost updated by RED)	✕				
Mauke Solar PV Mini-Grid System	■	■	■	■	■
Mitiaro Solar PV Mini-Grid System	■	■	■	■	■
Mitiaro generator, power house relocation and grid upgrade	■	■	✕		
Nassau Solar PV Project	✕				

Original Long-list	Minus long-term & 2014 completion	Minus ongoing/ committed	Revised List >$NZ0.5m	Top 24	Top 24 + ongoing/ committed
Palmerston Solar PV Mini-Grid System	■	➔			■
Penrhyn Solar PV Mini-Grid System	■	➔			■
Pukapuka Solar PV Mini-Grid System	×				
Pukapuka Bio fuel	■	■	×		
Rakahanga Solar PV Mini-Grid System	×				
Rakahanga generator control panels and powerhouse	■	■	×		
Rarotonga airport solar PV installation	■	➔			■
Tau control & Generation	■	■	■	■	■
INFORMATION & COMMUNICATIONS TECHNOLOGY					
Fibre-optic Cable for international Communications	■	■	■	■	■
MULTI-SECTOR					
Rutaki Foreshore Rock Revetment Development	■	■	■	■	■
Aluminium roofing/building material	■	■	×		
Outer island cyclone shelters	■	■	■	■	■
EDUCATION					
Apii Nikao School Reconstruction	■	■	■	■	■
Re-build National College (Tereora)	■	■	■	■	■
Re-modelling Classrooms for Modern Learning Environment (pilot)	■	■	■		
Fitting Schools with Water Harvesting Systems (pilot)	■	■	■	■	■
HEALTH					
Pukapuka Hospital and Doctor's residence Reconstruction	■	■	■		
Rarotonga Hospital Solar PV Installation	×				
OTHER INFRASTRUCTURE					
Vaikapuangi Government Office Complex Redevelopment	■	■	■		

3.2 Prioritisation Methodology

122 The prioritisation methodology involved several steps. Firstly all projects were screened to remove non-qualifying projects. The projects were then evaluated using multi-criteria analysis in a three-stage prioritisation process – initial scoring, review of scoring by stakeholders, and ratification and adjustment of scores by working group. (The criteria for prioritisation were previously developed through consultations and the Inception Workshop). All these steps are described below.

3.2.1 SCREENING

123 The long-list of projects was screened for the following:

- Strategic alignment, to confirm that projects are consistent with the Cook Islands NSDP 2011-2015
- Timing, to confirm that projects are needed within the next 10 years
- Projects above a value threshold of NZ$500,000

124 It should be noted that, although projects below the value of $NZ0.5m were taken out of the prioritisation process, they were not forgotten. They were effectively added back in (although unspecified), as an allocation was included in the funding strategy to cover these smaller projects over the next 10 years.

3.2.2 MULTI-CRITERIA ANALYSIS (MCA)

125 Projects passing the initial screening were ranked using Multi-criteria Analysis (MCA). MCA is a rapid appraisal technique, used to guide project prioritisation in the absence of more complete project documentation and cost-benefit analysis for most projects in the long-list. MCA involves identifying criteria relevant to project prioritisation, weighting criteria in accordance with their perceived importance, and applying a scoring system capturing the performance of projects against the criteria.

126 It should be recognised that MCA does not establish the viability of projects (i.e. the precise relationship between benefits and costs); rather it provides for ranking of projects in relation to their performance against selected criteria. Ranking of projects in this way identifies those with priority for further development along the project pipeline, but does not warrant final approval of the projects. Prior to implementation, all projects need to be fully documented and

subjected to more detailed assessment including the appropriate level of cost benefit analysis, environmental impact assessment etc. In some cases, this more detailed analysis may identify a need to modify or re-think the project.

127 Criteria selected for the MCA are of necessity general in nature, as they need to be applied to projects across all infrastructure sub-sectors. It is important that criteria are measurable to the extent that they allow projects to be ranked. Criteria and sub-criteria should also be kept to a manageable number to prevent the prioritisation exercise from becoming unwieldy.

128 In identifying criteria for the prioritisation process for the Cook Islands CI NIIP, consideration was given to the objectives and strategies set out in the NSDP and other statements of government policy including sector plans and the annual budget documentation. Consultations were held with the Infrastructure Committee, and in the course of one-on-one meetings with other key stakeholders in infrastructure sub-sectors. Note was also taken of lessons learned in the preparation of NIIPs in other Pacific countries, as identified in the review recently undertaken by the Pacific Region Infrastructure Facility (PRIF).

129 A draft set of criteria was presented to the Inception Workshop held on 27 February 2014, for review by stakeholders. Discussion among stakeholders recognised the need to strike a balance among a range of important considerations, and there was broad agreement with the draft presented. Workshop participants were invited to submit any further comments on the draft, prior to the finalisation of criteria in the lead up to the Prioritisation Workshop held on 28 April. The criteria finally adopted for project prioritisation are presented below:

Table 3.2 Prioritisation Criteria

Headline criteria	Sub-criteria	Cross-ref. to NSDP Goals	Key questions to aid scoring
Economic	Impact on costs and efficiency of infrastructure users	1,2,3	Will the project result in lower costs for infrastructure users through lower tariffs or slower growth in tariffs, time savings, reduced operating costs?
	Impact on economic growth and employment	1,2,3	Will the project facilitate expansion of industries e.g. tourism, fisheries, agriculture?
	Project viability	1,2,7	Is there evidence that the benefits of the project to the economy will exceed the costs by a sufficient margin?
Social	Support for improved social services	2,3,4,5,8	Will the project facilitate the delivery of health and education services?
	Service coverage	2,3,4,5,8	Will the project extend basic infrastructure service coverage to new areas and/or more people, or prevent loss of coverage?
	Other social benefits	2,4,5,7,8	Will the project have other benefits for the community e.g. improving the lives of women and children, assisting vulnerable/disadvantaged groups, alleviating poverty, responding to rural/urban drift, improved safety?
Environmental	Impact on land and water resources	2,5,6	Will the project have any positive or negative impacts on the environment e.g. land, water resources, coastal and marine environments?
	Degree of resilience to climate variability or climate change	2,5,6	How vulnerable is the project to the potential effects of climate variability, climate change, and disasters?
	Disaster risk management or climate change adaptation function	2,5,6	Will the project provide benefits or positive inputs for disaster risk management or climate change adaptation?
Project sustainability	Financial	1,2,7	Will the project be able to support the ongoing costs of operation and maintenance through user charges etc.?
	Technical	1,2,7	Will the technology used in the project be appropriate, and able to be operated and maintained?
	Institutional	1,2,7	Will the institution responsible for the project have sufficient capacity for implementation, operation and maintenance?

Key: NSDP 2011-2015 Goals
1. A vibrant Cook Islands economy
2. Infrastructure for economic growth, sustainable livelihoods and resilience
3. Energy security
4. Opportunity for all people who reside in the Cook Islands
5. Resilient and sustainable communities
6. Environment for living
7. Good governance
8. A safe, secure, just and stable society

130 The scoring system used in project prioritisation involved scoring sub-criteria on a scale of 0 to 5, with scores of 0 and 1 representing weak performance against the sub-criteria, scores of 2 and 3 representing moderate performance, and scores of 4 and 5 representing strong performance. Scoring was undertaken against the base case of the project not going ahead (thus, for example, avoiding a cost or loss of a benefit was considered as well as generating a benefit).

131 Weights were applied to scores for headline criteria and sub-criteria, based on the perceived importance of these criteria. Consultation in relation to these weights followed the same path as consultation in relation to the prioritisation criteria. Headline criteria were weighted as follows:

- Economic 30%
- Social 25%
- Environmental 25%
- Project sustainability 20%

132 A first round of scoring was undertaken on 24 April by a Working Group comprising representation from the Infrastructure Committee (including the Chairman, and representatives of ICI, MFEM, OPM, and the private sector), facilitated by the consulting team.

133 These initial scores prepared by the Working Group were then reviewed by the Prioritisation Workshop held on 28 April. Workshop participants worked in four groups, with each group tasked with reviewing scores for all projects under one headline criteria (Economic, Social, Environmental and Project Sustainability). Groups noted any revisions that they thought should be made to the scores prepared by the Working Group, and reported these and any other general observations back to a session involving all workshop participants. Following discussion of suggested revisions to scores, the outcome of the workshop was recorded and presented to participants.

134 It is noted that there was a high degree of consistency in the project ranking associated with the scoring done by the Working Group, and the ranking associated with the review of scoring by the Prioritisation Workshop. The top 20 projects as ranked by both groups contained 17 common projects. Sensitivity analysis was also conducted in relation to the weights allocated to headline criteria in the project scoring process. Project rankings proved robust to scenarios involving higher weighting to economic criteria and higher weighting to environmental criteria (these scenarios derived from comments received during the consultation process related to criteria weighting).

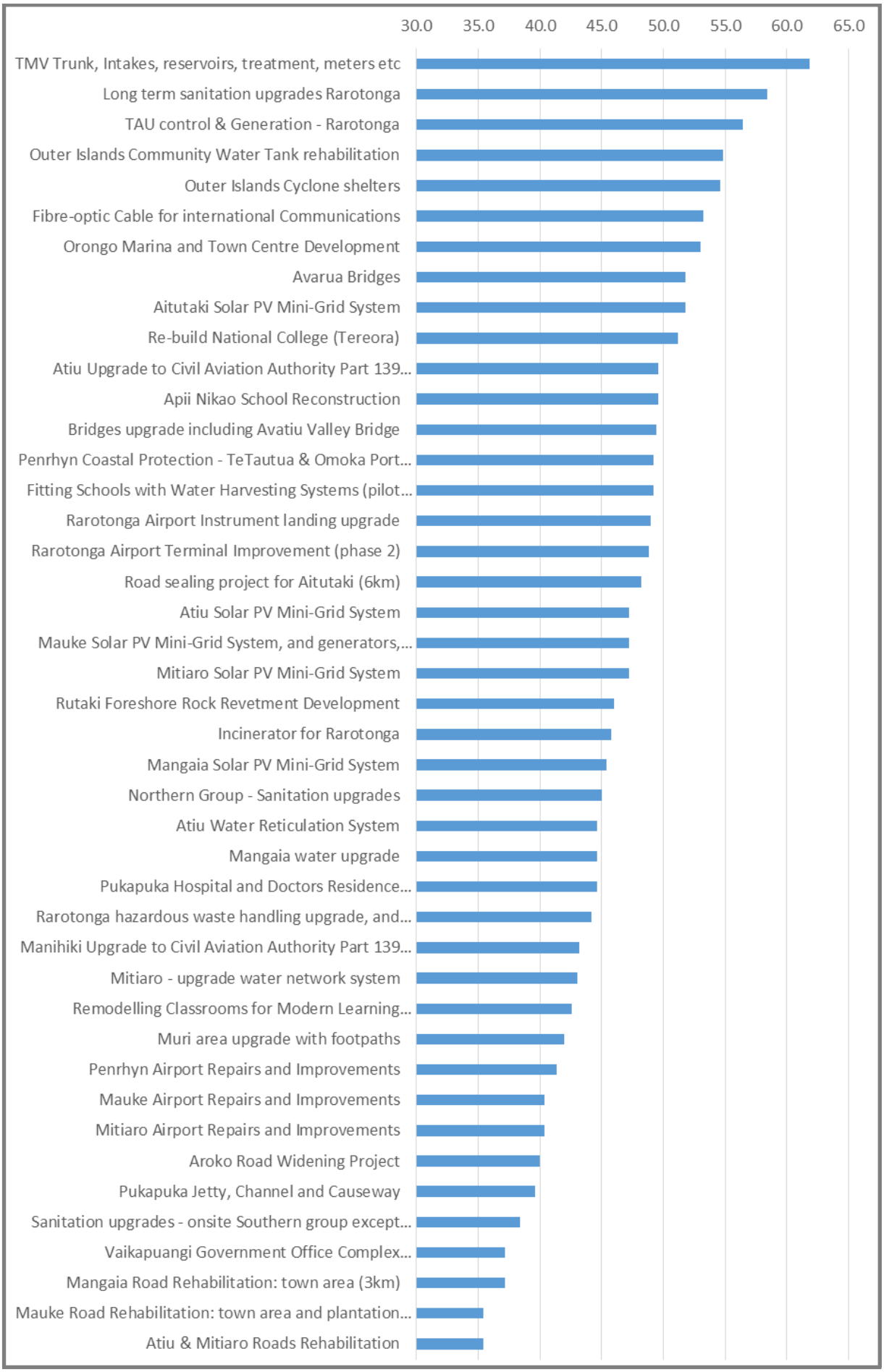
135 The outcome of the workshop was then presented to a meeting of the Infrastructure Committee held on 1 May. The committee considered the scoring done by the Working Group, and revisions to scores suggested by the Prioritisation Workshop, and finalised project scores.

136 Following the request by CIG to cover social as well as economic infrastructure in the plan, consultations were held with social sector ministries in relation to infrastructure needs. On 4 December the Infrastructure Committee endorsed seven social infrastructure projects to be added to the project long list. These projects were scored using the same criteria and weights as used for the economic infrastructure projects, and scores were finalised by the Infrastructure Committee on 14 January 2015.

3.2.3 RESULTS OF THE MULTI-CRITERIA ANALYSIS

137 The MCA provides a score for each project, summing the weighted scores for sub-criteria. The scores are shown in Figure 3.1 below, and shown in detail in Appendix B.

Figure 3.1 Results of Prioritisation Scoring



3.2.4 PREPARING THE INVESTMENT PLAN FROM THE PRIORITISED PROJECT LIST

138 The funding strategy prepared for the CI NIIP helped to guide the overall size and phasing of the infrastructure investment plan. Consideration was also given to implementation capacity (both in relation to project preparation and implementation of capital works). Other considerations in finalising the investment plan were the geographic balance of the plan, and possible linkages and synergies among projects. The funding strategy, which is described in detail in Chapter 5, revealed that twenty-four of the priority projects could be accommodated within an agreed funding envelope of $NZ288m. These twenty-four projects are shown in section 3.3 below along with ongoing projects and complementary activities.

3.3 Sub-sector Priority Projects

139 In each sub-sector the priority programmes are the combination of on-going projects plus the twenty-one proposed projects. In addition, complementary activities have been identified to support the planning and management of infrastructure. These are all summarised by sub-sector in the tables below. It is important to stress that the lists of priority projects reflect the results of the prioritisation process based on currently available information. Inevitably, by taking a set of projects at one point in time the details and readiness of project designs varies widely between different projects. There is also some uncertainty as to the context of some projects due to the lack of spatial planning (as explained elsewhere in the report), and also the varying levels of sub-sector planning.

140 The complementary activities are the measures that should be undertaken alongside the implementation of the projects. These include a variety of supporting mechanisms varying from technical outputs such as plans and regulations, to institutional strengthening, particularly capacity building in management. These complementary programmes mostly include those that are directly related to the planning, management and use of the economic infrastructure assets covered by CI NIIP. They do not include other indirect measures such as hygiene education programmes, road safety training etc.

Table 3.3 Ongoing, Committed and Proposed Projects - Air Transport

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	Rarotonga Airport Terminal Improvement	9.3	2024
	Rarotonga Airport instrument landing system upgrade	3.2	2016-2018
	Atiu Airport sealing and upgrade to CAA certification (Part 139)	3.9	2017-2019
Ongoing/Committed Projects	-		
Complementary Activities	Development strategy and scoping for all outer islands airports including airport classification		

Table 3.4 Ongoing, Committed and Proposed Projects - Road Transport

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	Avarua bridges	5.0	2021-2023
	Bridges upgrade including Avatiu Valley bridge	1.5	2016-2018
	Road sealing Aitutaki	0.8	2018
Ongoing/Committed Projects	Project City Stage 3 - Road Sealing Aquarius to Tupapa	5.0	2014
Complementary Activities	Develop and publish road standards manual		

Table 3.5 Ongoing, Committed and Proposed Projects - Marine Transport

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	Aitutaki, Orongo Marina and Town Centre Development	15.0	2017-2020
	Penrhyn Coastal Protection – Te Tautua and Omoka Port Facilities and Fuel Depot	4.0	2015-2017
Ongoing/Committed Projects	Manihiki Harbours Reconstruction	2.8	2014
Complementary	Prepare integrated coastal zone management and zoning		

	Project	Estimated Cost ($NZm)	Estimated timing
Activities Complementary Activities	plan to minimise ecological damage, particularly in areas of development pressure such as Rarotonga and Aitutaki		
	Inter-island shipping study to explore feasibility of improving services		

Table 3.6 Ongoing, Committed and Proposed Projects – Water Supply

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	Te Mato Vai – Trunk, Intakes, Reservoirs, Treatment, Meters etc.	36.3	2014-2018
	Outer Islands Community Water Tank Rehabilitation	1.5	2014-2016
Ongoing/Committed Projects	Te Mato Vai - Rarotonga ringmain	20.3	2014-2016
	Aitutaki Domestic Water Tanks	0.6	2014
Complementary Activities	Establish independent regulator to monitor service standards and tariffs		
	Groundwater investigations		
	Corporatisation of water supply – SOE to be established		
	A number of suggested further studies as listed in the Master Plan		

Table 3.7 Ongoing, Committed and Proposed Projects - Sanitation

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	Rarotonga long-term sanitation upgrade	37.0	2024
Ongoing/Committed Projects	Aitutaki sanitation upgrades	2.4	2014-2016
	Onsite sanitation upgrades Rarotonga	11.2	2014-2017
Complementary Activities	Environmental health awareness campaign in all islands		

Table 3.8 Ongoing, Committed and Proposed Projects - Solid Waste Management

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	Incinerator for Rarotonga	3.0	2021
Ongoing/Committed Projects	-		
Complementary Activities	Develop plan and programme for SWM facilities and management throughout Cook Islands.		

Table 3.9 Ongoing, Committed and Proposed Projects - Energy

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	TAU control & Generation - Rarotonga	45.2	2016-2023
	Aitutaki Solar PV Mini-Grid System	16.0	2015-2017
	Atiu Solar PV Mini-Grid System	3.1	2014-2016
	Mauke Solar PV Mini-Grid System, and generators, powerhouse, distribution upgrade	3.2	2014-2016
	Mitiaro Solar PV Mini-Grid System	1.9	2014-2016
	Mangaia Solar PV Mini-Grid System	3.5	2014-2016
Ongoing/Committed Projects	Palmerston Solar PV Mini-Grid System	0.6	2014
	Penrhyn Solar PV Mini-Grid System	1.7	2014-2015
	Rarotonga Airport Solar PV Installation	3.5	2014
Complementary Activities	Review and develop the role of the Energy Commissioner (to include price regulation and the management of solar energy providers)-		

Table 3.10 Ongoing, Committed and Proposed Projects - ICT

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	Fibre-optic Cable for international communications	35.0	2019-2021
Ongoing/Committed Projects	-		
Complementary Activities	Establish independent regulator to monitor and uphold service standards		

Table 3.11 Ongoing, Committed and Proposed Projects – Multi-sector

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	Rutaki Foreshore Rock Revetment	2.6	2017-2019
	Outer islands cyclone shelters	2.0	2016-2018
Ongoing/Committed Projects Complementary Activities	-		
	Prepare land-use development plans for Rarotonga and Aitutaki		
	Prepare integrated coastal zone management and zoning plan to minimise ecological damage, particularly in areas of development pressure such as Rarotonga and Aitutaki		
	Undertake land-titling project to formalise and digitise all boundaries		
	Improve digital mapping and GIS systems and coordinate across all ministries		
	Establish comprehensive monitoring system for NSDP		

Table 3.12 Ongoing, Committed and Proposed Projects - Education

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	Apii Nikao School reconstruction	11.4	2014-2017
	Re-build National College (Tereora)	30.0	2018-2022
	Fitting schools with water harvesting systems	0.5	2016-2017
Ongoing/Committed Projects	-		
Complementary Activities	Preparation of a long term infrastructure strategy for the Education Sector (including options to rationalise the school network)		

Table 3.13 Ongoing, Committed and Proposed Projects - Health

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	-		
Ongoing/Committed Projects	-		
Complementary Activities	Development of policy on aged care (including infrastructure requirements)		
	Development of policy on mental health (including infrastructure requirements)		
	Preparation of a long term infrastructure strategy for the Health Sector		

Table 3.14 Ongoing, Committed and Proposed Projects – Other Infrastructure

	Project	Estimated Cost ($NZm)	Estimated timing
Proposed Priority Projects	-		
Ongoing/Committed Projects	-		
Complementary Activities	Review of building code and transport systems to address disability access		

	Project	Estimated Cost ($NZm)	Estimated timing
	Study on future of Government housing		
	Study on potential for use of Government buildings for solar PV installations		

4 Infrastructure, Climate Change Adaptation and Disaster Risk Management

4.1 Introduction and Background

141 An integral part of the CI NIIP was an assessment of the potential impacts of climate change and natural hazards on the infrastructure sub-sectors being considered and in particular on the priority projects. The incorporation of climate change adaptation and disaster risk management (CCA/DRM) assessments into the CI NIIP process is summarised below:

- Review of current and future climate conditions in the Cook Island (see Appendix D).
- Identification of the vulnerability of different types of infrastructure, provincial variations in potential risk, and the possible adaptation strategies that can be employed (Appendix E).
- Inclusion of climate risk criteria for project prioritisation (see below).
- Overall assessment of priority projects' vulnerability to climate change and natural hazards (see below).
- Evaluation of the enabling environment for climate change adaptation and disaster risk management (see below).
- Detailed assessments for those proposed priority projects most susceptible to climate change and natural hazards in order to identify potential measures (and costs of integrating them) to mitigate impacts and increase their resilience (Appendix F).
- Identification of potential funding sources for CC/DRM (see Chapter 5).

4.2 Evaluation of climate change and natural hazard impacts and risks for CI NIIP priority projects

142 To evaluate the potential climate change and natural hazards impacts on prioritised economic infrastructure investments as stated in the CI NIIP, a risk assessment approach was selected. This followed the selection of priority projects from a long-list of proposed infrastructure projects from the Government of Cook Island database. For the long list, essentially the sub-criteria shown in Table 4.1 below, as an integrated component of the multi-criteria analysis (see also Table 3.2, Chapter 3), were used to screen all projects listed for climate change and natural hazards risks. All sub-criteria are scored on a scale from 0 to 5. If a proposed project had a weak performance against the sub-criterion, it was given a score of 0 or 1. For the first sub-criterion of degree of resilience to climate variability, climate change and disaster, projects scoring 0 or 1 were considered highly vulnerable to the impacts of climate change and natural hazards (low resilience). Correspondingly, score 2 and 3 expressed a

moderate vulnerability, and score 4 and 5 described a low vulnerability. Vulnerability is referred to as a function of exposure, sensitivity and adaptive capacity to climate change or natural hazards.

143 For the second sub-criterion, the proposed projects were screened for their contributions towards disaster risk management or climate change adaptation. A high score of 4 or 5 would provide essential positive benefits or inputs for disaster risk management or climate change adaptation by the screened project. Correspondingly, a low score of 0 to 1 would entail that there will be no or little contributions to this effect, score 2 and 3 described moderately positive benefits.

144 In addition, an environmental sub-criterion was used that screened for the risks of the project itself towards adversely affecting the environment, namely land and water resources in Cook Islands. It can be argued that, if a proposed project would, for example, weaken the natural barrier function of a natural reef in the process of project development, the resilience to climate change and disaster would be negatively affected, essentially weakening the system. The same scoring logic as explained above was used. A low score or weak performance against this sub-criterion indicated potentially significant negative impacts on the land and water resources (without mitigation).

145 The criteria finally adopted for project prioritisation relating to climate change under the Environment group of criteria are presented below:

Table 4.1 Prioritisation Criteria for Climate Change and Disaster Risk Management used in the MCA for CI NIIP

Degree of resilience to climate variability or climate change and disaster	How vulnerable is the project to the potential effects of climate variability, climate change, and disasters?
Disaster risk management or climate change adaptation function	Will the project provide benefits or positive inputs for disaster risk management or climate change adaptation?

146 Data available on climate change probabilities, expressed as return periods and likelihood of present and future climate events[14] were used for the climate change impact and natural hazards risk assessment (see Appendix D). The likelihoods were considered for present day and for the time horizon 2050, the latter being used as the indicative lifespan for major infrastructure developments.

147 As shown by the data, the likelihood of certain climate events is expected to increase and at the same time return periods will shorten leading up to 2050. A shorter return period means a higher probability of an extreme climatic event to occur with a higher frequency. This in turn affects the impacts caused by these events. Consequences of these climate events have been judged taking into account the vulnerability score from the MCA for a given location. Future consequences for 2050 were also judged based on the increased likelihood provided by the data and the expected impacts.

148 Following the mentioned changes of likelihood of extreme climatic events for present day and projected for 2050 and observed and projected consequences for projects, a qualitative risk score (low, medium, high) was assigned (see Table 4.2 with scores below). With increased likelihood of extreme climate events (up between 50 to 300 percent), the risks of severe climate change or natural hazard impacts to these proposed infrastructure projects are likely to increase as well. This was generally expressed by assigning a higher risk score. For example, for extreme wind gusts of at least 42 m/sec, data show an increase in likelihood of occurrence (LO) within one given year from 3 percent to 12 percent, between today and 2050 respectively, up by 133 percent. Based on this assessment, the number of individual CI NIIP projects receiving a high risk score for this event increased from two (present day) to nine (by 2050) out of 24 total CI NIIP projects assessed.

149 The risk assessment matrix presented in Table 4.2 was used as an assessment tool for the need of climate proofing for individual projects. The matrix identified them as potential candidates for climate proofing measures to serve the purpose of further building resilience of the projects to climate change and natural hazards.

150 In addition, field trips were carried out for selected priority projects on Rarotonga to better understand current vulnerability to natural hazards and the significance of the consequences potentially caused by present and future natural hazards and climate change. For outer islands, such likelihood data were not readily available. Though a general application of this approach based on the Rarotonga data is possible, some risk adjustments for the outer islands in the north of Cook Islands are necessary, given the different conditions of the islands in the southern and northern groups.

151 A sector-specific risk assessment was also prepared. This includes the sub-sectors that were shortlisted during the prioritisation process, namely: energy, water, sanitation, road transport, marine transport, air transport, solid waste, communications (ICT), multi-sector projects. At a later stage, social infrastructure projects were added to the short-list of CI NIIP priority projects upon request by the Cook Islands government. More details of the considerations for each sub-sector are included in Appendix E.

[14] In ADB (2005). Pacific Studies Series. Climate Proofing. A risk-based Approach to Adaptation. Page 15 ff.

Table 4.2 Climate Change and Natural Hazards Risk Assessment Matrix for CIIP Prioritised Projects

Sector Code	Prioritised Project		Assessed Risks based Present Day Likelihood				Assessed Risks based on 2050 Projection Likelihood				
		Climate Change Vulnerability Assigned during Prioritisation Process[15]	Extreme Rainfall- Daily at least 300mm	Height of Sea Surge- Extreme at least 6m above mean sea level	Wind Gust - Extreme at least 42 m/sec	Extreme Tempera- ture - Daily at least 34°C	Extreme Rainfall- Daily at least 300mm	Height of Sea Surge- Extreme at least 6m above mean sea level	Wind Gust - Extreme at least 42 m/sec	Extreme Temperature – Daily at least 34°C	Climate Proofing Needed Y= Yes N= No
WS	TMV Trunk, Intakes, reservoirs, treatment, meters, etc.	2	Medium	Low	Low	High	High	Medium to High	Medium	High	Y
SN	Long term sanitation upgrades Rarotonga	4	Low	Low	Low	Low	Low	Low	Low	Low	N
E	TAU control & Generation - Rarotonga	4	Low	Low	Low	Low	Low	Low	Low	Low	N
WS	Outer Islands Community Water Tank rehabilitation	2	Low	High	Medium to High	High	High	High	High	High	Y
MS	Outer Islands Cyclone shelters	2 (5)	Low	High	Medium	Low	Low	High	High	Low	Y
ICT	Fibre-optic Cable for international Communications	4	Low	Medium	Low	Low	Low	Medium	Low	Low	N
MT	Orongo Marina and Town Centre Development	1	Low	High	High	Low	Medium	High	High	Low	Y
RT	Avarua Bridges	3	Medium	High	Low	Low	High	High	Low	Low	Y
E	Aitutaki Solar PV Mini-Grid System	3	Low	Low	Medium	Low	Low	Low	High	Low	N
AT	Atiu Upgrade to Civil Aviation Authority Part 139 Regional Turbo Prop runway	3	Low	Medium	Low	Low	Low	Medium	Low	Low	N

[15] This column records the vulnerability to climate change and disaster in form of score (0 to 5) assigned to each project as part of the MCA and confirmed during the Prioritization Workshop held on 28 April 2014 in Cook Islands. The prioritization was conducted in two working sessions with the Cook Island Government Infrastructure Committee and with a wider group of stakeholders from Government, non-Government organisations and private sector. Social infrastructure projects were added to the priority list in January 2015 with limited data on project sites and vulnerability to CC and natural hazards.

Sector Code	Prioritised Project		Assessed Risks based Present Day Likelihood				Assessed Risks based on 2050 Projection Likelihood				
		Climate Change Vulnerability Assigned during Prioritisation Process[16]	Extreme Rainfall- Daily at least 300mm	Height of Sea Surge- Extreme at least 6m above mean sea level	Wind Gust - Extreme at least 42 m/sec	Extreme Tempera- ture - Daily at least 34°C	Extreme Rainfall- Daily at least 300mm	Height of Sea Surge- Extreme at least 6m above mean sea level	Wind Gust - Extreme at least 42 m/sec	Extreme Temperature – Daily at least 34°C	Climate Proofing Needed Y= Yes N= No
z	Rarotonga Airport Instrument landing upgrade	5 (1)	Low	Medium	Low	Low	Low	Medium	Low	Low	N
AT	Rarotonga Airport Terminal Improvement (phase 2)	4	Low	Medium	Low	Low	Low	Medium to High	Low	Low	N
RT	Road sealing project for Aitutaki (6km)	3	Low to Medium	Low to Medium	Low	Medium	Medium	Medium	Low	Low	N
E	Atiu Solar PV Mini-Grid System	3	Low	Low	Medium	Low	Low	Low	High	Low	N
E	Mauke Solar PV Mini-Grid System, and generators, powerhouse, distribution upgrade	3	Low	Medium	Medium	Low	Low	Medium	High	Low	N
E	Mitiaro Solar PV Mini-Grid System	3	Low	Low	Medium	Low	Low	Low	High	Low	N
MS	Rutaki Foreshore Rock Revetment Development	2	Low	Medium to High	Low	Low	Low	High	Medium	Low	Y
SW	Incinerator for Rarotonga	4	Low	Low	Low to Medium	Low	Low	Low	Medium	Low	N
E	Mangaia Solar PV Mini-Grid System	3	Low	Low	Medium	Low	Low	Low	High	Low	N
Ed	Apii Nikau School Reconstruction	2	Low	Medium	Low	Low	Low	Medium to High	Medium	Low	Y
Ed	Re-build of National College (Tereora)	3	Low	Medium	Low	Low	Low	Medium	Low	Low	N
Ed	Fitting Schools with Water Harvesting Systems (pilot)	2	Low	Medium	Low	Low	Low	Medium	Low	High	Y

[16] This column records the vulnerability to climate change and disaster in form of score (0 to 5) assigned to each project as part of the MCA and confirmed during the Prioritization Workshop held on 28 April 2014 in Cook Islands. The prioritization was conducted in two working sessions with the Cook Island Government Infrastructure Committee and with a wider group of stakeholders from Government, non-Government organisations and private sector. Social infrastructure projects were added to the priority list in January 2015 with limited data on project sites and vulnerability to CC and natural hazards.

4.2.1 RISK ASSESSMENT OF PRIORITY PROJECTS

152 Those CI NIIP priority projects that were found to have high risks at present day or in the future were then selected for further evaluation of preliminary climate change adaptation needs. This process was carried for nine out of the 24 shortlisted CI NIIP projects.

153 The majority of the prioritised 24 CI NIIP economic infrastructure projects are at the pre-concept or concept stage. Only a few have proceeded to a design development stage (e.g. Orongo Marina and Town Centre Development). A fine-scale climate proofing exercise with modelling studies, plans and designs for detailed engineering or non-engineering responses, as it has been already done for two port projects in Cook Islands, would need to be carried out for individual CI NIIP projects once more project details become available.

154 Climate change and natural hazards resilience is a major component in at least three of the 24 priority projects under the CI NIIP. Infrastructure development in the outer islands is the focus of ten of the 24 projects and even those projects that do not have a specific CCA/DRM emphasis will contribute to reducing the overall vulnerability of the outer islands communities.

155 Following the earlier described risk assessment approach for 2050 projected climate changes, the following nine CI NIIP projects were selected for further project-based preliminary climate change adaptation evaluation:

Table 4.3 Prioritised NIIP projects with climate proofing needs based on projected climate change risks (2050)

Sector Code		Assessed Risks based on 2050 Projection Likelihood					
	Prioritised Project	Extreme Rainfall- Daily at least 300mm	Height of Sea Surge- Extreme at least 6m above mean sea level	Wind Gust - Extreme at least 42 m/sec	Extreme Temperature – Daily at least 34°C	Climate Proofing Needed Y= Yes N= No	CCA DRR Function
WS	TMV Trunk, Intakes, reservoirs, treatment, meters, etc.	High	Medium to High	Medium	High	Y	High
WS	Outer Islands Community Water Tank rehabilitation	High	High	High	High	Y	High
MS	Outer Islands Cyclone shelters	Low	High	High	Low	Y	Very High
MT	Orongo Marina and Town Centre Development	Medium	High	High	Low	Y	Neutral
RT	Avarua Bridges	High	High	Low	Low	Y	Neutral
MT	Penrhyn Coastal Protection -	Medium	High	High	Low	Y	Neutral
MS	Rutaki Foreshore Rock Revetment Development	Low	High	Medium	Low	Y	High
Ed	Apii Nikau School Reconstruction	Low	Medium to High	Medium	Low	Y	Low*I
Ed	Fitting Schools with Water Harvesting Systems (pilot)	Low	Medium	Low	High	Y	Neutral

* Unless used as a cyclone shelter

156 The detailed assessments of these projects are provided in Appendix F.

157 Responses for climate change adaptation and disaster risk reduction vary from project to project. For the water and sanitation sector, the long-term sustainability of water resources need to be studied and potential pressure on water demand. Adequate and robust design responses may include:

(a) design additional, possibly enclosed, water detention and storage facilities that are filled during storm events and act as additional water reservoirs in case of prolonged droughts during dry season/ El Niño events;
(b) strengthen and expand water catchment protection legislation and programmes as a mean of building resilience against risks from more intense rainfall events (i.e. landslides, floods);
(c) if groundwater extraction is planned as supplement source water, take into account the effects of sea level rise and salt-water intrusion in a sustainable groundwater extraction design; and
(d) consider the effects of coastal erosion and impacts of storm surges and tropical cyclones when planning the routing of water pipes. This could include placing main pipes outside coastal inundation zones should be considered.

158 The Outer Islands Community Water tank rehabilitation project is already designed for building climate change and natural hazard resilience. However, CCCI should also consider the long-term sustainability of water resources, including climate change scenario. This includes the design of community water tanks with added protection against higher intensity storm surges and tropical cyclones, use of non-corrosive materials.

159 To further build resilience to climate change and natural hazards, long-term programmes should aim at rehabilitating contaminated groundwater resources on the outer islands. This could be achieved by improving septic treatment systems and promote grey water recycling with proper phyto-remediation treatment for non-potable water recycling purposes. The emphasis needs to be on appropriate technologies that can be managed by communities based on available resources on the islands.

160 The design for the cyclone shelter project needs to incorporate the projected increased intensity of tropical cyclones by building with less corrosive materials, increase the strength of pillars of cyclone shelters to allow for height increase in the future and larger wave impacts, strengthen community preparedness for disasters, awareness for public health during tropical cyclone events and establish risk management systems and emergency contingency plans during the hazard events (i.e. disconnecting pipes to tanks before cyclones and storm surges).

161 For the Orongo Marina and Town Centre Development project on Aitutaki, the general approach of climate change adaptation is to improve design and workmanship to make sure that any structure constructed takes into account changing climatic conditions. The detailed design should identify the adequacy of design of wharves given sea level rise, increased storm surges, wave action and the impact of increased salinity on corrosion.

162 For the Avarua Bridges,the following aspects should be considered during the design of the project:

(a) raising the height of bridge level to above projections for sea level rise;
(b) accept temporary bridge closures;
(c) rapid rehabilitation/ re-construction; and
(d) identify risks and contingency plans in case of bridge failure during extreme events.

Another adaptation strategy would be to strengthen and expand water catchment protection legislation and programmes as a mean of building resilience against risks from more intense rainfall events (i.e. landslides, floods).

163 The Penrhyn Coastal Protection TeTautura and Omoka Port Facilities and Fuel Depot Relocation project detailed design should address climate change and natural hazard impacts by identifying the adequacy of design of wharves given sea level rise, increased storm surges, wave action and the impact of increased salinity on corrosion. Additional resilience measures to protect the wharf areas from impacts include coral reef protection.

164 The Rutaki Foreshore Rock Revetment Development is already designed to provide protection along this particular area from high seas, storm surges and cyclonic events. Adaptation measures may include raising the height of the rock revetments to above projections for sea level rise and to consider additional buffer planting landward of the coastal protection zone. If these measures are not sufficient, road realignment and raising road levels in these low-lying areas may be considered.

165 The fitting schools in Rarotonga and the outer islands with rainwater harvesting systems and renewable energies (Rarotonga) increases water and energy security. Schools serve as evacuation shelters if located outside high risk areas. Thus, an independent water and energy supply could facilitate an initial disaster management response. With more extreme climatic events expected for the time horizon 2050, extended floods and droughts will be factors influencing the efficiency of these systems. Thus, rainwater harvesting systems need to be designed to maximise collection and storage through extended capacity in order to provide rainwater for longer periods in times of droughts. Climate proofing would also require that the rainwater harvesting systems are designed so that intrusion of seawater in case of storm surges is prevented.

166 For the Apii Nikau School Reconstruction project, climate proofing should entail the application of climate-proofed design and building materials in line with construction and material selection codes (the development of which are part of enabling environment activities). The elevation of school buildings should also take into account projected heights of storm surges for 2050 to assure that the buildings could function as shelters in case of natural hazards events.

4.3 Enabling Environment for Climate Change and Disaster Management in Cook Islands

167 Climate Change Cook Islands (CCCI) was established in 2011 as a division of the Office of the Prime Minister (OPM) with the transfer of the operational focal point functions from the National Environment Services (NES). All international, regional and national climate change matters are managed, overseen and coordinated by CCCI.

Disaster risk management matters are coordinated by Emergency Management Cook Islands (EMCI) as legislated by the 2007 Disaster Management Act. EMCI, also a division of the Office of the Prime Minister, is primarily charge of coordinating operational responses in the case of a disaster occurring. Though coordinating immediate emergency response to areas affected by cyclones remains the focus activity of EMCI, there are efforts to build capacity in disaster prevention. This includes the planning and construction of cyclone shelters in conjunction with other agencies, as well as reviewing and improving current shelter facilities, including school buildings in Rarotonga.

168 Another initiative in which EMCI is participating jointly with ICI is the establishment of Geographic Information System (GIS)-based cyclone vulnerability maps, detailing areas that are likely subject to cyclone impacts. The country has also invested in building a trust fund for emergency response work and insurance coverage for the costs of impacts caused by natural hazards. In line with the 2007 legislation, EMCI is responsible for the coordination of emergency response to multiple natural hazards, including droughts and floods.

169 The Central Planning and Policy Division (CPPO), within OPM, is mandated to oversee the implementation of development priorities. Advice and information on progress is currently provided to Cabinet on related outcomes by these divisions through the National Sustainable Development Commission (NSDC) and the Minister. As portfolios of the Prime Minister, these divisions along with the Office of the Energy Commissioner and Renewable Energy Development Division form a central policy and planning hub in addressing climate and disaster risks to development.

170 In 2012, the Cook Island Government presented the Joint National Action Plan (JNAP) for Disaster Risk Management and Climate Change Adaptation (2011 to 2015). To lead and support JNAP implementation, EMCI and CCCI will jointly provide secretariat services and also the required staff and other resources under the JNAP Project Management Committee to enhance the implementation by the relevant ministries and agencies. The committee will be responsible to an expanded National Disaster Risk Management and Climate Change Council (NDRMCCC) for the implementation of the plan.

171 To facilitate linkages between disaster risk management, climate change and their effects on development planning and implementation, CCCI, the national coordinator for the national climate change adaptation programme, provides the direct link for this programme to EMCI, the JNAP PMC and the NDRMCCC. The JNAP has proposed that EMCI receives further strengthening, including additional two staff and specialist support at a senior technical level to assist the Director of EMCI in the oversight and coordination of JNAP implementation aspects.

172 The two key components of the enabling environment for DRM and CCA that are considered to be particularly important for economic and social infrastructure in Cook Islands are as follows:

- Decision support tools, which relates to knowledge and information availability
- Governance framework, including legislation, institutions and policies

173 Decision support tools: In Cook Islands, climate change adaptation assessment is still being carried out on ad-hoc basis and not automatically included in every infrastructure project design, mostly with significant overseas technical assistance needed. Based on two ports that underwent detailed technical studies for climate change adaptation, the process is time consuming, taking up to year for the technical and modelling work to be completed. It is thanks to such external studies being undertaken, for instance for the Avatiu port on Rarotonga, that more detailed data on climate change vulnerability for sensitive coastal areas becomes available now for decision-making. ICI is coordinating an internet-based Geoportal Development Site that provides some relevant data on climate change and natural hazard vulnerable areas on-line.

The understanding of climate risks in Cook Island can be enhanced by overlaying spatial patterns of risk on the understanding of sub-sector level risk. Detailed vulnerability and risk mapping, for example, for coastal inundation is currently planned or underway for Rarotonga, in coordination between ICI, EMCI and the Meteorological Services. This can be based on available detailed elevation data (2m-contour lines for coastal areas) and models of future projected wave heights during a storm surge or tropical cyclone. However, at this time this information is not yet processed and published, with the exception for those study areas mentioned before.

174 Information sharing between Government agencies could be further improved to support decision-making. A centralised GIS centre that collects, processes and provides data would be a step into the right direction. Individual Government agencies often do not have the resources for such detailed assessments and would benefit from the availability of such data from a GIS centre.

175 Governance framework: The national climate change policy and the JNAP have received high-level Government support, with the JNAP in particular representing a major step forward in the identification and documentation of the country's DRM and CCA priorities. Efforts are now needed to ensure translation of the JNAP policies and actions into sector policy, legislation (for example building and material codes with climate proofing provisions) and work programmes. The integration of DRM and CCA issues into the CI NIIP has the potential to act as a pilot project for other sectors in this regard.

176 The Disaster Management Act 2007 establishes the institutional and organizational framework for DRM activities, with a focus on response activities, but does not address CCA. The environmental impact assessment (EIA) legislation makes limited reference to DRM and CCA issues, though NES is attempting to include these aspects in the terms of references for EIA. However, this will be only fruitful, if there is sufficient capacity within the EIA industry to integrate DRM and CCA with EIA services.

177 There is thus no clear legal framework or entry point for CCA that obliges proponents to assess the interaction of infrastructure with climate or natural disasters and to identify and implement appropriate resilience building measures.

178 Technical capacity within Government in relation to CCA and DRM is limited to a relatively small number of personnel within the JNAP Secretariat and Project Management Committee, CCCI and EMCI. Specific skills in use of decision support tools to support climate risk analysis and resilience building for large-scale economic infrastructure are lacking. These staff require more comprehensive and targeted skills so that they can act as focal points for CCA and DRM issues throughout the whole of Government. There is very little technical or material capacity for CCA or DRM on the outer islands.

5 Funding Strategy

5.1 Availability of Finance for Investment in Economic Infrastructure

5.1.1 CAPITAL INVESTMENT

179 Potential funding sources for capital investment in economic and social infrastructure, include:

- Financing by Government from domestic revenues (referred to as CAPEX in the Cook Islands).
- Concessional borrowing by Government, applied directly or on-lent to SOEs.
- Self-financing by SOEs, using cash reserves or commercial loans.
- Overseas development assistance (ODA), in the form of grants from Development Partners.
- Financing by the private sector, in the form of domestic or foreign private investment.

180 Capacity in relation to each of these potential funding sources is summarised below, and considered in more detail in Appendix H.

Financing by Government

181 Financing by Government from domestic revenues (CAPEX) funds smaller capital investment projects, and agreed Government contributions to larger projects financed through ODA or concessional loans. The Capital Plan (Budget Book 3) presented with the CIG Budget Estimates for 2013/14 shows an average annual provision for CAPEX over the period 2012/13 to 2015/16 of $NZ5.9 million. This provision covers all sectors, with economic and social infrastructure accounting for the majority.

182 Government's capacity to provide for CAPEX over the 10 year timeframe of CI NIIP is dependent on the Government's overall fiscal position, and is difficult to estimate over this length of time with any certainty, but a working assumption for planning purposes is that the average annual allocation of CAPEX for economic and social infrastructure over the planning period could amount to $NZ5.0 million.

Concessional borrowing

183 In recent years two major loans have been taken out for economic infrastructure. These are the ADB loan for the Avatiu Port Development Project taken out in 2009 (and supplemented in 2011), on-lent by Government to CIPA, and the loan from the People's Republic of China (PRC) for the Rarotonga Water Ring Main Upgrade taken out in 2012. An ADB loan amounting to $US11.8 million ($NZ13.2 million) for the Renewable Energy Project is in the pipeline.

184 Future borrowing is subject to the fiscal responsibility and transparency processes provided for in the MFEM Act 1995/96. Two important fiscal responsibility ratios are set in relation to Government borrowing.

185 Firstly, net debt should be maintained at a level below 35 percent of GDP. Net debt stands at just over 20 percent of GDP in 2013/14 and is projected to drop below 18 percent of GDP by 2016/17 (assuming no new borrowing), so this ratio is not an impending constraint on future borrowing. The level of net debt was $NZ83.8 million in 2013/14, and is projected to drop below $NZ50 million by the end of the CI NIIP planning period in 2023/24 (assuming no new borrowings).[17] These figures do not include the ADB loan for the Renewable Energy Project, though adding this loan leaves net debt still well below the fiscal responsibility threshold of 35 percent of GDP.

[17] Pre-election Economic and Fiscal Update 2014, MFEM, 30 April 2014, p56

186 The second fiscal responsibility ratio in relation to Government borrowing requires that net debt servicing should not exceed 5 percent of Government revenue. This ratio stands at just under 4 percent in 2013/14, and adding in the proposed loan for the Renewable Energy Project is projected to exceed the 5 percent threshold in the medium term. It is then projected to remain above the 5 percent threshold until beyond 2023/24 (the end of the 10 year time frame of CI NIIP).

187 A recent macroeconomic assessment of the Cook Islands[18] included a debt sustainability analysis. The debt sustainability analysis concluded that the debt position of the Cook Islands Government remains comfortable and that the Cook Islands can comfortably service existing debt. The assessment noted that debt is currently well below the Government's own threshold of 35 percent of GDP (and the 40 percent of GDP that the IMF considers a sustainable level of foreign debt for small developing countries). The assessment also noted that while the ratio of debt servicing to revenue was projected to exceed the Government's threshold of 5 percent in the medium term, this threshold was considered too conservative and recommended raising it to 10 percent. At the same time, the assessment noted that in the recent past the Cook Islands had struggled to service very high debt levels (which could re-emerge if public expenditure wasn't kept in check), and that it was prudent for the Government to maintain some borrowing space below the fiscal responsibility threshold to cover the possible need for reconstruction loans in the event of damage from disasters.

188 Government is cautious in relation to new borrowing, given projected levels of net debt servicing and the fiscal responsibility ratios that have been adopted, and there would not appear to be scope for additional borrowing for economic infrastructure within the 10 year timeframe of CI NIIP. The scope for additional borrowing could be kept under review, as part of the ongoing process of monitoring and updating CI NIIP.

189 The financing of the ongoing TMV Ring Main Upgrading via a loan from China, and the ADB loan for the Renewable Energy Project, are the only concessional borrowings included in estimates of the funding available for CI NIIP over the period 2014/15 to 2023/24.

Self-financing by SOEs

190 Capital expenditure self-financed by the three major SOEs involved in economic infrastructure (TAU, CIAA and CIPA) averaged just over $NZ5 million per annum in total over the five year period 2008/9 to 2012/13. It is assumed that capital expenditure by SOEs of this order will continue over the 10 year timeframe of CI NIIP. However, this level of capital expenditure would largely be absorbed by smaller projects outside the scope of the projects of strategic national significance covered by CI NIIP.

191 On the basis of a conventional analysis making provision for a reasonable return on equity in the form of dividends to Government, these SOEs do not currently have the capacity to borrow on commercial terms. However, it is recognised that CIAA is currently borrowing commercially, and that the three SOEs may continue to consider commercial borrowing as a source of finance over the timeframe of CI NIIP.

192 As a working assumption for planning purposes, it is assumed that SOEs will contribute a total of $NZ1 million per annum to the CI NIIP priority investment program, with this being self-financed from cash reserves or borrowed commercially.

Overseas development assistance

193 Overseas development assistance (ODA) is estimated to contribute $NZ129.5 million to Cook Islands development activities over the three year period 2013/14 to 2015/16.[19] Of this, just over $NZ64 million (or an average of just over $NZ21 million per annum over this period) relates to economic infrastructure. This information refers to ODA allocations, while expenditure performance against allocations has been low in earlier years due to issues with implementation capacity. It would appear that support to investment in economic infrastructure from Development Partners is currently at historically high levels, with the major Development Partner (New Zealand) contributing special assistance over and above normal bilateral allocations to fast track important investments in renewable energy and water and sanitation.

194 It is difficult to predict the level of ODA to Cook Islands over the 10 year timeframe of CI NIIP, and also the share of total ODA that will be allocated to economic and social infrastructure. Cook Islands does have a narrower range of major Development Partners than other Pacific Island countries,[20] due in part to its constitutional status and in part to its high level of per capita GDP. It is likely that grants from the major Development Partner, New Zealand, will return to more normal levels in coming years (with economic and social infrastructure competing for a share of an annual allocation of around $NZ14 million, plus an additional $NZ2 million managed on behalf of Australia), though one-off assistance outside the agreed bilateral allocation may still be available in special cases.

195 In relation to future ODA, despite the fact that Cook Islands has graduated they are still eligible under the 11th European Development Fund (EDF). Moreover, additional funding on climate adaptation and disaster risk reduction is coming (and could come in the future) from other EU budget lines. The GCCA+ is an example of how Cook

[18] Cook Islands: Macroeconomic Assessment, ADB Technical Assistance Consultant's Report RETA 7681, June 2013.
[19] Pre-election Economic and Fiscal Update 2014, MFEM, 30 April 2014, pp.62-66.
[20] The Cook Islands is not a member of the World Bank, for example.

Islands is benefitting and could further benefit from EU funding. Another example is the Investment Facility for the Pacific (€46 million) where Cook Islands could benefit from EU grant that could leverage additional funds from International Financial Institutions (loan or grants).

196 Experience in other Pacific Island countries suggests that the role of non-traditional donors is growing and new aid modalities are emerging which can change investment prospects dramatically (as an example, the Pacific Aviation Investment Project has enabled the investment needs of a number of countries in the aviation sector to be addressed utilising funding allocated on a regional basis).

197 Grant in kind funding is available from China, at a level estimated at $NZ18.7 million over the three year period 2013/14 to 2015/16, which could potentially be applied to in kind assistance related to infrastructure investment. To date this funding is being applied to agricultural machinery and heavy machinery for the outer islands.

198 Included within the ODA estimates set out above is funding for climate change adaptation, managed by the Office of the Prime Minister and including funding from the Global Environment Facility and the United Nations Adaptation Fund. Optimal use of climate change adaptation funding available from Development Partners has the potential to contribute significantly to the financing of CI NIIP investments.

199 As a working assumption for planning purposes, it is assumed that over the 10 year timeframe of CI NIIP ODA will contribute an average of $NZ18 million per annum for economic and social infrastructure.

Private Sector Investment

200 Projects financed purely from private sources are not included in the CI NIIP priority investment program, though the plan includes description of private sector participation in infrastructure investment. The private sector is expected to invest significantly in economic infrastructure, including in relation to the private production of renewable energy for own use and for sale to the power grid, and other potential projects including a pipeline for delivery of fuel to shore from larger tankers anchored offshore. Households are also making significant contributions to the upgrading of household sanitation systems.

201 Private investment is a possibility in some of the priority projects identified in CI NIIP, such as the fibre-optic cable for international communications, though the financing model for this project is still under development and none of the projects have so far been shown to demonstrate a sufficient degree of financial viability to warrant reliance on private investment alone. Other projects with potential for part-financing from private sources include the Rarotonga Airport Terminal Improvement (phase 2) and the Orongo Marina and Town Centre Development. As a working assumption for planning purposes, and as an aspirational target, it is assumed that private investment will contribute an average of $NZ2 million per annum to the CI NIIP priority investment program.

202 The scope for private sector participation in infrastructure investment is covered below in section 5.4.

5.1.2 SUMMARY OF THE AVAILABILITY OF FINANCE FOR CI NIIP

203 For planning purposes it is assumed that an average of $NZ28.8 million per annum, or $NZ288 million over the 10 year period 2014/15 to 2023/24, will be available to fund the capital investment plan under CI NIIP.[21] This is assumed to be contributed by:

Table 5.1 Contributions to CI NIIP Financing

Contributor to CI NIIP financing	Contribution
Government revenue	An average of $NZ5.0 million per annum, or $NZ50 million in total, from CAPEX
Government borrowing	$NZ14.8 million relating to completion of the ongoing TMV Ring Main Upgrading, and $NZ13.2 million for the Renewable Energy Project
SOE self-financing	An average of $NZ1 million per annum, or $NZ10 million in total
ODA	An average of $NZ18 million per annum, or $NZ180 million in total
Private sector	An aspirational target of $NZ2 million per annum, or $NZ20 million.[22]

204 It is clear that the bulk of investment under CI NIIP will need to be financed from ODA (grants from Development Partners). ODA levels are difficult to forecast over a period of 10 years, and the implementation of the plan will need to be monitored, and reviewed should ODA fall consistently below (or above) the levels projected. The adoption of an assumption for planning purposes in relation to the availability of funding for CI NIIP allows a cut-off point to be established for inclusion of proposed projects in the CI NIIP priority investment program, drawing on the project scores and rankings provided by the Multi-criteria Analysis used in project prioritisation.

[21] To put this in some perspective, a level of investment of $NZ288 million in infrastructure in 2014/15 would be equivalent to approximately 7% of projected GDP in current prices in that year. According to the World Bank's World Development Report for 1994, Infrastructure for Development, the annual level of public investment in infrastructure in developing countries ranges from 2% to 8% (and averages 4%) of GDP.
[22] The scope for private sector participation in infrastructure investments is covered below in section 5.4 of the plan.

5.2 Demand for Infrastructure Finance

5.2.1 CAPITAL

205 Capital investment requirements for economic infrastructure over the period 2014/15 to 2023/24 derived from projects ongoing or committed at the commencement of the plan period, high priority proposed projects of strategic importance which can be accommodated within the level of funding availability assumed for CI NIIP, an allowance for smaller projects below the capital cost threshold set for CI NIIP, and provision for any additional climate-proofing required for CI NIIP investments. These requirements are summarised below:

Table 5.2 CI NIIP Capital Investment Requirements

Component	Capital investment requirement 2014/15 to 2023/24 ($NZ million)
Ongoing and committed projects	35.4
High priority proposed projects	237.6
Allocation for smaller projects	10.0
Allocation for climate-proofing of CI NIIP projects	5.0
Total capital investment	**288.0**

206 The provision of $NZ237.6 million for high priority proposed projects caters for the 24 highest ranked projects as scored in the Multi-criteria Analysis, noting that two projects (the Long Term Sanitation Upgrades for Rarotonga and the Rarotonga Airport Terminal Improvement) are phased to commence within the CI NIIP plan period and to be completed beyond that period.

207 Most of the proposed projects included in CI NIIP are at an early stage of development, and this has implications for the accuracy of costings. As projects are further developed, costings will need to be refined to ensure that they reflect whole of life costs – allowing for concept development and planning, detailed design and documentation, construction or supply, contract supervision, operation and maintenance, and disposal or decommissioning. Indicative estimates of the annual cost of maintaining NIIP investments at the end of the plan period are provided in Appendix G.

208 The possible phasing of this capital expenditure over the ten year plan period is set out in Figure 5.1.

209 Due to the inclusion of ongoing projects, the investment plan includes a high level of expenditure in the first 2 years, a more even spread of expenditure over the following 6 years, and then a lower level of expenditure in the final 2 years of the 10 year planning period. This reflects the current heavy emphasis on infrastructure investment, and a return to more typical levels of expenditure thereafter. Any slippage of project implementation in the early years, due to strain on implementation capacity, may lead to a more even phasing of expenditure over the 10 year planning period.

Figure 5.1 Possible Phasing of CI NIIP Investments

Sector/Project	Status	Est. Cost	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
		($NZm)	($NZm)	($NZm)	($NZm)	($NZm)	($NZm)	($NZm)	($NZm)	($NZm)	($NZm)	($NZm)
Air Transport												
Rarotonga Runway Repairs (joints)	Completion due 2013/14	1.0										
Atiu Upgrade to Civil Aviation Authority Part 139 Regional Turbo Prop runway	Proposed	3.9				2.9	1.0					
Rarotonga Airport Instrument landing upgrade	Proposed	3.2			1.6	1.6						
Rarotonga Airport Terminal Improvement (phase 2)	Proposed	9.3										5.4
Marine Transport												
Manihiki Tukao & Tauhunu Harbour Upgrade	Ongoing	2.8	0.3									
Avana harbour upgrades	Completion due 2013/14	0.7										
Orongo Marina and Town Centre Development	Proposed	15.0				3.0	8.0	4.0				
Penrhyn Coastal Protection - TeTautua & Omoka Port Facilities and Fuel Depot relocation.	Proposed	4.0		2.0	2.0							
Road Transport												
Road sealing - Aquarius to Tupapa	Ongoing	5.0	5.0									
Avarua Bridges	Proposed	5.0								2.5	2.5	
Bridges upgrade including Avatiu Valley Bridge	Proposed	1.5			1.0	0.5						
Road sealing project for Aitutaki (6km)	Proposed	0.8					0.8					
Water Supply												
Aitutaki Domestic Water Tanks	Ongoing	0.6	0.2									
TMV Ringmain	Ongoing	20.3	11.2	3.6								
IWRM Demonstration Project Rarotonga	Completion due 2013/14	0.5										
TMV Trunk, Intakes, reservoirs, treatment, meters etc	Proposed	36.3	8.3	11.0	10.0	7.0						
Outer Islands Community Water Tank rehabilitation	Proposed	1.5	0.7	0.8								
Sanitation												
Sanitation upgrades - onsite Aitutaki	Ongoing	2.4	0.8	0.8								
Sanitation upgrades onsite - scale up pilot to Rarotonga, Phase 2	Ongoing	11.2	3.5	3.5	0.7							
Long term sanitation upgrades Rarotonga	Proposed	37.0										3.6
Solid Waste												
Incinerator for Rarotonga	Proposed	3.0								3.0		
Energy												
Manihiki Solar PV Mini-Grid System (cost updated by RED)	Completion due 2013/14	2.2										
Nassau Solar PV Project	Completion due 2013/14	0.9										
Palmerston Solar PV Mini-Grid System	Ongoing	0.6	0.6									
Penrhyn Solar PV Mini-Grid System	Ongoing	1.7	0.7	1.0								
Pukapuka Solar PV Mini-Grid System	Completion due 2013/14	2.8										
Rakahanga Solar PV Mini-Grid System	Completion due 2013/14	1.0										
Airport Solar PV Installation	Ongoing	3.5	3.5									
TAU control & Generation - Rarotonga	Proposed	45.2			4.0	8.0	8.0	8.0	8.0	8.0	1.2	
Aitutaki Solar PV Mini-Grid System	Proposed	16.0		8.0	8.0							
Atiu Solar PV Mini-Grid System	Proposed	3.1	1.6	1.5								
Mauke Solar PV Mini-Grid System, and generators, powerhouse, distribution upgrade	Proposed	3.2	1.6	1.6								
Mitiaro Solar PV Mini-Grid System	Proposed	1.9	1.0	0.9								
Mangaia Solar PV Mini-Grid System	Proposed	3.5	1.7	1.8								
ICT												
Fibre-optic Cable for international Communications	Proposed	35.0						15.0	20.0			
Multi-sector												
Outer Islands Cyclone shelters	Proposed	2.0			1.0	1.0						
Rutaki Foreshore Rock Revetment Development	Proposed	2.6				1.3	1.3					
Education												
Apii Nikao School Reconstruction	Proposed	11.4	1.4	6.0	4.0							
Re-build National College (Tereora)	Proposed	30.0					2.0	7.0	7.0	7.0	7.0	
Fitting Schools with Water Harvesting Systems (pilot)	Proposed	0,5			0.5							
Nominal allocation for projects below the NIIP threshold value			1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Nominal allocation for climate-proofing of projects vulnerable to climate change			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
			43.6	44.0	34.3	26.8	22.6	35.5	36.5	22.0	12.2	10.5

Key
Ongoing and committed projects
High priority proposed projects
Nominal allocation for smaller projects
Nominal allocation for climate-proofing of NIIP projects

5.2.2 MAINTENANCE

210 Maintenance responsibilities flow to the entities owning infrastructure assets, as summarised in Table 5.3 below.

Table 5.3 Infrastructure Maintenance Responsibilities

Sub-sector	Responsibility for infrastructure maintenance
Air Transport	CIAA for Rarotonga and Aitutaki Island Governments for outer islands, with technical support from ICI and CIAA
Marine Transport	CIPA for Rarotonga and Aitutaki Island Governments for outer islands, with technical support from ICI and CIPA
Road Transport	ICI for Rarotonga Island Governments for other islands
Water	ICI for Rarotonga Island Governments for other islands
Sanitation	ICI for Rarotonga Island Governments for other islands
Solid Waste	ICI (WATSAN Unit) for Rarotonga Island Governments for other islands
Energy	TAU for Rarotonga Island Governments for other islands, with technical support from ICI and TAU
Communications	Private sector (TCI, part owned by CIG)
Multi-sector	ICI for Rarotonga Island Governments for other islands
Education	CIIC for Government schools Churches and other organisations for private schools
Health	CIIC

211 This allocation of responsibilities for maintenance of infrastructure assets is likely to change in some cases over the 10 year timeframe of CI NIIP. Consideration is being given to changes in institutional arrangements for water and sanitation, in the course of implementing major projects such as TMV and WATSAN. This would involve operating water and sanitation on Rarotonga as a utility on an SOE model, possibly combined with the power utility. There is also discussion of extending the responsibilities of CIAA, CIPA and TAU to cover infrastructure services in other islands.

212 Maintenance requirements for economic infrastructure derive from the existing asset base at the commencement of CI NIIP, and additions to that asset base as a result of CI NIIP investments. Maintenance requirements are presented by sector below:

Table 5.4 Maintenance Requirements for Economic and Social Infrastructure

Sector	Existing asset base[1]	Estimated annual maintenance requirements	Estimated annual maintenance spending[2]	CI NIIP investments	Additional annual maintenance requirements at 2023/24
	($NZm)	($NZm)	($NZm)	($NZm)	($NZm)
Air transport	51.7	1.03	0.60	12.5	0.25
Marine transport	33.6	0.67	0.05	19.3	0.39
Road transport	72.8	1.46	0.50	12.3	0.25
Water	13.0	0.26	0.25	52.8	1.06
Sanitation	0.0	0.00	0.03	12.9	0.25
Solid waste	4.6	0.09	0.02	3.0	0.06
Energy	19.0	0.38	1.30	78.7	1.57
Communications	n.a.	n.a.	n.a.	35.0	0.70
Multi-sector	n.a.	n.a.	n.a.	4.6	0.09
Education	45.6	0.91	0.70	41.9	0.84
Health	8.3	0.17	0.70	-	-
Outer islands[3]	3.9	0.08	0.60	-	-
Small projects	n.a.	n.a.	n.a.	10.0	0.20
Climate-proofing	n.a.	n.a.	n.a.	5.0	0.10
Total	**252.5**	**5.05**	**4.75**	**288.0**	**5.76**

[1] Replacement cost where available, otherwise historical cost.
[2] Estimated actual spending from latest available annual accounts.
[3] All sectors except air transport, education and health

213 The estimates provided above of the existing infrastructure asset base are drawn from Government and SOE accounts and asset valuation studies[23], and the estimates appear low in some sectors. Estimates of the current level of maintenance spending should also be viewed with caution, as maintenance spending is not always itemised clearly in Government and SOE accounts, and some maintenance accounts only capture goods and services applied to maintenance and ignore other costs such as the labour input. The available data reveal that while in

[23] For example, Cook Islands Infrastructure Valuation report (Covering Rarotonga), AECOM New Zealand Ltd, March 2013 (prepared under ADB TA 7287 Infrastructure Services Delivery Improvement Project).

aggregate the current level of maintenance spending appears reasonable in comparison with the existing asset base, maintenance spending for transport infrastructure (air, marine, and road) appears low.

214 Noting again the limitations of the data in relation to the existing asset base and the current level of spending on maintenance, it is evident that the CI NIIP investment program will have a large impact on both the infrastructure asset base and the annual maintenance task over a 10 year period.

215 The maintenance requirements of the CI NIIP investment plan are addressed in more detail in Appendix G.

5.3 Funding Sources for CI NIIP Projects

216 The overall CI NIIP investment plan (including ongoing and proposed projects) will be funded from a combination of CAPEX, ODA, concessional loans, SOE self-financing, and private finance. Funding for ongoing projects is already secured, while funding for most proposed projects is yet to be determined. Figure 5.2 identifies the funding modality (or combination of modalities) that might be appropriate for each CI NIIP project.

Figure 5.2 Potential Funding Modalities for CI NIIP

Sector/Project	Status	Est. Cost ($NZm)	CAPEX ($NZm)	ODA ($NZm)	Concessional loans ($NZm)	SOE self-financing ($NZm)	Private ($NZm)
Air Transport							
Atiu Upgrade to Civil Aviation Authority Part 139 Regional Turbo Prop runway	Proposed	3.9					
Rarotonga Airport Instrument landing upgrade	Proposed	3.2					
Rarotonga Airport Terminal Improvement (phase 2)	Proposed	9.3					
Marine Transport							
Manihiki Tukao & Tauhunu Harbour Upgrade	Ongoing	2.8					
Orongo Marina and Town Centre Development	Proposed	15.0					
Penrhyn Coastal Protection - TeTautua & Omoka Port Facilities and Fuel Depot relocation.	Proposed	4.0					
Road Transport							
Road sealing - Aquarius to Tupapa	Ongoing	5.0					
Avarua Bridges	Proposed	5.0					
Bridges upgrade including Avatiu Valley Bridge	Proposed	1.5					
Road sealing project for Aitutaki (6km)	Proposed	0.8					
Water Supply							
Aitutaki Domestic Water Tanks	Ongoing	0.6					
TMV Ringmain	Ongoing	20.3					
TMV Trunk, Intakes, reservoirs, treatment, meters etc	Proposed	36.3					
Outer Islands Community Water Tank rehabilitation	Proposed	1.5					
Sanitation							
Sanitation upgrades - onsite Aitutaki	Ongoing	2.4					
Sanitation upgrades onsite - scale up pilot to Rarotonga, Phase 2	Ongoing	11.2					
Long term sanitation upgrades Rarotonga	Proposed	37.0					
Solid Waste							
Incinerator for Rarotonga	Proposed	3.0					
Energy							
Palmerston Solar PV Mini-Grid System	Ongoing	0.6					
Penrhyn Solar PV Mini-Grid System	Ongoing	1.7					
Airport Solar PV Installation	Ongoing	3.5					
TAU control & Generation - Rarotonga	Proposed	45.2					
Aitutaki Solar PV Mini-Grid System	Proposed	16.0					
Atiu Solar PV Mini-Grid System	Proposed	3.1					
Mauke Solar PV Mini-Grid System, and generators, powerhouse, distribution upgrade	Proposed	3.2					
Mitiaro Solar PV Mini-Grid System	Proposed	1.9					
Mangaia Solar PV Mini-Grid System	Proposed	3.5					
ICT							
Fibre-optic Cable for international Communications	Proposed	35.0					
Multi-sector							
Outer Islands Cyclone shelters	Proposed	2.0					
Rutaki Foreshore Rock Revetment Development	Proposed	2.6					
Education							
Apii Nikao School Reconstruction	Proposed	11.4					
Re-build National College (Tereora)	Proposed	30.0					
Fitting Schools with Water Harvesting Systems (Pilot)	Proposed	0.5					
Nominal allocation for projects below the NIIP threshold value		10.0					
Nominal allocation for climate-proofing of projects vulnerable to climate change		5.0					
Total			50.0	180.0	28.0	10.0	20.0

Notes:

1. Totals represent the estimates used for planning purposes in developing the NIIP funding strategy
2. Shaded areas indicate potential range of funding sources for each project. For many projects, the final mix of funding modalities is yet to be determined.
3. Some project costs fall outside of the ten year timeframe of NIIP (i.e. in earlier or later years)

217 Some of the priority proposed projects included in the CI NIIP investment plan are already the subject of discussions and negotiations between Government and Development Partners, while funding for most proposed projects is yet to be determined.

Table 5.5 CI NIIP Proposed Priority Projects – Possible Funding Sources

Proposed project	Estimated capital cost ($NZm)	Possible funding source
Air Transport		
Atiu Upgrade to Civil Aviation Authority Part 139 Regional Turbo Prop runway	3.9	To be determined
Rarotonga Airport Terminal Improvement (phase 2)	9.3	To be determined, possible private sector participation
Rarotonga Airport Instrument landing upgrade	3.2	To be determined
Marine Transport		
Penrhyn Coastal Protection - TeTautua & Omoka Port Facilities and Fuel Depot relocation	4.0	To be determined
Orongo Marina and Town Centre Development	15.0	To be determined, possible private sector participation
Road Transport		
Road sealing project for Aitutaki (6km)	0.8	To be determined
Bridges upgrade including Avatiu Valley Bridge	1.5	To be determined
Avarua Bridges	5.0	To be determined
Water Supply		
Outer Islands Community Water Tank rehabilitation	1.5	SRIC plus balance to be determined
TMV Trunk, Intakes, reservoirs, treatment, meters etc.	36.3	New Zealand / CIG / balance to be determined
Sanitation		
Long term sanitation upgrades Rarotonga	37.0	To be determined
Solid Waste Management		
Incinerator for Rarotonga	3.0	To be determined
Energy		
Aitutaki Solar PV Mini-Grid System	16.0	New Zealand / EU / ADB loan
Atiu Solar PV Mini-Grid System	3.1	New Zealand / EU / ADB loan
Mangaia Solar PV Mini-Grid System	3.5	New Zealand / EU / ADB loan
Mauke Solar PV Mini-Grid System, and generators, powerhouse, distribution upgrade	3.2	New Zealand / EU / ADB loan
Mitiaro Solar PV Mini-Grid System	1.9	New Zealand / EU / ADB loan
TAU control & Generation – Rarotonga	45.2	To be determined
ICT		
Fibre-optic Cable for international Communications	35.0	To be determined – mix including concessional loan finance and private sector participation likely[24]
Multi-sector		
Rutaki Foreshore Rock Revetment Development	2.6	To be determined
Outer Islands Cyclone shelters	2.0	To be determined
Education		
Apii Nikao School Reconstruction	11.4	PRC / CAPEX
Re-build National College (Tereora)	30.0	To be determined
Fitting Schools with Water Harvesting Systems (pilot)	0.5	To be determined

5.4 Private Sector Participation in CI NIIP Investments

218 Priority Area I of the NSDP is economic development, with the goal being a vibrant Cook Islands economy – “a Cook Islands where ingenuity and connection to our culture and environment underpins the ability of our people to build business and enterprise to contribute to national economic growth”. This represents a strong commitment by Government to developing the role of the private sector in the economy.

[24] Noting though that Government capacity to borrow is currently low, and that the assumptions made in relation to the availability of finance for CI NIIP assume no additional borrowing over the 10 year timeframe of the investment plan, other than the ADB loan for renewable energy already in the pipeline.

219 The private sector is closely engaged with Government in planning for economic and social development. In relation to infrastructure, the Government appointed Infrastructure Committee[25] has strong private sector representation, and is active in advising Government on infrastructure planning and implementation.

220 Inputs in the provision of infrastructure range from design to construction to operation to financing to ownership. In relation to existing assets (where design and construction are already complete), the spectrum of public sector/private sector involvement in the provision of these inputs can involve retention by the public sector, contracting out, corporatisation, partial privatisation, or full privatisation. In relation to new assets, this spectrum can involve delivery of all inputs by the public sector, contracting out, build-operate-transfer (BOT), build-own-operate-transfer (BOOT), or build-own-operate (BOO) at the fully private sector end of the spectrum.

221 In the Cook Islands, the telecommunications sector has the greatest private sector involvement, with infrastructure owned by a joint venture with majority private ownership (and currently operating as the sole provider of telecom services). The private sector is involved in design and construction activity in all infrastructure sectors, and also in aspects of operation through contracting out of services such as road maintenance and waste collection.

222 Opportunities for private sector involvement in the implementation of CI NIIP include:

- Design and construction of investment projects, which will be undertaken by local and international contractors.
- Further outsourcing of the operations of SOEs and Government departments involved in infrastructure provision to the private sector.
- The Fibre-optic Cable Project for International Communications is one project with potential for implementation and operation as a public private partnership (PPP).
- There is opportunity for the private sector associated with the expansion of renewable energy, with the power grid being developed to provide for the purchase of privately generated renewable energy.
- Households and businesses are also encouraged to participate in meeting their own needs for infrastructure services through schemes for generating renewable energy, improving capacity to store water, and improving household sanitation.

223 Domestic financial institutions play a role in the financing of infrastructure. There are three main commercial banks, one fully owned by Government. The commercial banks do at times lend to SOEs, and are also involved in lending to businesses and households for solar PV installations associated with TAU's net metering policy, and to households to meet the required contribution to septic tank upgrades. Lending could expand in the future as private production of renewable energy for sale to the grid expands. Indicative lending rates to businesses involve a base rate currently at 9.5 percent, with actual lending rates ranging from 7.8 percent to 11.5 percent depending on risk assessment. The Cook Islands National Superannuation Fund covers all workers in both the public and private sectors, and manages funds for 7,900 members totalling just under $NZ80 million. All funds are invested off-shore in bonds and equities via an administrator in New Zealand, though governing legislation has provision for up to 20 percent of funds to be invested on-shore.

5.5 Building the Financial Sustainability of Infrastructure Investment

224 Structural constraints impact on the financial sustainability of investments in infrastructure in the Cook Islands, making it even more important for infrastructure to be well managed.

- Investments in infrastructure are needed to sustain growth in the economy, but it does need to be recognised that growth prospects are limited. The Cook Islands has a small population dispersed over many islands, and is distant from larger markets. The economy remains dependent on tourism and development assistance.
- Some major infrastructure including airports and ports must be designed in line with international standards and trading systems, and in a small economy tends to be under-utilised. It is often not feasible to raise charges to a level that would recover all costs, as this would be self-defeating in terms of traffic volumes and overall financial results.
- To support the development objectives of the Government, infrastructure must serve all of the people and all islands of the Cook Islands. This imposes important logistical challenges in building and operating infrastructure, and the efficiency of this infrastructure is affected by diseconomies of small scale.

225 Much of the investment included in CI NIIP involves the rehabilitation or upgrading of existing infrastructure, rather than new infrastructure, and this focus on optimal utilisation of existing infrastructure is a positive factor in relation to the financial sustainability of the investment plan. The analysis presented in Appendix G shows that 45 percent of CI NIIP projects by number and 35 percent by value (that is, by capital cost) represent new investment, while the balance represent upgrading or deferred maintenance of existing infrastructure.

226 Analysis presented in Appendix G reveals that 18 percent of CI NIIP projects by number and 43 percent by value exhibit a high capacity to self-fund maintenance, 39 percent by number and 30 percent by value exhibit moderate

[25] The Infrastructure Committee deals with all public infrastructure, including economic and social infrastructure, and public buildings.

capacity to self-fund maintenance, and 42 percent by number and 27 percent by value exhibit low capacity. For those projects exhibiting high or moderate capacity to self-fund maintenance, cost recovery should assist in addressing the maintenance task.

227 Analysis presented in Appendix G also reveals that the Cook Islands Government will be directly responsible for maintenance of 34 percent of CI NIIP projects by number and 39 percent by value, Island Governments will be responsible for maintenance of 43 percent of CI NIIP projects by number and 20 percent by value, SOEs will be responsible for maintenance of 17 percent of NIP projects by number and 37 percent by value, while households will be responsible for maintenance of 6 percent of CI NIIP projects by number and 3 percent by value.

228 As SOEs manage much of the economic infrastructure, the financial health of these entities is important to the financial sustainability of the infrastructure investment program. CIAA and CIPA both incurred losses in 2012/13. CIAA is forecasting small profits in coming years, after consistent losses up to 2012/13. CIPA is forecasting continuing losses in coming years, following small profits up to 2011/12. TAU has been consistently profitable, though forecast profits are lower than profits made in recent years. The three SOE have positive EBITDA (earnings before interest, taxes, depreciation, and amortization), and are in a position to self-fund asset maintenance and smaller items of capital expenditure, though maintenance expenditure by CIPA has been consistently low. CIPA is the only one of the three SOEs with a significant level of debt (associated with the recent Avatiu Port Project).

229 Progress is being made in improving the efficiency and financial performance of SOEs, supported by the oversight role of the Cook Islands Investment Corporation. While SOEs are responsible for managing their own activities, some general points can be made in relation to further strengthening financial performance:

- Ensuring that the range of expertise needed to run SOEs is available (recognising that the Cook Islands may need to look overseas for this expertise in some cases).
- Retaining the clear commercial focus of SOEs, and the transparent identification of community service obligations and their funding.
- Encouraging a maintenance culture in SOEs driven by the Boards and Chief Executives, supported by the gradual strengthening of asset management systems.
- Continuing the monitoring of financial performance undertaken by CIIC (including the provision of clear guidelines to SOEs on expectations in relation to financial performance), and the dissemination of information on the financial performance of SOEs to the community.

230 In relation to infrastructure, which is managed directly by Government, financial sustainability is currently low. There is a need to strengthen management in areas such as:

- Stronger asset management systems with an emphasis on developing a stronger maintenance culture.
- Improved cost recovery, with regular review of fees and charges (taking into account the financial and economic impact of fees and charges), and efforts to strengthen the efficiency of collection systems.
- More systematic and reliable funding for maintenance and operations, premised on better performance in utilising funding and in reporting on performance.
- Ongoing review of institutional arrangements in relation to this infrastructure, with the aim of improving the efficiency of operations. Changes to institutional arrangements to provide for management of infrastructure in outer islands by SOEs would ease the maintenance task facing Island Governments, though care is also needed to avoid undermining the financial viability of SOEs.

231 Work is underway to build capacity in asset management across all Government agencies and SOEs. Staff across government (including outer islands, SOEs, and CIIC) need to be equipped to operate, maintain and update asset management systems. ADB technical assistance (TA 8416 Asset Management for Sustainable and Improved Infrastructure Services Delivery) has undertaken workshops and training on implementation of the Asset Management Information System. Models for asset valuation including templates have also been prepared. As government is working to improve public service efficiency and effectiveness, centralising the asset management system and function could also help with streamlining reporting and overall management. There is however a need for an improved governance framework to help enforce the practice. A national asset management policy and strategy have been prepared under the TA but the regulations still need to get through cabinet.

232 Government will also have responsibility for some investments relating to climate change adaptation and disaster risk management, though this responsibility is shared with all infrastructure stakeholders. Prospects for cost recovery are low in the case of most of these investments, but they have strong economic as well as social and environmental rationale, and requirements for strong management systems remain.

233 Funding of major capital investments in infrastructure will continue to rely heavily on assistance from Development Partners. With the Government facing a difficult fiscal environment, this assistance will need to be mainly in grant form in the immediate future. Project designs which recognise the need to keep the costs of operation and maintenance of infrastructure low will contribute to the financial sustainability of the investment plan.

5.6 Funding for Climate Change Adaptation and Disaster Risk Reduction

234 The Cook Island Government receives funds from overseas development assistance, including international dedicated climate change financing, for climate change adaptation and disaster risk reduction measures.

235 The projects in the CI NIIP are mostly at the concept stage of development and the project level budget estimates that have been developed are indicative with some changes to the budgets likely to occur when more detailed project details emerge. It was not possible to develop detailed project specific cost estimate for the identified climate change adaptation and disaster risk reduction measures or to carry out a cost benefit analysis of these measures. Thus, only a rough order of cost estimate is possible to guide provisions for climate change adaptation and disaster risk reduction measures for the CI NIIP.

236 The average costs of climate proofing new or replacement infrastructure (expressed as a percentage of total capital costs) are 1.4 percent for the East Asia and Pacific Region, and 0.8 percent for all lower-middle income countries (Hughes et al, 2010). In the Cook Island, climate proofing costs for the completed Avatiu port up-grading project were calculated to be about 3.6 percent of overall capital costs.

237 Recent and current spending for on-going and completed projects in climate proofing infrastructure in the Cooks Island may reach an average of between $NZ 0.6 - 1million per year since 2011. This does not include spending to repair damage caused by tropical cyclones and other natural hazards, which are expected to be more significant.

238 Under the CI NIIP, only selected prioritised infrastructure projects are likely to require climate proofing measures. Taking into account the above, $NZ 500,000 per year has been allocated for climate proofing measures for prioritised infrastructure projects under the CI NIIP.

239 The Pacific Adaptation to Climate Change (PACC) Programme is the first major climate change adaptation initiative in the Pacific region. Since it began in 2009 the Programme has been laying the groundwork for more resilient Pacific communities that are better able to cope with climate variability today and climate change tomorrow. The Programme approaches this from two directions: it is working to enhance adaptive capacity on the ground, and it is driving the mainstreaming of climate risks into national development planning and activities. Working in 14 Pacific island countries, the Programme is demonstrating best-practice adaptation in three key climate-sensitive areas: coastal zone management, food security and food production, and water resources management. Each country is hosting a pilot project in one of these theme areas to demonstrate how climate change adaptation can work on the ground.

240 Climate change threatens the achievement of all development goals. One solution is to mainstream climate change into the development process, that is, integrate climate risks into development planning processes and decision-making. The PACC Programme is promoting mainstreaming at all levels, within the country projects and regionally, at the community level through to the highest policy level. Knowledge generated by the PACC Programme will contribute to a sound base for future climate change adaptation in the region. Tools, technical guidelines, experiences and lessons learned will be shared regionally and globally, to enhance the capacity to plan for and respond to climate risks. The PACC Programme is a partnership between several key regional agencies and national agencies and communities in 14 Pacific island countries. It is funded by the Global Environment Facility (GEF) and the Australian Government, with the United Nations Development Programme (UNDP) as its implementing agency and the Secretariat of the Pacific Regional Environment Programme (SPREP) as implementing partner. The Project is supported by the United Nations Institute for Training and Research (UNITAR) C3D+programme.

241 There are three potential sources of financing for adaptation measures: The Government of Cook Islands through capital expenses, bilateral and multilateral donors, and international dedicated climate change financing.The following Table 5.6 summarises potential for accessing funding sources that provide financing for infrastructure investment.

242 There is a high potential for accessing the Adaptation Fund and SCCF/GEF facility, as there are proven track records of projects funded by these sources in Cook Islands. Indeed, there are plans for a SRIC II program beyond 2017. ICI plans to propose Penrhyn Coastal Protection project (Te Tautua & Omaka port facilities and fuel depot relocation) to the SCCF for climate proofing funding by August 2014.

243 Another potential exists in accessing a Chinese Government grant that provides in-kind support to the Cook Island Government. Though this does not qualify as a climate change adaptation financing instrument, in-kind contributions in form of materials, equipment and manpower could assist in climate proofing essential infrastructure projects during the construction and operational phase.

244 Many of these funds are replenished on a rolling basis, so access may increase in the future. The focal point for access to these resources is through the Climate Change Coordination Unit and Emergency Management Cook Islands (both in the Central Policy and Planning Unit, Office of the Prime Minister) as well as Infrastructure Cook

Island (ICI). The country is also aiming to achieve National Implementation Agency status, which would allow direct access and management of international dedicated climate change financing available (i.e. Adaptation Fund).

245 Incorporating CCA/DRM measures in sector activities and objectives from the outset of negotiations of various country strategies, and agreements between the Cook Island Government and financiers, may help ensure that CCA/DRM is fully integrated as part of the planning and implementation of infrastructure.

Table 5.6 Potential Sources of Financing for Climate Change Adaptation and Disaster Risk Management

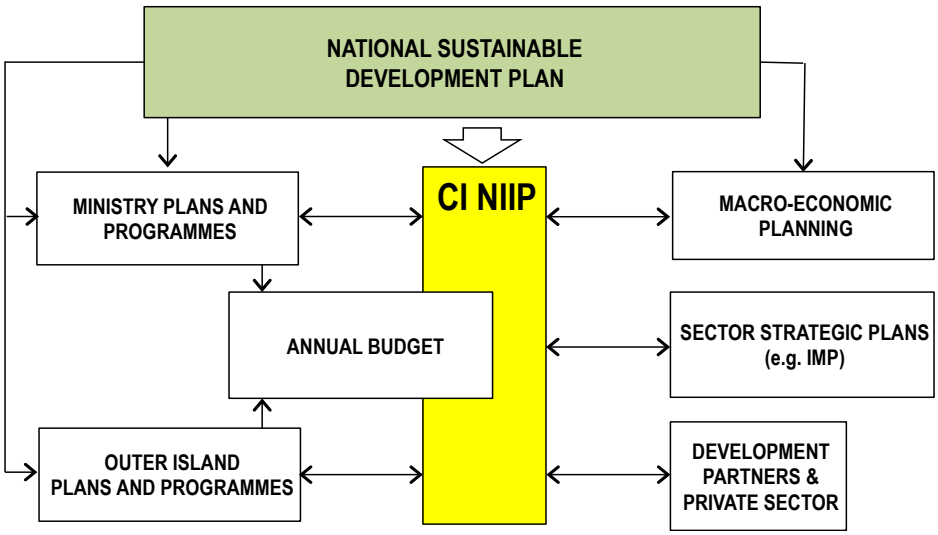
Fund Name	Current Access by Cook Islands	Potential for accessing resources for CI NIIP
Adaptation Fund	SRIC-CC (2012-2017) Administered by UNDP	Eligible activities include institutional, community and infrastructure vulnerability reduction measures. Potential source of future financing for both climate proofing of infrastructure and enabling environment improvements. Cook Islands have recently accessed adaption funding from the Adaptation Fund for Strengthening the Resilience of Island Communities to climate change. The fund provided a budget of about $NZ5.8 m ($US5.0 m) in financial support.
Special Climate Change Fund (SCCF)-GEF	Mangaia Harbour (Completed 2014)	The Mangaia Harbour Project in Cook Islands was funded under this program in conjunction with AUSAID funding. There are currently plans by the Cook Island Government to propose the Penrhyn coastal protection - Te Tautua & Omaka port facilities and fuel depot relocation project under this adaptation fund. This fund can be accessed through the Regional Pacific Adaptation to Climate Change Program (PACC).
Australian Government	Mangaia Harbour (Completed 2014)	The Government is funding a number of adaptation programs such as the Pacific Climate Change Science Program in 14 countries to strengthen scientific research and information. They also provided support to the Mangaia Harbour climate proofing project in the amount of $NZ 500,000.00.
Asian Development Bank	Avatiu Port (Completed 2013)	ADB has provided in number of TA projects to assist in building climate change resilience in the country. Following the preparatory work, the Avatiu port up-grading project was funded by a $NZ 928,000.00 ADB grant for additional infrastructure climate proofing. Climate change adaptation as well as mitigation are stated change drivers and as such are a high priority for ADB's Pacific program. Maintaining this approach can result in continued integration of CCA/DRM into ADB investments in the country, including to the CI NIIP.
New Zealand Government/ NZAID	The New Zealand Government funds a number of infrastructure programs in water, sanitation and renewable energy	The New Zealand Government is Cook Islands' main overseas development partner with about $NZ 14.0 Mill per year. Climate change proofing for infrastructure will be integrated into the infrastructure support in water, sanitation and renewable energy projects that the New Zealand Government supports.
Chinese Government (PRC)		Approximately $NZ 18.7 Mill worth of grant in form of in-kind support (material, equipment, manpower) available to the Cook Island Government until 2016. Some could contribute to climate proofing infrastructure.
EU	None for infrastructure	The EU can potentially provide adaptation funding through global and regional climate change support programs. (EU Global Climate Change Alliance Project?)
Green Climate Fund	None	Established under auspices of UNFCCC as a major international adaptation fund but is not yet operational. Expected to be operational post 2020.
Note: Cook Islands is not a member country of the World Bank.		

6 Managing and Monitoring the CI NIIP

6.1 The Role of CI NIIP

246 The preparation of this CI NIIP report is only the first step. It is intended that the Plan will become an established component of CIG planning and budgeting. The CI NIIP takes its priorities and criteria from the NSDP and draws on sector, ministry and island plans. It has been prepared in close liaison with the planning and budgeting sections of MFEM. Its' positioning in the current framework of operations, planning and decision-making is shown in Figure 6.1.

Figure 6.1 Positioning of the CI NIIP



247 CI NIIP should be viewed by a wide spectrum of stakeholders as the key guide to infrastructure investment. This will require a communication plan to effectively share information with diverse external stakeholders and all parts of Government.

248 The Infrastructure Committee will be responsible for overseeing and monitoring progress on implementation of the CI NIIP and will therefore be the champion to promote it and manage it. Clearly this will have implications for the workload of the Committee's secretariat in CIIC.

249 The role and responsibilities of the Infrastructure Committee itself should be reviewed. Specifically, the Committee's Terms of Reference need revision and strengthening. The existing terms of reference do not fully reflect the current tasks of the Committee, such as its input to the Capital Book process. Also the responsibilities in relation to the CI

NIIP should be added. One particular area for review is the make-up of the IC. Consideration should be given to ensuring wider representation from the general community, and possibly ensuring a minimal level of gender representation.

250 Consideration might also be given to extending the CI NIIP process to other sectors such as health and education in future updates.

6.2 Monitoring and Review

6.2.1 REGULAR REVIEWS

251 The CI NIIP should be updated on a regular basis to align with the latest planning and budget priorities, and to reflect progress on implementation.

252 As well as the scheduled reviews, there will be occasions on which intermediate reviews should be undertaken. The triggers for this would include such things as:

- Major amendments to the NSDP
- Publication of new sector or sub-sector plans
- Significant changes in development partner programmes
- Identification of major new projects

253 Government agencies and SOEs should be required to report on progress with projects contained in the CI NIIP and provide information about proposed new projects. This information, together with consultation with community representatives, the private sector, and development partners, will help to shape future updates of the CI NIIP. When projects and activities are identified between each update of the CI NIIP, these projects should be analysed by the Government using the same prioritisation methodology described in this report.

6.2.2 MEASURING PROGRESS OF CI NIIP

254 Assessing the progress of CI NIIP will use a blend of qualitative and quantitative monitoring and evaluation methods. Central to the process will be some measurable indicators, but it will be important not to confuse these with infrastructure indicators. The overall performance of infrastructure sub-sectors is monitored through the NSDP review process. This is managed by the Central Policy and Planning Office (CPPO) of the OPM and reported to the National Sustainable Development Commission (NSDC).

255 The CPPO is currently reviewing the indicators used to monitor the NSDP, and is also looking at how the planning, budgeting and monitoring of development can be better integrated. The current list of NSDP indicators are shown in Appendix J. It is anticipated that the number of indicators will be reduced down to only those that can actually be measured. In its own assessment[26] about 30 percent of the current indicators lack sufficient data to be useful in monitoring national trends. The revised set of indicators will be a component of the new NSDP to be released in 2015.

256 The monitoring of the CI NIIP should not duplicate the NSDP process so the indicators should be very specific to the CI NIIP. Suggested indicators are shown in Table 6.1.

Table 6.1 Indicators for Monitoring the CI NIIP

Indicator	Target	Suggested Target Date	Source/ Responsibility
CI NIIP is widely available in electronic form	Available on MFEM website	2nd ¼ 2015	MFEM
A CI NIIP summary is widely available in printed form	Summary prepared and printed	3rd ¼ 2015	MFEM
Percentage of projects with identified funding within 3 years	More than 50%	4th ¼ 2017	IC/MFEM
Institutional arrangement for monitoring CI NIIP agreed and in place	Completed and adopted	3rd ¼ 2015	IC/CPPO
Regularised system of project assessment and basic cost benefit analysis is established	Completed	4th ¼ 2015	IC/MFEM
Regularised system for CCA/DRM assessment of projects is established	Completed	4th ¼ 2015	IC/OPM
Annual review of CI NIIP	Completed	1st ¼ 2016 (and annually thereafter)	IC
Full update of CI NIIP every 3 years	Completed	1st ¼ 2018	IC

[26] Evidenced Based Development - Presentation to Development Partners' Meeting 11th February 2014

257 The CI NIIP monitoring will be managed by IC and reported to the NSDC. The IC already reports directly to the NSDC so this will just be a natural extension of its current tasks. The PRIF development partners have indicated that they would support the idea to prepare regular progress reviews to be presented to stakeholders and other development partners. In this way the CI NIIP will be a tool in measuring progress and coordination among stakeholders in the infrastructure sector.

6.2.3 LESSONS LEARNED

258 As part of the ongoing monitoring and management of the CI NIIP it would be helpful for CIG representatives to be able to compare notes with their Pacific island counterparts. Several other Pacific Island Countries have prepared CI NIIPs over the past few years. Whilst all countries vary in terms of size, geography, population, existing infrastructure, administration etc., there are lessons that can be learned from the experiences of these other CI NIIPs. Great value would therefore be added by key CIG officials gaining feedback from some of their fellow Pacific governments. This could be achieved either through study tours or an international workshop.

259 Beyond the immediate objective of lessons learned, there is also merit in looking at a more long-term arrangement for exchange of knowledge for the management of the CI NIIP. This might include the following:

- A Pacific Infrastructure Helpdesk through Pacific-based institutions helping staff work through practical questions and challenges.
- Peer learning groups across Pacific countries to support change, sharing successes and strategies.
- Reviving policy circles led by Pacific expert practitioners, this time organised around issues more responsive to current government needs and demands.

6.3 Building Capacity

6.3.1 MANAGEMENT AND COORDINATION

260 As mentioned in earlier chapters, the implementation of the investment programme set out in the CI NIIP will require complementary activities to support and facilitate the CI NIIP. In addition to the specific measures mentioned under each sector (and summarised later in this section), this will include capacity building of the key CIG institutions involved in the planning, provision and management of infrastructure. Particular among these is ICI, the agency responsible for delivering much of the country's infrastructure. ICI will require continued support as it transitions from an implementing agency to a management agency, with increased outsourcing to the private sector. CI NIIP's investment portfolio is demanding, and capacity development must complement the ten-year portfolio, beyond individual projects. Many donors express long-term commitments to infrastructure - a systemic approach to capacity development should match this.

261 A recent review of the Cook Islands national planning, budgeting, public financial and aid management systems was undertaken under the Forum Compact.[27] Some of the key recommendations from this peer review were:

- Need to ensure adequate capacity in CPPO to undertake national planning.
- Improved coordination needed between key agencies involved in strategic planning.
- Government's communication and consultation with the public needs to be improved.

262 Looking more specifically at infrastructure, the PIMP review discussed earlier recommended the following:

- Improvement of project management skills
- Improvement of skills in procurement
- Mentoring of senior management
- Improving financial systems and fiscal management.

263 Implementation of the measures listed above will help to build a background of competence in strategic planning and project management within which CI NIIP can operate. At the same time there will need to be capacity building aimed specifically at the CI NIIP process. Two particular aspects have been identified at this stage and these are as follows:

- Developing internal capacity for project appraisal including simple cost-benefit analysis. Given fiscal constraints, this would not involve additional staff, but training of existing staff in CIIC or DCD. The basis of such a system is already in place through the preparation of project data sheets but the system is patchy and analysis is not rigorous.
- The assessment of climate change adaptation implications should be established as a standard procedure for proposed projects.

[27] The Cook Islands Forum Compact Peer Review Report, Pacific Islands Forum Secretariat, January 2014

6.3.2 INSTITUTIONAL STRENGTHENING WITHIN SUB-SECTORS

264 As well as the capacity building described above, the successful management and implementation of CI NIIP will rely on improved capacities within the various infrastructure sub-sectors tasked with delivering the components of CI NIIP.

265 Some specific and some more general capacity-building issues have been identified under the sub-sectors in Chapter 3. Initiatives to address these are suggested under complementary activities in each section. These are summarised in Table 6.2 below, along with indications of which CIG agencies should be involved and whether or not the activity would require (or benefit from) external technical assistance. As mentioned in Chapter 3, these complementary programmes only include those that are directly related to the planning, management and use of the economic infrastructure assets covered by CI NIIP. They do not include other indirect measures such as hygiene education programmes, road safety training etc.

Table 6.2 Complementary Activities and other Capacity Building

Sector	Complementary Activities	CIG	Approx. Cost US$m*	TA?
General	Prepare land-use development plans for Rarotonga and Aitutaki	ICI	0.25	Yes
	Prepare integrated coastal zone management and zoning plan to minimise ecological damage, particularly in areas of development pressure such as Rarotonga and Aitutaki	CCCI, ICI	0.1	Yes
	Undertake land-titling project to formalise and digitise all boundaries	MOJ	2.0	Yes
	Improve digital mapping and GIS systems and coordinate across all ministries	OPM, ICI	0.5	
	Establish comprehensive monitoring system for NSDP	OPM	0.1	
	Support to MFEM to enable implementation and monitoring of the CI NIIP including improved project analysis (cost benefit analysis) and integration of CCA/DRM assessments	MFEM, CCCI	0.25	Yes
	Support to ICI for improved planning and management of infrastructure projects	ICI	1.0	Yes
	SOE monitoring and reform study	CIIC	0.3	Yes
Air Transport	Development strategy and scoping for all outer islands airports including airport classification	MOT	0.4	Yes
Marine Transport	Prepare integrated coastal zone management and zoning plan to minimise ecological damage, particularly in areas of development pressure such as Rarotonga and Aitutaki (same as under 'General')	CCCI, ICI	0.1	Yes
	Inter-island shipping study to explore feasibility of improving services	MOT	0.3	Yes
Road Transport	Develop and publish road standards manual	ICI	0.05	
Water Supply	Establish independent regulator to monitor service standards and tariffs	OPM	0.4	
	Groundwater investigations	ICI	0.1	
	Corporatisation of water supply – SOE to be established	OPM	0.2	
	A number of suggested further studies as listed in the Master Plan	ICI	**	Yes
Sanitation	Environmental health awareness campaign in all islands	MOH	0.1	
Solid Waste Management	Building on existing broad policy documents, develop plan and programme for SWM facilities and management throughout Cook Islands including assessment of potential for developing commercial recycling opportunities	ICI	0.3	Yes
Energy	Review and develop the role of the Energy Commissioner (to include price regulation and the management of solar energy providers)		0.1	
ICT	Prepare ICT sub-sector plan setting out national strategy and needs and priorities for each island		0.1	
	Establish independent regulator to monitor and uphold service standards	OPM	0.4	
Education	Preparation of a long term infrastructure strategy for the Education Sector (including options to rationalise the school network)	MOE, CIIC	0.15	Yes
Health	Development of policy on aged care (including infrastructure requirements)	MOH, MOIA	0.02	
	Development of policy on mental health (including infrastructure requirements)	MOH, MOIA	0.02	
	Preparation of a long term infrastructure strategy for the Health Sector	MOH, CIIC	0.1	Yes
Other Infrastructure	Review of building code and transport systems to address disability access	MOIA, ICI, CIAA, CIPA	0.05	

Sector	Complementary Activities	CIG	Approx. Cost US$m*	TA?
	Study on future of Government housing	CIIC	0.02	
	Study on potential for use of Government buildings for solar PV installations	CIIC	0.1	Yes

* These costs are broad-brush consultant estimates based on similar studies carried out elsewhere
** The Master Plan recommends a number of further activities under the categories of Legislation, Regulations and Policies; Accountability and Responsibility for the Water Supply System; Catchment Management Plans; Further Investigations; and Training, Processes and Procedures. The need and scope for these will become clearer during the ongoing Te Mato Vai project so it is not possible to finalise or estimate the cost of these.

Appendices

A List of Consultations and People Met
B Project Prioritisation Results
C Project Details
D Current and Future Climate in Cook Islands
E Climate Change Adaptation and Disaster Risk Management Issues
F Climate Change Project Assessments
G Life-cycle Costing Issues
H Funding Issues
J Existing NSDP Indicators

Appendix A: Consultations and People Met

Date	Agency	People Met
11 Feb 2014	Development Partners Meeting	Presentation to Development Partners' Meeting Side discussions with: Noriko Ogawa, ADB Andrew Jacobs, EU Charlie Jebb, Australian High Commission, Wellington Joanna Kempkers, NZ High Commissioner, Cook Islands Roger de Bray, Energy Commissioner, Cook Islands Nathalie Rossette-Cazel, Lex Act (France) Teresa Manarangi - Trott, Chamber of Commerce
14 Feb 2014	ADB Coordination Office, MFEM Development Coordination Division	Vanessa Jenner, Charmaine Dolan
17 Feb 2014	ADB Coordination Office, MFEM Development Coordination Division	Vanessa Jenner - ADB Liaison Officer Charmaine Dolan - ADB liaison Officer Peter Tierney - Manager Development Coordination Division TunoaKaina - Accounts Manager Edward Parker - Budget Analyst Angelia Williams - Budget Team
18 Feb 2014	MFEM	Richard Neves - Financial Secretary Christina Tatuava – Senior Budget Analyst TeuTeulilo- Treasury Operations Manager Elizabeth Tommy – Crown Account Manager
18 Feb 2014	OPM	OthenielTangianau - Director for Outer Islands
18 Feb 2014	NZMFAT	Howard Markland - Development Manager Cook Islands Program Steve Barrett – Senior Development Program Coordinator
19 Feb 2014	Infrastructure Committee	Michael Henry, Chairman - CIIC Board of Directors Julian Dashwood, Chairman - CIIC Board of Directors Malcolm Sword, Member - CIIC Board of Directors Sam Brown, Member Mac Mokoroa, Member TamariiTutangata, Member Richard Neves, Member Peter Tierney, DCD Joseph Akaruru, ICI Fred Hosking, ICI
19 Feb 2014	TeMatoVai	LatuKupa - Project Manager
20 Feb 2014	AECOM	Miles Wyatt - Senior Engineer, Asset Management
24 Feb 2014	Energy Commission	Roger De Bray - Energy Commissioner
24 Feb 2014	Infrastructure Cook Islands	Mac Mokoroa – Secretary Tekao Herman - Acting Director WATSAN Kenneth McDonald – Director, Ambient Adrian Teotahil - Acting Director Water Division TangiTaoro - WATSAN Program Administrator Joseph Akaruru - Acting Director Planning and Project Division NooroaTupa - Acting Electrical Inspectorate Louie Teiti- Building Inspectorate Fred Hosking - Procurement
25 Feb 2014	Telecom Cook Islands	Jules Maher - CEO
25 Feb 2014	Bank of Cook Islands	Vaine Nooana Arioka – Managing Director
25 Feb 2014	Chamber of Commerce	Steve Anderson - President
26 Feb 2014	Westpac	Henry Napa – Senior Relationship Manager David Street – Head of Sales Cathleen Ikurangi – Dealer Financial Markets
26 Feb 2014	TeApongaUira (Power Utility)	ApiiTimoti- CEO YamanikiaCooray, Manager Financial Services
26 Feb 2014	Ports Authority	BimTou – General Manager AlferetiVamarasi – Financial Controller
27 Feb 2014	Inception Workshop	Richard Neves, Financial Secretary Peter Tierney, Manager DCD, MFEM Roger de Bray ApiiTimoti, CEO, TAU Joe Ngamata, CEO, CIAA YamanikiaCooray, Manager Financial Services, TAU Alex Napa, Project Director, TAU Steve Anderson, President, Chamber of Commerce BimTou, General Manager, Ports Authority Otheniel Tangianau, Director for Outer Islands, OPM Tamarii Tutangata, Director, CIIC William Tuivaga, Manager, SRIC Fred Hosking, Capital Projects, ICI Tekao Herman - Acting Director WATSAN, ICI Tangi Taoro, WATSAN, ICI

Date	Agency	People Met
		Noeline Mateariki, Cook Islands Tourism Anne Taoro, Property Manager, CIIC Charmaine Dolan, ADB Liaison Officer
28 Feb 2014	CIAA	Joe Ngamata - CEO
28 Feb 2014	ANZ	Julia Kapi - Chief Operating Officer
3 March 2014	OPM	Maria Tuoro, Policy and Planning Officer
4 March 2014	OPM	Ana Tiraa, Climate Change Cook Islands William Tuivaga, Manager SRIC
7 March 2014	Ministry of Transport	Ned Howard, Secretary
10 March 2014	Aitutaki	Terura Bishop, Deputy Mayor TiraaArere, Executive Officer Hon. Teina Bishop, MP, Minister of Tourism & Education J.J. Browne, Board Member, Airport Authority Steve Doherty, Board Member, Tourism Rima Tuiravakai, Manager, Aitutatki Power Supply TukuaUpokomanu, Waterworks Supervisor Clive Baxter, Cooperation Manager, Aitutaki Port
11 March 2014	Aitutaki	Thomas Koteka, Owner, manager Samade
12 March 2014	Maritime New Zealand	John Mansell Principal Maritime Advisor,
12 March 2014	ADB	Robert Guild, Director, Transport, Energy and Natural Resource Division, Pacific Department, ADB
13 March 2014	Office of the Prime Minister	Elizabeth Koteka-Wright , Chief of Staff, Petero Okotai, Director of Central Policy and Planning
14 March 2014	Non-government Organisations	Kelvin Passfield, TeIpukarea Society Rodger Harkness, Creative Centre Mousie Skews, Are Pa Metua MaputuMariri, National Council of Women Kevin Hosking, Cook Islands National Disability Council Polly Tongia, National Council HIV/STI/ Rongo File
18 March 2014	OPM	Otheniel Tangianau Director Pa Enua Division
19 March 2014	ICI	Tekao Herrmann, Acting Director WATSAN,
25 March 2014	OPM	Roger De Bray, Energy Commissioner, Cook Islands
1 April 2014	TMV	Latu Kupa Project Manager, Te Mato Vai
3 April 2014	WATSAN	Kenneth McDonald Director Ambient, Consultant with ICI
14 April 2014	ICI	Hon Teariki Heather Minister for Infrastructure Mac Mokoroa, Secretary of ICI Joseph Akaruru, Acting Director, Planning and Project Division Tekao Herrmann, Acting Director, WATSAN
24 April 2014	CCCI	Ana Tiraa, William Tuivaga, Manager SRIC, OPM
24 April 2014	Prioritisation Working Group	Mike Henry Malcolm Sword Elizabeth Koteka-Wright, OPM Richard Neves, MFEM Peter Tierney, DCD Sam Brown, civil engineer (private practice) Joseph Akaruru, ICI Joe Ngamata, CIAA
24 April 2014	AECOM	Colin Gerrard, Principle Consultant Geoff Milsom, NZ Lead- Water and Infrastructure Services
28 April 2014	Prioritisation Workshop	Tony Wearing, Airport Authority Miles Wyatt, Asset Management - Project Manager Ronald Patia, Bank of Cook Islands Steven Anderson, Chamber of Commerce Anne Taoro, CIIC Tamarii Tutangata, CIIC – Infrastructure Committee member William Tuivaga, Climate Change – SRIC Manager (OPM) Peter Tierney, DCD Manager – Infrastructure Committee member Ana Tiraa, Director of Climate Change Cook Islands (OPM) Otheniel Tangianau, Director of Pa Enua Division (OPM) Joseph Akaruru, Infrastructure Cook Islands Vavia Tangatataia, Manager - Advisory & Compliance Division Patrick Arioka, Ministry of Agriculture Tarake Manuel Ministry of Agriculture Anthony Turne, Ministry of Education Junior Ngatokorua, Ministry of Transport Roger de Bray, OEC - Energy Commissioner Bim Tou, Ports Authority - CEO Nga Teao-Papatua, President of Are Pa Metua / Internal Affairs Sanjivi Rajasingham, PRIF Director Apii Timoti, TAU - CEO Alex Napa, TAU- Project Director

Date	Agency	People Met
		Teina Mackenzie, Te Ipukarea Society Latu Kupa, Te Mato Vai – Project Manager
1 May 2014	Working Group	Mike Henry Malcolm Sword Sam Brown Elizabeth Koteka-Wright Tamarii Tutangata Peter Tierney Anne Taoro
3 May 2014	Cook Islands Superannuation Fund	Angela Charlie, Acting CEO
3 May 2014	NZ High Commission	Joseph Mayhew, First Secretary (Development), NZ Aid Program Manager Steve Barrett, Senior Development Program Coordinator
5 May 2014	Emergency Management Cook Islands	Charles Carlson, Director
6 May 2014	ICI	Paul Teariki Maote Tenga Mana
6 May 2014	Meteorological Services Cook Islands	Technical Officer
8 May 2014	MFEM	Peter Tierney, Manager, Development Coordination Division
8 May 2014	EU	George Turia, EU Program Manager, Development Coordination Division, MFEM
8 May 2014	ICI	Timoti, GIS/Database Manager
9 May 2014	National Environment Service	Vavia Tangatataia Jnr, Manager –Advisory & Compliance Division
9 May 2014	OPM	Petero Okotai, CPPO
10 May 2014	MFEM	James Webb, Economic Advisor, Budget and Economic Division
15 May 2014	Democratic (Opposition) Party	Wilkie Rasmussan, MP for Penrhyn and Leader of Opposition Selena Napa, MP for Titikaveka James Beer, MP for Murienua Cassey Eggleton, Candidate for Matavera Tamaiva Tuavera, Candidate for Ngatangiia Richard Neves, Financial Secretary Tam Tutangata, CEO, CIIC Peter Tierney, Manager, Development Coordination Division, MFEM
20 May 2014	Cook Islands Cabinet	Hon Teariki Heather, DPM and Minister of Infrastructure Hon Mark Brown, Minister of Finance Hon Nandi Glassie, Minister of Health Hon Kiriau Turepu, Minister of Agriculture Hon Mona Ioane, Minister of Education Aukino Tairea, Secretary to Cabinet Richard Neves, Financial Secretary Tam Tutangata, CEO, CIIC Peter Tierney, Manager, Development Coordination Division, MFEM
1–5 Dec 2014	MFEM	Richard Neves
	MFEM	Vanessa Jenner
	MOIA	Bredina Drollet
	MOE	Sharyn Paio
	MOE	Gail Townsend
	CIIC	Tamarii Tutangata
	CIIC	Anne Taoro
	MOH	Ana Silatolu
	NZHC	Steve Barrett
	Infrastructure Committee	Michael Henry (Chairman) Sam Brown Richard Neves Tamarii Tutangata Joseph Akaruru (representing ICI) Hilary Gorman (representing Peter Tierney, MFEM) Anne Taoro (Secretary)
14 Jan 2015	Infrastructure Committee	Michael Henry (Chairman) Malcolm Sword Sam Brown Elizabeth Wright-Koteka Richard Neves Tamarii Tutangata Peter Tierney Joseph Akaruru Sharyn Paio, MOE Gail Townsend MOE Liz Iro, MOH Taamo Heather, MOIA

Appendix B: Prioritisation Results

Results of Prioritisation

Note: Scores are those assigned during the process described in Chapter 3.

Cook Islands NIIP Project Prioritisation Tool

KEY:

WG	**Working Group score**
WS	**Workshop score**
1	**Score adopted where WG and WS scores differed**
Final	**Final score**

			Economic			Social			Environmental			Project Sustainability				
Sector Code	**Proposed Project**		**Cost / efficiency**	**Economic growth**	**Viability**	**Improved social services**	**Service coverage**	**Other social benefits**	**Impact on land and water**	**Resilience to climate change**	**CC/DRM adaptation function**	**Financial**	**Tech.**	**Inst.**	**Grand Total**	**Project Rank**
WS	TMV Trunk, Intakes, reservoirs, treatment, meters etc	WG	4	3	2	4	4	5	1	2	4	3	3	2	61.8	
		WS	4	3	2	4	4	5	1	2	4	3	3	2	61.8	
		Final	4	3	2	4	4	5	1	2	4	3	3	2	61.8	1
SN	Long term sanitation upgrades Rarotonga	WG	1	4	3	3	4	3	4	4	1	3	3	2	58.4	
		WS	1	4	3	3	4	3	4	4	1	3	3	2	58.4	
		Final	1	4	3	3	4	3	4	4	1	3	3	2	58.4	2
E	TAU control & Generation - Rarotonga	WG	4	4	3	0	2	1	3	4	1	4	4	3	55.0	
		WS	4	4	3	0	2	1	3	4	1	4	4	4	56.4	
		Final	4	4	3	0	2	1	3	4	1	4	4	4	56.4	3
WS	Outer Islands Community Water Tank rehabilitation	WG	0	1	1	4	4	4	5	2	4	1	5	2	52.8	
		WS	2	1	1	4	4	4	5	2	4	1	5	2	56.8	
		Final	1	1	1	4	4	4	5	2	4	1	5	2	54.8	4
MS	Outer Islands Cyclone shelters	WG	0	1	1	1	3	5	3	5	5	2	3	2	50.0	
		WS	3	3	2	1	3	5	3	5	5	1	3	2	60.6	
		Final	3	3	1	1	3	5	3	5	5	1	3	2	54.6	5

Cook Islands NIIP Project Prioritisation Tool

KEY: **WG** Working Group score

WS Workshop score

1 Score adopted where WG and WS scores differed

Final Final score

			Economic			Social			Environmental			Project Sustainability				
Sector Code	**Proposed Project**		**Cost / efficiency**	**Economic growth**	**Viability**	**Improved social services**	**Service coverage**	**Other social benefits**	**Impact on land and water**	**Resilience to climate change**	**CC/DRM adaptation function**	**Financial**	**Tech.**	**Inst.**	**Grand Total**	**Project Rank**
ICT	Fibre-optic Cable for international Communications	WG	5	4	2	1	1	1	2	4	1	5	4	3	54.6	
		WS	5	4	3	1	1	1	2	4	1	4	4	3	55.2	
		Final	5	4	2	1	1	1	2	4	1	4	4	3	53.2	6
MT	Orongo Marina and Town Centre Development	WG	3	4	4	2	2	3	1	1	3	3	4	3	55.2	
		WS	3	4	3	1	2	3	1	1	3	4	4	3	53.0	
		Final	3	4	3	1	2	3	1	1	3	4	4	3	53.0	7
RT	Avarua Bridges	WG	3	3	4	1	1	2	3	3	3	1	4	3	52.2	
		WS	3	3	4	1	1	2	2	3	3	1	4	1	51.8	
		Final	3	3	4	1	1	2	2	3	3	1	4	1	51.8	8
E	Aitutaki Solar PV Mini-Grid System	WG	3	1	3	1	0	2	4	3	1	5	4	4	50.2	
		WS	3	1	3	2	1	2	4	3	1	4	4	4	52.0	
		Final	3	1	3	1	1	2	4	3	1	5	4	4	51.8	8
AT	Atiu Upgrade to Civil Aviation Authority Part 139 Regional Turbo Prop runway	WG	3	3	2	1	2	2	2	3	4	2	4	2	49.6	
		WS	1	3	2	1	2	2	2	3	4	2	4	2	45.6	
		Final	3	3	2	1	2	2	2	3	4	2	4	2	49.6	11

Cook Islands NIIP Project Prioritisation Tool

KEY: **WG** Working Group score

WS Workshop score

1 Score adopted where WG and WS scores differed

Final Final score

			Economic			Social			Environmental			Project Sustainability				
Sector Code	**Proposed Project**		**Cost / efficiency**	**Economic growth**	**Viability**	**Improved social services**	**Service coverage**	**Other social benefits**	**Impact on land and water**	**Resilience to climate change**	**CC/DRM adaptation function**	**Financial**	**Tech.**	**Inst.**	**Grand Total**	**Project Rank**
RT	Bridges upgrade including Avatiu Valley Bridge	WG	3	1	1	1	1	2	4	3	3	1	4	3	44.0	
		WS	3	2	3	1	1	2	4	3	3	1	4	4	51.4	
		Final	3	2	2	1	1	2	4	3	3	1	4	4	49.4	13
MT	Penrhyn Coastal Protection - TeTautua & Omoka Port Facilities and Fuel Depot relocation	WG	4	4	3	1	3	2	1	1	3	1	4	2	49.2	
		WS	3	4	3	1	3	2	1	1	3	1	4	1	45.8	
		Final	4	4	3	1	3	2	1	1	3	1	4	2	49.2	14
AT	Rarotonga Airport Instrument landing upgrade	WG	4	1	3	1	2	1	3	1	1	3	4	5	47.2	
		WS	4	1	3	1	2	2	3	1	1	3	4	5	49.0	
		Final	4	1	3	1	2	2	3	1	1	3	4	5	49.0	16
AT	Rarotonga Airport Terminal Improvement (phase 2)	WG	3	3	1	1	1	2	3	4	1	2	4	5	48.8	
		WS	3	3	1	1	1	2	3	4	1	2	4	5	48.8	
		Final	3	3	1	1	1	2	3	4	1	2	4	5	48.8	17
RT	Road sealing project for Aitutaki (6km)	WG	3	2	3	1	1	4	2	3	1	1	4	4	48.2	
		WS	3	2	3	1	1	3	2	3	1	1	4	4	46.4	
		Final	3	2	3	1	1	4	2	3	1	1	4	4	48.2	18

Cook Islands NIIP Project Prioritisation Tool

KEY:

WG	**Working Group score**
WS	**Workshop score**
1	**Score adopted where WG and WS scores differed**
Final	**Final score**

			Economic			**Social**			**Environmental**			**Project Sustainability**				
Sector Code	**Proposed Project**		**Cost / efficiency**	**Economic growth**	**Viability**	**Improved social services**	**Service coverage**	**Other social benefits**	**Impact on land and water**	**Resilience to climate change**	**CC/DRM adaptation function**	**Financial**	**Tech.**	**Inst.**	**Grand Total**	**Project Rank**
E	**Atiu Solar PV Mini-Grid System**	**WG**	3	3	2	3	3	3	4	3	1	2	3	2	53.8	
		WS	3	3	3	2	1	2	4	3	1	2	4	3	51.8	
		Final	3	3	2	2	1	2	4	3	1	2	3	2	47.2	19
E	**Mauke Solar PV Mini-Grid System, and generators, powerhouse, distribution upgrade**	**WG**	3	3	2	3	3	3	4	3	1	2	3	2	53.8	
		WS	3	3	3	2	1	2	4	3	1	2	4	3	51.8	
		Final	3	3	2	2	1	2	4	3	1	2	3	2	47.2	19
E	**Mitiaro Solar PV Mini-Grid System**	**WG**	3	3	2	3	3	3	4	3	1	2	3	2	53.8	
		WS	3	3	3	2	1	2	4	3	1	2	4	3	51.8	
		Final	3	3	2	2	1	2	4	3	1	2	3	2	47.2	19
MS	**Rutaki Foreshore Rock Revetment Development**	**WG**	3	1	2	1	1	1	5	2	5	0	3	4	46.4	
		WS	3	1	2	1	2	2	3	2	4	1	3	4	46.0	
		Final	3	1	2	1	1	2	3	2	4	1	3	4	46.0	22
SW	**Incinerator for Rarotonga**	**WG**	2	1	2	2	3	3	2	4	1	4	2	2	45.8	
		WS	2	1	2	2	3	3	2	4	1	3	2	2	44.4	
		Final	2	1	2	2	3	3	2	4	1	4	2	2	45.8	23

Cook Islands NIIP Project Prioritisation Tool

KEY:

WG	**Working Group score**
WS	**Workshop score**
1	**Score adopted where WG and WS scores differed**
Final	**Final score**

			Economic			**Social**			**Environmental**			**Project Sustainability**				
Sector Code	**Proposed Project**		**Cost / efficiency**	**Economic growth**	**Viability**	**Improved social services**	**Service coverage**	**Other social benefits**	**Impact on land and water**	**Resilience to climate change**	**CC/DRM adaptation function**	**Financial**	**Tech.**	**Inst.**	**Grand Total**	**Project Rank**
E	**Mangaia Solar PV Mini-Grid System**	**WG**	3	3	2	3	3	3	4	3	1	2	3	2	53.8	
		WS	3	3	3	2	1	2	3	3	1	2	4	3	50.0	
		Final	3	3	2	2	1	2	3	3	1	2	3	2	45.4	24
SN	**Northern Group - Sanitation upgrades**	**WG**	1	2	1	1	3	5	5	2	3	0	3	1	45.4	
		WS	1	2	1	1	3	5	4	2	3	1	3	1	45.0	
		Final	1	2	1	1	3	5	4	2	3	1	3	1	45.0	25
WS	**Atiu Water Reticulation System**	**WG**	0	1	1	4	4	2	1	3	2	2	4	2	40.6	
		WS	2	1	1	4	4	3	1	3	3	1	4	2	46.6	
		Final	1	1	1	4	4	3	1	3	3	1	4	2	44.6	26
WS	**Mangaia water upgrade**	**WG**	0	1	1	4	4	2	1	3	2	2	4	2	40.6	
		WS	2	1	1	4	4	3	1	3	3	1	4	2	46.6	
		Final	1	1	1	4	4	3	1	3	3	1	4	2	44.6	26
SW	**Rarotonga hazardous waste handling upgrade, and outer islands waste resource recovery centres**	**WG**	1	3	3	1	4	3	4	2	0	1	3	1	44.2	
		WS	1	3	3	1	4	3	4	2	0	1	3	1	44.2	
		Final	1	3	3	1	4	3	4	2	0	1	3	1	44.2	29

Cook Islands NIIP Project Prioritisation Tool

KEY:

WG	**Working Group score**
WS	**Workshop score**
1	**Score adopted where WG and WS scores differed**
Final	**Final score**

			Economic			**Social**			**Environmental**			**Project Sustainability**				
Sector Code	**Proposed Project**		**Cost / efficiency**	**Economic growth**	**Viability**	**Improved social services**	**Service coverage**	**Other social benefits**	**Impact on land and water**	**Resilience to climate change**	**CC/DRM adaptation function**	**Financial**	**Tech.**	**Inst.**	**Grand Total**	**Project Rank**
AT	**Manihiki Upgrade to Civil Aviation Authority Part 139 Regional Turbo Prop runway**	**WG**	4	2	1	2	3	2	1	1	4	1	3	2	43.2	
		WS	3	2	2	2	3	2	1	1	4	1	3	2	43.2	
		Final	3	2	2	2	3	2	1	1	4	1	3	2	43.2	30
WS	**Mitiaro - upgrade water network system**	**WG**	0	1	1	4	4	2	1	2	2	2	4	2	39.0	
		WS	2	1	1	4	4	3	1	2	3	1	4	2	45.0	
		Final	1	1	1	4	4	3	1	2	3	1	4	2	43.0	31
RT	**Muri area upgrade with footpaths**	**WG**	1	2	2	1	1	4	1	3	1	1	5	3	40.2	
		WS	1	3	3	1	2	4	1	3	1	1	4	4	46.0	
		Final	1	2	2	1	2	4	1	3	1	1	4	4	42.0	33
AT	**Penrhyn Airport Repairs and Improvements**	**WG**	3	2	1	2	2	2	3	2	4	1	4	2	46.0	
		WS	3	2	2	2	2	2	1	1	4	1	4	1	41.4	
		Final	3	2	2	2	2	2	1	1	4	1	4	1	41.4	34
AT	**Mauke Airport Repairs and Improvements**	**WG**	3	3	2	1	1	2	2	3	3	1	4	1	43.6	
		WS	3	3	2	1	1	2	2	2	2	1	4	1	40.4	
		Final	3	3	2	1	1	2	2	2	2	1	4	1	40.4	35

Cook Islands NIIP Project Prioritisation Tool

KEY:
- **WG** — **Working Group score**
- **WS** — **Workshop score**
- **1** — **Score adopted where WG and WS scores differed**
- **Final** — **Final score**

			Economic			Social			Environmental			Project Sustainability				
Sector Code	**Proposed Project**		**Cost / efficiency**	**Economic growth**	**Viability**	**Improved social services**	**Service coverage**	**Other social benefits**	**Impact on land and water**	**Resilience to climate change**	**CC/DRM adaptation function**	**Financial**	**Tech.**	**Inst.**	**Grand Total**	**Project Rank**
AT	Mitiaro Airport Repairs and Improvements	WG	3	3	2	1	1	2	2	3	3	1	4	1	43.6	
		WS	3	3	2	1	1	2	2	2	2	1	4	1	40.4	
		Final	3	3	2	1	1	2	2	2	2	1	4	1	40.4	35
RT	Aroko Road Widening Project	WG	1	2	1	1	1	4	1	3	1	1	4	3	37.0	
		WS	1	2	1	1	2	4	1	2	1	1	4	4	38.4	
		Final	1	2	1	1	2	4	1	3	1	1	4	4	40.0	37
MT	Pukapuka Jetty, Channel and Causeway	WG	4	1	1	3	3	2	0	1	3	0	1	1	34.2	
		WS	4	3	2	3	3	2	0	1	3	1	1	1	41.6	
		Final	4	2	2	3	3	2	0	1	3	1	1	1	39.6	38
SN	Sanitation upgrades - onsite Southern group except AIT/RAR	WG	1	2	1	1	1	3	4	3	3	0	3	1	38.4	
		WS	1	2	1	1	1	3	4	3	3	0	3	1	38.4	
		Final	1	2	1	1	1	3	4	3	3	0	3	1	38.4	39
RT	Mangaia Road Rehabilitation: town area (3km)	WG	1	1	1	1	1	4	3	3	1	1	4	2	37.2	
		WS	1	1	1	1	1	3	3	3	1	1	4	2	35.4	
		Final	1	1	1	1	1	4	3	3	1	1	4	2	37.2	41

Cook Islands NIIP Project Prioritisation Tool

KEY:

WG	**Working Group score**
WS	**Workshop score**
1	**Score adopted where WG and WS scores differed**
Final	**Final score**

			Economic			Social			Environmental			Project Sustainability				
Sector Code	**Proposed Project**		**Cost / efficiency**	**Economic growth**	**Viability**	**Improved social services**	**Service coverage**	**Other social benefits**	**Impact on land and water**	**Resilience to climate change**	**CC/DRM adaptation function**	**Financial**	**Tech.**	**Inst.**	**Grand Total**	**Project Rank**
RT	**Mauke Road Rehabilitation: town area and plantation roads**	**WG**	**1**	**1**	**1**	**1**	**1**	**4**	**3**	**3**	**1**	**1**	**4**	**2**	**37.2**	
		WS	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**4**	**2**	**35.4**	
		Final	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**4**	**2**	**35.4**	**42**
RT	**Atiu & Mitiaro Roads Rehabilitation**	**WG**	**1**	**1**	**1**	**1**	**1**	**4**	**3**	**3**	**1**	**1**	**4**	**2**	**37.2**	
		WS	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**4**	**2**	**35.4**	
		Final	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**4**	**2**	**35.4**	**42**

Education, Health and Other Infrastructure projects

KEY:

C	**Consultants' initial score**
IC	**Infrastructure Committee score**
1	**Score adopted where C and IC scores differed**
Final	**Final score**

			Economic			Social			Environmental			Project Sustainability				
Sector Code	**Proposed Project**		**Cost / efficiency**	**Economic growth**	**Viability**	**Improved social services**	**Service coverage**	**Other social benefits**	**Impact on land and water**	**Resilience to climate change**	**CC/DRM adaptation function**	**Financial**	**Tech.**	**Inst.**	**Grand Total**	**Project Rank**
Ed	**Apii Nikao School Reconstruction**	**C**	**0**	**1**	**1**	**5**	**4**	**4**	**3**	**1**	**1**	**1**	**4**	**4**	**46.0**	
		IC	**0**	**2**	**1**	**5**	**4**	**4**	**3**	**2**	**1**	**1**	**4**	**4**	**49.6**	
		Final	**0**	**2**	**1**	**5**	**4**	**4**	**3**	**2**	**1**	**1**	**4**	**4**	**49.6**	**11**
Ed	**Re-build National College (Tereora)**	**C**	**0**	**1**	**1**	**5**	**1**	**4**	**3**	**2**	**3**	**1**	**4**	**4**	**46.0**	
		IC	**0**	**2**	**1**	**5**	**2**	**4**	**3**	**3**	**3**	**1**	**4**	**4**	**51.2**	
		Final	**0**	**2**	**1**	**5**	**2**	**4**	**3**	**3**	**3**	**1**	**4**	**4**	**51.2**	**10**
Ed	**Remodelling Classrooms for Modern Learning Environment (pilot project)**	**C**	**0**	**1**	**1**	**5**	**1**	**4**	**3**	**3**	**1**	**1**	**4**	**4**	**44.4**	
		IC	**0**	**1**	**1**	**5**	**1**	**4**	**2**	**3**	**1**	**1**	**4**	**4**	**42.6**	
		Final	**0**	**1**	**1**	**5**	**1**	**4**	**2**	**3**	**1**	**1**	**4**	**4**	**42.6**	**32**
Ed	**Fitting Schools with Water Harvesting Systems (pilot project)**	**C**	**0**	**1**	**1**	**5**	**1**	**4**	**4**	**2**	**3**	**2**	**3**	**4**	**48.0**	
		IC	**0**	**1**	**1**	**5**	**1**	**4**	**4**	**2**	**3**	**2**	**4**	**4**	**49.2**	
		Final	**0**	**1**	**1**	**5**	**1**	**4**	**4**	**2**	**3**	**2**	**4**	**4**	**49.2**	**14**
H	**Pukapuka Hospital and Doctors Residence Reconstruction**	**C**	**0**	**1**	**1**	**5**	**2**	**4**	**3**	**1**	**3**	**0**	**4**	**4**	**44.6**	
		IC	**0**	**1**	**1**	**5**	**2**	**4**	**3**	**1**	**3**	**0**	**4**	**4**	**44.6**	
		Final	**0**	**1**	**1**	**5**	**2**	**4**	**3**	**1**	**3**	**0**	**4**	**4**	**44.6**	**26**
H	**Rarotonga Hospital Solar PV Installation** (Not prioritised pending further study of solar PV potential across all government buildings)	**C**	**1**	**1**	**2**	**2**	**1**	**1**	**4**	**3**	**3**	**4**	**4**	**4**	**47.4**	
		IC														
		Final														
OI	**Vaikapuangi Government Office Complex Redevelopment**	**C**	**0**	**0**	**2**	**0**	**0**	**0**	**3**	**3**	**1**	**3**	**4**	**4**	**30.4**	
		IC	**0**	**0**	**2**	**0**	**0**	**2**	**3**	**3**	**3**	**3**	**4**	**4**	**37.2**	
		Final	**0**	**0**	**2**	**0**	**0**	**2**	**3**	**3**	**3**	**3**	**4**	**4**	**37.2**	**40**

Appendix C: Priority Project Descriptions

Project : AIR TRANSPORT : Rarotonga Instrument Landing System	
Project Scope: **Rarotonga International Airport operates an older instrument landing system that has been in place over thirty years and has become difficult to maintain given the difficulty in obtaining spare parts. Hence the need to improve and upgrade the instrument landing system.** **New landing guidance systems allow for GPS techniques that have not been approved for operation within the Cook Islands although both Air Rarotonga and Air New Zealand use the GPS system that does not require any instrument landing system.** **Demand is split between the need to have a facility for airlines other than Air Rarotonga and Air New Zealand (who use GPS location techniques) and the means by which airlines contribute to funding (user charges) when they don't require such a system.** **CI operates under its own CAA legislation and Rules, under the authority of the Ministry of Transport (MOT) mirroring those of New Zealand. CAACI is heavily reliant on CAANZ for technical support.**	
Agencies Responsible:	CIAA
Project Benefits/Outcomes:	Maintains and makes available international standard guidance system for all airlines using Rarotonga. Estimated number of beneficiaries: 136,000 – CI population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1, 2, 5, 7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability[28] 1 Climate proofing needed No
Project Status: **(Including risks/obstacles**	The airport authority has recently commissioned consultants to prepare an "Airports Master Plan" which is due for completion in October 2014 and will better position the priority need of this project against other intended airport projects.
Estimated Cost:	Rough Order Of Cost $ 3.2 million
Estimated Maintenance Cost:	Minimal maintenance will be required and will be covered on a commercial basis.
Implementation period:	Projected for construction in 2016/18
Potential Funding:	To be determined

[28] The figure indicates the score allocated to the project for the climate vulnerability criterion during prioritisation.

Project : AIR TRANSPORT : Rarotonga Terminal Improvement	
Project Scope: **The increase in tourism numbers along with flights into Rarotonga has driven the need to provide increased covered arrivals areas at the airport. Since the completion of stage 1 the departure hall has often reached capacity when flights are delayed or culminate in arriving at the same time.** **There is also the need for upgrades in other areas including 'back end' baggage screening and handling etc.**	
Agencies Responsible:	CIAA
Project Benefits/Outcomes:	Improved passenger facilitation through airport Provides to increased security X-ray measures at departure. Will allow under cover parking for arriving passengers Estimated number of beneficiaries: 136,000 – CI population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1, 2, 5, 7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 4 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	The airport authority has recently commissioned consultants to prepare an "Airports Master Plan" which is due for completion in October 2014 and will better position the priority need of this project against other intended airport projects. Concept of replicating present stage 1 structure to cater for arrivals adjacent was always allowed for at time of stage 1 planning.
Estimated Cost:	Rough Order Of Cost $ 9.3 million
Estimated Maintenance Cost:	Maintenance will be covered on a commercial basis.
Implementation period:	Projected for construction in 2024
Potential Funding:	To be determined, possible private sector participation

Project : AIR TRANSPORT : Atiu Airport Upgrade to Regional Turbo Prop Std.	
Project Scope: **The island of Atiu has developed and shown strong tourism growth over the past few years. This growth has reached a stage where many economic gains could be delivered through larger aircraft operation into Atiu.** **The concept is to upgrade and seal the runway and provide a better terminal area along with airfield fencing to control and restrict animal movements.** **CI operates under its own CAA legislation and Rules, under the authority of the Ministry of Transport (MOT) mirroring those of New Zealand. The CAACI Director is John Jones, a New Zealander who previously headed CAANZ and is domiciled in New Zealand. CAACI is heavily reliant on CAANZ for technical support.**	
Agencies Responsible:	ICI, CIAA, Island Council,
Project Benefits/Outcomes:	Reduced maintenance / runway upkeep. Enables better passenger service to Atiu Increased aircraft size will enable outward freighting of agricultural products. Estimated number of beneficiaries: 132,000 – Rarotonga population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1,2,4,5,7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 3 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Full scoping and feasibility completed Relatively straight forward engineering project Institutional arrangements --- possible control by CIAA
Estimated Cost:	Rough Order Of Cost $ 3.9 million
Estimated Maintenance Cost:	Minimal maintenance will be required and could be covered on a commercial basis once facility operational.
Implementation period:	Projected for construction in 2017/19
Potential Funding:	To be determined

Project : ENERGY : Aitutaki Solar PV Mini-grid System	
Project Scope: **The CIGOV policy of conversion of the Cook Islands Group to renewable energy electricity is documented in the National Sustainable Development plan. The initial phase is the conversion of the Northern Group to be completed in 2014 to be followed by the Southern Group** **The Aitutaki project will develop renewable energy generation to supply 50% of the islands energy demand.**	
Agencies Responsible:	OPM, TAU, Island Council,
Project Benefits/Outcomes:	Reduces reliance on fossil fuels. Better use of renewable energy Estimated number of beneficiaries: 24,000 – Aitutaki population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1,2,3,7
Susceptibility to Climate Change and Natural Disasters:	Climate change vunerability 3 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Full scoping and feasibility completed Site identified awaiting calling of tenders Institutional arrangements --- possible control by TAU Rarotonga and Aitutaki Power Authority.
Estimated Cost:	$NZ16.0m
Estimated Maintenance Cost:	Minimal maintenance will be required and will be covered on a commercial basis once facility operational.
Implementation period:	Projected for construction in 2015/17
Potential Funding:	New Zealand/EU/ADB loan

Project : ENERGY : Atiu Solar PV Mini-grid System	
Project Scope: **The CIG policy of conversion of the Cook Islands to renewable energy electricity is documented in the National Sustainable Development plan. The initial phase is the conversion of the Northern Group to be completed in 2014 to be followed by the Southern Group** **The Atiu project will develop renewable energy generation to supply 95% of the islands energy demand.**	
Agencies Responsible:	OPM, TAU, Island Council
Project Benefits/Outcomes:	Reduces reliance on fossil fuels. Better use of renewable energy Greater reliability of service. Estimated number of beneficiaries: 1,500 – Atiu population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1, 2, 3, 7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 3 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Full scoping and feasibility completed Site identified awaiting calling of tenders Institutional arrangements --- possible control by TAU Rarotonga.
Estimated Cost:	Cost Projections $ 3.1 million
Estimated Maintenance Cost:	Minimal maintenance will be required and will be covered on a commercial basis once facility operational.
Implementation period:	Projected for construction in 2014/16
Potential Funding:	New Zealand/EU/ADB loan

Project : ENERGY : Mangaia Solar PV Mini-grid System	
Project Scope: **The CIG policy of conversion of the Cook Islands Group to renewable energy electricity is documented in the National Sustainable Development plan. The initial phase is the conversion of the Northern Group to be completed in 2014 to be followed by the Southern Group** **The Mangaia project will develop renewable energy generation to supply 95% of the islands energy demand.**	
Agencies Responsible:	OPM, TAU, Island Council,
Project Benefits/Outcomes:	Reduces reliance on fossil fuels. Better use of renewable energy Greater reliability of service. Estimated number of beneficiaries: 760 – Mangaia population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1, 2, 3, 7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 3 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Full scoping and feasibility completed Site identified awaiting calling of tenders Institutional arrangements --- possible control by Te Aponga Electricity Authority Rarotonga.
Estimated Cost:	Cost Projections $ 3.5 million
Estimated Maintenance Cost:	Minimal maintenance will be required and will be covered on a commercial basis once facility operational.
Implementation period:	Projected for construction in 2014/16
Potential Funding:	New Zealand/EU/ADB loan

Project : ENERGY : Mauke Solar PV Mini-grid System	
Project Scope: **The CIGOV policy of conversion of the Cook Islands Group to renewable energy electricity is documented in the National Sustainable Development plan. The initial phase is the conversion of the Northern Group to be completed in 2014 to be followed by the Southern Group** **The Mauke project will develop renewable energy generation to supply 95% of the islands energy demand.** **This also project includes the upgrade of generators, powerhouse, and distribution system.**	
Agencies Responsible:	OPM, TAU, Island Council,
Project Benefits/Outcomes:	Reduces reliance on fossil fuels. Better use of renewable energy Great reliability of service Estimated number of beneficiaries: 450 – Mauke population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1, 2, 3, 7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 3 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Full scoping and feasibility completed Site identified awaiting calling of tenders Institutional arrangements --- possible control by TAU Rarotonga.
Estimated Cost:	Cost Projections $ 3.2 million
Estimated Maintenance Cost:	Maintenance will be required and will be covered on a commercial basis once facility operational.
Implementation period:	Projected for construction in the 2014/16
Potential Funding:	New Zealand/EU/ADB loan

Project : ENERGY : Mitiaro Solar PV Mini-grid System	
Project Scope: **The CIGOV policy of conversion of the Cook Islands Group to renewable energy electricity is documented in the National Sustainable Development plan. The initial phase is the conversion of the Northern Group to be completed in 2014 to be followed by the Southern Group** **The Mitiaro project will develop renewable energy generation to supply 95% of the islands energy demand.**	
Agencies Responsible:	OPM, TAU, Island Council,
Project Benefits/Outcomes:	Reduces reliance on fossil fuels. Better use of renewable energy Greater reliability of service. Estimated number of beneficiaries: 224 – Mitiaro population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1, 2, 3, 7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 3 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Full scoping and feasibility completed Site identified awaiting calling of tenders Institutional arrangements --- possible control by TAU Rarotonga.
Estimated Cost:	Cost Projections $ 1.9 million
Estimated Maintenance Cost:	Minimal maintenance will be required and will be covered on a commercial basis once facility operational.
Implementation period:	Projected for construction in 2014/16
Potential Funding:	New Zealand/EU/ADB loan

Project : ENERGY : TAU Control & Generation Rarotonga

Project Scope:

The advent of Renewable Energy (RE) systems being connected on to the grid, requires new generators with expanded specifications so as to work in conjunction with the RE through, control and communication systems, between the diesel system, and the distributed RE systems.

The generation largely includes 5 x replacement diesel engines, and two 'flywheel' based engines, together with associated control systems that will improve the capability of the central generation plant to manage the intermittent generators that are connected to the grid. The new engines and associated control systems, including enabling technologies such as DUPS (Diesel Uninterrupted Power Supply) are necessary to maintain grid stability and hence supply security.

Up to around 3.4 MW grid connect RE, with intermittent generators can be connected to the grid before instability becomes a major issue. So beyond 2015 the installation of RE generators will include storage facilities.

Initially this will include batteries. Other storage technologies, which include pumped hydro systems, are contemplated for the future and so feasibility studies will be undertaken in assess this form of RE.

Agencies Responsible:	CIIC, TAU, IC
Project Benefits/Outcomes:	Reduces reliance on fossil fuels. Better use of renewable energy Long term cheaper and more efficient energy Estimated number of beneficiaries: 132,000 – Rarotonga population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1,2,3,5,7.
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 4 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Full scoping and general feasibility on going Land secured and new power house site identified awaiting tenders to determine design consultants Strong Institutional arrangements in place
Estimated Cost:	$NZ45.2m
Estimated Maintenance Cost:	Ongoing maintenance will be required and will be covered on a commercial basis through Te Aponga being a trading SOE..
Implementation period:	Projected for construction 2016-23
Potential Funding:	To be determined

Project : ICT : Fibre-optic Cable For International Communications	
Project Scope: **To provide a robust international telecommunication system that offers greater performance, lower latency and greater immunity from natural disasters.** **The private sector have supported this project, and suggest it is crucial that first-world standard communications are provided to Cook Islanders to allow the development and maintenance of existing and new enterprises, connected in real-time, at reasonable prices, to the rest of the world.** **Investment in an undersea cable, providing bandwidth to existing and/or new Telco operations will be a 'game changer' for the Cook islands economy.** **The recently initiated O3B international satellite system has been committed to by Telecom C.I. for a five year term.** **This offers the opportunity to, further investigate, design, plan, and possibly position an undersea cable system in the first five year planning period, with take up following the termination of the O3B contract.**	
Agencies Responsible:	OPM, ICI,
Project Benefits/Outcomes:	Increased communication speed. Greater immunity to natural disasters Increased band width. Estimated number of beneficiaries: 132,000 – Rarotonga population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1,4,5,7. The NSDP 2011-15 clearly identifies telecommunications as being important to the country achieving its national objectives.
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 4 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Scoping undertaken and 2012 ADB report offers suggestions on routes and the way forward.
Estimated Cost:	Rough Order Of Cost $ 35 mil
Estimated Maintenance Cost:	Ongoing maintenance costs, would be expected to be recovered by user pays system and rental out to Telecom companies.
Implementation period:	Probable construction likely in 2019-21 period.
Potential Funding:	To be determined – mix including concessional loan finance and private sector participation likely

Project : MARINE TRANSPORT : ORONGO DEVELOPMENT : AITUTAKI

Project Scope:

The island of Aitutaki lacks central community facilities following the destruction of the main Administration buildings in a 2010 cyclone. Fundamental aspects of the project include

Replacement of the central community buildings and administration buildings destroyed in cyclone 'Pam'
Deepening of the port access channel to enable larger yachts and island trading vessels to access dock side facilities.
Improve enlarge on land harbour storage area
Create a marina to facilitate greater number of visits by cruising yachts.

The above improvements will lead to stronger and increase economic activity through the opportunity to host more visiting yachts and offer a market environment to visiting tourists, so increase on island tourist spend.

Easier access to an inner harbour will reduce shipping costs and flow through to cheaper commodity costs.

Research suggests that up to 1000 yacht visits a season could be possible given the movement from French Polynesian through the Cook Islands to Tonga. These yachts track close by Aitutaki and only very few stop over although research suggests this would change dramatically if facilities and easier port access was available.

Agencies Responsible:	Ports Authority, Island Council,
Project Benefits/Outcomes:	Provides a comprehensive community facility for Aitutaki Establishes an easier/larger passage access to the inner harbour Provides to a new tourism market --- visiting yachts Increases economic activity to Aitutaki Estimated number of beneficiaries: 1,770 – Aitutaki population
Alignment with NSDP Priority Areas:	Supports 1,2,4,5,7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 1 Climate proofing needed Yes
Project Status: **(Including risks/obstacles)**	Recent initial scoping has taken place. Need to review institutional arrangements --- possible control by Ports Authority Rarotonga.
Estimated Cost:	Design / Building Replacement $ 2,600,000 Channel / marina $ 5,500,000 Harbour Upgrade $ 6,900,000 Total $ 15,000,000
Estimated Maintenance Cost:	Ongoing maintenance will be required and will be covered on a commercial basis once each activity is complete.
Implementation period:	Projected for construction over the period 2017-20
Potential Funding:	To be determined – possible private sector participation

Project : MARINE TRANSPORT : PENRHYN COASTAL PROTECTION **Te Tautau & Omoka Port facilities and Fuel Depot Relocation**	
Project Scope: **This project is necessary to upgrade the existing facilities including harbour, fuel depot, entry passage and provide a safe port environment within the lagoon area of Penrhyn Island. Coastal protection works also required.** **Establish Omoka port as a Port of Entry thereby providing the following services;** **Transit point for delivery of cargo to Northern Group islands** **Transit and refuelling station for maritime surveillance vessels** **Allow for landing of front/rear loading barges** **Opportunity to provide greater servicing to the long liners fishing within Cook Island waters in the northern group, and so attract fishing vessels to uplift fuel and supplies thereby providing some stimulus to the local island economy** **Opportunity to provide export facilities for fish processing plants on Penrhyn** **Border Control services including Immigration, Customs and Quarantine** **The relocation of the fuel depot further inland due to present vulnerability to sea surges.**	
Agencies Responsible:	ICI, Island Council, Ports Authority
Project Benefits/Outcomes:	Establishes a safe northern group international port of entry Increases protection to important infrastructure Provides long term security to fuel supplies Estimated number of beneficiaries: 213 – Penrhyn population
Alignment with NSDP Priority Areas:	Supports 1,2,4,5,7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 1 Climate proofing needed Yes
Project Status: **(Including risks/obstacles)**	Recent initial scoping has taken place. No foreseeable obstacles other than remoteness. Need to review institutional arrangements --- possible control by Ports Authority Rarotonga.
Estimated Cost:	NZ$4.0m
Estimated Maintenance Cost:	Once completed maintenance costs expected to be minimal.
Implementation period:	Projected for construction in the period 2015-17
Potential Funding:	To be determined

Project : MULTI SECTOR : RUTAKI ROCK REVETMENT	
Project Scope: **The coastal area around Rutaki leading up to Vaimaanga Hotel project on the southern side of Rarotonga is prone to inundation from high seas due to strong onshore wave action from southern ocean storms and cyclone activity.** **Experience has shown ongoing foreshore scouring, causing beach erosion, and escarpments forming threatening the road, and water pipeline infrastructure along with public and private properties.** **This has had an effect on flora and fauna along this coastal area with the loss of many large trees through undermining. The total area affected is estimated at 1.8 km.** **Proven rock revetment works close by (Rarotongan hotel area) are an example of the system to be replicated along this stretch of coast line providing long term protection to the road.**	
Agencies Responsible:	ICI
Project Benefits/Outcomes:	Sustain the present sealed road system Increase protection to important infrastructure Provide protection to public property Estimated number of beneficiaries: 10,600 – Raotonga population
Alignment with NSDP Priority Areas:	Supports 1, 2, 4, 5, 7 Reference to the Joint National Action Plan for Disaster Risk Management & Climate Change Adaptation (JNAP) 2011 – 2015 has highlighted the need for the "coastal zone to be developed and managed on a more sustainable basis, to take into account the impacts of climate change.
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 2 Climate proofing needed Yes
Project Status: **(Including risks/obstacles)**	Project has been scoped, involvement/discussion with stake holders, local community, Rutaki school, Rutaki Aronga Mana, etc required.
Estimated Cost:	NZ$2.6m
Estimated Maintenance Cost:	Once completed maintenance costs expected to be minimal.
Implementation period:	Projected for construction in the period 2017-19
Potential Funding:	To be determined

Project : MULTI SECTOR : OUTER ISLAND CYCLONE SHELTERS	
Project Scope: **The Pa Enua in the north are often subjected to damaging cyclones that can and have endowed these islands land masses. Most island communities utilise schools and / or community buildings as shelters once a cyclone warning has been initiated. Many of these buildings are themselves vulnerable and inadequate often being older, and close to lagoons, and not purpose built to withstand the higher category storms.** **Southern group islands are in a similar situation however these islands generally have elevated land masses where protection from damaging seas does not pose the same concerns.** **The first purpose built cyclone shelter was completed in Manihiki approximately 10 years ago and has proven to be an ideal facility for the protection of the community with design parameters allowing for longer term shelter for residents.** **The replication of the elevated Manihiki concept would be the basis of providing shelters to Rakahanga, Penrhyn, Palmerston, and Nassau in the north as the first priority.**	
Agencies Responsible:	ICI, Island Councils,
Project Benefits/Outcomes:	Provides a safe community facility during cyclones Establishes a known control centre for monitoring the population. The facility would be the centre of co-ordination for any rescue efforts A well designed facility would provide all the necessities of life and provide protection to the population while outside help is being co-ordinated. Estimated number of beneficiaries: 423 – Outer islands population – Penrhyn, Rakahanga, Nassau, Palmerston
Alignment with NSDP Priority Areas:	Supports 1,2,3,4,7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 5 Climate proofing needed Yes
Project Status: **(Including risks/obstacles)**	Recent review of shelters has suggested this project requires some urgency. Procurement of the 'best' land may be an obstacle. Manihiki shelter provides an ideal basis of design.
Estimated Cost:	Suggested budget of NZ$2 million would provide to the Northern Group.
Estimated Maintenance Cost:	Ongoing maintenance will be required and funds appropriated within government budget for each island as required.
Implementation period:	Projected for construction in the period 2016-18
Potential Funding:	To be determined

Project : ROAD TRANSPORT : AITUTAKI SEALING

Project Scope:

There is a need to protect the present sealed road asset by way of providing a second coat seal to the main roads on the island. All sealed road systems require resealing within a period of seven years due to either wear and tear, or bitumen oxidation that will lead to the stripping of the sealing chip and so the failure of the sealed surface.

The intended works will improve and maintain a good and reliable road transport network while extending the all-weather road system in Aitutaki.

The clay roads on the southern portion of Aitutaki become almost impassable during periods of high rainfall, and in dry conditions pose health risks due to fine clay particles in the atmosphere.

As tourist arrivals increase to the island of Aitutaki and tourists become more adventurist there is a need to provide an extended safe transport system.

It follows that the sealing programme applied in the new millennium requires upgrading and maintenance with extension of basecourse and seal over the present loose clay surfaces to reduce health risks posed by fine clays and silts.

Agencies Responsible:	ICI, Aitutaki Island Council
Project Benefits/Outcomes:	Sustain the upkeep of the present sealed road system Extend the sealed roads to more residential areas Reduce health risks associated with fine silts in the atmosphere during increasing dry spells. Estimated number of beneficiaries: 24,000 – Aitutaki population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1, 2, 4, 5, 7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 3 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Project has been scoped with sealing works covering 6km of roads programmed
Estimated Cost:	Construction cost NZ$800,000
Estimated Maintenance Cost:	Ongoing maintenance will be required every 7-9 years.
Implementation period:	Projected for construction in 2018
Potential Funding:	To be determined

Project : ROAD TRANSPORT : AVARUA BRIDGES

Project Scope:

The Avarua Bridges are structures located on the main road in the main CBD area of Rarotonga.
They extend form the east of the CBD and are known as
Empire Theatre Bridge,
Banana Court Bridge
Avatiu Port Bridge

Each bridge is failing or offers inadequate geometrics, due to one or a combination of the following conditions
Abutment scouring
Deck failure due to overloading
Inadequate waterway

Increasing peak stream and river flows during heavy rainfall have damaged and under mined abutments and shown waterways to be inadequate, putting the structures at risk of failure and /or approach wash out.

Traffic configuration with increased cyclists and pedestrians requires more modern geometric application. This flows through to the need for a modern design to accept heavier vehicles that are causing deck failures with consequential dramatic increased maintenance.

Agencies Responsible:	ICI
Project Benefits/Outcomes:	Improve road geometrics Improved design criteria to accept heavier vehicles Climate proofing needs that require lifting of decks and increased waterways Estimated number of beneficiaries: 132,000 – Rarotonga population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1,2,5,7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 3 Climate proofing needed Yes
Project Status: **(Including risks/obstacles)**	Full detailed site investigations and design to be actioned. No obvious risks, alternative road network available during time of construction.
Estimated Cost:	Engineering investigations and design $ 150,000 Construction cost $ 4,850,000
Estimated Maintenance Cost:	Minimal ongoing maintenance will be required upon completion
Implementation period:	Projected for construction in the period 2021-23
Potential Funding:	To be determined

Project : ROAD TRANSPORT : AVATIU VALLEY BRIDGES	
Project Scope: **The Avatiu Valley bridge requires replacement due to the undermining and scouring of the abutments.** **This structure provides access to the main power station, and supports all underground high voltage lines that feed the Rarotonga sub stations and the power distribution about Rarotonga. Also to be noted is that a number of residents reside in the valley environs.** **Regular deliveries of diesel fuel to the power station are carried out to enable a 24/7 power output since large fuel storage facilities are not available at the power station.** **The Avatiu stream has seen increasing peak flows that have damaged and under mined the abutments putting the structure at risk of failure and /or approach wash out during times of heavy river flows.** **Newer modern road tankers with varying wheel axle configurations are overloading the structure and replacement is recommended to ensure continuity of access.**	
Agencies Responsible:	ICI
Project Benefits/Outcomes:	Improve road geometrics Improved design criteria to accept heavier vehicles Increasing waterway and providing abutments that better withstand stream flows. Estimated number of beneficiaries: 132,000 – Rarotonga population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1,2,4,5,7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 3 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Full detailed site investigations and design to be actioned. No obvious risks, alternative temporary stream crossing easily catered for during time of construction.
Estimated Cost:	Engineering investigations and design $ 50,000 Construction cost $ 1,450,000
Estimated Maintenance Cost:	Minimal ongoing maintenance will be required upon completion
Implementation period:	Projected for construction in the period 2016-18
Potential Funding:	To be determined

Project : SANITATION : Long Term Upgrades For Rarotonga.	
Project Scope: **The construction of a Rarotonga reticulated system has been the subject of discussion over a long period of time and the report by Beca dated September 2012 provides some scoping comments and a possible way forward.** **Central treatment of liquid waste at satellite systems with effluent discharge by way of over the reef pipe outfalls is the suggested focus of any proposed upgrades.** **With tourism as the main economic driver, then central control of disposal will, ensure through monitoring that all effluent meets the regulations before discharge.**	
Agencies Responsible:	ICI, WATSAN,
Project Benefits/Outcomes:	Consistency of island treatment, of waste water. Opportunity to direct volumes of effluent to irrigation for agriculture purposes. Ensures high standard of liquid waste control. Estimated number of beneficiaries: 10,500 – Rarotonga population
Alignment with NSDP Priority Areas:	Supports 1,2,4,6,7 Sanitation in the Cook Islands 3-year Plan 2013-2016 outlines the activities to be undertaken to improve sanitation systems and monitoring on Rarotonga and Aitutaki, and to scope the upgrades on other outer islands. Ministry of Infrastructure and Planning / Infrastructure Cook Islands Business Plan 2013/14 (Output 4) supports the delivery of water and sanitation improvement initiatives.
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 4 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Scoping undertaken and 2012 report offers suggestions. More detailed concepts/design required Over reef discharge likely to be controversial Land issues may be an issue when locating satellite systems. Institutional and management arrangements will require clarification.
Estimated Cost:	Rough Order Of Cost $37m
Estimated Maintenance Cost:	Ongoing maintenance costs, would be expected to be recovered by user pays system.
Implementation period:	Probable construction in 2024
Potential Funding:	To be determined

Project : SOLID WASTE : Incinerator For Rarotonga	
Project Scope: **A one off incinerator for Rarotonga could assist Airline waste, ship waste, hospital waste etc.** **The present facility managed by the Airport Authority has been in place since 1974 with minimal upgrades.** **The extension of use could be into power generation using the waste as fuel.** **A Strategic Assessment is required and being implemented by way of the appointment of a Project manager expected to start on 1st April 2014 for a 12 month contract.** **This will include an 'Economic Analysis' and a 'Waste Audit' that covers** **Rarotonga hazardous waste handling facilities upgrade** **Contribution to TGA Rarotonga compost facility** **Solid waste resource recovery centres** **Solid waste resource recovery in the outer islands**	
Agencies Responsible:	ICI.
Project Benefits/Outcomes:	Will provide a facility that will ensure modern health requirements are met. Provides to a number of agencies who have the need for incinerator use. Possibility of energy generation. Estimated number of beneficiaries: 10,500 – Rarotonga population plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1, 2, 4, 7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 4 Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Full scoping and feasibility study required. Institutional arrangements --- will require possible control by Te Aponga Electricity Authority Rarotonga and Aitutaki Power Authority.
Estimated Cost:	Rough Order Of Cost $ 3.00 million
Estimated Maintenance Cost:	Maintenance will be covered on a commercial basis from user pays..
Implementation period:	Projected for construction in 2021
Potential Funding:	To be determined

Project : WATER : OUTER ISLAND COMMUNITY WATER TANK REHABILITATION

Project Scope:

Many of the Pa Enua communities had specific village water tanks built in the 1960's to provide safe water to the population of the villages. Water was obtained from the tanks placed in containers and transported back to the homes.

As some reticulation over the years became available to households, villagers used the community water less and less, and given this, these facilities were left to deteriorate and became unusable.

Recent funding of water tanks by way of the provision of a 6000 litre tank to each household in the northern group along with upgrades to the water systems in these islands, while effective have shown that storage volumes are inadequate for the longer dry spells being experienced.

This has led to the desire to rehabilitate the community concrete tanks. These 45,000 litre tanks are located about the various villages with water being saved from a purpose designed iron roof system over the tanks.

These tanks would then provide a backup for the supply of water to the communities. The project covers all islands in the Northern Group as well as Aitutaki, Atiu and Mitiaro

Agencies Responsible:	CIIC, Island Governments
Project Benefits/Outcomes:	Provides a backup supply of water to communities during times of excessive dry spells. Estimated number of beneficiaries: 3,500 – Northern Group population plus Atiu, Mitiaro and Aitutaki
Alignment with NSDP Priority Areas:	Supports 1,2,4,5,6,7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 2 Climate proofing needed Yes
Project Status: **(Including risks/obstacles)**	Tanks exist, repairs reroofing of structures required and relatively straight forward. Easily scoped and actioned.
Estimated Cost:	Suggested budget of $ 1.5 million.
Estimated Maintenance Cost:	Regular low-cost maintenance will be required.
Implementation period:	Projected for construction 2014-16
Potential Funding:	SRIC plus balance to be determined

Project : WATER : TE MATO VAI : Trunk, Intakes, Reservoirs, Treatment etc	
Project Scope: **The design and construction for the ring mains around Rarotonga both inner and outer road were conducted by the Chinese contractor, China Civil Engineering Construction Corporation. The contract started back in 2012 and will continue through to 2015.** **Design of the trunk main pipelines, which connect the water intake sources to the ring main pipeline, also including the upgrading of the access roads and rehabilitation of existing water intakes is intended to start in June 2014 with a construction tender to be completed by the end of 2014 to allow commencement of construction April 2015.** **Water Treatment Plants and Storage reservoirs will be constructed with 12 Treatment Plants to be designed and constructed, appropriate technology to be finalised during the detailed design phase which will start mid-2014.** **Storage reservoirs / tanks also for the treated water will be constructed at the same time with the water treatment plants to ensure adequate storages along with appropriate locations, to ensure sufficient flow and pressures are met at customer levels.**	
Agencies Responsible:	ICI
Project Benefits/Outcomes:	Consistency of water to the community on a 24/7 basis Reduction of losses in network currently assessed at between 20% & 70%. Provides long term security to water supplies Estimated number of beneficiaries: 131,000 – Rarotonga population (92% coverage) plus annual tourist numbers
Alignment with NSDP Priority Areas:	Supports 1,2,4,6,7
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 2 Climate proofing needed Yes
Project Status: **(Including risks/obstacles)**	First stage ring main work currently underway. Contract for trunk, reservoir design imminent Land issues at headwaters for reservoirs could become longwinded arguments. Institutional arrangements to be decided.
Estimated Cost:	$NZ36.3m
Estimated Maintenance Cost:	Once completed maintenance costs expected to be recovered by user pays system.
Implementation period:	Projected for construction in the period 2014-18
Potential Funding:	New Zealand, CIG – balance to be determined

Project : EDUCATION: Apii Nikao School Reconstruction	
Project Scope: **The new primary school will merge the Avatea Primary School (damaged by fire in October 2013) and the Nikao Maori School (structurally unsound) which were co-located on one site. It will accommodate 500 students and 40 teachers; draw on the cultural heritage of the local area; provide quality, comfortable and flexible learning environments; and address climate change by adopting energy efficiency measures. The individual buildings are being planned as modern learning environments, involving larger open spaces where a number of teachers can work with students across different levels and subject areas, rather than single classrooms. These "learning communities" have smaller break out areas that can be used for smaller groups or specific activities.**	
Agencies Responsible:	MOE, CIIC
Project Benefits/Outcomes:	Replaces a school damaged by fire Provides a modern learning environment, which can set a precedent for future school redevelopment projects Merges two existing schools Environmentally sustainable building
Alignment with NSDP Priority Areas:	Supports 4
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 2 (moderate) Climate proofing needed Yes
Project Status: **(Including risks/obstacles)**	The project has been approved by CIG, and CAPEX funding of $1.4 million allocated in the 2014/15 Capital Plan for local costs. China has been approached to fund the $10 million construction cost.
Estimated Cost:	$11.4 million
Estimated Maintenance Cost:	$0.2 million per annum
Implementation period:	Projected for 2014-2017
Potential Funding:	China has been approached to fund the construction cost of $10 million. CIG CAPEX will fund design, demolition, asbestos removal, and construction supervision at an estimated cost of $1.4 million.

Project : EDUCATION: Re-build National College (Tereora)	
Project Scope: **The project involves a complete re-build of Tereora College, with the opportunity taken to contribute to the rationalisation of senior secondary education facilities in Cook Islands through the provision of a larger, better equipped facility with a modern learning environment. Tereora College caters for Year 9 to Year 13 students, and with 647 students enrolled and 55 teachers and staff in 2014 is the largest school in Cook Islands by a significant margin. Other schools catering for senior secondary education on Rarotonga are Titikaveka College (80 senior secondary students), Nukutere College (85 senior secondary students) and Imanuela Akatemia (14 senior secondary students).**	
Agencies Responsible:	MOE, CIIC
Project Benefits/Outcomes:	Facilitates continued and strengthened role for Tereora College as the pre-eminent senior secondary school in Cook Islands. Provides scope to rationalise the provision of senior secondary education in Cook Islands in a larger, better equipped facility with a modern learning environment.
Alignment with NSDP Priority Areas:	Supports 4
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 3 (moderate) Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Not yet approved by CIG, but included in the CIIC database. Had been considered the top priority infrastructure project in the Education Sector, but priorities were re-assessed following damage to Avatea School by fire. No project design has been prepared as yet, but current thinking is that all buildings will need to be replaced. A risk to the project is that delays in securing agreement on steps to rationalise senior secondary education will delay project design and implementation.
Estimated Cost:	Rough order of cost: $30 million
Estimated Maintenance Cost:	$0.6 million per annum
Implementation period:	Projected for 2018-2023
Potential Funding:	CAPEX plus ODA (source not yet determined)

Project : EDUCATION: Fitting Schools with Water Harvesting Systems (pilot project)	
Project Scope: **This is a pilot project to equip schools with water harvesting systems (Rarotonga and outer islands, and including water tanks, fittings, pumps and filtration systems), to provide greater water security. If successful the pilot project could be extended and a general policy adopted to equip all schools with these systems.**	
Agencies Responsible:	MOE, TAU, ICI
Project Benefits/Outcomes:	Water security for schools Increased potential for schools to function as a broader community resource If successful, pilot project can be rolled out to other schools subject to availability of funding, and may lead to a general policy for all schools to be equipped with water harvesting systems
Alignment with NSDP Priority Areas:	Supports 4
Susceptibility to Climate Change and Natural Disasters:	Climate change vulnerability 2 (moderate) Climate proofing needed No
Project Status: **(Including risks/obstacles)**	Not yet approved by CIG, but included in CIIC database
Estimated Cost:	Rough Order of Cost $0.5 million for pilot project
Estimated Maintenance Cost:	$10,000 per annum
Implementation period:	Projected for 2016-2017
Potential Funding:	CIG CAPEX, ODA (source yet to be identified)

Appendix D: Current and Future Climate in Cook Islands

The climate of Cook Islands can be defined as warm tropical oceanic climate. Temperatures are mild all year round. Seasonal temperatures differ between the northern and southern Cook Islands. The Northern Cook Islands' position so close to the equator results in fairly constant temperatures throughout the year, while in the Southern Cook Islands temperatures cool off during the dry season (May to October). Changes in temperatures are strongly tied to changes in the surrounding ocean temperature. Annual average temperature of the Northern Group Islands is 28°C and at Rarotonga in the Southern Group Islands is 24.5°C. Cook Islands' climate varies considerably from year to year due to the El Niño-Southern Oscillation. In Rarotonga, El Niño events tend to bring drier and cooler conditions than normal, while in the north El Niño usually brings wetter conditions. In May 2014 it was reported that based on the observed movement of warm ocean waters towards the east of the Pacific Ocean, an El Niño is expected for the period of August to November 2014.

Rainfall in Cook Islands is strongly affected by the South Pacific Convergence Zone (SPCZ). This band of heavy rainfall is caused by air rising over warm waters where winds converge, resulting in thunderstorm activity. It is centred close to or over the Southern Group from November to May. From November, the South Pacific Convergence Zone is strong enough for the Northern Group to also receive significant rainfall. The driest months of the year in Cook Islands are from June to October.

Two-thirds of the annual rain falls from November to April. The precipitation in this period is characterised by heavy rains forming cyclones, which occur during the same period. Between 1969 and 2010, 47 tropical cyclones were recorded within 400km of Rarotonga (PCCSP, 2011). The most devastating ones were cyclones Martin and Pam in 1997 and cyclone Pat in 2010, where wind and storm surge caused widespread damage on the infrastructure of Manihiki Atoll and Aitutaki islands (PCRAFI, 2011). Over the period 1969 to 2010, cyclones occurred more frequently in El Niño years. The predicted El Niño in 2014 may result in a high probability of one or more tropical cyclones in the same year.

Instruments mounted on satellites and tide gauges are used to measure sea level. Satellite data indicate the sea level has risen near Cook Islands by about 4 mm per year since 1993. This is slightly larger than the global average of 2.8 – 3.6 mm per year. This higher rate of rise may be partly related to natural fluctuations that take place year to year or decade-to-decade caused by phenomena such as the El Niño- Southern Oscillation.

The *Pacific Climate Change Science Program* (PCCSP) provides an overview of the current and future climate of Cook Islands (2011) in country reports. Information on climate projections for Cook Islands has been drawn from the outputs of 18 global circulation models (GCM) for three emission scenarios as provided by the PCCSP. The scientific programme, funded by the Australian Government, has also set up a web-based tool, the *Pacific Climate Futures*, that allows to view climate change predictions and probabilities for selected climate parameters on-line, including for Cook Islands. Projected qualitative changes in Cook Islands' climate are summarised below in Table D.1.

Table D.1 Overview of Cook Island's Projected Climate Changes

Temperature	Temperatures have warmed and will continue to warm with more very hot days in the future.
Rainfall	Annual rainfall since 1960 has increased at Penrhyn in the Northern Cook Islands, but there are no clear trends in rainfall at Rarotonga in the Southern Cook Islands. Rainfall patterns are projected to change over this century with more extreme rainfall days and less frequent droughts.
Cyclone	By the end of this century, projections suggest decreasing number of tropical cyclones but a possible shift towards more intense categories.
Sea Level	Sea level near Cook Islands has risen and will continue to rise throughout this century.
Ocean acidification	Ocean acidification has been increasing in Cook Islands' waters. It will continue to increase and threaten coral and reef ecosystems.

Source: Pacific Climate Change Science Program (2011)

Projected Temperature Changes

Projections for all emissions scenarios indicate that the annual average air temperature and sea surface temperature will increase in the future in Cook Islands. By 2030, under a high emissions scenario, this increase in temperature is projected to be in the range of 0.5–0.9°C in the Northern Group and 0.4–1.0 °C in the Southern Group. For the purpose of the CIIP, a time horizon of 2030 to 2050 seems most relevant for proposed infrastructure development.

Increases in average temperatures will also result in a rise in the number of hot days and warm nights, and a decline in cooler weather.

Based on simulation, using the *Pacific Climate Futures* public web-based portal, temperatures will continue to increase on Cook Islands beyond 2030. Slightly higher temperature increases are expected in the North islands (from 1.4°C to 2.7°C) compared to the South islands (1.4°C to 2.5°C) according to low and high climate scenarios for 2090.

Changing Rainfall Pattern

There is uncertainty around rainfall projections for Cook Islands as model results are not consistent. However, average

annual and seasonal rainfall is generally projected to increase over the course of the 21st century. For the Southern Group average rainfall during the wet season is expected to increase due to the projected intensification of the South Pacific Convergence Zone. Droughts are projected to become less frequent throughout this century. Model projections show extreme rainfall days are likely to occur more often.

The average annual seasonal rainfall is projected to increase in all three future scenarios while extreme rainfall days are likely to occur more often (PCCSP, 2011; GSSA, 2012). As a consequence the tropical cyclones are expected to be more intense in the future and potentially cause more damage to existing and up-coming infrastructure development.

Cyclones

On a global scale, the projections indicate there is likely to be a decrease in the number of tropical cyclones by the end of the 21st century. But there is likely to be an increase in the average maximum wind speed of cyclones by between 2% and 11% and an increase in rainfall intensity of about 20% within 100 km of the cyclone centre.

In Cook Islands region, projections tend to show a decrease in the frequency of tropical cyclones by the late 21st century and an increase in the proportion of the more intense storms.

Sea Level Rise

Current rate of the sea level rise is about 3 mm/year worldwide. For Cook Islands, the sea level is expected to rise even more steadily (PCCSP, 2011). The projections for the medium emission scenario show the rise in sea level in the range of 4-15 cm by 2030; 10-30 cm by 2060 and 18-55 cm by 2090 (relative to year 1990). This implies that especially coastal lowland areas and their related infrastructures will be prone to the coastal flooding.

Natural Hazards

Tropical cyclones are most likely the single most predominant natural hazard, affecting Cook Islands between November and April. In the 41-year period between 1969 and 2010, 47 tropical cyclones passed within 400km of Rarotonga, an average of just over one cyclone per season. The number of cyclones varies widely from year to year, with none in some seasons, but up to six in others. Over the period 1969 to 2010, cyclones occurred more frequent in El Niño years.

Disasters like tsunamis can pose threats to human lives and infrastructure of Cook Islands in the future. In 1909, a tsunami with waves up to three meters high caused damage to roads, bridges and crops in Rarotonga. According to the earthquake hazard predictions, Cook Islands are situated in a relatively quiet seismic area and have low chance of experiencing a strong earthquake in the next 50 years. Nonetheless, the larger tectonic area of Pacific “Ring of Fire” can in the future generate tsunamis that may affect Cook Islands' shores (PCRAFI, 2011).

Recent major under-sea earthquake events in the Pacific Region – Samoa (2009) and Japan (2011) – have resulted in none or minor waves in Cook Islands (EMCI, pers. comm.).

Climate Risk Profile of Cook Islands

ADB (2005) has produced a climate risk profile for Cook Islands under the Climate Change Adaptation Programme for the Pacific. The following presents a review of this and other climate risk profiles for Cook Islands.

Risk evaluation for present and future likelihoods evaluated were extreme rainfall events (both hourly and daily), drought, high sea levels, strong winds and extreme high air temperatures. Tropical cyclone frequencies over the past century were also examined. Current and projected future return periods for major climate parameters are summarised below in Table D.2.

Table D.2 Return Period and Likelihood of Occurrence* in 1 Year, for Given Extreme Events in Rarotonga, for the Present and Projected Future

Event and Location	Present		2025		2050		2100	
	RP	LO	RP	LO	RP	LO	RP	LO
Rainfall-Daily Total at least 300mm	38	0.03	26	0.04	19	0.05	11	0.09
Rainfall-Hourly Total at least 100mm	91	0.01	57	0.02	25	0.04	13	0.08
Height of Sea Surge-Extreme at least 6m above mean sea level	10	0.10	8	0.13	7	0.15	5	0.21
Wind Gust-Extreme at least 42m/sec	29	0.03	16	0.06	14	0.07	-	-
Maximum Temperature-Daily at least 34^{o}C	29	0.03	14	0.07	9	0.12	3	0.29
* A likelihood of o= zero chance, a likelihood of 1= a statistical certainty that the event will occur within a year RP= return period in years; LO= likelihood of occurrence								

Source: CCAIRR Findings/ ADB, 2005

Summary Climate Risk Profile for Rarotonga

A summary of the CRP is presented in Table D.3. The table presents the return periods for Rarotonga of specified extreme events. The information is also presented in terms of the likelihood that the specified event will occur within a time horizon of 1 year. While all the chosen extreme events are relatively rare at the present time, climate change will cause marked increases in the frequency of all of them.

Higher frequency of heavy rainfall events likely

The long rainfall record for Rarotonga provides an opportunity to investigate changes in likelihoods over time. Rainfall data show that between the periods 1929–1959 and 1970–2003, a substantial increase occurred in the likelihood of a daily rainfall of 250 mm or more. This finding is not surprising given that, of the six days since 1929 that had precipitation amounts over 200 mm, all but one was later than 1966.

Table D.3: Return Periods (RP) (yr) and Likelihood of Occurrence (LO) in One Year for Daily Rainfall of at least 250 mm in Rarotonga

Time Period	Return Period (RP) (yr)	Likelihood in Any One Year*
1929-1959 (observed)	66	0.02
1970-2003 (observed)	17	0.06
2025 (projected)	13	0.08
2050 (projected)	10	0.10
2100 (projected)	6	0.17

*A likelihood of 0 equals zero chance while a likelihood of 1 equates to a statistical certainty that the event will occur within a year.

Source: CCAIRR findings/ ADB 2005

As shown in Table D.3, climate change will alter significantly the return periods, and hence the likelihoods, of the extreme rainfall events. The likelihood of both, extreme hourly and daily rainfall events will increase over the remainder of the present century.

While the frequency of heavy rainfall events in Rarotonga is clearly increasing, so too is the frequency of low monthly rainfall totals. Recorded data show that in the latter part of the last century Rarotonga experienced unprecedentedly low rainfall conditions. In 1998 alone, 4 consecutive months had rainfall below the 10th percentile. In that same year, 6 months had rainfall below the 10th percentile, with 3 below the fifth percentile. All the low rainfall years, namely 1982/83, 1992/93 and 1997/98, coincided with El Niño events.

The results indicate that prolonged and more intense periods of drought will occur in Cook Islands during the remainder of the 21st century. This will impact primarily infrastructure projects in the water supply and land transportation (i.e. roads sector), which will be further addressed in following sections.

Sea Levels and Extreme Wave Heights are expected to increase

The relationship between maximum wind speed and significant wave height for a given return period is determined using past studies of tropical cyclone risks for the study area. Mean sea level rise due to climate change will likely further impact the wave run-up in coastal areas. Previous modeling studies (ADB CLIMAP TA 2004), found that, under current climate conditions (2004), a significant wave height is estimated to be about 10.8 meters with a 50 years return period. Under the climate projected for the year 2060 (based on emission scenario SRES A2), the 50-year significant wave height increases to about 12.0 meters. Climate change influences a number of climatic parameters – mean sea level, wind speed, sea surface temperature -, which have a combined effect on extreme wave heights. It is estimated that over the coming 50 years or so the return periods for the most extreme wind speeds will reduce significantly, approximately halving by 2050 (ADB CLIMAP TA 2004). If extreme wind speeds of 47.8 m/sec has occurred in Rarotonga every 113 years based on observed data, it will return every 64 years by 2050 following climate change projections.

There is a large inter-annual variability in sea level for Rarotonga, relative to mean sea level. Exceptional high sea levels and wave heights are associated with the occurrence of tropical cyclones as shown in Table D.4. It shows a systematic increase in upper 10th- percentile heights of open water waves associated with tropical cyclones occurring in the vicinity of Rarotonga.

Table D.4: Open Water Wave Height (Average of top 10%) Associated with Tropical Cyclones Recently Affecting Rarotonga

Cyclone (name and year)		Wave Height (m)
Charles	(1978)	11
Sally	(1987)	10
Val	(1991)	14
Pam	(1997)	14
Dovi	(2003)	17

Heta	(2004)	17
Meena	(2005)	17
Nancy	(2005)	22
Olaf	(2005)	19
Percy	(2005)	16
Pat	(2010)	-

Source: ADB, 2006, Dorrell (pers. comm.)

Return periods for significant on-shore wave heights in Rarotonga are expected to further shorten and likelihoods of occurrence are expected to increase in the future as a consequence of climate change.

Table D.5: Return Periods (yr) for Significant On-shore Wave Heights, Rarotonga

Sea Level (m)	Present Day		2025		2050		2100	
	RP	LO	RP	LO	RP	LO	RP	LO
2	2	0.51	2	0.59	2	0.65	1	0.75
4	4	0.25	3	0.31	3	0.35	2	0.45
6	10	0.10	8	0.13	7	0.15	5	0.21
8	30	0.03	23	0.04	18	0.05	12	0.08
10	112	0.01	80	0.01	62	0.02	39	0.03
12	524	0	349	0	258	0	149	0.01

The above Table D.5 shows that projected return periods for even moderate wave heights of between 4 and 8 meters will decrease between present day and year 2100 by as much as 50 to 60%.

Cyclone Intensity Increases

The number of tropical cyclones passing close to, and affecting, Rarotonga, appears to have increased during the last century. However, since observing and reporting systems improved substantially over the time period, it is unwise to read too much into the marked contrast in frequency between the first and second halves of the 20th century. The record for the last few decades is much more reliable, and hence the doubling in decadal frequencies between the 1950s and 1990s may well be closer to the truth. It is certainly consistent with the fact that, since the 1970s, the tendency has been for more frequent El Niño episodes, without intervening “La Niña” events. The duration of the 1990–95 El Niño is unprecedented in the climate records of the past 124 years.

Studies by Australia’s Bureau of Meteorology reveal the consequences of the weakened trade winds and eastward movement of the warm waters of the western tropical Pacific during El Niño events. A possible consequence of the increased persistence of El Niño conditions in recent decades is the apparent intensification of tropical cyclones. In the assessment of tropical cyclone intensity, IPCC’s Fourth Assessment Report (2007) also states that tropical cyclones are likely to become more intense in the future, with larger peak wind speeds and more heavy precipitation associated with them.

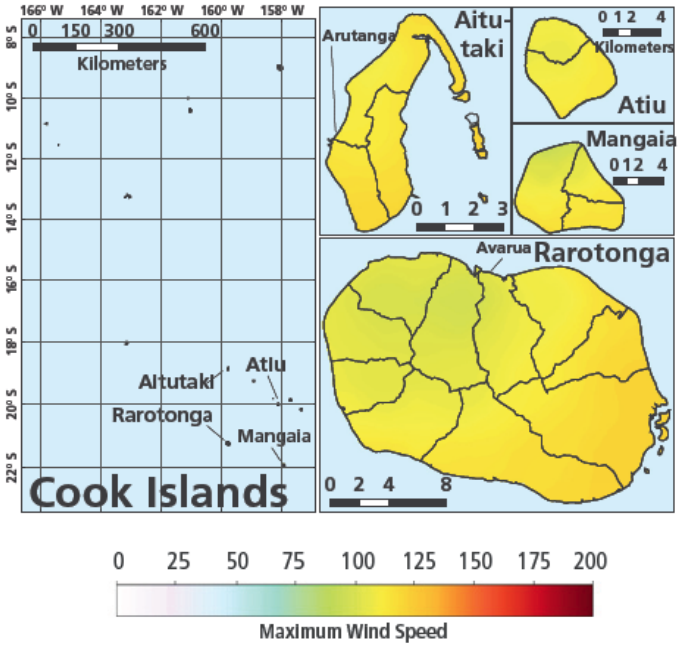
It is commonly assumed that increasing sea surface temperatures (SSTs) will lead to more tropical cyclones because the areas of formation are primarily determined by SST reaching a particular threshold. Modelling studies indicate fewer tropical cyclones globally in the future because of changes in the atmospheric dynamics (e.g. wind shear, or variations in the wind at different heights) and thermodynamics (e.g. static stability, relative SSTs). In regions where wind shear increases and/or the relative SSTs decrease, there will be fewer tropical cyclones. While there is uncertainty as to the magnitude of increases in tropical cyclone intensity as a result of climate change, projected rises in sea level could increase the vulnerability to storm surge flooding of low-lying areas, including the coral atolls of Northern Group in Cook Islands.
In conclusion, coastal infrastructures are put at a higher risk in Cook Islands. Direct damage by tropical cyclones, coastal flooding, and significant on-shore waves could result in losses to buildings, agriculture and infrastructure in Cook Islands.

Figure D.1 shows the levels of wind speed due to tropical cyclones that have about a 40% chance to be exceeded at least once in the next 50 years (100- year mean return period). These wind speeds, if they were to occur, are capable of generating severe damage to buildings, infrastructure and crops with consequent large economic losses. Figure 4 shows indicatively that the north, east and south of Rarotonga, Aitutaki, Atiu and Mangaia are exposed to higher wind speeds than western regions of the respective islands.

The Pacific Catastrophe Risk Assessment and Financing Initiative estimates in its country risk profile for Cook Islands (2011), that the country is expected to incur, on average, 5 million USD per year in losses due to earthquakes and tropical cyclones.

According to this study, losses caused by cyclones to infrastructure contribute only about 1% to the overall projected annual losses (see Figure 6, page 4). The assumed losses (approximately USD 50,000 per annum) due to damage to infrastructure appears to be too low.

Figure D.1 Maximum 1 minute Sustained Wind Speed (mph) with a 40% Chance to be Exceeded at Least Once in the next 50 Years (100 year mean return period)



Source: The Pacific Catastrophe Risk Assessment and Financing Initiative (2011)

Appendix E: Climate Change and Disaster Risk Management Issues

RISK ASSESSMENT BY ECONOMIC INFRASTRUCTURE SUB-SECTOR

This Appendix presents an evaluation of climate change impacts on priority economic infrastructure sub-sectors as per those shortlisted during the prioritization process. Based on the process described in detail in Chapter 3, the following sub-sectors are in included in the CI NIIP: Energy, Water, Sanitation, Road Transport, Marine Transport, Air Transport, Solid Waste, Communications (ICT) and Multi Sector Projects. The risk assessment is followed by a closer look at the individual CI NIIP projects with the expected highest risk of climate change and natural hazards impacts.

Potential significant impacts that individual sub-sectors may experience from climate change and natural hazards are described here first. Primary impacts of climate change and natural hazards on economic infrastructure are often associated with a range of secondary, indirect impacts, in particular without adaptation measures taken. The most notable potential secondary impacts include: increased maintenance and repair costs, accelerated deterioration of assets, increased cost of supply, and increased frequency of closures/disruptions to service. These secondary impacts have both social and economic implications (for example disruptions to economic activity and access to social services), as well as in some cases environmental implications (such as increased pollutant or sediment runoff to marine environments during flooding), that need to be considered in infrastructure planning and costing, design, construction and maintenance.

Taking into account present day and 2050 time horizon likelihoods (see Table E.1 below) of significant climate change and natural hazard impacts to occur and the consequences of these impacts, sub-sector specific risk assessments are presented below.

Energy

Energy production, utilization, conversion and transportation have and will be affected by most natural weather phenomena such as wind gusts, storm surges and cyclones.

The energy infrastructure sector is considered to be in general at low to medium risk in both the short and long term from climate change and natural hazards in Cook Islands. The infrastructure will be located. This is based on the evaluation that, both, the installation of PV mini grid systems on the outer islands, as well as the retirement and replacement of old diesel powered energy generators at Rarotonga will contribute in building resilience for the energy sector and improve energy security beyond 2020. However, more extreme wind gusts, including associated debris from damaged structures and fallen trees may cause physical damage to the PV mini grid systems in the long-term, with higher likelihood of extreme wind gusts and higher intensity of tropical cyclones.

An evaluation of the effects of climate change and natural hazards on the fuel storage facilities finds these infrastructures at a high risk in the short- and long term. However, at this point, only the relocation of the fuel depot at Penrhyn has been included in the CI NIIP. The coastal fuel depots on Rarotonga have not been considered for further climate or proofing or disaster risk reduction measures.

The severity of impacts in this sector is heightened by the fact that failures of the energy generation or transmission network have a high probability of causing cascade failures in other infrastructure sectors that rely on a secure energy source, for example water supply, air transport and communications.

Table E.1: Summary of Potential Impacts and Adaptation on Energy Infrastructure

Climate change/hazard	Potential Impact	Potential Resilience Measure	Complementary Measures
Sea-level rise	Most PV mini grid and diesel powered generators are expected to be located inland and not directly affected by sea-level rise. On smaller outer atoll islands the distance from the shoreline may not be at a significant from the shoreline.	Locate PV and generator infrastructure above sea level. Materials substitution for less corrosive materials. Relocate fuel depots outside climate change and natural hazard impact zones.	
Increase in rainfall and more intense and prolonged droughts	PV power generation systems rely on the sun. More cloud formation and rainfall may decrease the efficiency of those systems. On the other side longer drought periods may benefit PV power generation.	Include back-up power generation and energy storage systems (i.e. pump up water into reservoirs).	
Tropical Cyclones and frequent extreme wing gusts	As with all structures, PV installations could be directly damaged by storms and fallen	Design more robust support infrastructure and protection from storm debris.	

Climate change/hazard	Potential Impact	Potential Resilience Measure	Complementary Measures
	debris. Transmission lines and towers are damaged.		
Increased temperatures	Higher evaporation rates could indirectly affect energy storage (i.e. open water reservoirs)	Consider evaporation losses in the design.	

Water Supply

Cook Islands' water supplies stem primarily from precipitation, and any alterations in the patterns or frequency of rainfall will therefore impact on the water availability. Temperature variations can result in changes in water use (expressed as evapotranspiration), soil moisture, and infiltration rates.

Sea-level variations can contribute to varying salt-water intrusion in the groundwater, in particular for the outer islands. Cyclone induced debris, storm surge, and salt spray, can overtop, contaminate, and degrade the aquifers, wells, and storage facilities. This also applies for rainwater harvesting from roofs, which gets affected by the salt spray during wind gusts and tropical cyclones.

After heavy rainfall water becomes silty or cloudy, for the first few days after the event, requires boiling prior to domestic use. Drought is a major concern to the people inhabiting atolls such as Aitutaki with impacts on the drinking water supply in particular. The susceptibility of this sector to water shortages due to drought conditions is further compounded by partially poor rainwater catchment and water resources management. For supply, the impacts of cyclones are negative. Although heavy precipitation may fall, usually damage associated with cyclones on water related infrastructure means that this precipitation is not viable for catchment. Furthermore, the erosion risk in the hillside catchment areas is increased; resulting in the transport of high sediment loads and potential pollutants into the catchments, intakes/galleries and rendering them temporarily unusable.

The implications of increased El Niño episodes may create different impacts between the Northern and Southern Cook Islands. In Rarotonga, El Niño events tend to bring drier and cooler conditions than normal, while in the north El Niño usually brings wetter conditions. In May 2014 it was reported that based on the observed movement of warm ocean waters towards the east of the Pacific Ocean, an El Niño is expected for the period of August to November 2014. The picture may reverse during La Niña with more precipitation available for catchment.

The overall sector level risk for water supply infrastructure is medium to high in the short and long term, given the improvements proposed for the sub-sector in Rarotonga. In its current configuration this water supply that services the majority of the Cook Island population in Rarotonga is unlikely to be affected by saline intrusion due to sea level rise, or wave action during tropical cyclones or storm surges.

However, this risk rating is highly influenced by the geological formation, location and size of the country's islands. Water supply in the outer islands depends primarily on rainwater harvesting, groundwater resources found often to be not suitable or contaminated. In these islands climate change and more intense natural hazards pose a high risk to the water supply sector.

Table E.2: Summary of Impacts and Adaptation on Water Supply Infrastructure

Climate change/hazard	Potential Impact	Potential Resilience Measure	Complementary Measures
Sea-level rise	Rising sea levels /coastal erosion causes damage to water supply infrastructure, saltwater intrusion into groundwater lens on low-lying and atoll islands.	Use non-corrosive materials, improve rainwater harvesting and storage systems, find alternate and diverse sources of water to those coastal, desalinization Graywater recycling where feasible. For Rarotonga, groundwater extraction at sustainable levels in cases of droughts.	Demand side management, Provide better wastewater treatment to protect groundwater from contamination, undertake regular water quality assessments
Increase/decrease in rainfall	Water shortages; Water demand may increase. Competition and conflict between different water users (agriculture/tourism); increased runoff can decrease water supplies by reduced infiltration into the groundwater. Excess water to the system can overflow and damage infrastructure, floods, and contamination and result in overall poor distribution into the dry season if storage is inadequate.	Where possible improve both natural and artificial water storage, with an emphasis on smaller and more dispersed infrastructure on outer islands; improve water efficiency and water loss measures; increase available resources	Long-term demand side management, Long-term water availability studies and planning, integrated multi-user assessment of supply needs, inter-sectoral management of water resources, ensuring groundwater recharge zones
Tropical Cyclones and frequent strong storms /wind gusts	Damage to water infrastructure could undermine the quality and quantity of water.	Design critical supply infrastructure for hazards.	Enhance community disaster preparedness for water supply through training.

Sanitation

There are currently mainly decentralised septic systems used for wastewater treatment. Where septic tanks are located in low-lying areas close to the coastline or estuarine zones, sea level rise and other climate change may impact the functionality of these systems.

Table E.3: Summary of Impacts and Adaptation on Sanitation Infrastructure

Climate change/hazard	Potential Impact	Potential Resilience Measure	Complementary Measures
Sea-level rise	The reliance on septic tanks and soak away systems are vulnerable close to the shore. Storm surge can result in waste from the coast being deposited inland or to coastal access routes; groundwater levels may rise and may be contaminated by septic system effluent	Introduce reticulated sewer systems and mechanical/biological sewage treatment systems or alternative treatment systems; reduce reliance on water intensive sanitation systems, locate new septic systems away from coastline and above projected mean sea levels, integrate and improve septic systems with other treatment options.	Utility management of centralised sanitation systems are more resilient to changes in climate than that localised sewerage systems.
Increase/decrease in rainfall	Health impacts as result of shortages of water to manage liquid waste; floods can result in sewerage overflows and additional solid and liquid- overflows, putting human health at risk, interruption in service; flooding of septic systems can also result in higher incidents of water-borne diseases.	Back-up systems in place to manage shortage/excess in water; design system for higher variability in water availability; increase water efficiency; low-flush septic systems.	Monitor effects of energy interruptions in the safe operation on STP systems; long-term planning and water source sustainability to plan for changes in water volumes and effects on infrastructure needs.
Cyclones, frequent strong storms and wind gusts	Damage to near shore septic tanks resulting in serious pollution. Storm surge can also result in an	Systems which link multiple communities and multiple sources spread risk and are more resilient, since failure,	

Climate change/hazard	Potential Impact	Potential Resilience Measure	Complementary Measures
	accumulation of debris and waste in sewer pipes, creating backups.	deficiency or flood damage to one source or component are unlikely to cause catastrophic failure; Separation of stormwater from sewage is highly advisable to minimise the risk of overwhelming collection systems and treatment facilities, and the associated pollution impacts	
Temperature increase	Higher incidence of water borne diseases, new diseases	Adjust sanitation processes for the emergence of new and higher levels of warmer weather diseases	Monitor incidences of new disease types and levels and develop response plans

Road Transport

At a sub-sector level, land transport infrastructure, notably roads and bridges, is considered to be at medium to high risk from climate change and natural hazards in both the short and long term. The highest levels of risk are confined to those sections of the network located in low-lying and/or coastal zones. Flooding and associated damage to pavements and drainage structures on low-lying coastal roads as a result of storm surge or wave action during cyclones is considered to be the most potentially damaging impact; such effects not only cause flooding and damage infrastructure, but create obstacles to the evacuation of affected populations and planning and implementation of disaster response. Coastal erosion from sea level rise, which is already evident along unprotected sections of low-elevation roads in close proximity to eroding coastlines as in Rutaki on Rarotonga, is also considered to be a high risk to infrastructure in affected locations. As noted the gradual and relatively predictable nature of this impact limits its overall risk rating. The lower risk rating for this sector compared to the energy and ports infrastructure sector reflects the fact that the entire network would not be at the same level of risk, and the lesser duration of impacts linked to flooding or overtopping of transport infrastructure.

For road transport infrastructure, adaptation to mean sea level change and increased storm surge wave height, could entail the following measures:

- *Realignment* – Where the elevation of the road is so low such that the sea will intrude on both sides of the road, the preferred strategy is to relocate the road.
- Erosion protection – Where the road will be subject to risk of erosion from wave action, the preferred strategy is to construct an earth levee bank with riprap protection against erosion by wave action.
- Increased maintenance – The quantity of maintenance increases in response to the faster rate of physical deterioration.

The climate proofing response to more intense short-duration precipitation would be:

- Increased capacity of transverse drainage system – Where the intensity of short-duration precipitation events increases, the capacity of transverse drainage system will be increased by providing additional relief culverts.
- Improved longitudinal drainage – The ability of the longitudinal drainage systems to accommodate the higher quantity of run-off due to the higher precipitation rates will be improved by lining drains and providing larger ones.
- *Erosion protection* – Areas in the vicinity of the road at risk of erosion will be protected using bioengineering techniques. In addition, steeply graded streams in the vicinity of the road will be provided with check dams to reduce sediment loads on the road drainage system.
- Increased maintenance – The quantity of maintenance increases in response to the faster rate of physical deterioration.

Non-engineering Options

Conventional responses to natural hazards, such as coastal erosion, flooding and landslides, would be designing and providing additional engineering structures, or reinforcing existing ones. Other climate change adaptation options include reforestation and bioengineering measures along water courses and road slopes as well as upper catchment zones. These options are considered ‘no regret’ or ‘low regret’ adaptation activities (ideally a win–win situation for mitigation, adaptation and sustainability), by increasing land cover or coastal buffers and adding carbon storage capacity. The bioengineering adaptations methods are complementary to the engineering methods. They can be implemented along with the road construction schedule, or ahead of it, as they may be located also outside the Right-of-Way (e.g. reforestation). These solutions are relatively inexpensive, flexible and reversible, and also increase adaptive capacities

when facing uncertainty. Finally, they can be part of the community programmes, involving maintenance by the local communities.

Table E.4: Summary of Impacts and Adaptation on Road Transport

Climate change/hazard	Potential Impacts	Potential Infrastructural Adaptation Strategies	Complementary Measures
Temperature increases resulting in very hot days and heat waves	Deterioration of pavement e.g., softening, rutting, migration of liquid asphalt for bitumen roads and loss of pavement binding materials for gravelled pavements.	Substitute materials for higher temperature thresholds. Create roadside shading through wide canopy trees.	
Sea level rises	Damage to roads and bridges due to flooding, inundation in coastal areas, and coastal erosion. Severe damage due to landslides and subsidence, saturated pavements and subgrade.	Re-alignment further inland, raising the height of roads/bridges to above projections, coastal reinforcement protection measures (i.e. CPU), accept temporary road closures, rapid rehabilitation/ construction contingency resources	Coastal zone ecosystems management (i.e. reefs) to reduce impacts on coasts.
Increase in rainfall/land based flooding	Severe damage to road pavements due to increase in soil moisture content and inadequate drainage provision to cope with increase in precipitation; gully erosion, flooding	Substitute materials for higher moisture contents, increase drainage capacity. Increase water retention capacity and slow infiltration through natural or bio-engineered systems. Protect catchments to maximise infiltration and slow release of surface run-off.	
Cyclones and frequent strong storms	Increased probability of road failures due to inadequate design provisions to withstand changes. Increased threat to stability of bridge decks and to bridge approaches by washing away embankments.	Increase maintenance schedule preceding cyclone season, increase return period design standard, coastal reinforcement protection measures.	Early warning systems and road closure, alternate routes, rapid-post disaster reconstruction
Increase in wind speeds/wind gusts	Fallen trees and other structures onto roads causing safety risks to vehicles and pedestrians and possible road closures.	Strengthen roadside structures, weak remove roadside trees.	Local maintenance crews equipped with removal equipment, remove trees.

Adapted from “Infrastructure and Climate Change in the Pacific” (Draft report) prepared by the Australian Government’s Pacific Adaptation Strategy Assistance Program (PASAP).

Marine Transport

Marine transport infrastructure in Cook Islands, mainly ports, harbours and wharves/marinas have been severely impacted by tropical cyclones, storm surges and high wave actions in the past, as recent as in 2010. Infrastructure in this sub-sector sector is considered to be at medium to high risk from climate change and natural hazards in both the short and long term. Port infrastructure on Penrhyn and Orongo Marina and Township Development were considered in this risk assessment as these infrastructures are proposed in the CI NIIP.

Wind and wave induced damage from cyclones and/or storm surge was considered to be the highest risk impact in the short-term. Two ports in Cook Islands, Avatiu and Mangaia, have already been climate proofed recently. For the future (2050), wave or wind damage caused by more intense tropical cyclones and storm surges in addition to the expected mean sea level rise will pose a higher risk to these infrastructures. Despite of the probability of a reduced frequency of tropical cyclones in Cook Islands, significant damage to ports has been caused by even a single tropical cyclone event. It can be expected that more intense, though less frequent tropical cyclones, could cause significant damage to infrastructure and potential loss of life.

Increased air temperature is expected to be of low risk for the marine transport sector both in the short and long term, though indirectly an increase in air temperatures will result in increased sea surface temperatures, which in conjunction

with increasing ocean acidification will contribute to weaker coral reefs and their protective functions for coastal infrastructure.

Risks in this sub-sector are exacerbated by the potential for adverse effects on movements of freight and passengers, as well as the delivery of a natural disaster response if infrastructure is non-operational.

Table E.5: Summary of Impacts and Adaptation on Marine Transport

Climate change/hazard	Potential Impacts	Potential Adaptation Strategies	Complementary Measures
Temperature increases resulting in very hot days and heat waves	Corrosion of reinforced concrete sub-structures due to increase in salt levels, cracking of deck surface.	Substitute with less corrosive materials	
Sea level rises and associated storm surges	Over-topping of wharf decks and other structures, Damage to wharf deck and sub-structure due to prolonged submergence in salt water and increase in salt levels, changes in the rate and pattern of sedimentation of bays[29]	Substitute with less corrosive materials, increase the height of the wharf deck , increase the strength of the pillars to allow for height increase in the future and larger wave impacts, for smaller infrastructure, use small scale removable/floating decks with can be removed during storms	
Cyclones, frequent strong storms and wind gusts	Increase probability of structural failures due to inadequate design provisions to withstand stronger winds.	Increase design standard to withstand greater storm intensity, Use coastal protection measures to reduce/deflect wave strength reaching wharves.	Sea navigation systems to improve safety during extreme events
Ocean acidification	Increased rate of deterioration of concrete and supportive structures	Utilise reinforced concrete and substitute materials, increase maintenance frequency	

Air Transport

Airport infrastructure, including runways, control towers, meteorological equipment and related infrastructure, is considered to be at low to medium risk of climate change and natural hazards. The main national airport in Rarotonga is located at an elevation of about 5m ASL. The main risk to airport infrastructure is associated with wind damage to the control tower and meteorological equipment and office buildings during a tropical cyclone event. Airport strips in the outer island, and potentially also on Rarotonga could be under water, in case of extreme wave height actions.

The risk is exacerbated by the important role that this infrastructure could play in the event of a disaster by allowing international air access to Cook Islands, and by providing meteorological information to inform disaster response efforts.

[29] See: http://www.epa.gov/climatechange/impacts-adaptation/transportation.html#airtransportation

Table E.6: Summary of Impacts and Adaptation on Air Transport

Climate change/hazard	Potential Impacts	Potential Adaptation Strategies	Complementary Measures
Temperature increases resulting in very hot days and heat waves	Deterioration of pavement e.g., softening, rutting, migration of liquid asphalt for bitumen	Ensure temperature thresholds for materials used are appropriate to rising maximum temperature.	
Sea level rises and associated storm surges	Damage to runways and buildings by storms, gradual erosion of coastal landing areas, landslides and subsidence, airport closures, flooding from underneath for coastal airstrips.	Relocate airstrips to higher ground, airport, plan for salt water intrusion into the water table beneath airstrips on low lying atolls. Coastal protection measures	
Increase in rainfall	Severe damage to airstrips due to increase in soil moisture content and inadequate drainage provision to cope with increase in precipitation.	Substitute materials used, improve drainage. Increase sheltered areas	
Cyclones and frequent strong storms	Increased flooding of airstrips, damage to airport tower and essential equipment, increased safety concerns, Fallen trees and other items obstructing runway	Design airstrips for increased flooding, increase maintenance budget.	Improved early warning systems

Solid Waste

The overall sub-sector level risk for solid waste management is low to medium. The solid waste facility on Rarotonga has been constructed in an inland and relatively elevated location and is an engineered sanitary landfill facility. There is minimal risk of damage from climate change or natural hazards other than temporary flooding from increased rainfall intensity. For the planned waste incinerator, the risk level is also low to medium. Strong wind gusts may affect the structural stability of the incinerator stack, though it is expected that the stack remains at a low height due to the small capacity of the plant.

Information and Communication Technology (ICT)

Telecommunications infrastructure, in the form of telephone and radio communications towers and fibre optic cabling, is considered to be of low to medium risk by climate change and natural hazards. Wind induced damage during tropical cyclone is expected to be the most potentially damaging impact. At a network level, the relatively dispersed nature of infrastructure, and its relatively young age contributes to the overall risk rating. However, certain pieces of infrastructure, notably communications infrastructure linked to disaster warnings and coordination of response efforts and communications infrastructure on outer islands is individually at high risk.

Fibre optic cabling, as proposed in the CI NIIP is at low risk in locations where it is underground/undersea, although any sections to be installed above ground would have a high risk rating comparable to that of overhead energy transmission lines. This does not address non-climate related impacts to the cable, for example from marine wildlife and vessels. In particular, the cable landing infrastructure, where the glass-fibre optic cable reaches the shoreline, would need to be designed to withstand the increased intensity of cyclones, storm surges and extreme wave heights in the long term and/or located away from the sites most exposed to natural hazards.

Multi Sector Projects

Coastal Protection

For the purposes of this analysis, coastal protection infrastructure includes seawalls, rock revetments or other types of foreshore protection, including the successfully applied Coastal Protection Units (CPUs) on Rarotonga. Such infrastructure is considered to be of medium to high risk to climate change and natural hazards in both the short and long term. The risk rating is largely influenced by the potential impacts of wave and wind induced damage to foreshore protection infrastructure during tropical cyclones or storm surge. Temporary or permanent failure of such infrastructure could lead to adverse effects on other infrastructure types including roads and the proposed water supply ring main, where the infrastructure is located close to coastal areas.

Outer Islands Cyclone Shelters

Based on the design, successfully tested on Manihiki, shelters are planned for the outer islands Rakahanga, Penrhyn, Palmerston and Nassau in the north. Though these shelters will be purpose built, they will be located on lower lying atoll islands. Such infrastructure is considered to be of medium to high risk to climate change and natural hazards in both the short and long term, similar to coastal protection structures. In the long term, wave or wind damage caused by more intense tropical cyclones and storm surges in addition to the expected mean sea level rise will pose a higher risk to these infrastructures. The risk rating is also influenced by the availability of suitable sites for procurement to build these shelters.

Table E.7: Summary of Impacts and Adaptation on Multi-Sector Projects

Climate change/hazard	Potential Impacts	Potential Adaptation Strategies	Complementary Measures
Sea level rises and associated storm surges	Over-topping of coastal protection structures, Damage to sub-structure due to prolonged submergence in salt water.	Substitute with less corrosive materials, increase the height and width of the coastal protection structures, increase the strength of the pillars of cyclone shelters to allow for height increase in the future and larger wave impacts.	
Cyclones, frequent strong storms and wind gusts	Increase probability of structural failures due to inadequate design provisions, inadequate siting to withstand stronger winds.	Increase design standard to withstand greater storm intensity, Re-inforce coastal protection measures to reduce/deflect wave strength.	

Social Infrastructure Projects (Education, Health and Other Infrastructure e.g. Government offices)

School buildings function, in principle, as any other building structure and are considered to be of medium risk to climate change and natural hazards in the short and of medium to high risk in the long term, in particular on the outer islands.

Limited information on the short-listed priority social infrastructure projects was available at this time. A further detailed risk assessment would require further information on project locations and typical building designs.

As public buildings, schools are often used as emergency evacuation centres or shelters in case of natural hazard events, requiring them to be designed and protected to withstand such hazards (i.e. cyclones, storm surges, etc.) in order to play an active part in the country's disaster risk management strategy. Individual projects should follow building and material codes that have included climate-proofing provisions. Raising building platforms above the reach of projected sea level rises and associated storm surges will be in particular important on the low lying atolls of the outer islands.

For rainwater harvesting systems, future more extreme climatic events, such as extended floods and droughts, will be factors influencing the efficiency of these systems. Thus, rainwater harvesting systems need to be designed to maximise collection and storage through extended capacity in order to provide rainwater for longer periods in times of droughts. Climate proofing would also require that them to be designed so that intrusion of seawater is prevented, in case of storm surges and cyclones.

Table E.8: Summary of Impacts and Adaptation on Social Infrastructure Projects

Climate change/hazard	Potential Impacts	Potential Adaptation Strategies	Complementary Measures
Sea level rises and associated storm surges	Flooding of buildings, damage to structure due to prolonged submergence in salt water.	Elevate buildings above highest projected level of storm surge impacts. Substitute with less corrosive materials, increase the strength of the pillars of buildings being used as cyclone shelters to allow for and larger wave impacts.	
Cyclones, frequent strong storms and wind gusts	Increase probability of structural failures due to inadequate design provisions, inadequate siting to withstand stronger winds.	Increase design standard to withstand greater storm intensity.	Amend building and material codes to include climate proofing provisions.
Temperature increases resulting in very hot days, heat waves, prolonged droughts	Rainwater harvesting systems are ineffective to provide water during drought periods.	Maximise rainwater storage capacity of rainwater systems.	

Climate change/hazard	Potential Impacts	Potential Adaptation Strategies	Complementary Measures
Increase in rainfall/land based flooding	Inadequate drainage provision to cope with increase in precipitation; gully erosion, flooding.	Increase water retention capacity (for example by maximising storage capacity of rainwater harvesting systems).	

Appendix F: Climate Change and Natural Hazard Evaluations of Key Priority Projects

Project Name: TMV Trunk, Intakes, reservoirs, treatment, meters, etc. Climate Change and Natural Hazard Risk Evaluation and Response Strategy		
Sub-Sector	WS	
Authority	WATSAN	
Description	The project is expected to up-grade or to replace the current water supply infrastructure of intakes, reservoirs and pipes. A ring main pipe around the island is in the process of being built. The project also provides further treatment of the raw water and allow for chlorination as a mean of disinfection to produce high quality potable water to households in Rarotonga. The project also includes the installation of water meters in preparation for the introduction of water tariffs.	
Climate Change / Natural Hazard Vulnerability	**2 (High Vulnerability)**	
Climate Change / Natural Hazard Risk	**Present Day: Medium**	**Future (2050): Medium to High**
Potential for CCA and DRR Function	**4 (High CCA DRR Function)**	
Estimated Capital Costs (NZD)	36.3 million	
Estimated CCA /DRR Costs (NZD)	To be advised at a later stage	
Potential Funding Source for CCA/DRR	NZ AID, Chinese Government	

A. Climate Change and Natural Hazard Threats

Cook Islands' water supplies stem primarily from precipitation, and any alterations in the patterns or frequency of rainfall will therefore impact on the water availability. Temperature variations can result in changes in water use (expressed as evapotranspiration), soil moisture, and infiltration rates. In its current configuration, the water supply that services the majority of the Cook Island population on Rarotonga is unlikely to be affected by saline intrusion due to sea level rise, or wave action during tropical cyclones or storm surges. However, this may change if groundwater extraction is used as additional source water beyond sustainable aquifer recharge levels in the future. Plans of supplemental groundwater extraction are being prepared.

The susceptibility of this sector to water shortages due to more intense and prolonged drought conditions is further compounded by partially poor rainwater catchment and water resources management. Although heavy precipitation may fall, usually damage associated with cyclones on water related infrastructure means that this precipitation is not viable for catchment. Furthermore, the erosion risk in the hillside catchment areas is increased with more intense rainfalls, resulting in the transport of high sediment loads and potential pollutants into the catchments, intakes/galleries and rendering them temporarily unusable. In Rarotonga, El Niño events tend to bring drier and cooler conditions than normal, while in the north El Niño usually brings wetter conditions.
The overall risk for water supply infrastructure on Rarotonga is medium to high in the short and long term.

B. Climate Change Adaptation / Disaster Risk Reduction Response

Strategy 1: Study the long-term sustainability of water resources, including under a climate change scenario, and potential pressure on water demand and integrate adequate and robust design and programmatic responses in this project. It is proposed that this includes the following aspects:

- Design additional, possibly enclosed, water detention and storage facilities that are filled during storm events and act as additional water reservoirs in case of prolonged droughts during dry season/ El Niño events.
- Strengthen and expand water catchment protection legislation and programmes as a mean of building resilience against risks from more intense rainfall events (i.e. landslides, floods).
- If groundwater extraction is planned as supplement source water, take into account the effects of sea level rise and salt -water intrusion in a sustainable groundwater extraction design.
- Consider the effects of coastal erosion and impacts of storm surges and tropical cyclones when planning the routing of water pipes. Placing main pipes outside coastal inundation zones should be considered.
- Encourage water conservation and recycling of in the future.

Project Name: Outer Islands Community Water Tank rehabilitation Climate Change and Natural Hazard Risk Evaluation and Response Strategy		
Sub-Sector	WS	
Authority	Climate Change Cook Islands (CCCI) /Emergency Management Cook Islands (EMCI)/ Island Councils	
Description	Many of the Pa Enua communities had specific village water tanks built in the 1960's to provide safe water to the population of the villages. Water was obtained from the tanks placed in containers and transported back to the homes. Recent funding of water tanks by way of the provision of a 6000 litre tank to each household in the northern group along with upgrades to the water systems in these islands, while effective have shown that storage volumes are inadequate for the longer dry spells being experienced. This has led to the desire to rehabilitate the community concrete tanks. These 45,000 litre tanks are located about the various villages with water being saved from a purpose designed iron roof system over the tanks. These tanks would then provide a backup for the supply of water to the communities.	
Climate Change / Natural Hazard Vulnerability	**2 (High Vulnerability)**	
Climate Change / Natural Hazard Risk	**Present Day: Medium to High**	**Future (2050): High**
Potential for CCA and DRR Function	**4 (High CCA DRR Function)**	
Estimated Capital Costs (NZD)	1.5 million	
Estimated CCA /DRR Costs (NZD)	included	
Potential Funding Source for CCA/DRR	Adaptation Fund (already included and budgeted)	

A. Climate Change and Natural Hazard Threats

Cook Islands' water supplies stem primarily from precipitation, and any alterations in the patterns or frequency of rainfall will therefore impact on the water availability. Temperature variations can result in changes in water use (expressed as evapo-transpiration), soil moisture, and infiltration rates. Water supply in the outer islands depends primarily on rainwater harvesting, groundwater resources found often to be not suitable or contaminated. In the outer islands, climate change and more intense natural hazards pose a higher risk to the water supply sector.

The susceptibility of this sector to water shortages due to more intense and prolonged drought conditions is further compounded by partially poor rainwater catchment and water resources management. Although heavy precipitation may fall, usually damage associated with cyclones on water related infrastructure means that this precipitation is not viable for catchment. El Niño events tend to bring wetter conditions to the north.

Sea-level variations can contribute to varying salt-water intrusion in the groundwater, in particular for the outer islands. Cyclone induced debris, storm surge, and salt spray, can overtop, contaminate, and degrade the aquifers, wells, and storage facilities. This also applies for rainwater harvesting from roofs, which gets affected by the salt spray during wind gusts and tropical cyclones. The overall risk for water supply infrastructure on the outer is medium to high in the short and high in the long term.

B. Climate Change Adaptation / Disaster Risk Reduction Response

Strategy 1: This project is already designed for building climate change and natural hazard resilience. However, CCCI should also assess the long-term sustainability of water resources, including under a climate change scenario, and potential pressure on water demand and integrate adequate and robust design and programmatic responses in this project. It is proposed that this includes the following aspects:

- Design community water tanks with added protection against higher intensity storm surges and tropical cyclones, use of non-corrosive materials.
- Strengthen community preparedness for disasters, awareness to public health during flooding and drought events and establish risk management systems and emergency contingency plans during the hazard events (i.e. disconnecting pipes to tanks before cyclones and storm surges).
- Encourage water conservation and recycling of in the future.

Strategy 2: To further build resilience to climate change and natural hazards, long-term programmes should aim at rehabilitating contaminated groundwater resources on the outer islands. This could be achieved by improving septic treatment systems and promote gray water recycling with proper phyto-remediation treatment. The emphasis needs to be on appropriate technologies that can be managed by communities based on available resources on the islands.

Project Name: Outer Islands Cyclone Shelters Climate Change and Natural Hazard Risk Evaluation and Response Strategy		
Sub-Sector	MS	
Authority	ICI/ Island Governments	
Description	The Pa Enua in the north are often subjected to damaging tropical cyclones. Most island communities utilise schools and / or community buildings as shelters once a cyclone warning has been initiated. Many of these buildings are themselves vunerable and inadequate often being older, and close to lagoons, and not purpose built to withstand the higher category storms. Southern group islands are in a similar situation however these islands generally have elevated land masses where protection from damaging seas does not pose the same concerns. The first purpose built cyclone shelter was completed in Manihiki approximately 10 years ago and has proven to be an ideal facility for the protection of the community with design parameters allowing for longer term shelter for residents. The replication of the elevated Manihiki concept would be the basis of providing shelters to Rakahanga, Penrhyn, Palmerston, and Nassau in the north as the first priority.	
Climate Change / Natural Hazard Vulnerability	**2 (High Vulnerability after adjustment)**	
Climate Change / Natural Hazard Risk	**Present Day: Medium**	**Future (2050):Medium to High**
Potential for CCA and DRR Function	**5 (Very High CCA DRR Function)**	
Estimated Capital Costs (NZD)	2.0 million	
Estimated CCA /DRR Costs (NZD)	To be advised at a later stage	
Potential Funding Source for CCA/DRR	NZ Aid, Chinese Government, Climate Change Fund (SCCF) and AUSAID	

A. Climate Change and Natural Hazard Threats

Though these shelters will be purpose built, they will be located on lower lying atoll islands. Such infrastructure is considered to be of medium to high risk to climate change and natural hazards in both the short and long term, similar to coastal protection structures. In the long term, wave or wind damage caused by more intense tropical cyclones and storm surges in addition to the expected mean sea level rise will pose a higher risk to these infrastructures. The risk rating is also influenced by the availability of suitable sites for procurement to build these shelters.

The overall risk for water supply infrastructure on the outer is medium in the short and medium to high in the long term.

B. Climate Change Adaptation / Disaster Risk Reduction Response

Strategy 1: This project is already designed for building climate change and natural hazard resilience. However, there may be obstacles such limited availability of suitable sites for the cyclone shelters. The design for the cyclone shelters need to incorporate the projected increased intensity of tropical cyclones by:

- Substitute with less corrosive materials.
- Increase the strength of the pillars of cyclone shelters to allow for height increase in the future and larger wave impacts.
- Strengthen community preparedness for disasters, awareness to public health during tropical cyclone events and establish risk management systems and emergency contingency plans during the hazard events (i.e. disconnecting pipes to tanks before cyclones and storm surges).

Project Name: Orongo Marina and Town Centre Development Climate Change and Natural Hazard Risk Evaluation and Response Strategy		
Sub-Sector	MT	
Authority	Port Authority, Island Council	
Description	The island of Aitutaki continues to "lack a heart" or central community facilities following the destruction of the main administration buildings in a 2010 cyclone. Fundamental aspects of the project include Replacement of the central community buildings and administration buildings destroyed in cyclone 'Pam', Deepening of the port access channel to enable larger yachts and island trading vessels to access dock side facilities, Improve enlarge on land harbour storage area, Create a marina to facilitate greater number of visits by cruising yachts, The above improvements will lead to stronger and increase economic activity through the opportunity to host more visiting yachts and offer a market environment to visiting tourists, so increase on island tourist spend. Easier access to an inner harbour will reduce shipping costs and flow through to cheaper commodity costs. Research suggests that up to 1000 yacht visits a season could be possible given the movement from French Polynesian through Cook Islands to Tonga. These yachts track close by Aitutaki and only very few stop over although research suggests this would change dramatically if facilities and easier port access were available.	
Climate Change / Natural Hazard Vulnerability	**1 (High Vulnerability)**	
Climate Change / Natural Hazard Risk	**Present Day: Medium to High**	**Future (2050): High**
Potential for CCA and DRR Function	**3 (Neutral CCA DRR Function)**	
Estimated Capital Costs (NZD)	15.0 million	
Estimated CCA /DRR Costs (NZD)	To be advised at a later stage	
Potential Funding Source for CCA/DRR	NZ Aid, Chinese Government, Climate Change Fund (SCCF) and AUSAID	

A. Climate Change and Natural Hazard Threats

Marine transport infrastructure in Cook Islands, mainly ports, harbours and wharves/marinas have been severely impacted by tropical cyclones, storm surges and high wave actions in the past, as recent as in 2010 by Cyclone Pam. Infrastructure in this sub-sector sector is considered to be at medium to high risk from climate change and natural hazards in both the short and long term.

Wind and wave induced damage from cyclones and/or storm surge was considered to be the highest risk impact in the short-term. For the future (2050), wave or wind damage caused by more intense tropical cyclones and storm surges in addition to the expected mean sea level rise will pose a higher risk to these infrastructures. There are several forecasts of sea level rise and the general consensus is that it could be +/- 500mm over 100 years. Therefore adaptation and mitigation measures as they relate to project design are essentially important considerations for this proposed project.
Despite of the probability of a reduced frequency of tropical cyclones in Cook Islands, significant damage to ports has been caused by even a single tropical cyclone event. It can be expected that more intense, though less frequent tropical cyclones, could cause significant damage to infrastructure and potential loss of life.

Increased air temperature is expected to be of low risk for the marine transport sector both in the short and long term, though indirectly an increase in air temperatures will result in increased sea surface temperatures, which in conjunction with increasing ocean acidification will contribute to weaker coral reefs and their protective functions for coastal infrastructure.

Risks in this sub-sector are exacerbated by the potential for adverse effects on movements of freight and passengers, as well as the delivery of a natural disaster response if infrastructure is non-operational.
The overall risk for this project is medium to high in the short and high in the long term.

B. Climate Change Adaptation / Disaster Risk Reduction Response

Strategy 1: Climate change and natural hazard impacts need to be considered in project detailed design, both in regards to stormwater infrastructure and coastal structures. The general approach of climate change adaptation is to improve design and workmanship to make sure that any structure constructed takes into account changing climatic conditions. The proposal accommodates potential climate change through proposed design that can be climate proofed (i.e. breakwater structure design that can be raised to allow for sea level rise). The following aspects should be considered during the DED for the project:

- Identify the adequacy of design of wharves given sea level rise, increased storm surges, wave action and the impact of increased salinity on corrosion. Provide recommendations on improving structural measures given lessons learned to date, including considering using different wharf types such as floating and retractable wharves.
- Identify resiliency measures to protect wharf area from impacts, such coral reef protection.
- Identify risks and contingency plans in case of wharf failure during extreme events.

Project Name: Avarua Bridges Climate Change and Natural Hazard Risk Evaluation and Response Strategy		
Sub-Sector	RT	
Authority	ICI	
Description	These structures being located on the main road are critical to maintaining and improving the road network for tourists and the population in general. Increasing peak stream and river flows during heavy rainfall have damaged and under mined abutments and shown waterways to be inadequate, putting the structures at risk of failure and /or approach wash out. Traffic configuration with increased cyclists and pedestrians requires more modern geometric application. This flows through to the need for a modern design to accept heavier vehicles that are causing deck failures with consequential dramatic increased maintenance.	
Climate Change / Natural Hazard Vulnerability	**3 (Neutral Vulnerability)**	
Climate Change / Natural Hazard Risk	**Present Day: Medium**	**Future (2050): Medium to High**
Potential for CCA and DRR Function	**3 (Neutral CCA DRR Function)**	
Estimated Capital Costs (NZD)	5.0 million	
Estimated CCA /DRR Costs (NZD)	To be advised at a later stage	
Potential Funding Source for CCA/DRR	To be advised	

A. Climate Change and Natural Hazard Threats

Land transport infrastructure, notably roads and bridges, is considered to be at medium to high risk from climate change and natural hazards in both the short and long term. Flooding and associated damage to abutments and pavements on low-lying coastal bridges as a result of storm surge or wave action and intense rainfall during cyclones is considered to be the most potentially damaging impact; such effects not only cause flooding and damage infrastructure, but create obstacles to the evacuation of affected populations and planning and implementation of disaster response. As noted the gradual and relatively predictable nature of this impact limits its overall risk rating. The lower risk rating for this sector compared to the energy and ports infrastructure sector reflects the fact that the entire network would not be at the same level of risk, and the lesser duration of impacts linked to flooding or overtopping of transport infrastructure.

The overall risk for this project is medium in the short and medium to high in the long term.

B. Climate Change Adaptation / Disaster Risk Reduction Response

Strategy 1: Climate change and natural hazard impacts need to be considered in detailed bridge design (DED). The general approach of climate change adaptation is to improve design and workmanship to make sure that any structure constructed takes into account changing climatic conditions. The proposal accommodates potential climate change through proposed design that can be climate proofed. The following aspects should be considered during the DED for the project:

- Raising the height of bridge level to above projections for sea level rise.
- Accept temporary bridge closures.
- Rapid rehabilitation/ construction.
- Identify risks and contingency plans in case of bridge failure during extreme events.

Strategy 2: Strengthen and expand water catchment protection legislation and programmes as a mean of building resilience against risks from more intense rainfall events (i.e. landslides, floods).

Project Name: Penrhyn Coastal Protection - TeTautua & Omoka Port Facilities and Fuel Depot relocation Climate Change and Natural Hazard Risk Evaluation and Response Strategy		
Sub-Sector	MT	
Authority	Port Authority, Island Council	
Description	Establish Omoka port as a Port of Entry thereby providing the following services; Transit point for delivery of cargo to Northern Group islands Transit and refuelling station for maritime surveillance vessels Allow for landing of front/rear loading barges Opportunity to provide greater servicing to the long liners fishing within Cook Island waters in the northern group, and so attract fishing vessels to uplift fuel and supplies thereby providing some stimulus to the local island economy Opportunity to provide export facilities for fish processing plants on Penrhyn Border Control services including Immigration, Customs and Quarantine	
Climate Change / Natural Hazard Vulnerability	**1 (High Vulnerability)**	
Climate Change / Natural Hazard Risk	**Present Day: Medium to High**	**Future (2050): High**
Potential for CCA and DRR Function	**3 (Neutral CCA DRR Function)**	
Estimated Capital Costs (NZD)	4.5 million	
Estimated CCA /DRR Costs (NZD)	To be advised at a later stage	
Potential Funding Source for CCA/DRR	Climate Change Fund (SCCF) and AUSAID	

A. Climate Change and Natural Hazard Threats

Wind and wave induced damage from cyclones and/or storm surge was considered to be the highest risk impact in the short-term. For the future (2050), wave or wind damage caused by more intense tropical cyclones and storm surges in addition to the expected mean sea level rise will pose a higher risk to these infrastructures. There are several forecasts of sea level rise and the general consensus is that it could be +/- 500mm over 100 years. Therefore adaptation and mitigation measures as they relate to project design are essentially important considerations for this proposed project.

Despite of the probability of a reduced frequency of tropical cyclones in Cook Islands, significant damage to ports has been caused by even a single tropical cyclone event. It can be expected that more intense, though less frequent tropical cyclones, could cause significant damage to infrastructure and potential loss of life.

Increased air temperature is expected to be of low risk for the marine transport sector both in the short and long term, though indirectly an increase in air temperatures will result in increased sea surface temperatures, which in conjunction with increasing ocean acidification will contribute to weaker coral reefs and their protective functions for coastal infrastructure.

Risks in this sub-sector are exacerbated by the potential for adverse effects on movements of freight and passengers, as well as the delivery of a natural disaster response if infrastructure is non-operational.

The overall risk for this project is medium to high in the short and high in the long term.

B. Climate Change Adaptation / Disaster Risk Reduction Response

Strategy 1: Climate change and natural hazard impacts need to be considered in project detailed design, both in regards to stormwater infrastructure and coastal structures. The general approach of climate change adaptation is to improve design and workmanship to make sure that any structure constructed takes into account changing climatic conditions. The proposal accommodates potential climate change through proposed design that can be climate proofed (i.e. breakwater structure design that can be raised to allow for sea level rise). The following aspects should be considered during the DED for the project:

- Identify the adequacy of design of wharves given sea level rise, increased storm surges, wave action and the impact of increased salinity on corrosion. Provide recommendations on improving structural measures given lessons learned to date, including considering using different wharf types such as floating and retractable wharves.
- Identify resiliency measures to protect wharf area from impacts, such coral reef protection.
- Identify risks and contingency plans in case of wharf failure during extreme events.

Project Name: Rutaki Foreshore Rock Revetment Development Climate Change and Natural Hazard Risk Evaluation and Response Strategy		
Sub-Sector	MS	
Authority	ICI	
Description	The coastal area around Rutaki leading up to Vaimaanga Sheraton is prone to inundation from high seas because of low-lying depressions. Experience over the past has shown ongoing foreshore scouring causing continuous erosion due to high seas and increased wave activities threatening infrastructures such as roads, water pipeline and public and private properties. This also affects flora and fauna along this coastal area. The total area affected is estimated at 1.8 km. To provide protection along this particular area from high seas, storm surges and cyclonic events, the construction of a rock revetment protection along this coastal area is highly recommended.	
Climate Change / Natural Hazard Vulnerability	**2 (High Vulnerability)**	
Climate Change / Natural Hazard Risk	**Present Day: Medium**	**Future (2050): Medium to High**
Potential for CCA and DRR Function	**4 (High CCA DRR Function**	
Estimated Capital Costs (NZD)	2.6 million	
Estimated CCA /DRR Costs (NZD)	To be advised at a later stage	
Potential Funding Source for CCA/DRR	To be advised	

A. Climate Change and Natural Hazard Threats

Coastal protection infrastructure includes seawalls, rock revetments or other types of foreshore protection, including the successfully applied Coastal Protection Units (CPUs) on Rarotonga. The risk rating is largely influenced by the potential impacts of wave and wind induced damage to foreshore protection infrastructure during tropical cyclones or storm surge. Temporary or permanent failure of such infrastructure could lead to adverse effects on other infrastructure types including the road at Rutaki.

Coastal erosion from sea level rise, which is already evident along unprotected sections of low-elevation roads in close proximity to eroding coastlines in Rutaki on Rarotonga, is also considered to be a high risk to infrastructure in affected locations. As noted the gradual and relatively predictable nature of this impact limits its overall risk rating. The lower risk rating for this sector compared to the energy and ports infrastructure sector reflects the fact that the entire network would not be at the same level of risk, and the lesser duration of impacts linked to flooding or overtopping of transport infrastructure.

The overall risk for this project is medium in the short and medium to high in the long term.

B. Climate Change Adaptation / Disaster Risk Reduction Response

Strategy 1: This project is already designed for building climate change and natural hazard resilience. The following aspects should be considered during the DED for the project:

- Raising the height of the rock revetments to above projections for sea level rise.
- Consider additional buffer planting landward of the coastal protection zone.

Strategy 2: For road transport infrastructure at risk, adaptation to mean sea level change and increased storm surge wave height, could entail the following measures:

- *Realignment* – Where the elevation of the road is so low such that the sea will intrude on both sides of the road, the preferred strategy is to relocate the road.
  - Raising road level – Where realignment may not be an option due to constraints, another possibility is to raise the road level above the projected mean sea level rise, similar to a wharf deck.
  - Increased maintenance – The quantity of maintenance increases in response to the faster rate of physical deterioration.
- *Non-engineering Options:* Conventional responses to natural hazards, such as coastal erosion, flooding and landslides, would be designing and providing additional engineering structures, or reinforcing existing ones. Other climate change adaptation options include reforestation and bioengineering measures along water courses and road slopes as well as upper catchment zones. These options are considered 'no regret' or 'low regret' adaptation activities (ideally a win–win situation for mitigation, adaptation and sustainability), by increasing land cover or coastal buffers and adding carbon storage capacity. The bioengineering adaptations methods are complementary to the engineering methods. They can be implemented along with the road construction schedule, or ahead of it, as they may be located also outside the Right-of-Way (e.g. reforestation). These solutions are relatively inexpensive, flexible and reversible, and also increase adaptive capacities when facing uncertainty. Finally, they can be part of the community programmes, involving maintenance by the local communities.

Project Name: Apii Nikao School Reconstruction Climate Change and Natural Hazard Risk Evaluation and Response Strategy		
Sub-Sector	Ed	
Authority	MOE, CIIC	
Description	The new primary school will merge the Avatea Primary School (damaged by fire in October 2013) and the Nikao Maori School (structurally unsound) which were co-located on one site. It will accommodate 500 students and 40 teachers; draw on the cultural heritage of the local area; provide quality, comfortable and flexible learning environments; and address climate change by adopting energy efficiency measures. The individual buildings are being planned as modern learning environments, involving larger open spaces where a number of teachers can work with students across different levels and subject areas, rather than single classrooms. These "learning communities" have smaller break out areas that can be used for smaller groups or specific activities.	
Climate Change / Natural Hazard Vulnerability	**2 (High Vulnerability)**	
Climate Change / Natural Hazard Risk	**Present Day: Medium**	**Future (2050): Medium to High**
Potential for CCA and DRR Function	**1 (Low CCA DRR Function, unless dual function as shelter)**	
Estimated Capital Costs (NZD)	11.4 million	
Estimated CCA /DRR Costs (NZD)	To be advised at a later stage	
Potential Funding Source for CCA/DRR	To be advised	

A. Climate Change and Natural Hazard Threats

School buildings function, in principle, as any other building structures and are exposed to climate change and natural hazards in both the short and long term, in particular on the outer islands. The risk rating is largely influenced by the potential impacts of wave and wind induced damage during tropical cyclones or storm surge. The overall risk for this project is medium in the short and medium to high in the long term.

A further detailed risk assessment would require further information on project locations and typical building designs.

B. Climate Change Adaptation / Disaster Risk Reduction Response

Strategy 1: Climate proofing should entail the application of climate-proofed design and building materials in line with construction and material selection codes (the development of which are part of enabling environment activities).

The elevation of school buildings should also take into account projected heights of storm surges for 2050 to assure that the buildings could function as shelters in case of natural hazards events.

Project Name: Fitting Schools with Rainwater Harvesting Systems (pilot project) Climate Change and Natural Hazard Risk Evaluation and Response Strategy		
Sub-Sector	Ed	
Authority	MOE, TAU, ICI	
Description	This is a pilot project to equip schools with renewable energy (Rarotonga) and water harvesting systems (Rarotonga and outer islands, and including water tanks, fittings, pumps and filtration systems), to provide greater power and water security and to reduce school operating costs. If successful the pilot project could be extended and a general policy adopted to equip all schools with these systems.	
Climate Change / Natural Hazard Vulnerability	**2 (High Vulnerability)**	
Climate Change / Natural Hazard Risk	**Present Day: Low to Medium**	**Future (2050): Medium**
Potential for CCA and DRR Function	**3 (Neutral CCA DRR Function)**	
Estimated Capital Costs (NZD)	0.5m for pilot project	
Estimated CCA /DRR Costs (NZD)	To be advised at a later stage	
Potential Funding Source for CCA/DRR	To be advised	

A. Climate Change and Natural Hazard Threats

For rainwater harvesting systems, future more extreme climatic events, such as extended floods and droughts, will be factors influencing the efficiency of these systems. During heavy storm events and floods, not all rainwater can be collected and stored, whereas during droughts not sufficient water is available. Seawater intrusion through sea level rise and storm surges may also pose a threat to the functioning of the system.
A further detailed risk assessment would require further information on project locations and typical designs.

B. Climate Change Adaptation / Disaster Risk Reduction Response

Strategy 1: Rainwater harvesting systems need to be designed to maximise collection and storage through extended capacity in order to provide rainwater for longer periods in times of droughts. Climate proofing would also require that them to be designed so that intrusion of seawater is prevented, in case of storm surges and cyclones.

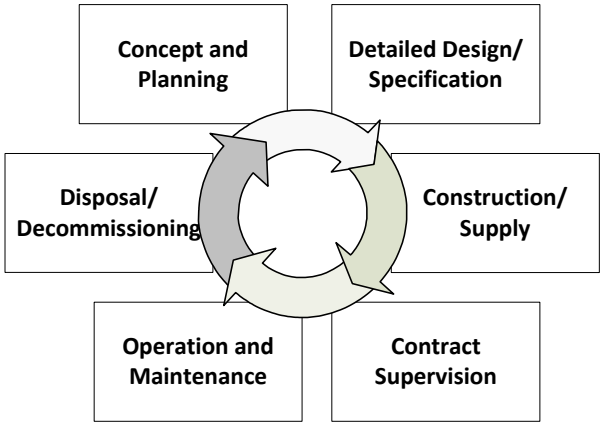
Appendix G: Life-cycle Costing Issues

This Appendix examines the life-cycle costs of economic infrastructure[30] and the maintenance implications of the CI NIIP infrastructure investment program.

Infrastructure life-cycle costs

The purchase or construction of an infrastructure asset is one step in the life-cycle of an asset that extends from the initial identification of needs through to disposal of the asset at the end of its useful life. Figure G.1 shows the steps in the infrastructure asset life-cycle.

Figure G.1: The asset life-cycle



All of these steps involve costs, including:

Concept development and planning – the cost of planning studies, developing the design concept, and associated studies such as environmental impact assessment.

Detailed design and documentation – the cost of detailed designs and specifications, and contract documentation.

Construction or supply – construction or supply cost of the infrastructure, including allowance for escalation and contingencies.

Contract supervision – the cost of ensuring that the work is done to the required standard in accordance with contract requirements.

Operation and maintenance – the cost of operating the infrastructure over its useful life, and the cost of maintaining the infrastructure in good condition (this includes both routine maintenance involving small-scale activities undertaken regularly, and periodic maintenance involving larger scale activities undertaken at longer intervals).

Disposal or decommissioning – the cost of disposal of the asset which can include the cost of decommissioning, removal and clean-up.

Table G.1 provides an indicative analysis of the level of costs at each stage in the asset life-cycle (excepting operation costs and disposal costs which are variable).

[30] Drawing on the analysis presented in the *Tonga National Infrastructure Investment Plan*, October 2010.

Table G.1: Indicative analysis of life-cycle costs

Stage	Rate [a]	Construct / Supply Only	+ Other Up-front Costs	20 Year Maintenance
Concept development and planning	2-5%		$2-5	
Detailed design and documentation	5-10%		$5-10	
Infrastructure construction / supply		$100	$100	
Contingency escalation	10%		$10	
Contract supervision	2-5%		$2-5	
Operating cost	variable			
Maintenance – routine [b]	0-5%			$0-100
Maintenance – periodic [c]	5-10%			$10-20
Disposal / decommissioning	variable			
Total		**$100**	**$120-130**	**$10-120**

[a] Based on typical infrastructure costing parameters, derived from literature review and consultation with infrastructure project management specialists.
[b] Varies from minimal routine/periodic maintenance for buried infrastructure (such as water pipes) up to 5% per year routine and 10% periodic for gravel roads.
[c] Based on 20 year asset life with periodic maintenance every 7 years.

Source: *Tonga National Infrastructure Investment Plan*, October 2010

It can be seen that other up-front costs normally add 20% to 30% over and above the nominal cost of constructing or purchasing the infrastructure asset, while maintenance over the life of the asset (depending on the type of asset) can cost from 10% to as much as 120% of the nominal cost of the asset. Setting aside operation costs and disposal costs, the total cost of an infrastructure asset over its life cycle can be from 130% to 250% of the nominal cost of asset construction or purchase, with most of the variation attributable to differences in maintenance requirements.

Project costing

Most of the proposed projects included in CI NIIP are at an early stage of development, and this has implications for the accuracy of costings. As an illustration of this, one of the more developed projects among the proposed projects in CI NIIP is the Te Mato Vai project. The master plan developed for this project[31] notes that the estimated cost of the project, which does include elements such as the cost of preparing detailed designs and contingencies, is a class 5 (conceptual) estimate with an intended level of accuracy of ± 50%.

AECOM classifies cost estimates into the following estimate classes:

- Class 5 (Conceptual): intended level of accuracy ± 50%. Based on limited project scope definition. Generally used to determine indicative end cost values for comparison of scope or delivery method options and for initial evaluation of project economic viability. Also used for long range planning and project screening.
- Class 4 (Pre-Feasibility Estimate): intended level of accuracy ± 25%. Based on preliminary engineered project definition where the driving components of the scope are definable in terms of capacity and quantity. Used to determine indicative end costs for pre-feasibility studies, strategic planning, budget approvals and to confirm project economic viability.
- Class 3 (Feasibility Estimate / Preliminary Design): intended level of accuracy ± 15%. Based on a detailed level of project documentation of both scope and project delivery methodology and where meaningful budget quotations of contractor / vendor pricing may be sourced. Represents the minimum standard for client funding requests and bankable feasibility studies.
- Class 2 (Detailed Estimate / detailed design): intended level of accuracy ± 10%. Based on a detailed level of project documentation where the majority of commitments have been formally tendered or already in place. Generally used to determine final cost control baseline, supplier negotiation support, claims and dispute resolution.
- Class 1 (Construction Estimate): intended level of accuracy ± 5%. Based on a highly detailed level of project documentation.

Life-cycle costing for CI NIIP investments

Most CI NIIP project cost estimates are at an early stage of development, and it is considered that they need firming up before the aforementioned principles of life-cycle costing can be applied fully. Maintenance costs are the most significant factor in life-cycle costing, and the sustainability of CI NIIP investments is dependent on having in place measures to

[31] *Te Mato Vai, Water Supply Master Plan for Rarotonga*, AECOM New Zealand Ltd, April 2014.

ensure that maintenance is carried out as part of a broader asset management system. An analysis of the maintenance requirements of CI NIIP is presented below.

Maintenance requirements of CI NIIP

Table G.2 examines the maintenance implications of CI NIIP, by project. The CI NIIP capital investment program involves capital investment totalling $NZ288 million over the 10 year period 2014/15 to 2023/24. At the end of this period, the annual maintenance cost of the CI NIIP investments is estimated to be $NZ5.76 million (using an indicative annual maintenance rate of 2 percent of capital cost).

Table G.2: Maintenance implications of CI NIIP at plan end date (2023/24)

Sector	Project	Type of project Deferred maint. (DM) / Upgrading (U) / New (N)	Estimated cost ($NZm)	Maintenance rate (per annum)	Est. annual maintenance ($NZm)	Capacity to self-fund maintenance	Responsibility for maintenance
AT	Atiu Upgrade to Civil Aviation Authority Part 139 Regional Turbo Prop runway	U	3.9	2%	0.08	Moderate	IG
AT	Rarotonga Airport Terminal Improvement (phase 2)	U	5.4	2%	0.11	Moderate	SOE
AT	Rarotonga Airport Instrument landing upgrade	U	3.2	2%	0.06	Moderate	SOE
MT	Manihiki Tukao & Tauhunu Harbour Upgrade	U	0.3	2%	0.01	Low	IG
MT	Penrhyn Coastal Protection - TeTautua & Omoka Port Facilities and Fuel Depot relocation.	U	4.0	2%	0.08	Low	IG
MT	Orongo Marina and Town Centre Development	N	15.0	2%	0.30	High	IG
RT	Road sealing - Aquarius to Tupapa	U	5.0	2%	0.10	Low	CIG
RT	Road sealing project for Aitutaki (6km)	U	0.8	2%	0.02	Low	IG
RT	Bridges upgrade including Avatiu Valley Bridge	U	1.5	2%	0.03	Low	CIG
RT	Avarua Bridges	U	5.0	2%	0.10	Low	CIG
WS	Aitutaki Domestic Water Tanks	N	0.2	2%	0.00	Low	IG
WS	TMV Ringmain	U	14.8	2%	0.30	Moderate	SOE
WS	Outer Islands Community Water Tank rehabilitation	DM	1.5	2%	0.03	Low	IG
WS	TMV Trunk, Intakes, reservoirs, treatment, meters etc	U	36.3	2%	0.73	Moderate	SOE
SN	Sanitation upgrades - onsite Aitutaki	U	1.6	2%	0.03	Low	Private
SN	Sanitation upgrades onsite - scale up pilot to Rarotonga, Phase 2	U	7.7	2%	0.15	Low	Private
SN	Long term sanitation upgrades Rarotonga	N	3.6	2%	0.07	Moderate	CIG
SW	Incinerator for Rarotonga	N	3.0	2%	0.06	High	CIG
E	Palmerston Solar PV Mini-Grid System	N	0.6	2%	0.01	Moderate	IG
E	Penrhyn Solar PV Mini-Grid System	N	1.7	2%	0.03	Moderate	IG
E	Airport Solar PV Installation	N	3.5	2%	0.07	High	SOE
E	Aitutaki Solar PV Mini-Grid System	N	16.0	2%	0.32	High	IG
E	Atiu Solar PV Mini-Grid System	N	3.1	2%	0.06	Moderate	IG
E	Mangaia Solar PV Mini-Grid System	N	3.5	2%	0.07	Moderate	IG
E	Mauke Solar PV Mini-Grid System, and generators, powerhouse, distribution upgrade	N	3.2	2%	0.06	Moderate	IG
E	Mitiaro Solar PV Mini-Grid System	N	1.9	2%	0.04	Moderate	IG
E	TAU control & Generation - Rarotonga	U	45.2	2%	0.90	High	SOE
ICT	Fibre-optic Cable for international Communications	N	35.0	2%	0.70	High	CIG
MS	Rutaki Foreshore Rock Revetment Development	N	2.6	2%	0.05	Low	CIG
MS	Outer Islands Cyclone shelters	N	2.0	2%	0.04	Low	IG
Ed	Apii Nikao School Reconstruction	U	11.4	2%	0.23	Low	CIG
Ed	Re-build National College (Tereora)	U	30.0	2%	0.60	Low	CIG
Ed	Fitting Schools with Water Harvesting Systems (pilot)	U	0.5	2%	0.01	Moderate	CIG
	Allocation for smaller projects		10.0	2%	0.20		CIG
	Allocation for climate-proofing of NIIP projects		5.0	2%	0.10		CIG
					5.76		

Analysis of Maintenance Requirements

CI NIIP Projects are classified above as involving investment in new infrastructure, or upgrading or deferred maintenance in relation to existing infrastructure. For investments involving new infrastructure, all maintenance requirements represent additions to the maintenance task. However, for investments involving upgrading or deferred maintenance of existing infrastructure, additional maintenance requirements will be offset to a greater or lesser extent by savings related to the existing level of maintenance spending for these assets prior to the CI NIIP investment (assuming that some maintenance is being undertaken). The extent of this potential offset is difficult to estimate, though data presented in Chapter 5 suggest that maintenance in most infrastructure sectors is under-funded. Analysis of this data reveals that 45 percent of CI NIIP projects by number and 35 percent by value (that is, by capital cost) represent new investment, while the balance represent upgrading or deferred maintenance of existing infrastructure.

CI NIIP projects are also classified as having high, moderate or low capacity to self-fund maintenance. The basis of this classification is the scoring of projects against the financial sustainability sub-criterion in the Multi-criteria Analysis. A score of 4 or 5 related to strong performance against this sub-criterion, a score of 2 or 3 represented a moderate level of performance, while a score of 0 or 1 represented weak performance against the sub-criterion. Analysis of this data reveals that 18 percent of CI NIIP projects by number and 43 percent by value exhibit a high capacity to self-fund maintenance, 39 percent by number and 30 percent by value exhibit moderate capacity to self-fund maintenance, and 42 percent by number and 27 percent by value exhibit low capacity. For those projects exhibiting high or moderate capacity to self-fund maintenance, cost recovery should assist in addressing the maintenance task.

Finally, CI NIIP projects are classified by the institution responsible for maintenance. Analysis of this data reveals the Cook Islands Government will be directly responsible for maintenance of 34 percent of CI NIIP projects by number and 39 percent by value, Island Governments will be responsible for maintenance of 43 percent of CI NIIP projects by number and 20 percent by value, SOEs will be responsible for maintenance of 17 percent of NIP projects by number and 37 percent by value, while households will be responsible for maintenance of 6 percent of CI NIIP projects by number and 3 percent by value.

The breakdown of annual maintenance costs by the institution responsible for maintenance (at the end of the CI NIIP planning timeframe in 2023/24) is as follows:

Table G.3: CI NIIP maintenance requirements by institution

Institution	Annual maintenance requirement at 2023/24 ($NZm)
Cook Islands Government	2.2
Island Governments	1.2
SOEs	2.2
Households	0.2
Total	**5.8**

The relatively high annual maintenance requirement for Island Governments flows from the significant number of projects in CI NIIP addressing the needs of outer islands, and the fact that Island Governments are responsible for most infrastructure in outer islands. The scale of this required contribution becomes clear when compared with the annual appropriation from CIG to Island Governments – a gross appropriation of $NZ11.6 million and net appropriation (accounting for trading revenues) of $NZ8.6 million in 2013/14. Changes to institutional arrangements to provide for management of infrastructure in outer islands by SOEs would ease the maintenance task facing Island Governments, though care is also needed to avoid undermining the financial viability of SOEs. It is also noted that heavy machinery suitable for maintenance of roads and some airfields is being procured under grant in kind assistance from China. This has the potential to boost capacity of Island Governments in infrastructure maintenance, provided the equipment itself is sustainably managed.

Thirty percent of the annual maintenance requirement identified for CIG relates to the fibre-optic cable project. The responsibility for maintenance is linked here to CIG, pending finalisation of a financial and institutional model for this project.

Appendix H: Funding Background and Issues

Table H.1 summarises Government fiscal operations on a GFS[32] basis. It can be seen that the Government's overall fiscal balance moved from a deficit position equivalent to 2.1 percent of GDP in the 2012/13 supplementary estimates to a surplus position equivalent to 2.5 percent of GDP in the 2013/14 estimates, with forecasts of deficits in 2014/15 and 2015/16 equivalent to 3.9 percent and 6.5 percent of GDP respectively.

Table H.1: Cook Islands Government fiscal operations (GFS operating statement)

	2012/13 Supplementary Estimates ($NZm)	2013/14 Budget Estimates ($NZm)	2014/15 Forecasts ($NZm)	2015/16 Forecasts ($NZm)
Revenue	158.6	178.3	156.9	145.2
Taxes	98.5	105.2	106.9	108.6
Grants	47.5	59.4	35.8	22.4
Other	12.6	13.7	14.2	14.2
Expense	131.1	131.0	133.0	132.9
Compensation of employees	46.7	49.2	49.1	49.0
Subsidies	16.2	16.1	15.0	15.0
Other	68.2	65.7	68.9	68.9
Net operating balance	27.4	47.3	23.9	12.2
Gross transactions in non-financial assets	35.5	36.9	40.3	40.3
Net borrowing/lending (overall balance)	-8.1	10.4	-16.4	-28.1
as a proportion of GDP	2.1%	2.5%	3.9%	6.5%

Source: adapted from CIG Budget Estimates 2013/14, Book 1, Table 3.1

The Government's presentation of its underlying fiscal position, prepared on a different basis than the GFS presentation above, shows an overall deficit equivalent to 3.5 percent of GDP for 2013/14 in the 2014 pre-election fiscal update, with projected deficits equivalent to 3.1 percent of GDP for 2014/15, 3.2 percent of GDP for 2015/16, and 2.0 percent of GDP for 2016/17.

Government's fiscal operations are governed by the MFEM Act 1995/96. A set of fiscal responsibility ratios have been developed to guide compliance with the Act. These are:

- *Tax revenues to remain within 25 percent of GDP* – performance against this ratio has been affected by reclassification of departure tax as a tax for this purpose, and forecasts are that tax revenues will remain within a band of 25 to 26 percent of GDP over the period 2013/14 to 2016/17.
- *Personnel costs to remain within 40 percent of total revenue* – this ratio sits at 41.5 percent in 2013/14, but is projected to drop to 38.1 percent by 2016/17.
- *Running an underlying operating surplus in each budget* – Government is expecting to run small underlying operating deficits until 2015/16, before returning to surplus in 2016/17.
- *Net debt servicing costs to be kept within 5 percent of total revenue* – net debt servicing costs are currently below 5 percent of total revenue, but are expected to exceed this threshold in the medium term with the addition of the proposed loan for the Renewable Energy Project[33].
- *Net debt to be kept within 35 percent of GDP* – this ratio sits at just above 20 percent of GDP in 2013/14, and is expected to fall to under 20 percent of GDP by 2016/17 (assuming no new loans).
- *Budget overall balance to be maintained at a level equivalent to ±2 percent of GDP* – the budget overall deficit is estimated to be equivalent to 3.5 percent of GDP in 2013/14, with the deficit falling to 2 percent of GDP by 2016/17.

The Government's gross debt is expected to stand at $NZ100 million at the end of 2013/14. Net debt is expected to stand at $NZ83.6 million, after allowing for $NZ16.3 million held in the loan reserve fund (debt servicing paid to Government by SOEs in relation to concessional loans on-lent, in advance of Government's debt servicing commitments). This debt is held by ADB (68 percent), the Export Import Bank of China (29 percent), and the Government of France (3 percent). Debt is denominated in Special Drawing Rights (34 percent), New Zealand dollars (34 percent), Renminbi (29 percent), and Euro (3 percent). Government aims to have as much debt as possible denominated in New Zealand dollars in order to minimise the foreign exchange risk.

[32] The GFS (Government Financial Statistics) is an international standard for the presentation of data on public finance. The Cook Islands Government is including presentation of data on this basis in the annual budget documentation.

[33] The macroeconomic assessment (and associated debt sustainability analysis) undertaken with ADB technical assistance in June 2013 (under RETA 7681) concluded that this fiscal responsibility ratio was too conservative, and recommended lifting the threshold ratio of net debt servicing to revenue from 5 percent to 10 percent.

Planned borrowing is limited to one ADB loan of $US11.8 million as part of the funding package for investment in renewable energy. No other Government borrowings for infrastructure are assumed during the 10 year timeframe of NIIP.

SOE finance

The SOEs involved in the provision and operation of economic infrastructure are the Cook Islands Airport Authority, the Cook Islands Ports Authority, and Te Aponga Uira (the power utility). Financial indicators for these SOEs are presented below:

Table H.2: SOE financial indicators (2012/13)

Indicator	CIAA	CIPA	TAU
Shareholder funds ($NZm)	36.9	6.5	42.1
Net profit after tax ($NZm)	-2.6	-1.3	1.6
Return on equity (%)	-7.2	-20.1	3.9
Total revenue ($NZm)	8.2	3.1	21.2
Revenue generated from operations ($NZm)	6.0	2.9	21.2
Dividends ($NZm)	0.0	0.0	0.5
Total debt ($NZm)	3.6	23.2	0.0
Debt/equity ratio (%)	9.6	356.6	0.0
EBITDA ($NZm)	2.3	1.7	3.9
Infrastructure assets at cost / revaluation ($NZm)	15.91	33.6	19.1
Infrastructure assets book value ($NZm)	15.8	30.9	18.7
Maintenance expenditure ($NZm)	0.4	0.1	2.0
Capital expenditure ($NZm)	0.2	9.2	1.4
[1] There was a significant downward revaluation of CIAA's assets in 2012/13.			

Source: SOE Annual Financial Statements

CIAA and CIPA both incurred losses in 2012/13. CIAA is forecasting small profits in coming years, after consistent losses up to 2012/13. CIPA is forecasting continuing losses in coming years, following small profits up to 2011/12. TAU has been consistently profitable, though forecast profits are lower than profits made in recent years. The three SOE have positive EBITDA, and are in a position to self-fund asset maintenance and smaller items of capital expenditure, though maintenance expenditure by CIPA has been consistently low. CIPA is the only one of the three SOEs with a significant level of debt (associated with the recent Avatiu Port Project).

A conventional analysis of capacity to borrow (see Table H.3 below), allowing for a reasonable level of return on equity in the form of dividends to the shareholder, indicates that none of the SOEs has capacity to borrow at market rates of interest or at the concessional rates of interest currently available to Cook Islands.

Table H.3: SOEs – indicative borrowing capacity (2012/13, $NZ million)

Item			CIAA	CIPA	TAU
EBITDA	A		2.3	1.7	3.9
Shareholder funds	B		36.9	6.5	42.1
Nominal return on equity	C		10%	10%	10%
Nominal dividend	D	B x C	3.7	0.7	4.2
Free funds	E	A – D	-1.3	1.0	-0.3
Minimum debt service cover ratio	F		1.5	1.5	1.5
Debt servicing capacity	G	E / F	nil	0.7	Nil
Interest rate (concessional)	H		6%	6%	6%
Estimated debt carrying capacity	I	G / H	nil	11.4	Nil
Existing debt	J		3.6	23.2	0.0
Indicative borrowing capacity	K	I - J	nil	nil	Nil

However, SOEs are not currently being required to pay dividends consistent with the level of shareholder funds (assuming profitability warranted this), CIAA is borrowing commercially, and CIPA has taken on significant debt (on concessional terms) for the Avatiu Port Project. TAU also has substantial cash reserves which provide scope for self-financing of investment in infrastructure, at least for a time.

Clearer guidelines for SOEs on Government's expectations in relation to levels of earnings and dividends would strengthen incentives for efficiency in SOE operations.

Overseas Development Assistance (ODA)

ODA supporting investment in infrastructure is currently running at a very high level in comparison with longer term trends. Table H.4 summarises ODA allocated to infrastructure over the three year period 2013/14 to 2015/16, which totals just over $NZ64 million, or approximately $NZ21 million per annum. This information covers ODA *allocations*, and it is apparent that *expenditure performance* against allocations has been low in the past (anecdotal evidence suggests as low as 40 percent[34]), due to issues with implementation capacity. Available information on actual levels of spending is presented later in this section.

Table H.4: ODA for infrastructure 2013/14 to 2015/16

Sector	Development partners	Major projects	Allocations 2013/14 to 2015/16 ($NZm)
Air transport			
Marine transport	Australia New Zealand	Penrhyn Coastal Harbour Upgrade Mangaia Harbour Climate Adaptation Mauke and Mitiaro Harbours	0.7 0.6 0.3
Road transport			
Water	EU New Zealand	Water and Sanitation Budget Support Te Mato Vai Northern Water Improvement Program – Household Supply	5.6 16.0 0.6
Sanitation	New Zealand	Waste Management and Sanitation Improvement Program	9.0
Solid waste	New Zealand	(share of Waste Management and Sanitation Improvement Program)	
Energy	New Zealand Japan (PEC)	Renewable Energy Support Program Atiu Generator Renewable Energy PV Mini Grids	24.6 0.2 3.4
ICT			
Multi-sector	UNDP UN Adaptation Fund	Pacific Adaptation to Climate Change (PACC+) Cook Islands Strengthening Resilience of Island Communities (SRIC)[a]	0.7 2.6
Total			**64.3**

[a] It is assumed that 50 percent of the SRIC allocation is spent on infrastructure.
[b] MOE record a total of $10.3 million in ODA over this period and MOH $3.6 million, though little of this appears to relate to infrastructure.

Source: *Pre-election Economic and Fiscal Update 2014*, MFEM, 30 April 2014, Table 8.1.

One further ODA contribution recently agreed in relation to this three year period is the EU grant co-financing of the Renewable Energy Project for the Southern Group including Rarotonga, also involving a contribution from New Zealand and a concessional loan from ADB. The EU co-financing amounts to $NZ8.4 million.

Historical data collected from the aid management database kept by Development Coordination Department (DCD), MFEM, reveal the following levels of spending on infrastructure involving ODA in earlier years.

Table H.5: ODA spending on infrastructure 2007/8 to 2012/13

Year	ODA spending on infrastructure ($NZm)
2007/8	1.2
2008/9	2.4
2009/10	1.3
2010/11	2.0
2011/12	4.8
2012/13	6.8

ODA spending on infrastructure built up steadily to 2012/13, and the planned level of spending from ODA sources over the period 2013/14 to 2015/16 is at a significantly higher level again.

[34] As an illustration, Budget Book 3 for 2013/14 (Capital Plan) estimates that capital expenditure funded from ODA amounted to $NZ8.8 million in 2012/13, compared with an original budget allocation for the year of $NZ26.2 million. These figures cover all capital expenditure, including social infrastructure and public buildings as well as economic infrastructure. Total capital expenditure from all sources of funding (CAPEX, ODA, concessional loans etc) was estimated to be $NZ22.9 million in 2012/13, compared with an original budget allocation of $NZ40.7 million.

Historical levels of investment in infrastructure

Historical data collected from the Government accounts, supplemented by data on infrastructure additions not capitalised in the Government accounts (drawing on the aid management database kept by DCD, MFEM), reveal the following additions to the total stock of infrastructure in earlier years:

Table H.6: Additions to infrastructure 2007/8 to 2012/13

Year	Additions to infrastructure ($NZm)
2007/8	4.7
2008/9	4.1
2009/10	7.2
2010/11	11.1
2011/12	28.1
2012/13	12.9

Additions to infrastructure have been financed through a combination of CAPEX, SOE self-financing, ODA and concessional borrowing. There has been a steady build-up in spending on infrastructure, which is continuing over the period covered by the current Government budget (2013/14 to 2015/16).

Appendix I: Existing NSDP Indicators

Priority Area in NSDP	Indicators
Economic Development	- Real GDP growth averages 2.5% per annum
	- Private sector employment growth averages 2.5% per annum
	- Growth in total visitor numbers over 120,000
	- Growth in contribution to the economy as a % growth of GDP from our tourism industry
	- Growth in contribution to the economy as a % growth of GDP from our marine resources
	- Growth in contribution to the economy as a % growth of GDP from our agricultural production
	- Growth in contribution to the economy as a % growth of GDP from our Offshore Financial Services Industry
	- Government tax revenue to GDP maintained within 25% over the medium term
	- Personnel to total revenue is reduced and maintained within 40% over the medium term
	- A National Trade Policy will be adopted and trade agreements entered into where they offer opportunities and benefits to the Cook Islands
Infrastructure	- Percentage of households having access to water is increased
	- All 12 water intakes will be rehabilitated
	- Volume of waste at landfills declined
	- Telephone connection increased
	- Cellular subscribers increased
	- Internet usage increased
	- Number of certified trades professionals increased
	- Percentage of infrastructure projects implemented by local contractor increased
Energy	- 100% of households with access to electricity
	- National spending as a % of GDP on fossil fuels for transportation and electricity reduced
	- Renewable energy coverage increased 50%
Social Development	- Enrolment rate for Early Childhood Education is 95% across all islands
	- 65% Year 4 Literacy results in Cook Islands Maori at or above expected levels
	- 60% Year 4 Literacy results in English at or above expected levels
	- 90% NCEA Level 1 Numeracy rate
	- 90% NCEA Level 1 Literacy rate
	- 62% achievement in NCEA Level 1 qualification
	- 70% retention rate from Year 11-12
	- Increase of 50% rate of tertiary qualified Cook Islanders
	- Increase of 50% rate of vocational education and training achievement
	- Greater than 90% antenatal care for all mothers
	- Low infant (under 5 years) and maternal mortality rates
	- Greater than 90% immunisation coverage
	- Reduce by 10% incidence rates of NCD's
	- Reduce by 30% rates of teenage pregnancy
	- Reduce by 30% rates of sexually transmitted infections
	- Maintain nil or low rates of HIV.AIDS and Tuberculosis (TB) infections
	- Reduce by 50% the number of overweight children
	- Increase the % of women in business and professional occupations
	- Increase the % of women in local and national government
	- Decline in rate of domestic violence
	- Decline in rate of crimes committed against children
	- Decline in rate of crimes committed by youth offenders
	- Reduction in unemployment rate

Priority Area in NSDP	Indicators
	- Increase by 50% the employment rate for persons with disabilities
	- Increase in levels of funding for non-government and civil society organisations providing social services
Resilience	- Historical comparison of recovery cost for various categories of cyclones decreased
	- Historical comparison of lives lost for comparable hazards
	- Number of actions contained in the National Action Plan for DRM and CCA implemented/completed
	- Percentage of Government budget allocated to Disaster Risk Reduction and CCA
Ecological Sustainability	- Water demand and use per capita is reduced
	- Increased and improved water storage
	- Catch from offshore fisheries per effort is maintained at an ecologically sustainable level
	- Percentage of organic agricultural production is increased
	- Loss of soil through erosion is reduced
	- Percentage of land covered by forest increased
	- Percentage of population with sanitation systems upgraded to approved standards of sanitation increased
	- Stream, lagoon water and in-land water intake quality improved to within approved thresholds
	- Importation of ozone depleting substances and persistent organic pollutants declined
	- Tonnage of waste going to landfill declined
	- Tonnage of recycled materials increased
	- Percentage of total land areas under protected status increased
	- Area of protected lagoons and seas increased
	- Numbers of endangered species, animals and plants as a percentage of described species decreased
Governance	- A functional review implementation framework which enhances service delivery is executed
	- Implement leadership and development programs that reinforce strategic decision and fosters innovation and service excellence across the Public Service
	- As the "Employer of Choice", strategies that enhance the recruitment and retention of a competent workforce will be implemented
	- PFM Roadmap fully implemented and PEFA assessment in 2015 demonstrates planned improvements in PFM systems in accordance with the Roadmap goal scores
	- Personnel to GDP reduced and maintained within 40% over the planning period
	- Majority of the general public are informed and aware of the performance of Government through public opinion polls, with actions facilitating this being:
	a. The introduction of an annual Parliament calendar by 2012
	b. Reinstating parliamentary Select Committees responsible for scrutinising performance of the public service including the Public Finance and Expenditure Select Committee
	c. Introducing one point of access for information relating to all aspects of Government operations
	- Adoption of a National Foreign Policy
Law and Order	- Percentage of community that 'feel safe both at home and public places' increased
	- Percentage of community 'satisfied with the level of police visibility in public areas' increased
	- Reporting of family violence increased
	- Crime rate decreased
	- Number of motor vehicle accidents decreased
	- An effective, automated border management system meeting the needs of relevant agencies, especially both customs and immigration, is established and supported by modern legislation