



Technical Assistance Consultant's Report

Project Number: 39118
September 2006

Cook Islands: Strengthening Disaster Management and Mitigation

Prepared by MPC Group International Pty Ltd, Australia in association with Fraser Thomas Partners, New Zealand and International Global Change Institute, New Zealand

For the Ministry of Finance and Economic Management, Cook Islands

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Asian Development Bank

ASIAN DEVELOPMENT BANK

MID-TERM REPORT

TA 4605-COO: STRENGTHENING DISASTER MANAGEMENT AND MITIGATION:

COMPONENT 2: PREVENTIVE INFRASTRUCTURE MASTER PLAN



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CURRENCY EQUIVALENTS

(as of 8 September 2006)

Currency Unit	–	New Zealand Dollar (NZ\$)
NZ\$1.00	=	US\$0.64
US\$1.00	=	NZ\$1.55

ABBREVIATIONS

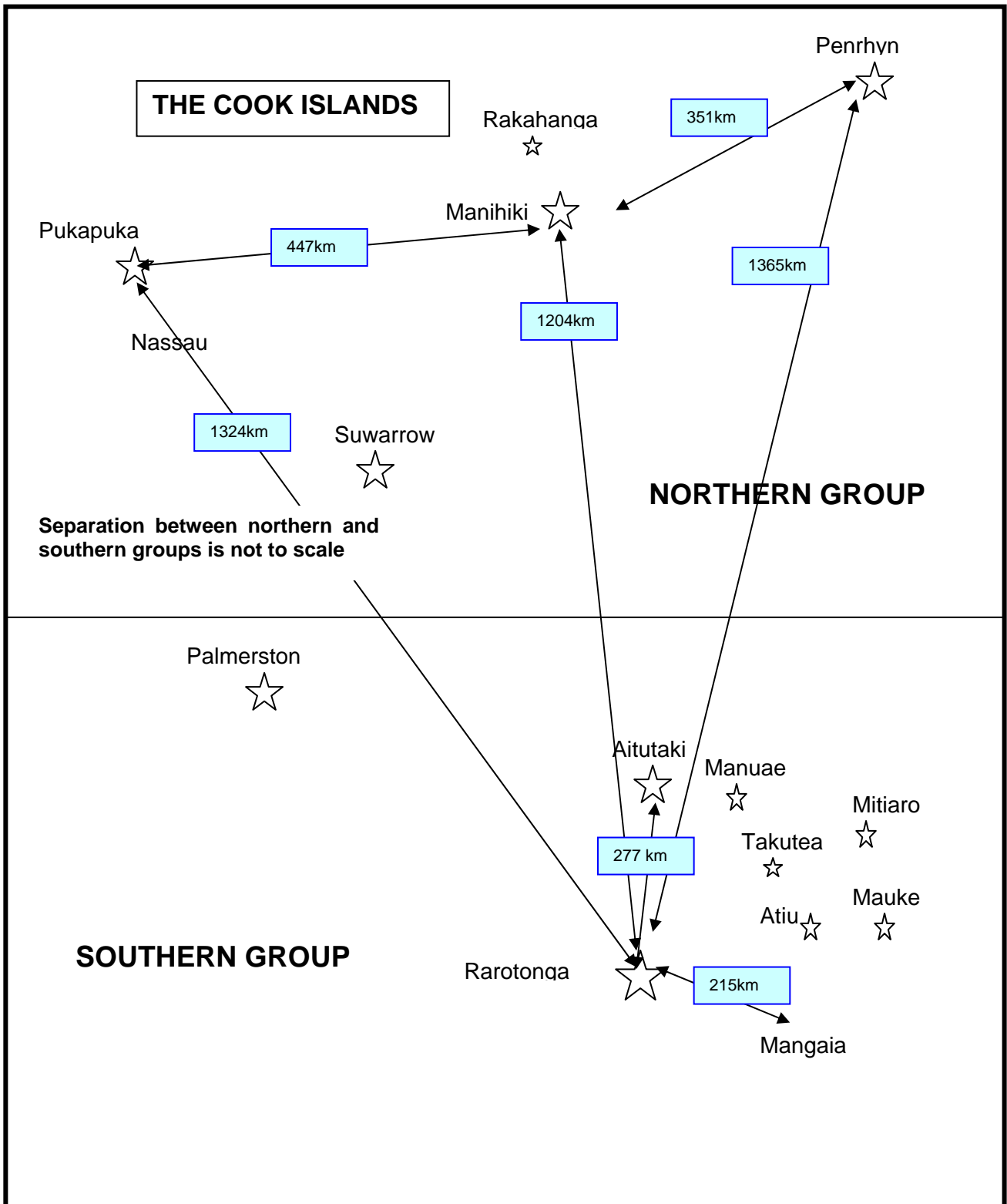
ACC	Aid Coordinating Committee
ADB	Asian Development Bank
AMD	Aid Management Division
AusAID	Australian Agency for International Development
BI	Building Inspector
CAANZ	Civil Aviation Authority of New Zealand
Capex	Capital Expenditure
CBDAMPIC	Community Based Development of Adaptation Measures for Pacific Island Countries
CEA	Cyclone Emergency Assistance
CI	Cook Islands
CIAA	Cook Islands Airport Authority
CIGOV	Cook Islands Government
CIIC	Cook Islands Investment Corporation
CIPA	Cook Islands Port Authority
CITTC	Cook Islands Trade Training Centre
CITV	Cook Islands Television
CLIMAP	ADB Climate Change Adaptation Program for the Pacific
CROP	Council of Regional Organizations
CRP	Climate Risk Profile
DBST	Double Bituminous Surface Treatment
DNHRD	Department of National Human Resource Development
DOH	Department of Health
DPA	Development Partnership Agreement
EMC	Emergency Management Centre
EMCI	Emergency Management Cook Islands
FY	Financial Year
GHD	GHD Consultants
HRD	Human Resource Development
IA	Island Administration
IC	Island Council
ICAO	International Civil Aviation Organization
ICT	Information, Communications and Technology
IGCI	International Global Change Institute
ILS	Instrument Landing System
IMP	Infrastructure Master Plan
ISPC	International Shipping and Ports Service
km	Kilometre
MC	Micro Shelter
MFEM	Ministry of Finance & Economic Management
MMR	Ministry of Marine Resources
MOH	Ministry of Health
MOT	Ministry of Transport
MOW	Ministry of Works
NBC	National Building Code

NDB	Non-directional Beacon
NDMO	National Disaster Management Office
NES	National Environment Service
NSDP	National Sustainable Development Plan
NSW	Cook Islands National Waste Strategy
NZ	New Zealand
NZAID	New Zealand Agency for International Development
O&M	Operations & Maintenance
OICDU	Outer Islands Infrastructure Development Unit
OMIA	Office of the Minister of Island Administrations
PCU	Project Coordination Unit
PD	Police Department
PDU	Project Development Unit
PERCA	Public Expenditure Review Committee and Audit
PFL	Forum Pacific Line
PICCAP	Pacific Islands Climate Change Assistance Program
PIU	Project Implementation Unit
PMG	Pitt Media Group
RIC	Rarotonga Island Council
ROW	right-of-way
SLIS	Survey and Land Information Systems
SOPAC	South Pacific Applied Geoscience Assistance
TA	Technical Assistance
TEU	twenty-foot equivalent unit
TAU	Te Aponga Uira
TNZ	Telecom New Zealand
TOR	Terms of Reference
TVNZ	New Zealand Television
VASIS	Visual Approach Slope Indicator System
VOR	Variable Omni-range

NOTES

- (i) The fiscal year (FY) of the Government of the Cook Islands ends on 30 June. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2000 ends on 31 December 2000.
- (ii) In this report, "\$" refers to New Zealand dollars.

MAP



Source: <http://www.cook-island.maps-pacific.com/>

I. INTRODUCTION

A. Background

1. Between 4 February and 8 March 2005, the Cook Islands experienced five damaging cyclones, four of which were assigned a severity rating of Category 5 and caused damage to homes and essential public infrastructure. The Government and its agencies provided early warning information dissemination, evacuation and emergency relief to the affected population with the support of international and regional relief agencies. Following the cyclones, the Government assessed the physical damage but it lacked all of the capacity and resources to finance the immediate recovery and reinstatement of basic services.

2. On 30 June 2005, the Asian Development Bank (ADB) approved a loan for the Cyclone Emergency Assistance (CEA) Loan Project for the sum of US\$2.85 million, effective from 14 July 2005. The loan was to mitigate the social and economic impact of the cyclone damage by providing the necessary concessional resources to assist the Government implement a comprehensive recovery program. The total cost of the CEA Project is estimated at US\$7.9 million.

3. The 2005 cyclones highlighted the need for a long-term national climate change adaptation strategy and an integrated infrastructure development plan, which incorporates climate change adaptation concepts. The strategy and plan should include policies and priorities both to support economic and social development and protect the country's basic infrastructure against weather-related impacts.

4. As with most Pacific island states, the Cook Islands' social infrastructure is ill prepared against weather-related vulnerability, as highlighted under the Climate Change Adaptation Project for the Pacific¹. The inherent geographical vulnerability of the country to climate change can be ameliorated by initiating integrated infrastructure and social development, including human resources development. Consequently, there is a need for 'climate proofing' the country. That is, for enhancing the country's adaptive capacity and resilience to climate change, including the impacts of extreme events. Strengthening disaster management and mitigation capacity will help to ensure that future social and infrastructure programs will incorporate climate change adaptation and mitigation strategies.

B. Objectives of the Technical Assistance

5. The objective of the Technical Assistance (TA) is to assist the Government of the Cook Islands (CIGOV) in the following:

- To strengthen disaster and recovery management, including damage assessment, aid management and operational coordination;
- To establish financial controls required to ensure good governance in the management of the rapid disbursement of recovery funds;

¹ RETA 6064-REG: Climate Change Adaptation Project for the Pacific approved for US\$0.8 million, November 2005.

- To develop a far-reaching and a systematic approach to mitigating the country's vulnerability to adverse weather conditions;
- To establish institutions and environmentally sustainable infrastructure with capacity to impede the reoccurrence of a disaster with harmful effects on communities and key infrastructure.

6. The TA will establish a robust disaster management operation and control mechanisms to support efficient and effective implementation of the Cyclone Emergency Assistance Program Loan as well as future disasters; and a preventive master plan will develop long-term preparedness of the Cook Islands to respond to disasters by minimizing the potential harmful impacts of future emergencies.

C. Scope of the Technical Assistance

7. The TA is divided into two components:

Component 1: immediate establishment of a rapid, effective and robust response capability through efficiently coordinated networks of skilled personnel to administer disaster mitigation operation. The South Pacific Applied Geoscience Commission (SOPAC) is undertaking this.

Component 2: preparation of a comprehensive and integrated environmentally sustainable infrastructure master plan covering basic infrastructure including the transport, water, sanitation, power and telecommunications sectors; and recommendations for an effective governance and policy framework for the delivery and maintenance of infrastructure in these sectors.

D. Current Situation

8. Component 1 is nearing completion. CIGOV has established a disaster management unit, Emergency Management Cook Islands (EMCI), together with procedures and arrangements needed to respond quickly and effectively to future natural disasters. A draft final report is under preparation.

9. For Component 2, ADB has engaged the services of the MPC Group International Pty Ltd., Australia in association with Fraser Thomas Partners, New Zealand and The International Global Change Institute (IGCI), New Zealand. The Consultant's staff commenced services in the Cook Islands on 18 April 2006.

E. Consultants Contact Details

10. Contact details for the contract managers in Australia and relevant information relating to the project's office and team members in the Cook Islands are detailed below:

Contracting Head Office:

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Team Leader/Transport Engineer: Janusz Sobieniak
Infrastructure Development Planner: Les Taylor
Institutional Specialist: Brian Deutrom

II. STATUS OF THE INFRASTRUCTURE MASTER PLAN

A. Summary of Work Completed

11. Since the submission of the Inception Report in May 2006 the Consultant team has carried out the following tasks:

- i. An inception workshop was held in Rarotonga on 23 May 2006 with a broad range of government and private sector agencies with various roles and responsibilities in infrastructure management and the provision of transport and other public services. The workshop presented the objectives and the approach being taken in developing the infrastructure master plan, and obtained initial feedback from the participants.
- ii. Visits were made to all inhabited islands to (1) inventory and inspect the condition of infrastructure in the sectors addressed by the TA, (2) assess the need for improvements, (3) assess the institutional capacities of the government agencies involved in the operation and maintenance (O&M) of infrastructure, and (4) hold initial stakeholder consultations.
- iii. Palmerston and Nassau were not visited but consultations were held with Palmerston Island Administration representatives visiting Rarotonga, and Nassau's requirements were identified in consultations with the Pukapuka Island Council, which Nassau comes under.
- iv. An inventory of infrastructure facilities and O&M equipment on each island was compiled from the site visits, reports and questionnaires sent to each Island Secretary.
- v. Feasibility studies, engineering reports, project completion reports and other technical documents available in each sector were reviewed. Follow-up discussions were held with the managers and technical staff in all agencies involved in infrastructure management in one form or another.
- vi. Information on staff resources and qualifications in each sector was assembled from questionnaires sent to each Island Secretary and consultations with government agencies in Rarotonga.
- vii. An assessment was made of the roles, responsibilities and functions of all agencies involved in the planning, financing, implementation, O&M and regulation of infrastructure in each sector. Discussions were also held with the principal commercial users.
- viii. An outline infrastructure master plan was created which is described in this report.
- ix. Options for changes, reforms and strengthening institutions were developed which are described in this report.

B. Contents of the Mid-Term Report

12. The report is divided by sectors as follows:

- III. Air Transport Sector
- IV. Marine Transport Sector
- V. Road Sector
- VI. Water Supply Sector
- VII. Energy Sector
- VIII. Sanitation Sector
- IX. Solid Waste Management Sector

- X. Telecommunications Sector
- XI. Outer Island Operation and Maintenance Facilities
- XII. Emergency Management Facilities
- XIII. Outline Infrastructure Master Plan
- XIV. Institutional Action Plan

13. The discussion on each sector in this report follows roughly the same outline:
- Description of existing facilities and equipment and their condition;
 - Current and expected future demand for services in each sector;
 - Current levels of service provided and proposed level-of-service standards to be used in planning infrastructure improvements;
 - Projects and initiatives under way or programmed for early implementation;
 - Assessment of needs in the immediate future (0-3 years), short term (3-5 years), medium term (5-10 years) and long term (10-20 years);
 - Identification of improvements to address these needs; and
 - Institutional assessment describing the institutions involved and a summary of the major issues and requirements.

14. The improvements are organized into discrete projects each of which could be completed within a reasonably short time period (e.g. one to two years) or programmes comprising a series of sub-projects which would be implemented over a longer time frame. Indicative cost estimates are provided where preparatory work has been completed by others. At this stage no cost estimates can be provided for the majority of new projects.

C. Environment and Climate Change

15. The proposed infrastructure improvements in the sectors are aimed both at improving levels of service and reducing user costs and at preserving or improving the physical environment. This is especially true in the water supply, sanitation and solid waste management sectors.

16. The work has not yet addressed the need for measures to protect inhabitants and infrastructure from, or to mitigate against, climate change impacts except for identifying additional emergency management centres and supporting equipment. Such measures are expected to include (1) modifying the engineering and O&M requirements of proposed infrastructure projects to satisfy higher design criteria and (2) proposing specific measures such as foreshore protection.

17. Work is under way to update the Climate Risk Profile (CRP) which will provide an indication of the severity of the problem and point to mitigation measures which will be required in future. This will be addressed in the next stage of the Consultant team's work.

18. Work is under way to update the Cook Islands Building Code which is expected to identify the need to upgrade building structures, utilities and sanitation standards in response to changing climate conditions.

D. Next Steps

19. A Mid-Term Workshop will be held on 19 September 2006 to present the outline infrastructure master plan and the institutional assessment. Participants will be requested to give their views on the needs assessment and scope and priorities of the proposed projects.

20. During September and October 2006 the Consultant will hold follow-up stakeholder consultations on the master plan and institutional arrangements.
21. A Draft Final Report and Final Workshop are scheduled for the end of October 2006.

III. AIR TRANSPORT SECTOR

A. Introduction

22. This chapter addresses the Cook Islands' requirements for air transport and identifies proposed airport infrastructure improvements and institutional arrangements for the sector, including implementation and on-going operation and maintenance (O&M) of airport improvements. In the short term the focus is upon air transport sector improvements in the outer islands (OIs) needed to facilitate their economic development and social wellbeing. At present, upgrading of the outer island airports, particularly in the northern group, is the subject of a detailed technical study by the government and the assessment described in this chapter draws heavily on the work being done by the Ministry of Transport (MOT), Cook Islands Airports Authority (CIAA), Aid Management Division (AMD) and New Zealand Agency for International Development (NZAID).

23. The airport infrastructure improvements needed in future in Rarotonga and Aitutaki are assessed separately and in less detail.

B. Air Transport Services

24. International passenger and cargo services are provided by Air New Zealand from Rarotonga International Airport comprising daily or twice daily services to Auckland, thrice weekly services to Papeete and Los Angeles, and a once weekly service to Fiji. Pacific Blue has begun a twice-weekly service between Rarotonga and Auckland. Services to Auckland provide connections to Australia and all major points in the Asian-Pacific region and services to Los Angeles provide connections to all North American cities and to major cities in Europe. Aircraft operated are B767 and A320/A319 types. Air New Zealand is expected to provide the same or similar services in the foreseeable future. The B767 used on the Auckland-Rarotonga-Los Angeles service is expected to be replaced by the B777 some time in the future.

25. Foreign air carriers have provided regular charter passenger services to Rarotonga in the past, e.g. Canada 3000. At present, there are only occasional specialty charter or general aviation flights but the prospect exists for resumption of weekly charter flights in the future. There are occasional charter flights from Tahiti to Aitutaki.

26. Air Rarotonga is the sole domestic air carrier flying scheduled services to the OIs. It operates one Saab 340 (34 seats) and three Banderante (12 seats) aircraft. The Saab 340 is used almost exclusively to serve the Aitutaki route. The Banderante operates on the remaining routes and supplements the Saab 340 on the Aitutaki route. The Banderante's payload on the northern airports is reduced from 12 to eight or nine passengers due to the aircraft's payload-range performance over these long distances. The northern routes are not profitable with high airfares, severely limited capacity and problems with fuel supply, due to infrequent marine transport services. The solution is to improve the airports to allow Saab 340 flights as discussed in a later section.

C. Airports

27. CIAA operates Rarotonga International Airport and Aitutaki Airport. Both airports are adequate for the level of aircraft, passenger and cargo traffic handled at present and there are no pressing needs, though upgrading and expansion of selected facilities will be expected over the time horizon of the infrastructure master plan as described later in the section.

28. The remaining airports in Atiu, Mangaia, Mauke and Mitiaro in the southern group and Manihiki, Penrhyn and Pukapuka in the northern group are basic airstrips consisting of a crushed coral runway, small concrete apron and very basic passenger shelters. The airports are licensed to Island Councils or community groups and the Island Administrations have taken on the responsibility for keeping the runways in serviceable condition and providing fuel storage and refuelling services. Air Rarotonga serves these outer island airports using the Banderantes with an occasional flight by the Saab 340 to Manihiki, Penrhyn and Atiu. Air Rarotonga is reluctant to provide further Saab 340 service because of unsatisfactory runway conditions and the difficulty in arranging fuel. None of the airports are certified to Civil Aviation Authority of New Zealand (CAANZ) Regulations Part 139, which is required for scheduled Saab 340 services.

29. The domestic airports, services and traffic are summarized in Table 1 below.

Table 1: Existing Domestic Airports and Service

Island	Usable Runway Length	Air Rarotonga Services
Aitutaki	1800m sealed runway	5-6 flights per day
Mangaia	950m coral runway	2 flights per week
Atiu	1200m coral runway	3 flights per week
Mauke	1200m coral runway	2 flights per week
Mitiaro	1200m coral runway	2 flights per week
Palmerston	No airport	-
Pukapuka	1200m coral runway	6-10 charters per year
Nassau	No airport	-
Manihiki	1200m coral runway	1 flight per week
Rakahanga	Airport destroyed	-
Penrhyn	1200m coral runway	1 flight per week
Suvarrow	No airport	-

Source: Ministry of Transport and Air Rarotonga

D. Air Traffic

1. Rarotonga International Airport

30. The growth in traffic at Rarotonga International Airport between 2000 and 2005 is summarized in Table 2 below. The airport is handling approximately 8000 aircraft movements and just under 300,000 origin-destination passengers per year (excluding transit passengers). International and domestic passenger traffic has grown at 4.3% per annum during this period. Inbound and outbound cargo has increased at 3.8% and 2.4% per annum respectively.

Table 2: Rarotonga International Airport Traffic

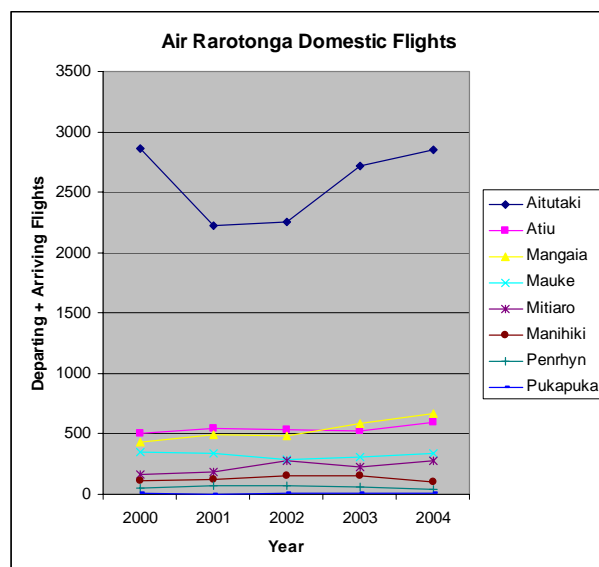
Year	2000	2001	2002	2003	2004	2005
Aircraft Movements						
International Scheduled	1147	1227	1180	1409	1488	1751
Domestic Scheduled	4487	3977	4062	4595	4866	5025
Other						1200
Total						7976
Origin-Destination Passengers						
International	163,430	167,580	166,083	177,548	189,397	202,014
Domestic	64,101	67,272	70,332	74,833	81,361	78,725
Total	227,581	234,852	252,381	252,758	270,758	280,739
Air Cargo Tonnes Inbound		659	675	740	765	
Air Cargo Tonnes Outbound		290	415	650	677	

Source: Cook Island Airports Authority

2. Domestic Traffic to the Outer Islands

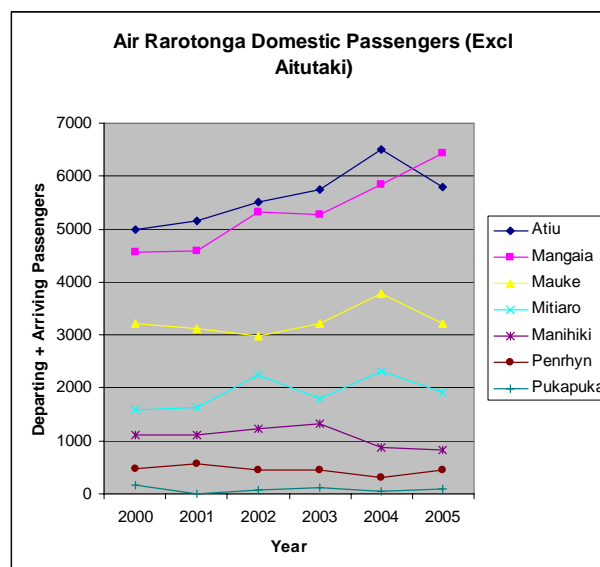
31. The number of domestic flights and passengers between Rarotonga and the OIs between 2000 and 2005 are shown in Tables 3 and 4 below. Inter-island activity is excluded. Aitutaki passenger traffic is not shown because the scale is much higher: passengers increased from 48,000 to 60,000 per year from 2000 to 2005.

Table 3: Air Rarotonga Domestic Flights



Source: Cook Islands Airports Authority

Table 4: Air Rarotonga Domestic Passengers (Excl Aitutaki)



Source: Cook Islands Airports Authority

32. Services to the northern group are much less frequent than to the southern group, which is reflected in the lower passenger traffic. Trips per capita are shown in Table 5 below. Aitutaki is not a representative case because the majority of passengers are tourists visiting the island. The other southern group islands generate an average of between 8 and 9 annual trips per person. In sharp contrast, the northern group islands generate less than 2 annual trips per person, which indicates a substantial unsatisfied demand (although the air fares are higher to the northern group which will reduce traffic compared to the equivalent islands in the southern group).

Table 5: Domestic Trips Per Capita

Island	2005 Arr + Dep Passengers	2001 Population	Annual Trips Per Person
Aitutaki	60,042	1946	30.9
Mangaia	5787	623	9.3
Atiu	6421	744	8.6
Mauke	3207	470	6.8
Mitiaro	1908	230	8.3
Manihiki	est. 800	515	1.6
Penrhyn	est. 440	357	1.2
Pukapuka	est. 100	664	0.2

Source: 2001 Census and Cook Islands Airports Authority

E. Air Transport Policy

33. Air transport, together with marine transport and telecommunications, is vital for sustaining the economic development and social well being in an islands nation such as the Cook Islands. At present, the government does not have an air transport policy, which

defines national objectives for the air transport sector and lays out a strategy and supporting policies, regulatory actions and other measures for achieving those objectives. Moreover, air transport is dependent on marine transport for shipping aviation fuel supplies to the more distant OIs and a similar lack of policy exists in the marine transport sector.

34. In the absence of any intervention by the government, save for providing budgets to the Island Administrations for the (minimal) O&M of the outer island airports, the level of air transport service is extremely low, especially in the northern group. Service is constrained by the commercial interests of the carrier and Taio Shipping, which transport aviation fuel to the OIs. Scheduled services are once per week at most and passenger airfares and cargo rates are extremely high. Despite indications of unsatisfied demand, traffic levels are extremely low which works against efficiencies to reduce user costs. For example, the waiting period for obtaining a seat between Rarotonga and Manihiki or Penrhyn is as much as two months and Pukapuka has no scheduled service.

35. The low level of service has significant negative impacts, which contribute directly to the downward economic spiral, isolation and consequent depopulation in the OIs. Some form of government intervention is required to improve levels of service and reverse this negative spiral. Governments' intervention in the transport sector has been used in many countries to spur economic development and there is no reason why the same cannot hold true in the Cook Islands. Our recommendation is:

A comprehensive transport policy study covering domestic and international air and marine transport services to the OIs is urgently needed to inform decisions on investments in transport infrastructure and to identify feasible interventions to improve level of service and reduce user costs.

36. In the absence of such a transport policy, the infrastructure master plan for airports is being guided by the objective of enabling reliable, safe and affordable air services to be provided to each island where economically feasible. The proposed infrastructure requirements are necessary but not sufficient for achieving this objective and the abovementioned transport policy study is expected to identify other interventions needed by the government in the provision of air transport services.

37. As a guideline we propose that each island (except Palmerston, Nassau, Rakahanga and the uninhabited islands) receive a scheduled air service at least once per week. Most islands have sufficient demand for this level of service at present except for Pukapuka where the standard could be relaxed to twice-monthly service. Pukapuka's needs could be met if government financial support were given to Air Rarotonga to operate this service. This subject needs to be addressed in the proposed transport policy study.

F. Outer Islands Airport Improvements

1. Air Rarotonga Saab 340 Operations

38. In the short term, airport infrastructure improvements in the OIs are determined almost entirely by Air Rarotonga's operational requirements. Air Rarotonga faces several operational and financial constraints, which are related to the small island populations, low demand (except on Aitutaki), long distances to the northern group and the unreliability of fuel supplies, especially in the northern group. At present, Air Rarotonga can only operate the Saab 340 on the Aitutaki route, which limits its utilization to about 1700 hours per year compared to an average of roughly 2400 hours reported by other operators. This has a major impact on the carrier's costs. The Banderante can operate to the northern group airports but only with a reduced payload, which makes these services uneconomic even with the present high fares. The solution is to improve the outer island airports and provide

sufficient fuel supplies to permit Saab 340 scheduled services. This will increase the Saab 340's utilisation and significantly increase the level of service provided.

39. Air Rarotonga's immediate priority is to introduce Saab 340 services to Manihiki, Penrhyn and Atiu, provided the airports are improved sufficiently to be licensed under CAANZ Civil Aviation Rules Part 139 governing airports with regular air services by aircraft with 30 seats or more. Mangaia is another possibility, though Mauke and Mitiaro will continue to be served by the Banderante or a successor small aircraft. Pukapuka would probably be served by the Saab 340 and therefore it will need to be improved sufficiently to handle the Saab 340 as well.

40. In terms of airport infrastructure, the Saab 340 requires 1500m runway length as a preferred minimum and 1300m absolute minimum. The equivalent Banderante requirements are 1300m and 1100m. Air Rarotonga's aircraft can operate on crushed limestone pavements at several frequencies per week provided the surfaces are properly maintained. A sealed runway is preferred for daily frequencies or more, as at Aitutaki.

41. In addition to the runway length required by Air Rarotonga, licensing the airports to Part 139 requires the airports to comply with CAANZ and ICAO standards governing runway grading and marking, runway strip, visual aids, obstacle clearances, fire fighting and rescue services. Achieving the required runway strip dimensions and obstacle clearances will require agreements with landowners on land acquisition and clearance of buildings and trees which protrude into the obstacle clearance areas.

42. Following improvement and licensing under Part 139, the airports will require a much higher standard of O&M than provided at present. In particular, the runway will require regular inspection, sweeping and repair to maintain the crushed limestone graded surface, keeping it free of stones, grass, ruts and potholes. The airports will be subject to regular inspections by CAANZ similar to Aitutaki. O&M is discussed under institutional arrangements below.

43. Air Rarotonga will require a three months' supply of aviation fuel in the northern islands, which translates into approximately 50,000L at Penrhyn and 10,000L at Manihiki. The air service will depend upon a regular supply of fuel by marine transport.

44. The airport improvements to meet Part 139 for the Saab 340 will be sufficient for larger turbo-prop aircraft such as the Bombardier Q400 and the ATR42 (except for some operational requirements such as fire fighting and rescue equipment and fuel supply). Therefore these standards should be sufficient for many years. In future, the runways will be sealed and a passenger terminal with international passenger and cargo processing will be required if regional international services were to begin (e.g. Tahiti to Aitutaki, Manihiki or Penrhyn).

2. Airport Investigations Undertaken

45. In May 2006, Air Rarotonga, CIAA and OMIA carried out a joint investigation of the condition of the three northern airports, Pukapuka, Manihiki and Penrhyn, and prepared a civil engineering works programme for upgrading to enable Saab 340 operations. It was proposed the improvements would be implemented by shipping construction plant and equipment from Rarotonga and using equipment operators recruited for the project and local labour under the supervision of a construction manager. The estimated cost of civil works excluding engineering design and construction management is: Pukapuka \$403,000; Manihiki \$534,000; and Penrhyn \$425,000 for a total of \$1.363 million.

46. NZAID has offered to include airport improvements in its Outer Islands Development Programme and to this end AMD has retained the services of GHD Consultants (GHD) of New Zealand to (1) investigate the condition of all the outer island airports excluding Aitutaki, (2) identify what improvements are required to operate the Saab 340 and Banderante aircraft as planned by Air Rarotonga and (3) prepare indicative cost estimates in advance of further detailed engineering survey and design stages. GHD visited the southern group airports in April 2006 and the northern group airports in August 2006. A report will be submitted in September 2006. GHD has recommended that a full land survey of the airports and their environs be undertaken immediately as a starting point for any detailed engineering design and cost estimation. The expected scope of works (except Mitiaro and Mauke) is similar to the Air Rarotonga-CIAA-OMIA recommendations, namely reshaping of the runways, grading of the runway strip and end areas, improvements to airfield drainage and removal of obstacles to provide a category 3C runway (Saab 340).

47. The two sets of investigations are very similar in their findings, the only difference being that the scope of works identified following a detailed land survey may involve higher costs of compensation for land, trees and structures clearing, and construction quantities than presently envisaged.

3. Atiu, Manihiki, Penrhyn and Pukapuka Airports

48. These airports will be improved to a standard that will enable them to be certified to CAANZ Part 139 to handle scheduled Saab 340 services. It is expected that the airports will be provided with a runway length of 1300-1500m, runway strip width of 80 or 90m (depending on discussion with CAANZ) and the requisite runway markings, visual aids and fire fighting and rescue equipment. As mentioned previously, the full extent of the works required cannot be determined until a detailed land survey of the airports and their environs has been completed. The work is expected to include scarifying and re-profiling of the runway, brush clearing and grading of the runway strip, drainage works and removal of trees and structures in the obstacle clearance areas as a minimum. The non-directional beacons (NDBs) at Manihiki and Penrhyn will likely need to be replaced. The estimated cost for each airport ranges from \$0.5 to perhaps \$2.0 million depending on the physical conditions found, availability of materials, and construction regime (e.g. direct labour versus contracting).

49. Air Rarotonga would also like to operate night flights to Manihiki and Penrhyn to increase the utilization of the Saab 340. This would require installation of airfield lighting, PAPI, obstacle lights and a standby generator.

50. The above improvements will be sufficient in the short term while Saab 340 frequencies are low. Air Rarotonga has indicated that air carriers need a sealed runway for daily services, which could be provided with a DBST seal similar to that at Aitutaki. The runway is adequate for larger turboprop aircraft such as the Bombardier Q400 or ATR 42/72. In addition, Penrhyn and possibly Manihiki could receive international air services from Tahiti in the future. Therefore a terminal building for passengers and cargo handling, more aircraft apron space and higher-capacity fuel storage and fire fighting and rescue services will be required. As suggested by GHD, individual airport master plans should be prepared to reserve areas for future facilities.

51. Improved air services to the northern group are also dependent on an adequate supply of aviation fuel. The storage capacity required in Penrhyn of approximately 50,000L is not economic with 2000L drums and a move to 20,000L ISO containers is required. These can be transported by ship to Penrhyn Harbour and unloaded on the wharf but a higher-capacity crane, land transport and secure storage area is needed which should be included in the investment cost of the airport improvement. The storage capacity at Manihiki of

approximately 10,000L can continue to be handled in drums transported across the lagoon by barge. In the longer term, higher storage capacity at both airports will be required.

4. Other Outer Island Airports

52. Mangaia's 950m runway cannot be extended due to physical restrictions. There is a suitable area on the east side of the island where a longer runway could be constructed. Traffic to Mangaia has been growing and the long-term prospects for tourism, agriculture and other economic activities are promising. Air Rarotonga would introduce Saab 340 service if a longer runway were available. A new airport complying with Part 139 would cost in excess of \$5million and a detailed feasibility study is needed to determine the best solution.

53. Mauke and Mitiaro do not generate sufficient traffic to support a Saab 340 service and Air Rarotonga plans to continue services with Banderante (or successor aircraft). Both runways need to be repaired and maintained at a proper standard.

54. Rakahanga's airport was destroyed some years ago and it totally unusable. Air Rarotonga has expressed no interest in providing service either now or in future given its low population and proximity to Manihiki. It would be prohibitively costly and uneconomic to make serviceable and maintain therefore no airport reconstruction is proposed.

G. Rarotonga International Airport

55. Rarotonga International Airport was completed in 1974 and has operated with its original facilities for the past 32 years, with the exception of some incremental changes made in the passenger terminal building such as extension of the roof over the departures check-in area, and construction of hangars by the private sector. In 2005 the airport suffered some minor damage from Cyclone Olaf at the runway 08 end: scouring of the embankment off the runway threshold and damage to the foundation of the ILS equipment building at the end of the drainage channel.

56. The recent passenger and aircraft traffic volumes are summarized in the previous table. The airport now handles approximately 300,000 international and domestic origin-destination passengers per year. Passenger traffic will double in approximately 15 years if the present growth rates are sustained. International aircraft movements are expected to increase at a lower rate as carriers introduce larger-capacity aircraft as passenger loads increase. Domestic movements will more closely parallel growth in domestic passenger traffic.

57. No long-term master plan has been prepared for the airport, although the CIAA has a land use plan, which shows land areas reserved for future uses. Several studies have been carried out on extensions to the runway and passenger terminal area. The most recent of these was a study by Airbiz of New Zealand for a 222m extension at the 26 end. The high cost of construction (about \$14 million) and the requirement to relocate structures and even limit the height of vessels in Avatiu Harbour to comply with extended approach and take-off clearance surfaces make it unlikely that this project can be implemented. Furthermore, the air carriers have not indicated that the existing runway length of 2328m will adversely restrict their operations.

58. Several studies have been carried out on the passenger terminal including a proposal to construct a new international departures building between the present check-in area and the arrivals hall. Costs in the order of \$20 million are mentioned. Passenger terminal requirements are or should be determined by peak period hour volumes since it is the capacity of the aircraft being served which creates the requirement for processing facilities

and terminal space. Given the low frequency of international flights it is unlikely that the airport will be required to handle two or three times the present number peak period passengers. Some increase can be expected when for example B767 is replaced by the B777. A detailed feasibility study should be carried out before any investment decision of this magnitude is made.

59. Notwithstanding, in the short term the airport faces requirements to increase capacity in the passenger terminal area:

- The CIAA faces an internationally mandated requirement to separate arriving and departing passengers and is considering construction of a covered departures holding area in the grassed area between emigration and the arrivals hall as a low-cost solution.
- Increased baggage carousel capacity will be needed especially if the B777 is introduced and the CIAA has a plan to enlarge the building, install a larger carousel and make changes in the immigration and customs areas.
- More aircraft parking space is needed which can be provided by extending the main apron to east.

60. Feasibility studies are needed to determine the scope of work, options and cost estimates.

61. After 32 years of operation many capital equipment items are nearing the end of their useful life and will need to be replaced in the near future. These include:

- Instrument landing system (ILS) \$1.6 million (scheduled for 2009-2010);
- VOR en-route navaid \$1.2 million;
- Airfield lighting system including cables, transformers and controllers;
- Other visual aids such as Visual Approach Slope Indicator System (VASIS).

62. CIAA has set aside reserves for the ILS and VOR but further funding will be required for the airfield lighting and other equipment. It is recommended that the CIAA carry out a condition survey of its assets and prepare a multi-year replacement programme.

63. Cyclone Olaf demonstrated that the airport is at risk of serious damage and even prolonged closure from weather events. Many critical facilities such as the airport standby generator and switchgear, airfield lighting controls, runway 08 end embankment and pavement are located in exposed areas. Some mitigation measures are possible, such as re-enforcing the runway 08 end embankment and relocating the generator and controls to the south side of the runway. These actions are costly but might be implemented as part of the equipment replacement programme mentioned above.

64. An airport risk assessment study is needed to identify the range of damage that the airport could sustain under various scenarios, the consequent operational availability, and the estimated cost of mitigating against damage. This would inform decisions on infrastructure improvements and changes needed to protect the airport.

H. Aitutaki Airport

65. Aitutaki is served with a combination of five to six Saab and Banderante scheduled flights per day (except Sundays) and occasional charters from Rarotonga. Air Rarotonga can increase the frequency of service to meet increasing demand and, in addition, plans to

acquire a second Saab, therefore route capacity should not be an issue in the foreseeable future. The airport was improved in 1992 and its facilities and equipment are generally sufficient to meet expected traffic in the short term. The runway is scheduled for resealing in 2010 or thereabouts.

66. In the next several years the airport may require improvement to handle international services depending on interest shown by the air carriers. Services from Tahiti using ATR42/72 or Bombardier Q400 are the most likely expectation. These aircraft carry 40-80 passengers and therefore would require improvements to the existing passenger terminal and increased aircraft handling capacity.

67. In the longer term jets in the A320/B737 category might serve Aitutaki. This would require a major investment in runway strengthening (AC overlay), enlarged apron, fuelling, aircraft support equipment and a new terminal building.

I. Summary of Airport Improvements

1. Outer Islands including Aitutaki

68. Airport improvement projects in the OIs are summarized in Table 6 below.

Table 6: Summary of Outer Island Airport Improvement Projects

Island	Immediate Improvement 1-2 years	Indicative Cost, \$M	Short-Medium Term Improvement 3-10 years	Indicative Cost, \$M	Long Term Improvement 10-20 years	Indicative Cost, \$M
Aitutaki			Expand passenger terminal and apron Strengthen runway pavement with overlay	2.0 1.0	Construct new passenger terminal complex for international services	5.0
Mangaia	Repair and maintain runway		Construct airport with 1200-1500m runway to Part 139 at new site	3.0		
Atiu	Improve airport to Part 139	1.5	Construct new passenger terminal	0.5		
Mauke	Repair and maintain runway				Improve airport to Part 139	1.0
Mitiaro	Repair and maintain runway				Improve airport to Part 139	1.0
Palmerston	No airport				-	
Pukapuka	Improve airport to Part 139	1.0				
Nassau	No airport				-	
Manihiki	Improve airport to Part 139	1.5			Construct new passenger terminal complex for international services	1.0
Rakahanga	Airport destroyed				-	
Penrhyn	Improve airport to Part 139	1.5			Construct new passenger terminal complex for international services	1.0
Suvarrow	No airport				-	
Total		5.5		6.50		9.0

Source: Estimates based on Consultant's analysis

2. Rarotonga

69. An indicative list of Rarotonga airport improvement requirements is summarized in Table 7 below.

Table 7: Summary of Rarotonga International Airport Improvements

Short-Medium Term Improvement 3-10 years	Indicative Cost, \$M	Long Term Improvement 10-20 years	Indicative Cost, \$M
Capacity improvements: Construct enlarged enclosed departures area Extend apron Construct enlarged arrivals area with new baggage carousel	NA	New international check-in and departure area	20.0
Equipment replacement: ILS VOR Airfield lighting	1.6 1.2		
Cyclone damage mitigation: Embankment protection Relocate ATC tower Relocate electrical station	NA		

Source: Estimates based on Consultant's analysis

J. Institutional Analysis

70. Agencies involved in the air sector include government ministries, statutory corporations, the Island Administrations, landowners and their organizations and the private sector.

71. A recent development needs to be mentioned prior to the analysis below, as it will impinge on the operations of several of the agents involved in the air sector. That is the recent Cabinet decision to authorize the Cook Island Airports Authority (CIAA) to take over responsibility for the operation of all OI airports.

1. Ministry of Transport

72. The MOT coordinates the audit of Civil Aviation Safety and Security Oversight. The Ministry has no formal legislation but provides a scope of services under the *Air Services Licensing Act 1984*, *The Department of Civil Aviation Act 1986/87* and the *Civil Aviation Act 2002* and the *Civil Aviations Regulations* for implementing the Act. Until 2002 the Civil Aviation Authority of NZ (CAANZ), under a technical assistance program provided this function for Rarotonga and Aitutaki. Since then the MOT has had to pay CAANZ for this service.

73. Audits on all Outer Island airports other than Aitutaki are currently conducted by a CAANZ trained and licensed local civil engineer. The upgrading of three additional airports to Part 139 under the CAANZ regulations will require the services of additional qualified inspectors and auditors.

2. Cook Islands Airport Authority

74. The CIAA was established under the *Airport Authority Act 1985*. The core function of the Airport Authority is the management of Rarotonga and Aitutaki airports, which includes the responsibility for security, air traffic, fire rescue services, and the maintenance of airport

runways subject to the Director of Civil Aviation. Buildings around the airport are subject to the MOW administered Building Control Regulations.

75. The recent Cabinet decision to authorize CIAA to take over all other airports was not accompanied by any framework under which new arrangements will be implemented. The main concern of CIAA is that of funding for their proposed new responsibilities. Currently, maintenance for each OI airport is funded through respective Island Administration budgets. Other concerns include the issue of insurance. These airports are currently not insured but would have to be if they came under CIAA. The question of who would take the risk and who would pay for the insurance remains unanswered.

3. Cook Islands Investment Corporation

76. As owner of all Crown assets the CIIC controls and manages the CIAA. The CIAA reports annually to the Board of CIIC on the management and status of assets. The inclusion of responsibility under CIAA for airports built on traditionally owned land will pose an interesting precedence for CIIC which will require innovative solutions.

4. Landowners

77. The outer island airports are licensed either to the Island Council (Mauke) or landowner groups (Atiu, Mangaia) or are unlicensed private airstrips on private land. Under the decentralization reforms of 2000, the OIs airports excluding Aitutaki have run on license to Island Councils, local customary leadership or land owner trusts who receive landing fees. It is widely believed that even if CIAA takes over these airports, landowners would not relinquish their rights to collect landing fees.

78. Plans that are underway to upgrade Penrhyn, Manihiki and Atiu airports will pose unprecedented challenges. The land for the original strip in each island is used under a variety of lease arrangements with customary landowners. The upgrading of all three will require the acquisition of additional land and the establishment of adjacent restricted areas which will not need to be acquired, but on which agricultural, housing and obstruction restrictions will apply. This land for acquisition will need to be surveyed and marked, landowners identified, negotiations undertaken and agreements for lease established and documented. The restricted land will also need to be surveyed and marked, landowners identified, trees, dwellings and other obstructions identified with compensation and relocation negotiations and implementation. Awareness of the requirements will need to be ensured so as to guarantee both an understanding of the need for the restrictions and for the prevention of future intrusions into the restricted air space. One estimate by a visiting engineer envisaged the removal of a total of approximately 10,000 trees, 6 houses, about 12 lampposts and the realignment of roads for the three strips. Agreement will need to be reached on compensation and relocation arrangements. The MOT reported longstanding land issues with customary landowners for most of the Outer Island airports and expect to face difficult negotiations relating to the proposed upgrades.

79. The Crown has the right to 'expropriate' land by warrant either in perpetuity or for a limited period. This process may have been much simpler for a colonial government but has rarely if ever been used since 1965 and is now considered to be tantamount to political suicide.

5. Island Administrations

80. Island Administrations (IAs) are responsible for the maintenance and operation of the airports on their respective islands. A lack of appropriate heavy machinery and trained operators mitigates against proper maintenance. The IAs and communities people will need

to be trained. Part 139 airports will require a competent airport manager and considering the shortage of skilled persons in the OIs the Island Secretaries may well have to take on this role. The IA's infrastructure staff would also need to be trained in strip maintenance and in appropriate grader and roller operation skills. One suggestion has been that CIAA will organise training programmes using Aitutaki airport as a training centre because of the availability of both sealed and unsealed landing surfaces. Further opportunities for training will be available during the construction phase of the upgrade. Manihiki and Penrhyn will also need people trained in the day-to-day maintenance of existing navigation aids.

6. Options and Recommendations

81. Of the three options raised in the sector, the first would be to maintain the status quo for the time being. This would mean that contrary to the recent Cabinet decision, OI airport licensing and management would remain with the OI landowners and IAs respectively. CIAA was established to manage airports that were financially self-sustainable and therefore their responsibilities were restricted to Rarotonga and Aitutaki airports. It is unrealistic to assume that the other airports will ever be financially self-sustaining. CIAA will, on taking over responsibilities of these airports need financial subsidies from the government. Management and maintenance difficulties would continue to remain a major constraint because of the lack of skilled capacity at the IA and community level. The lack of capacity would seriously compromise the ability to maintain the upgraded airports to Part 139 standards and diminish the return on investment in the upgrading. Maintaining the status quo is an unacceptable option particularly for airports being upgraded to Part 139, as they will, as part of the approval process need to be licensed to CIAA. This option is not recommended.

82. A second option would be for CIAA to immediately takeover responsibility of all airports. The lack of an acceptable framework for the operation, maintenance, ownership, licensing and financial arrangements make this option impractical. Such a move would encourage unrealistic expectations from landowners, the IAs and the travelling public and would, through the resulting financial and resource drain on CIAA, compromise the operations of Rarotonga and Aitutaki airports. This option is not recommended.

83. The third and recommended option is a staged incorporation of airports under the umbrella of the CIAA. This would allow for the development of a framework for the financial arrangements including budgetary allocations, the transfer of funds from IAs to CIAA, revenue sharing and subsidies. A rational programme would include the development of a transport policy with a training component for staff from MOT, CIAA, IAs and landowners for all aspects of airport operation, management, maintenance and monitoring. Surveys and awareness will need to be conducted for all airports beginning with those proposed for upgrading. Once land has been surveyed and marked the accepted process of landownership identification and negotiations for leasing and compensation can commence with landowners (made easier if the land is registered and the registers are up-to-date) or with customary chiefs, leaders and the community in cases where land is not surveyed and registered.

7. Recommended Institutional Arrangements

84. Following is a list of institutional arrangements needed to implement the transfer of responsibility to CIAA. Initially CIAA will take over each of the three airports proposed for upgrading only after they are certified to Part 139 and administrative agreements have been reached with IAs. Other airports will be taken over only after land leasing and licensing agreements are reached with landowners and financial and administrative arrangements are reached with IAs.

85. Several of the steps in the processes outlined below are only of relevance to the three airports proposed for Part 193 upgrading. Land, licensing, financial and training issues however are relevant to all OI airports.

86. CIGOV through the PIU will need to take on responsibility for a process to lead to the commissioning of the airports. CIAA and MOT do not have the resources to undertake this process.

- A survey is required of each of the airports and their environs;
- An engineering design will need to be carried out and overlaid on the survey to identify lease and restricted land;
- Land ownership will need to be established and the process for negotiations, leasing, compensation and relocation commenced;
- Undertake negotiations to reach agreements on licensing, insurance and revenue sharing arrangements commensurate with Part 193 requirements. Currently licenses are held by IAs or landowner groups who collect landing fees and the airports do not carry insurance;
- It is assumed that the IAs will develop and administer annual O&M budgets with the assistance of CIAA and that CIAA will receive budget allocations for additional operational costs and maintenance of their assets such as fire fighting and rescue vehicles;
- Engage consultant(s) to assist with the preparation of tender documents, tender evaluation and selection;
- Engage consultant(s) to assist government with contract administration, construction supervision, commissioning and inspection prior to the lapse of the defects liability period.

87. PIU make institutional arrangements between CIAA and IAs and train IA staff for O&M. An operations manual will need to be developed and IA staff trained to undertake airport operations and management. Staff from the IAs infrastructure section will be utilized to maintain the airstrips and will need to be up skilled. Two options are available. A training component could be included as part of the construction contract with the alternative being to train staff overseas. The latter option would be expensive and not always appropriate to local needs. It is recommended that a training component for up-skilling local staff be incorporated into all major infrastructure contracts.

88. MOT will need to take responsibility with CAANZ for Part 139 certification and as such will need to initially contract out inspections. A training component for the training of local inspectors should however be included as part of the airport up-grading programme.

89. PIU make necessary commercial and institutional arrangements to ensure aviation fuel supplies are provided to Penrhyn and Manihiki

IV. MARINE TRANSPORT SECTOR

A. Introduction

90. This chapter addresses the Cook Islands' requirements for marine transport and identifies proposed port and harbour infrastructure improvements and institutional arrangements for the sector including implementation and on-going O&M of these improvements. In the short term the focus is upon improvements in the OIs needed to facilitate their economic development and social well being. At present, repair and upgrading of the outer island harbours is the subject of detailed technical study by the government and the assessment described in this chapter draws heavily on the work being done by the Aid Management Division (AMD) and NZAID.

91. The Port and Harbour improvements needed in future in Rarotonga and Aitutaki are assessed separately.

B. Shipping Services

92. Reef Shipping, through its local agent Express Cook Islands Agents (ECIL) and the Forum Pacific Line currently provide international shipping to and from New Zealand to Rarotonga and Aitutaki. Both international providers operate a service approximately every 3 weeks. Mataroa International has in the past operated a cargo vessel on charter but has not been operational for some time. Major local importers including Foodland, CITC and General Transport are half owners of ECIL. There are reports of cartel type practices by ECIL that have disadvantaged their competitors in the retail and wholesale trade in Rarotonga.

93. Taio Shipping Ltd operates services to the OIs with two vessels, MV Manui Nui and MV Mangaroa. Both vessels are at the end of their useful lives and will need to be replaced within two years. Taio provides ten and six sailings per year to the southern and northern group islands respectively. None of the harbours can handle Taio ships therefore cargoes are palletised and transferred by barge to shore. Damage and losses are inevitable using this method of transport. Diesel fuel purchased by the Island Councils for the electricity generators is carried in large tanks aboard ship; 1600 L tanks are transported to the ship for filling and then taken back to shore. Petrol and aviation fuel are transported by drum (or special aviation tanks) and barged ashore. Each island is required to store fuel amounts sufficient for two months. The low traffic generated by the OIs and the need for lighterage means that service is poor and costs are high.

94. Populations on the OIs also rely on Taio Shipping for passenger service because air service is limited and costly. The level of service is very poor due to a lack of passenger accommodation and the infrequent service. Mataroa Shipping has one vessel, MV Miss Mataroa, for a domestic service but has not operated for several months due to financial and other problems. Surveys of the domestic vessels continually identify maintenance requirements. However, these vessels are given dispensations to operate because they are the only service to the OIs.

95. Two new players have recently shown interest in the domestic market. The motor sailer, Kwai, has commenced trading between Honolulu, the northern Group and Rarotonga. The vessel can carry 200 tonnes of pallet cargo, 8 passengers in cabins and 12-16 foresail passengers. The vessel has plans to include freezer space capable of carrying 4-5 tonnes of red snapper to a large market in Honolulu on the condition that blast freezers are available in the northern islands. The master of the locally registered 'Picton Castle' is reported to have purchased two vessels, which are being converted to schooners for carrying 12 high end tourists and a similar number of budget passengers. The vessels will have limited cargo

space of around 30 tonnes. It is planned for one of these vessels to work exclusively in the Cook Islands while the other operates regionally.

C. Existing Harbours in Outer Islands

96. The harbours in the OIs typically comprise of a channel cut through the reef flat to a small basin containing a dock area and small boat ramp. Some harbours have concrete seawalls to provide a measure of protection to the channel and basin. Typically the dock area comprises of a concrete paved quay and a small handstand area. Barges transferring cargoes from the ship berth on the quay line wall and are unloaded by HIAB trucks. Pallets are then moved to a nearby storage shed. This configuration applies to all the southern group and Manihiki (two harbours in Tauhunu and Tukao) and Rakahanga.

97. Penrhyn has the only harbour (Omoka) in the OIs, which is directly accessible by ship. It and the airport were constructed by the US military during the Second World War. Ships enter the lagoon through a passage north of Moananui and are able to berth alongside the quay and unload cargo directly onto the quay pavement. The dock area also contains fuel storage tanks for the CI patrol boat, Te Kukupa.

98. Pukapuka has a narrow, shallow channel cut through the reef into the lagoon. Cargoes are unloaded from the barge at a beach (Yato) in front of the storage shed.

99. Manihiki, Penrhyn and Pukapuka also have small boat wharfs inside the lagoon at each village for serving the barges or dinghies transferring cargoes and fuel from the main harbour to the separate villages.

D. Proposed Harbour Improvements in the Outer Islands

100. As part of the Outer Islands Development Partnership Agreement (DPA) the government through AMD and NZAID plan to repair and improve harbour facilities in the OIs. To this end AMD has retained the services of GHD Consultants of New Zealand to (1) investigate the condition of all the outer island harbours excluding Aitutaki, (2) review works completed to date and prepare feasible concepts for upgrading works, and (3) prepare indicative cost estimates in advance of further detailed engineering survey and design stages. GHD visited the southern group harbours in April 2006 and the northern group in August 2006. Draft reports on the southern group islands were submitted in July 2006 and reports on the northern group will be submitted in September 2006.

101. The master plan Consultant team formed part of the AMD-NZAID-GHD-ADB mission, which visited the northern group islands in August and participated in the stakeholder consultations held on each island to address infrastructure requirements including improvements needed in the harbours. The recommendations made by GHD were accepted by the Island Councils and will form the basis of immediate and short-medium term marine infrastructure projects in the infrastructure master plan. Refer to Table 8 below.

Table 8: Proposed Immediate Improvements to Outer Island Harbours

Island and Harbour	Proposed Improvement	Cost Estimate, \$ million
Atiu (Tuanganui Landing)	Repair western ramp and construct grooved concrete slab Install new bollards and fendering to quay line wall	0.760
Mangaia	Remove encroaching reef and improve channel to uniform 3m depth Enlarge basin to south and construct new 25m quay and small boat ramp closer to shoreline makatea to improve basin protection Construct new south breakwater to protect channel Install new bollards and fendering to quay line wall Install additional beacon light and reflector channel markers on ends	2.402

Island and Harbour	Proposed Improvement	Cost Estimate, \$ million
	of seawall Demolish existing quay and construct concrete landing ramp to enable future loading barge access (possible stage 2 works)	
Mauke (Taunganui landing)	Remove encroaching reef and improve channel to uniform 3m depth Enlarge basin to south and construct new 25m quay and 15m wide small boat ramp closer to shoreline makatea to improve basin protection Extend new south breakwater to protect channel and basin Construct new north seawall to protect basin Install new bollards and fendering to quay line wall Install additional beacon light and reflector channel markers on ends of seawall Construct concrete landing ramp to enable future loading barge access (possible stage 2 works)	1.949
Mitiaro	Remove encroaching reef and improve channel to uniform 3m depth Enlarge basin to south and construct new 25m quay and 6m wide small boat ramp closer to shoreline makatea to improve basin protection Construct new north and south breakwaters to protect channel and basin Construct new finger breakwaters to protect quay line from wave action Install new bollards and fendering to quay line wall Install additional beacon light and reflector channel markers on ends of seawall Construct concrete landing ramp to enable future loading barge access (possible stage 2 works)	2.747
Palmerston	To be determined	
Pukapuka (Yato Landing) (Motu Ko)	Improve channel into lagoon by widening and clearing obstructions and install channel markers Construct small jetty at beach landing in front of the transit shed Construct concrete landing ramp to enable future loading barge access (possible stage 2 works) Construct small jetty at beach landing for airport passenger and cargo loading	
Nassau	To be determined	
Manihiki Same scope of works for Tauhunu and Tukao Landings)	Remove encroaching reef and improve channel to uniform 3m depth Enlarge basin to south and construct new 25m quay and small boat ramp closer to shoreline to improve basin protection Construct new north and south breakwaters to protect channel and basin Construct new finger breakwaters to protect quay line from wave action Install new bollards and fendering to quay line wall Install additional beacon light and reflector channel markers on ends of seawall Construct concrete landing ramp to enable future loading barge access (possible stage 2 works)	
Rakahanga	Install new bollards and fendering to quay line wall Install additional beacon light and reflector channel markers on ends of seawall Construct concrete landing ramp to enable future loading barge access	
Penrhyn	Repair quay walls by constructing a concrete wall behind existing corroding sheet pile walls Repair or replace quay pavements Install new bollards and fendering to quay line wall	\$1.000 (based on 2002 Royal Australian Army estimate)
Suwarrow	-	

Source: GHD draft reports and Consultant's estimates

E. Rarotonga

1. Traffic

102. Port traffic measured in vessel arrivals and departures and revenue tonnes handled are summarized in Tables 9 and 10 below. Overall, Rarotonga has experienced a healthy growth in international commercial activity in terms of numbers of arrivals, containers and total tonnage. The decrease in cruise vessels and yachts in 2005 is no doubt due to the cyclones which struck the Cook Islands. There is every expectation of continued increase in traffic due to growth in the economy and tourism.

Table 9: Port of Call Arrivals and Departures - Rarotonga

Vessel	2002/2003	2003/2004	2004/2005	Average Growth, % per year
General – International	33	31	66	25.7
General – Domestic	50	58	54	2.6
Tankers	28	20	25	-3.7
Cruise Vessels	13	30	24	22.4
Yachts	161	142	98	-15.1
Fishing Boats	147	258	452	44.9
Total Arrivals/Departures	432	539	719	18.3

Source: Cook Islands Ports Authority

Table 10: Annual Revenue Tonnes – Rarotonga and Aitutaki

	2002/2003	2003/2004	2004/2005	Average Growth, % per year
Rarotonga				
Full Container Load, TEU ¹	36,763	44,215	47,259	8.6
Less than Container Load, TEU	8,393	7,541	7,052	-5.6
Total Containers	45,156	51,756	54,311	6.3
Break Bulk	12,805	17,017	17,459	10.8
Vehicles	330	320	278	-5.5
Bulk Fuel	19,968	19,645	21,830	3.0
Total Tonnage	77,929	88,418	93,600	6.2
Aitutaki				
Full Container Load, TEU	3,357	5,662	6,432	23.9
Less than Container Load, TEU	2,329	2,404	1,687	-10.1
Total Containers	5,686	8,066	8,119	12.5
Break Bulk	9,650	5,415	2,425	-36.6
Vehicles	NA	NA	NA	NA
Bulk Fuel	NA	NA	NA	NA
Total Tonnage	15,336	13,481	10,544	-11.6

Source: Cook Islands Ports Authority

¹ TEU = Twenty foot equivalent unit

2. Current Port Development

103. The Cook Islands Port Authority (CIPA) is currently implementing Stage 2 of the western basin development to relieve congestion and delays in the harbour and provide more quay capacity and improved protection for small craft as well as rectifying damage caused by the 2005 cyclones. The development aims to maximize the quay length available within the basin for vessels up to 33m in length. The main works involve:

- Widening, deepening and re-shaping the basin excavated in a previous stage;

- Construction of additional sheet-piled quay walls;
- Construction of additional concrete quays;
- Completion of the south breakwater return;
- Reconstruction of the main western breakwater;
- Protection works to all newly cut faces;
- A slipway and launching ramp;
- Reshaping/extending the hardstand areas adjacent to the basin;
- Improvement to access roads.

104. The total estimated cost of Stage 2 is \$2.6 million. Construction of Stages 2A and 2b are under way and should be completed in 2007.

105. CIPA also wishes to implement a further Stage 3 depending on funding availability. It would include completion of the north breakwater return, rock protection to all basin faces and miscellaneous works such as power, fresh water, toilets and small building.

3. Future Port Development

106. In the short term the port, as an International Maritime Facility is faced with the requirement to comply with the International Shipping and Ports Service (ISPC) Code's new security regulations. In order to comply, the CIPA will have to increase port security by controlling public access to port areas which will entail security fencing, surveillance and other security measures. The costs of increasing security are unknown at present and a planning and engineering study is required.

107. In the medium term the port will require continued incremental upgrading to provide improved cargo handling and enlarged storage space, possibly including secure off-site storage. Again, the costs of these improvements are unknown and further feasibility and engineering studies are required.

108. The long term development of the port depends on its capacity to handle larger vessels with lengths of 60m or more. The present channel dimensions and the length and geometry of the quayline restrict the port to smaller international vessels. Cruise liners and larger container vessels, for example, cannot dock at the quay. The CIPA envisages straightening the quayline and extending it towards the reef together with reconstructing the seawall and widening and deepening the channel. This is a very major undertaking and will require detailed economic, engineering and environmental studies to determine if the scheme is feasible.

109. A larger Port would generate significant economic benefits in the form of reduced transport costs if international liner services are able to stop at Rarotonga. Regular cruise liner traffic will also provide increased economic opportunities although there will be additional costs associated with large influxes of daily visitors.

F. Aitutaki

1. Traffic and Port Facilities

110. Port traffic in Aitutaki has increased in terms of container activity but decreased in terms of break bulk cargo tonnes as shown in the previous table. The decline in inter-island shipping services no doubt accounts for the decrease in break bulk cargo. There is anecdotal evidence that there is unsatisfied demand, which is not being met since Mataroa International stopped providing service.

111. Reef Shipping provides a regular monthly service delivering an average of 40 containers, which require two days to unload. Mataroa International used to provide a monthly service with break bulk cargo.

112. Ships cannot berth at the quay because of the channel depth (maximum one fathom at high tide) and restricted basin space. The CIPA has a lighter operation using two old barges, which can each transport one full twenty-foot equivalent unit (TEU) and up to three empty containers. A new barge capable of carrying two full TEUs is being acquired. The port operates two mobile cranes with 18-20t capacity each, and two forklifts with 3.5t and 6t capacity respectively. A new forklift with a 25t capacity is being acquired.

113. The port facilities are very basic comprising two quays at right angles and an L-shaped storage area behind the quays and an additional unpaved storage area south of the quay. The quay is in need of repairs and pavements are broken and uneven. The only channel navigation aid is a transit but there are no channel marker buoys. There is no covered secure storage area and containers are either transported to shippers' premises or unpacked in the open behind a temporary fence. The CIPA has a small office and a secure maintenance garage where its cranes and forklifts are stored and maintained. The garage is in good condition.

2. Future Port Development

114. Aitutaki has been the subject of several studies to deepen and widen the channel and basin and extend the quay to allow ships to berth and unload containers directly to the port. There are also proposals to develop a yacht marina in the vicinity of the port to take advantage of the deeper channel and larger basin. These proposals raise extreme concerns about the environmental impact on Aitutaki's lagoon including the inner lagoon. Aitutaki's economy depends almost entirely on tourism therefore any threat to the lagoon also jeopardizes the development and social well-being of the island. The University of Auckland has been conducting an on-going environmental study of opening the channel but no firm conclusions have been reached.

115. As an international port, Aitutaki faces a similar requirement as Rarotonga to improve security in keeping with ISPC's rules. This will require installation of fencing and controls over access to the port area.

116. Several scenarios exist for future port development:

- Continue with a lighterage operation but improve port operations and facilities to reduce ship stopping times and improve cargo handling and storage
- Dredge and widen the channel and basin and extend the quay to accommodate international vessels to berth at the quay
- Dredge the centre of the channel and a basin sufficient to accommodate visiting yachts and develop a marina
- Relocate the port where a jetty could be constructed over the lagoon and reef with a 'dry port' developed inland, for example on the abandoned runway.

117. Each of these scenarios will require an economic, environmental and engineering study to ascertain the practicability and feasibility of the scheme.

118. Assuming that lighterage operations will continue in the foreseeable future several improvements are envisaged which will reduce cargo handling costs and improve level of service. These include:

- Security improvements needed to comply with ISPC rules;
- Repairs of the quay to prevent further deterioration, improve safety and reduce damage to barges and visiting vessels;
- Repair the concrete pavements and extend the hardstand area to facilitate container handling and storage;
- Construct a concrete ramp at the end of quay to provide future loading barge access;
- Construct a secure, covered cargo storage building;
- Re-grade and construct a sealed pavement for bulk cargo storage.

119. Indicative port developments for Rarotonga and Aitutaki are summarized in Table 11 below.

Table 11: Summary of Port Developments - Rarotonga and Aitutaki

Time Frame	Port Projects	Cost Estimate \$M
Immediate 0-2 years	Rarotonga: Completion of western harbour development Stage 2 Completion of western harbour development State 3	2.6 -
Short Term 3-5 years	Rarotonga: Implement security measures under ISPC Rules	-
	Aitutaki: Implement security measures under ISPC Rules Repairs to quays and hardstand areas Construction of concrete ramp for future loading barges Construction of secure, covered storage building Improvements to bulk cargo storage area	-
Medium Term 5-10 years	Rarotonga: Continued improvement in cargo handling and storage areas	-
Long Term 10-20 years	Rarotonga: Development of port to handle larger container ships and cruise liners Widen and deepen channel and basin Extend quay to seawards Construct new seawalls to protect the channel and basin	-

Source: Cook Islands Ports Authority and Consultant's estimates

G. Institutional Analysis

120. Agents involved in the marine sector include government ministries, statutory corporations, private-public sector partnership organizations and the private sector.

1. Ministry of Transport

121. The Ministry, through its Maritime Division is responsible for the administration and monitoring of shipping licenses issued to international and domestic shipping operators, including issues associate with safety and freight rates. Using intelligence and information the Division provides advice on and develops policy for maritime security.

122. The Maritime Training Centre of MOT is responsible for developing and presenting maritime training programmes including boat-master and sea-safety training. This training is generally restricted to small artisanal craft.

2. Ports Authority

123. The PA was established under the *Ports Authority Act 1995* with the objective of promoting, encouraging and assisting in the development of commercially viable port

operations. The Authority is responsible for the operations of the Avatiu (Rarotonga) and Aitutaki Ports and their assets. The assets that are held through the CIIC include Crown land and buildings, wharves, port facilities, tug boats, plant and equipment, storage sheds and open storage areas of a net book value of \$5.7 million. The Authority is required to provide a commercial environment at each of the two ports to ensure efficient and effective customer services for visiting cargo and pleasure vessels.

3. Cook Islands Investment Corporation

124. The CIIC operates under the *Cook Islands Investment Corporation Act (3 of 1998)* and has ownership over Crown assets. The CIIC controls and manages the PA and other government statutory corporations, ensures that these statutory corporations do not compete with legitimate private enterprise activities and manages and facilitates the leasing and disposal of their assets.

4. Island Administrations

125. The respective IAs operate all other OI harbours and port facilities. They are not financially self-sustaining and their O&M are funded through IA budgets as part of the government's social responsibility.

5. Private Sector

126. Private sector organizations own and operate vessels for domestic and international cargo and passenger shipping, fishing, local and domestic tourist operations, research and pleasure.

127. The CIGOV holds, through CIIC, shares in the Forum Pacific Line (PFL). The South Pacific Forum established PFL in 1977 as a commercial shipping company and as an instrument for regional development at a time when existing shipping services to and from the Pacific were losing money and in danger of being curtailed. PFL initially operated under a mix of commercial and developmental principles but was quickly forced to recognize the fatal conflict between these. PFL served its initial purpose of ensuring continued overseas shipping for the Cook Islands. Now however, this involvement of government as a competitor with other legitimate private enterprise activities and the resulting crowding out is unacceptable and it has been said to have been in some way responsible for the recent demise of one of the private sector participants.

128. The viability of commercial domestic shipping is constrained by the fact that the international lines service Aitutaki, the largest and most profitable OI destination. An interesting comparison was drawn between the commercial air and marine transport services during one of the consultations. It was postulated that Air Rarotonga's profitability was primarily derived from its flights to Aitutaki, which subsidised its operations to the Northern Islands. Taio Shipping Ltd operates an infrequent and unreliable domestic service with two vessels to the other OIs. Mataro Shipping has one vessel for a domestic service but has not operated for several months. The combined tonnage of these three vessels is reported to be beyond the domestic (excluding Aitutaki) cargo tonnage requirements. This is probably a reason why these services are of marginal economy, poorly maintained and provide cargo driven unreliable services.

129. There are 4-5 fishing vessels working small long-line operations out of Avatiu harbour providing fish for the Rarotonga household and restaurant markets.

130. Pleasure boats include domestic craft used for private purposes and to support the tourist industry (glass bottom boats, dive boats etc), and international cruise liners and visiting yachts.

6. Maritime Cook Islands Ltd

131. The Maritime Cook Islands Ltd is a local entity, which manages the shipping register under a management agreement with MOT. This is an example of a flourishing public – private partnership, which replaced a struggling government organization.

7. Options and Recommendations

a. Rarotonga and Aitutaki

132. The Port Authority is responsible for Avatiu and Aitutaki harbours and it is not envisaged that the Authority will in the life of this plan take over responsibilities for any of the other ports or harbours.

133. One option is for the status quo to remain and for the PA to continue to maintain, operate and manage all activities on both ports with the private sector undertaking longshoreman activities in Rarotonga.

134. A second option is for the PA to continue to operate and maintain the ports and harbours facilities but to privatise the stevedoring and longshoreman activities in both ports. This is consistent with practice in most ports around the world. This would involve the disposal of all cargo handling assets and the leasing out of warehouses and other container and cargo storage facilities. The PA may not, in the short term, be well disposed to dispose of their newly acquired barges, forklift trucks and cranes in Aitutaki. The privatisation could first be completed in Avatiu and followed up in 2 or 3 years on Aitutaki.

135. A third option would be for the government to retain ownership of the infrastructure of the Avatiu and Aitutaki harbours but have CIIC follow the successful international trend of leasing port operations to the private sector. These two ports are a standout example of a government asset that will gain from a public-private partnership. The improved organisational and service efficiencies resulting from public-private partnership for Maritime Cook Island Ltd is a model for this exercise.

136. Private sector involvement and investment in Avatiu and Aitutaki harbours would improve facilities at both ports, which have the potential to provide a regional service. Aitutaki port has the potential for becoming a major focal point for the international yacht circuit and improved services at Avatiu would increase the desirability of that port as a cruise boat destination. Commercial incentives to the leaseholders could include development of the existing Crown land associated with the PA, which will provide facilities and stimulate economic growth.

b. Other Outer Islands

137. Port and harbour operations and maintenance for the other OIs will by necessity remain the responsibility of the IAs. These facilities are badly in need of upgrading and maintenance and several projects for their improvement are being proposed. However, the IAs does not have the capacity or resources to manage the proposed aid funded improvements of their harbours and port facilities. PIU will need to take responsibility for these proposed projects, which will provide opportunities for training of IA infrastructure staff in their operations and maintenance.

8. Recommended Institutional Arrangements

a. Harbours and Ports

i. Outer islands (excluding Aitutaki)

138. CIGOV through the AMD will need to take on responsibility for a process to lead to the upgrading and commissioning of OI harbours.

- Engineering designs will need to be completed;
- Consultant(s) will need to be engaged to assist government with the preparation of tender documents, tender evaluation and selection;
- Consultant(s) will need to be engaged to assist government with contract administration, construction supervision, commissioning and inspection prior to the lapse of the defects liability period;
- Staff from the IAs infrastructure section will be utilized to maintain the harbours and will need to be up skilled. A training component could be included as part of the construction contracts;
- Ancillary equipment such as forklifts and tractors should be included on a needs basis as part of any aid or loan arrangements for the development of the harbours and ports facilities.

ii. Rarotonga and Aitutaki

139. The PA through CIIC will need to initiate a process by which the O&M (with relevant assets) of stevedoring and longshoreman activities in Avatiu and Aitutaki are either fully privatise or contracted out to the private sector on a management lease. CIIC will need to:

- Undertake a due diligence study of the PA in order to ascertain the true value of these PA operations;
- Prepare tender documents, invite, evaluate and assess tenders;
- Draw up contracts.

V. ROAD SECTOR

A. Introduction

140. This chapter addresses the Cook Islands' requirements for road infrastructure improvements and institutional arrangements for the sector including implementation and on-going O&M of these improvements. The focus is upon improvements in Rarotonga's road network where the main road investment requirements will occur. Road improvement requirements in the OIs are minimal by comparison and are assessed briefly and in less detail.

B. Rarotonga Road Network

141. The road network comprises the Ara Tapu main ring road (32km), the Ara Metua inner ring road (approximately 20 km), the short feeder roads, which connect to these two ring roads, and the street network in Avarua. There are approximately 100 km of sealed and 90 km of unsealed public roads on the island.

142. The Ara Tapu is a two-lane road with a carriageway width varying between 6 and 7m. There is a 1 km dual carriageway section along the Avarua waterfront with angle parking on both sides of the median and in front of the landside shops. The pavement surface is Double Bituminous Surface Treatment (DBST) in fair to good condition. In 2005 a 50-100m section of road located at the west end of the airport runway was washed out by Cyclone Olaf. Along most of its length the road is located within a few metres of the shoreline and hence is at risk of serious damage and closure from sea surges and flooding from heavy rains.

143. The right-of-way (ROW) varies between 10 and 12m, which is narrower than normally provided in other countries and therefore presents safety and maintenance problems. Hedges and signs built up to the ROW obscure line-of-sight distances for traffic on the road and those entering from side roads. In many areas there is very limited space for pedestrian traffic and there is no room for side drainage ditches along most of the road length. Repairs to water, power and telecommunications lines buried within this narrow strip affect the pavement structure and pavement depressions and edge failures are common.

144. The road has numerous short bridges and culverts. Most are in acceptable condition but many require repair, or reconstruction in some cases. A number of bridges have been reconstructed over the past several years.

145. The Ara Metua is a winding, single-lane road, except for the sections immediately east and west of Avarua. The pavement surface is DBST or Single BST (SBST) and is in fair condition for most of its length. Fortunately traffic is very light except in the Avarua area so that the road geometry and surface condition does not represent a serious problem for the time being. The Ministry of Works (MOWs) priority is to complete and upgrade sections of the Ara Metua so that it can be used as a diversion route in the event the main ring road is closed for any reason.

146. The government is receiving technical and financial assistance from China to upgrade a 5.5 km section of the Ara Metua between the roundabout in Avarua and Pokoinu Road and including Pokoinu Road to the main ring road immediately west of the airport. This will enable traffic to bypass the highly trafficked sections of the main ring road along the Avarua foreshore, Avatiu Harbour and the airport, which are most vulnerable to cyclones.

147. The works will include realignment to eliminate the worst curves and provide a 40 km/hr design speed, relocation of utilities to one side of the roadway, clearance of trees and structures as needed, and construction of a 8m roadway with 6-7m two-lane carriageway

within a 10m ROW. Work completed to date includes a survey, identification of the new alignment and ROW, and identification of land take requirements. The next step will be consultation with landowners leading to land acquisition. The MOW will be responsible for acquiring the ROW and relocating the utilities in advance of construction. The estimated cost of utilities relocation is \$2 million. The estimated road construction cost is \$5.6 million (roughly \$1 million per km). Land acquisition costs are unknown at this point.

148. The Ara Metua has three gaps: in Rutaki (near the uncompleted Sheraton Hotel site); Titikaveka; and behind Muri Lagoon. The MOW would like to complete these missing road sections but the chief obstacle is acquiring the ROW from property owners, which is unlikely in the foreseeable future.

149. Apart from the small street grid in Avarua the remaining roads in Rarotonga are short feeder roads, which connect to the two ring roads. Most of these are 'unlegalised' meaning the government does not have title to the ROW and the roads are built on the properties of the landowners on either side of the road. This problem is expected to persist indefinitely.

C. Vehicle Population and Road Traffic

150. The estimated number of vehicles in Rarotonga is shown in Table 12 below. These were determined by adding new registrations to the 2000 vehicle population obtained from the census. Scappage is ignored but is unlikely to affect the totals very much over such a short time period.

151. Over the past five years the vehicle population in all categories except utility vehicles has been increasing at high rates. The private vehicle ownership rate (counting cars/jeeps/vans/pickups) is roughly 300 vehicles per 1000 population but it includes the substantial number of rental cars. The actual household ownership rate is lower and has 'room' to increase as people change from motorcycles to cars with rising household incomes. A doubling of the motor vehicle population on the island is distinctly possible.

Table 12: Estimated Vehicle Registrations in Rarotonga

Year	Car/Jeep	Van/Pickup	Truck/Bus	Utility	Motorcycle
2000	1,267	274	440	364	2,371
2001	1,540	389	503	373	3,167
2002	1,901	538	570	379	4,282
2003	2,140	682	625	386	5,091
2004	2,540	874	680	396	6,075
2005	2,833	963	721	410	7,226
Average Growth, %pa	17%	29%	10%	2%	25%

Source: 2001 Census and BCI new vehicle registrations

D. Road Improvement Requirements

152. As stated above work is underway to upgrade the inner road between Avarua and the intersection with the main ring road west of the airport. This will meet the MOW's most immediate priority. The MOW's next priority is completion of the gaps in the inner ring road but this is an unlikely prospect due to the difficulty in acquiring the necessary ROW from the many affected landowners.

153. Rarotonga's road network is expected to require improvement in several areas in the medium term (5-10 years):

- Introduction of traffic management measures to alleviate localised traffic congestion in and around Avarua
- Increase in road capacity of the main ring road on the outskirts of Avarua
- Rehabilitation and partial reconstruction of the main ring road around the island to combat pavement deterioration
- Road safety improvements
- Measures to combat climate change impacts

154. Sections of the main ring road in Avarua and its outskirts are beginning to experience minor traffic congestion at peak periods such as at mid-day and Saturday mornings. Daily and peak period traffic levels are expected to increase creating a need for a combination of traffic management measures (e.g. traffic signals, parking controls) and road capacity improvements (e.g. turning lanes and additional road lanes).

155. Traffic management measures are very cost-effective but they are not being applied at present. The Foodland – Mama’s Café controversy points to the need for traffic management measures to be introduced to avoid further degradation of Avarua’s town centre. The MOW and Police Department together need to strengthen their traffic management planning and enforcement as a matter of urgency.

156. Extension of the four lanes on the main ring road to Avatiu Harbour and the airport entrance and exit are expected to be required in the next 5-10 years. Road widening to four lanes in the easterly direction through Tupapa is probably infeasible due to the land acquisition required. A practical solution is probably a combination of minor widening together with turning lanes, and some improvements in the inner ring road to divert local traffic away from the main ring road.

157. The main ring road pavement is deteriorating continuously over time as a result of (1) surface course aging, (2) increased axle loads (heavier trucks) in relation to the pavement bearing strength, (3) installation of utility lines which continuously weakens the pavement and (4) increased rainfall which soaks and weakens the pavement. The MOW is continuously providing maintenance to the road but eventually it will prove economic to rehabilitate the heavily trafficked sections on the north, east and west sides of the island. Such rehabilitation is expected in the next 5-10 years. Conventional road economics suggest that the DBST surface should be rehabilitated with an asphaltic concrete pavement when average annual daily traffic (AADT) exceeds 3000-5000 vehicles.

158. Road safety is expected to become an increasingly important issue as traffic levels increase. Many factors come into play: (1) the lack of separation between motor vehicles and pedestrians except in Avarua and sections in Arorangi, (2) the mix of motorcycles and motor vehicles, (3) sub-standard road geometric standards, (4) short line-of-sight distances, (5) uneven pavement surfaces and (6) poor lighting, just to name a few. A concerted effort to implement the ‘four Es of road safety’ is needed: Engineering, Education, Enforcement and Emergency. Engineering involves a broad range of infrastructure improvements including road geometry changes, traffic signals, road markings, barriers, signage, lighting, pedestrian pathways and pedestrian islands to name a few. Education involves driver training and public awareness programmes; Enforcement is a responsibility of the Traffic Police; and Emergency refers to the provision of rapid ambulance paramedic response.

159. The main ring road is at risk from sea surges due to its proximity to the shoreline and from flooding due to increased intense rainfall. It is impractical to relocate the road, therefore other mitigation measures must be considered. These include raising the embankment

height in low-lying areas, improving side drainage, increasing bridge and culvert openings and armouring embankment sides to resist scouring.

E. Proposed Road Improvement Programme

160. A long term staged road improvement programme for Rarotonga is recommended as summarised in Table 13 below. The cost estimates are indicative only, but show the order of magnitude of investment required.

161. The term 'programme' as opposed to 'project' is used because it is not expected that the proposed works will be implemented as discrete projects. Even the current Chinese-funded upgrading of the inner main road is part of a longer-term programme. Considerable planning, public consultations, engineering and budgeting will be required and works will be implemented in stages over several years.

Table 13: Proposed Road Infrastructure Programme in Rarotonga

Time Frame	Road Projects	Cost Estimate \$M
Short Term 3-5 years	Upgrading of inner ring road from Avarua to Pokoinu Rd intersection with main ring road west of airport	7.0
	Traffic management measures in Avarua area: Parking plan Traffic signals at congested intersections Intersection improvements Minor widening and turning lanes	0.2
	Road safety programme: Road safety audit Removal of line-of-sight obstructions Road markings, cats eyes, reflective signs Upgraded road lighting Pedestrian pathways in school and tourist areas Driver education and public awareness programmes Improved enforcement of traffic rules	0.5
Medium Term 5-10 years	Capacity improvements in Avarua area: Extension of main ring road four lane section to Avatiu Harbour and possibly the international airport passenger terminal area Minor widening of main ring road and provision of turning lanes and traffic signals in Tupapa	5.0
	Rehabilitation programme for the main ring road Reconstruction of pavement and drainage structures where required Minor widening and realignment where required Construction of localized curb and gutter and sidewalks Construction of pedestrian pathway Replacement of DBST with AC surfacing	15.0
	Rehabilitation programme for the inner ring road Minor repairs and reconstruction where needed Reseal with SBST	2.0
Long Term 10-20 years	Completion of inner ring road	10.0

Source: Estimates based on Consultant's analysis

F. Outer Island Road Networks

162. The length of roads on the OIs is summarised in Table 14 below.

Table 14: Outer Island Road Lengths

Island	Road Length, km	Comment
Aitutaki	59	16km sealed
Mangaia	58	3km sealed
Atiu	NA	8.9km sealed
Mauke	40	Unsealed
Mitiaro	21	Unsealed
Palmerston	2	Unsealed
Pukapuka	9	Unsealed
Nassau	NA	Unsealed
Manihiki	NA	Unsealed
Rakahanga	2	Unsealed
Penrhyn	2	Unsealed
Suvarrow	NA	Unsealed

Source: OMIA

163. The outer island roads are constructed of crushed coral or 'lagoon mud'. Several years ago the MOW shipped its road sealing vehicles to Aitutaki, Mangaia and Atiu and provided a SBST on the main roads in Aitutaki and the village roads in Mangaia and Atiu as shown above.

164. The outer island roads are generally in fair condition and, although potholes and ruts are common, the roads are adequate for the very low levels of motorcycle and motor vehicle traffic. The most important requirement is that roads connecting the communities with critical infrastructure such as the cyclone management centre, hospital, harbour and airport will remain passable except in the most extreme weather events. This will require some minor reconstruction where necessary (e.g. raising grades and providing better drainage).

165. It is proposed that the most critical road repairs in the OIs be implemented as additions to the planned airport and harbour improvement projects when the necessary engineering skills and construction machinery are on the island. It will be a simple matter for the contractors to re-profile roads, raise embankments and make drainage improvements before they demobilise.

G. Institutional Analysis

166. Agents involved in the air sector include government ministries, statutory corporations, the Island Administrations, landowners and their organizations and the private sector.

1. Ministry of Works

167. The core functions of the Ministry of Works (MOW) as addressed in the *Supportive Services Act (36 of 1973-74)* includes the engineering and maintenance services covering general operational civil engineering for roads, drains, bridges and foreshores defined as a 30 meter wide strip of land extending along and abutting the mean high water mark. The 15 staff of the Roads Work Division of MOW discharge these functions. Decentralisation of infrastructure functions to the OIs has, in theory, left MOW responsible only for roads on the island of Rarotonga.

168. The *Rarotonga Island Council: (Empowering Public Works and services) Ordinance (4 of 1959)* empowers the Rarotonga Island Councils (RIC) to maintain improve and control roads and foreshores on the island. However, their limited technical and plant capacity confine their activities to the cutting of grass on verges and some maintenance of drains.

169. The MOW's plant, equipment and workshop facilities on Rarotonga are suitable for small-scale activities and routine maintenance of roads. Equipment is hired from the private sector to undertake major capital road works on Rarotonga.

170. IAs seek the services of the MOW's Road Works Division on a regular basis. MOW provides the OIs with technical advice, design assistance assisting with the costing requirements for annual budget preparation, strategic planning and the design of proposed works and with the management and supervision of the island road works. MOW sources materials and machinery for the OIs and assists with their purchase. When MOW staff visit the OIs they conduct on-the job training of the respective islands' infrastructure division staff.

2. Island Administrations

171. The decentralisation of infrastructure functions to the OIs has meant that each islands' respective Infrastructure Divisions are, under the Island's Infrastructure manager, responsible for the engineering and maintenance services for roads, drains, bridges and foreshores.

172. There is currently no legislative framework under which the IAs manage and operate their infrastructure. If the *Island Government Bill* and the *Ministry of Islands Development Bill* are enacted in their current form they will confirm the ability of an IA to carry out works and perform its functions by using its own employees or by arrangement and contract with the Crown, any department of the state, statutory body, enterprise of the crown or any other person or organization.

3. Office of the Minister for Island Administration (OMIA)

173. OMIA was established under the *Public Service Commission Schedule Order 2000* to facilitate the corporate affairs of the IAs, to assist in the maintenance of existing infrastructure and to anticipate and plan for additional demands resulting from new developments. With limited funds and no technical staff, (the one civil engineer on staff has recently resigned) OMIA faces major constraints in carrying out its functions in the road sector. OMIA therefore provides a focus for liaison and contact between IAs and the Roads Division of MOW with the staff of the latter working directly with IAs or in partnership with aid agencies or private contractors.

4. Landowners

174. Section 608 of the *Cook Islands Act 1915* states although all roads shall be formed, maintained and repaired by the Crown, any road in the Cook Islands shall not vest in the Crown, but shall belong in accordance with common law to the adjoining owners. MOW advice is that it is their understanding that only the two ring roads around Rarotonga have been "legally acquired" by the State. Land issues on both Rarotonga and the OIs could prove to be a serious constraint to improving existing and constructing new road works.

175. The Chinese funded upgrading of sections of the inner ring road in Rarotonga will provide valuable experience in dealings with landowners and the issues of land acquisition and compensation. MOW is currently working with contractors on the survey of the upgrading. The extent of land acquisition, if any, and the damage to adjoining properties is as yet not unclear and the subject of conjecture. We will continue to monitor progress and provide further information and possible lessons learned in the final report.

5. Police Department (PD) and Ministry of Transport (MOT)

176. The PD has responsibility for the registration of vehicles, the regulation and monitoring of traffic and road safety, including the erection of road signs. The MOT is responsible for the regulation and registration of vehicle dealers.

6. Private Sector

177. The private sector's participation in the road sector is presently limited to the contracting of plant and equipment on Rarotonga, Aitutaki and Mangaia. Costs of hiring plant are reported to be high compared to the cost-out rates of MOW and IAs. One example provided in Rarotonga was the private sector cost of \$160 an hour for the use of a backhoe compared to the MOW charge-out rate of \$90 an hour. This comparison was accompanied by the information that MOW could not maintain their equipment under current budget allocations. It is doubtful if the current MOW rates are a true reflection of the actual cost to government. MOW agrees that they should decrease their own plant and machinery inventory and increasingly use the private sector to supply its needs. There is support for increased involvement of the private sector in maintaining MOWs fleet of vehicles and its reduced plant and equipment inventory. MOW has also investigated the contracting out of planning and design aspects of its roadwork but states that current charge-out rates for these services are high and would initially require increased budget allocations.

178. A few years ago MOW sold to the private sector at a peppercorn price a crusher whose operations had been uneconomical and maintenance costs high. The contractor who purchased the equipment has maintained and upgraded the equipment and now provides MOW with a reliable and cheaper service for road material. There is room for further private sector involvement in the road sector and elements within MOW believe that current costs should stabilise in a competitive, free market environment. It would be instructive to develop projections for the contracting out of aspects of MOW's services at current and project private sector rates.

7. Issues and Options

a. Rarotonga

179. As with other relevant utility sectors a shortage of qualified, experienced and skilled persons mitigates against duplication and therefore MOW should remain as the main agency responsible for road works in Rarotonga. MOW is, despite budget constraints, doing an excellent job in maintaining roads in Rarotonga.

180. MOW does not however have a capacity for road planning, traffic management and safety – issues which become increasingly important given the growth in traffic and the medium to long term improvement requirements for Rarotonga roads. MOW could train a young engineer to undertake this function; however the scope of work is too small for full time employment so in the short term this function could be contracted out to a local or overseas consultant.

181. The private sector is not sufficiently developed at the moment to provide competitive options for full privatisation of road works. There is no contractor on the island capable of providing the full range of services. There is for example no contractor with a capacity for bituminous works. Since aid and loan funding will continue to require open bidding, the annual value of government business on Rarotonga is not sufficient to attract off shore interests.

182. Maintaining the status quo and not increasing private sector participation would not however contribute to better efficiencies. There is a growing commitment by agencies such as MFEM, Aid Management, MOW, CIIC and OMIA to increase contracting out of the planning, design, project management and supervision and implementation of new works to the private sector.

183. As stated earlier MOW should continue to undertake the pavement works as there is no private sector contractor with the specialised skills and equipment to maintain road surfaces. However the maintenance of rights of way, including vegetation control and drainage should continue to be contracted out. Similarly the inspection and maintenance of bridges should remain with MOW with painting being contracted.

184. Improvements to traffic control will require the installation of traffic lights and improved signage. MOW does not have the capacity to maintain and service the electronic components of traffic lights. These services should be contracted out to either Telecom or to a private electronics contractor and training of the contractor should be included in the contract to supply and install. The production of signage and crash barriers could also be contracted out. To keep these services in-house would require the establishment of a sign shop within MOW.

185. Increased opportunities for private sector participation in the development, O&M of infrastructure in Rarotonga (and where applicable Aitutaki and other islands) will contribute to increased private sector investment. This will also lead to a growth in the number of potential businesses capable of active participation, competition and price stabilisation, increased employment and economic development.

b. Outer Islands

186. IAs should continue to be responsible for road maintenance though they have a serious shortage of skilled capacity. OMIA should act as a liaison point for OIs, engaging MOW and or the private sector to provide assistance as required. OI staff need training in basic maintenance skills as well as in the design and strategic planning of roads.

8. Recommended Institutional Arrangements

a. Rarotonga

187. The responsibility for the construction and maintenance of roads in Rarotonga should remain with MOW with an incremental contracting of activities to the private sector.

188. It is recommended that CIGOV through AMD and MOW organise a workshop / forum with the private sector and its peak bodies to develop strategies to increase participation of the private sector in all aspects of road maintenance and construction. The forum should:

- Develop an understanding by both public and private sectors of each others aspirations, concerns and constraints;
- Take steps to consolidate and maintain a register of all potential private sector participants including their capacity and pricing;
- Develop mechanisms for wide, regular and transparent dissemination of opportunities for private sector participation.

189. It is recommended that:

- An institutional strengthening programme be developed to improve MOWs capacity to develop and manage contracts, improve operational efficiency and financial control;
- CIGOV through AMD and MOW develop the Terms of Reference (TORs) and tender documents for the engagement of a consultant to provide MOW with a capacity for road planning and traffic management and safety;
- CIGOV through CIIC ensure that a suitably qualified supervision engineer be appointed to the proposed inner ring road project to ensure that all construction work meets established standards;
- The appointment of the supervising engineer should be undertaken under the same conditions as the similar appointment made under CIIC for the Police Station Project.

VI. WATER SUPPLY SECTOR

A. Sector Overview

190. The water supply sector has been receiving considerable support from the government and donor agencies in recent years. The sector attracts the highest allocation of funds from the government capital expenditure (capex) of all the sectors, amounting to about 15% of the national budget on capital expenditure. Donor agencies inject a further 9% of the aid funds into the sector bringing the overall national expenditure in the water sector to just under NZ\$1 million in fiscal year 2005/06 (*Source: Cook Islands Appropriations Amendment 2005-2006*).

191. There has been a steady improvement in overall water supply coverage since 1990 and in 2001 access to sources of water supply exceeded 99% on Rarotonga and was about 87% overall on the OIs. However, there is still a large disparity between the southern and northern groups; on the latter about 35% of the people (representing around 5% of the national resident population) still rely on carting water to their houses from bores and public water tanks. (*Ref: Cook Islands Millennium Development Goals National Report, June 2005*). The recent cyclones have caused considerable damage to water infrastructure on the affected northern islands, thus compounding an already stressed situation. Despite these setbacks, the country is expected to reach its Millennium Development Goals of providing water to more than 95 percent of its population.

192. The water sector suffers from major institutional constraints in O&M of assets due to an overlap of functions arising from policy gaps, the wide geographic spread of the islands, and a general shortage of skilled professionals compounded by a “brain drain” to the larger economies of New Zealand, and to a lesser extent Australia. In short, there is a need for an institutional strengthening and streamlining of services through a comprehensive water sector policy review.

193. Due to the nature of life on resource-limited islands, Cook Islanders are highly conscious about the need to conserve water. Despite this awareness, water is provided to consumers free of charge, which does little to encourage water saving, especially as western cultural lifestyles are adopted. This is already a point of concern on the two main islands of Rarotonga and Aitutaki and an emerging problem on the other islands.

B. Objectives

194. The CIGOV objectives in the water sector are to provide sufficient quantities of potable water to all consumers in the Cook Islands and, where applicable, to operate secure water distribution networks with minimal loss. The National Sustainable Development Plan Targets directly affecting infrastructure development are summarized in Appendix 3.

195. The aims in the water sector under this project are to establish an investment program that will enable the CIGOV to reach its stated objectives through the construction of environmentally sustainable infrastructure and improved efficiency of operation and management of water assets.

C. Existing Status

196. Existing water assets and their condition on each island and observations made during the field visits under this project are summarized in Appendix 2. A brief description of the existing status of water supply in Rarotonga and the southern and northern islands is presented below.

1. Rarotonga

197. On Rarotonga the water supply system comprises 12 intakes from spring and surface water sources, no treatment of the raw water except for a coarse gravel filter screen, and a gravity fed distribution pipe network. A ring main around the island supplies most consumers, except those that live at higher elevations who cannot be supplied by gravity. The town reticulated water system is also used for agricultural purposes. Households that are not connected to the central system rely on rainwater capture and on site storage tanks for their source of supply which is occasionally augmented by purchasing and carting in water from the town network during extended dry periods. Effectively, all households on Rarotonga (reportedly in excess of 99%) have access to clean water.

198. Water quality is variable and piped water is turbid after extended and intense rainfall periods. None of the water sources are disinfected so that people either boil the water or buy bottled water for potable use. Diarrhoea and other water-borne diseases are noticeable on Rarotonga.

199. MOW staff advised that many of the pipes are old and heavily corroded and so requiring replacement. Because water is provided free, there is little incentive for householders to fix leaking taps and pipes on their property, thus leading to more wastage. Although MOW estimates indicate a water loss in excess of 70%, neither the sources nor consumers are metered so that the unaccounted for water cannot be determined with any reliability. MOW has an ongoing program of pipe replacement and is in the process of renewing most of the ring main.

200. As Rarotonga is the main economic centre of the Cook Islands, it also acts as the national centre for the repair of plant and equipment. Consequently, any pump or other equipment breakdowns can be repaired promptly.

2. Southern Islands

201. The water supply on the southern islands is also centralized with consumers being serviced through a reticulated distribution system. Groundwater is the primary source of water on Aitutaki, Atiu and Mauke whereas both surface water (through three intakes) and groundwater sources are used on Mangaia. People on Mitiaro rely on a combination of spring water and rainwater. The centralized system is also used for agricultural purposes on all of the southern islands except for Aitutaki.

202. As there is no treatment on any of the islands, water quality is of non-potable standard and often brackish, indicating that exploitation of the water lenses is at the limit of sustainability and saltwater intrusion is an increasing threat. Consumers increasingly rely on augmenting their supplies with rainwater capture from their own roof. Community rainfall catchments and storages are also used as a back up supply during extended dry periods. Inadequate water quality is a major concern on Aitutaki as incidence of diarrhoea and other water-borne diseases are significant and the island has the second largest tourist population in the Cook Islands.

203. With all of the systems, untreated water from the bores is pumped into a storage from which water is piped under gravity to the consumers. Nearly all systems have problems with frequent pump failures and lengthy downtimes due to delays in getting units shipped for repair to Rarotonga. Consequently the quality of service to consumers is less than satisfactory. In addition, the pumps are nearing the end of their useful life and so the long hours of operation necessitated by the downtime of the standby units accelerate wear and tear thus increasing maintenance cost of the pumps.

204. The pipe networks, like on Rarotonga, were mostly built in the late 1960s and their condition reflects their age. As most of the pipes are of galvanized steel, corrosion is prevalent giving rise to high leakage losses from the network. There are further losses at the consumer level as leaking taps and in-house pipes are not repaired. As water is pumped, at least from the source to the distribution tanks, the high losses have a direct cost implication.

3. Northern Islands

205. All islands in the Northern Group rely on rainwater for their primary source of water supply. Additionally, in most villages public building roofs and dedicated rainfall catchment roofs are used to collect rainwater in large community storages which are used for community premises, as sources of water for households which do not have onsite tanks and also as a back up supply in case of extended dry weather periods.

206. Most households capture roof runoff and store it on site in storage tanks, which range in size from 2,000 L to 10,000 L depending on household size and affluence. It was observed during the field inspections that many of the houses affected by the March 2005 cyclones on Pukapuka and to a lesser extent by Cyclone Martin (in 1997!) on Rakahanga are still without roofs and even rainwater water tanks. This has a serious impact on the livelihood of people who have to rely on carting water from the community tanks. In addition, many of the houses, especially on Penrhyn (the most drought-prone island), capture runoff from only part of the roof area as the guttering is missing or corroded away, thus making very inefficient use of scarce resources. Although the new 6,000 L tanks have integrated covers, many of the older tanks do not or are poorly covered with no screens to keep out leaves and other debris. These uncovered tanks are a breeding place for mosquitoes and possibly promote the occasional outbreak of dengue fever. Water quality is variable as none of the tanks observed had first-flush diversion mechanisms.

207. Many of the old community tanks are of concrete construction with external steel bands for additional support and to maintain water tightness. Typically their capacity is 44,000 L. However, most of the tanks are old (up to 40 years old) and are in unsound structural condition. Leakage and rusted steel bands are a common problem.

208. Several shallow wells were inspected along coastal areas in Pukapuka but many appear to be contaminated with seepage of effluent from nearby septic tanks, pig holding areas and wind-blown debris. The wells are less than 5 m deep and water quality would also be affected by tidal variations. Studies carried out by Mr. Tony Falkland in 2001 under an Australian Agency for International Development (AusAID) funded project indicated that water quality is acceptable for non-potable use. However, as a general observation, the shallow water lens under most of the atolls in the Northern Group would be at risk from contamination from seepage of waste from onsite sanitation systems and to a lesser extent roaming pigs, which have highly concentrated wastes. Should the groundwater supplies be used as a reticulated source of water to households, catchment management practices and treatment, especially disinfection, would be required.

D. Proposed Level of Service Standards

209. A suggested minimum level of service standards that may be adopted for prioritizing water projects over the planning period are:

- Adequate quantity of water is available to be able to meet the daily needs of all the population of the island (including expected visitors where applicable) under 1 in 10 year drought conditions;
- Quality of supply meets Cook Islands standards and World Health Organization (WHO) guidelines for safe drinking water except for microbiological parameters;

- Water supply headworks (intakes, treatment facilities and storages including rainwater tanks) are protected from the elements to an agreed upon level of risk under the expected climate change conditions

210. It is noted that while achieving WHO guideline levels for microbiological parameters is desirable and probably could be attained on the islands with reticulated water supply systems, it would be very difficult to achieve on the northern islands where most households rely on rainwater capture from their own roofs. Disinfection of such sources would not be practical. Therefore, setting potable water targets is not considered practical in the medium term.

E. Needs Assessment in the Sector

1. Asset Rehabilitation

211. There is priority need for a comprehensive rehabilitation and continuous maintenance program of the water supply systems on all of the islands. On Rarotonga and most of the southern islands a large percentage of the old pipelines in the distribution networks need replacement. This is essential in order to reduce the high system losses and to eliminate infiltration of contaminants at worn out pipe joints. A rehabilitation program could be drawn up as part of an asset management plan for each island.

212. Pumps at the headworks of several of the systems in the southern islands are nearing or beyond their design life and should be replaced. A replacement schedule should be incorporated into the abovementioned asset management plan.

213. On islands without reticulated water, especially in the Northern Group, there is a priority need for the supply of rainwater tanks to ensure that all households have at least some onsite storage. It is noted that on islands that have a reticulated water supply the government invests the taxpayers' money to build the water supply scheme. However, on islands without such centralized system, the onus is on households to secure their own water supply and government only provides the community storages for use as the back up source. Therefore, it can be argued that for a more equitable share of the budget allocations in the water sector, the government could fund the supply of one rainwater tank for each household and a replacement tank say every 10 years or the nominal useful life of the polyethylene rainwater tanks widely used in the northern islands. The standard capacity of the tank could be calculated for each island based on local rainfall patterns and average family and household size. For now, it is estimated that a nominal 6,000 L capacity tank should suffice for most households. Under this scheme, should households wish to have larger tanks, they would have to purchase them at their own expense.

214. A systematic gutter inspection and rehabilitation program is required to ensure that houses fitted with rainwater tanks utilize all of the roof area to capture rainfall runoff and that gutters and spoutings are in good order.

215. The old community tanks and those damaged by the recent cyclones are in need of repairs. This would involve installation of internal liners to stop the leakage, replacement of the external steel bands and repair of the tank roofs.

2. Water Quality and Improvement

216. None of the sources are disinfected so that people either boil the water or buy bottled water for potable use. Diarrhoea and other water-borne diseases are noticeable on Rarotonga and Aitutaki (the two primary tourist centres) and Manihiki. It is evident on the other islands too but is usually masked in statistical records as usually people do not report

diarrhoea cases except in severe cases. However, disinfection of all water supplies would be very costly and not considered achievable in the medium term.

217. It is recommended that on islands which have distribution networks, water supplies be disinfected. This should be carried out within the medium term. The priority should be on Rarotonga and Aitutaki because of the higher population densities on these two islands.

218. For islands that rely on rainwater capture, some improvements in water quality could be made through the installation of first-flush diversion devices, inlet screens and roof covers on rainwater tanks.

3. System Operation Efficiency Improvements

219. Given the very limited knowledge of the available yield of water sources, water supplied, consumer demand and water losses, there is an acute need for improving the operational efficiency of the centralized water supply schemes, especially on Rarotonga. As a starting point, meters should be installed at all water intakes, isolating valves should be installed in the distribution system to enable the tracking and quantifying of water losses. These works together with the data from property connection meters would enable the operators to determine water usage and losses.

220. There is a need for better source management. The yields of most sources are not known and water quality is not monitored regularly. A program of regular monitoring of discharge measurement and water quality testing need to be put in place. This also applies to potential new sources such as groundwater and the work started under the AusAID program should be continued.

221. Where groundwater sources are unsuitable due to poor water quality, catchment areas could be created on less-traffic areas (such as school sports fields) to capture rainfall infiltration and store the water in underground galleries. The system comprises an impervious liner placed at a depth of say 0.5 m to 1.0 m below surface, agricultural drain pipes to drain the captured water percolating through the ground above it into the storage gallery. Provided that the surface area is kept clear of pigs and cars the quality of the water would be good enough for non potable use. It is suggested that such a system be piloted to investigate their feasibility. If successful it could be installed on islands such as Palmerston.

4. Water Conservation

222. There is adequate water supply on each island for now under normal or average climatic conditions, and with declining or near static population projection, this should be the case for the foreseeable future. However, as water is regarded as free with no tariffs payable, its use is generally inefficient and wasteful. There is no metering of production or consumption of this vital resource. Further, resources are finite, so there is an urgent need to develop much more efficient ways of utilization if the resources are to be adequate for future generations. While on the northern islands, where rainwater water harvesting is practiced, there is an awareness of the limited resources, on the southern islands there is much less appreciation of this fact. This will become an increasing problem and it is vital that a community awareness programme be put in place to promote water conservation. This should be an ongoing program and made part of the school curriculum for children.

223. In communities where water is piped to each household free of charge, there is little incentive for consumers to fix leaking taps and pipes on their property, thus leading to more wastage. It is recommended that water meters be installed on all property connections on islands that have reticulated systems. In the short term this would enable planners to get a better understanding of the water demand by consumers, raise awareness about water

being a finite resource that needs to be monitored and would also provide the flexibility to put in place a tariff collection system in the future.

224. There are also concerns regarding the proposal to pipe water from community tanks to households on islands which at the present rely on on-site capture of rainwater. The community tanks serve as emergency supplies in times of extended dry periods, but piping water from such tanks to the households for daily use could encourage wasteful practices.

5. Emergency Supplies

225. The lessons learned from the cyclones in 2005 are that the sources of supply, particularly on islands which depend on stored rainwater, need greater protection as contamination by seawater could severely reduce the available supplies of potable water at a time where replenishment by shipping is hampered by rough seas. The current initiative to install underground storages under micro-shelters and strengthen community tanks at the cyclone management centres (CMC) has merit and should be made mandatory on all islands.

6. Operator Training

226. There are usually one or two technicians/mechanics on each of the OIs who are responsible, among other duties, for the operation and maintenance of the water supply system. However, their skill level is limited to routine maintenance and basic repairs. They are also constrained by the lack of proper tools and spare parts apart from basic items such as fan belts etc. Consequently, breakdowns require the calling in of technicians from Rarotonga or sending the equipment to Rarotonga for repairs. Both alternatives are subject to scheduled air/shipping transport timetables and can mean delays of weeks or months.

227. In short, the main issues in the water sector are the lack of awareness of the finite nature of existing resources and so the need for water conservation, public health risks due to lack of disinfection, corroded pipelines where a network is in place leading to high losses and inefficient operation of the distribution systems where they are in place.

F. Project Identification

228. A suggested list of projects in the water sector under a 20-year master plan is included in Table 15. Cost estimates will be prepared once the broad thrust of the suggested plan is agreed.

Table 15: Summary of Suggested Projects in the Water Supply Sector

Island	Suggested Projects		
	Immediate (1-3 years)	Medium to Short Term (3-10 years)	Long Term (10-20 years)
Rarotonga	<ul style="list-style-type: none"> • Replacement of old sections of ring main is ongoing • Commence an ongoing community awareness campaign for water conservation 	<ul style="list-style-type: none"> • Complete rehabilitation of existing distribution network • Install water meters at intakes and isolation valves in distribution network • Install property connection meters • Conduct water loss reduction study • Undertake water loss reduction program • Install water treatment facilities • Conduct operator skill upgrade and training program • Review and upgrade water supply master plan • Set up an ongoing water resources monitoring program • Ongoing community awareness campaign for water conservation 	<ul style="list-style-type: none"> • Upgrade water supply master plan • Ongoing water resources monitoring program • Continue ongoing distribution system rehabilitation program • Upgrade water treatment facilities • Periodic skill upgrade and training program • Ongoing community awareness campaign for water conservation
Southern Group	<ul style="list-style-type: none"> • Construction of a new reticulation system on Mangaia (\$0.5 million) • System upgrade feasibility study for Atiu • Design of system upgrade works and replacement of old pipelines for Mauke (\$1.3 million) • Mitiaro system upgrade feasibility. Study (\$0.15 million) 	<ul style="list-style-type: none"> • Upgrade intake structures on Aitutaki • Conduct water loss reduction study for all islands in the Southern Group • Install water meters at intakes and isolation valves in distribution network • Install property connection meters • Install disinfection facilities on each island 	<ul style="list-style-type: none"> • Upgrade water supply master plan • Ongoing water resources monitoring program • Continue ongoing distribution system rehabilitation program • Upgrade disinfection facilities • Periodic skill upgrade and training programmes
Southern Group (continued)	<ul style="list-style-type: none"> • Complete construction of emergency supply storages • Repair/replace existing headworks pumps on all islands • Commence a community awareness 	<ul style="list-style-type: none"> • Review and upgrade water supply master plan for each island • Prepare an asset management plan for each island • Set up an ongoing water resources 	<ul style="list-style-type: none"> • Ongoing community awareness campaign for water conservation

Island	Suggested Projects		
	Immediate (1-3 years)	Medium to Short Term (3-10 years)	Long Term (10-20 years)
	campaign for water conservation	monitoring program <ul style="list-style-type: none"> Ongoing community awareness campaign for water conservation 	
Northern Group	<ul style="list-style-type: none"> Source augmentation with groundwater feasibility study for Pukapuka, Nassau, Manihiki, Rakahanga and Penrhyn (total cost for 5 studies - \$2.7 million) Complete construction of emergency supply storages on all islands 	<ul style="list-style-type: none"> Review water supply system adequacy on each island Provide rainwater tanks to all households Install first flush mechanism to improve microbiological water quality Optimize roof capture runoff Pilot infiltration gallery system to augment water source on Palmerston Ongoing community awareness campaign for water conservation 	<ul style="list-style-type: none"> Review and update water supply system adequacy on each island Renew household rainwater tanks Refurbishment of community rain water tanks Construct distribution network of water for non-potable use based on groundwater sources Ongoing community awareness campaign for water conservation
Overall Indicative Cost Estimates	\$4.65 million (already planned/committed)		

Source: Ministry of Works and Consultant's estimate

G. Institutional Assessment

1. Stakeholder Agencies

a. Ministry of Works

229. The Water Works Division of MOW is responsible under the *Supportive Services Act 1994* and the *Rarotonga Waterworks Ordinance (11 of 1960)* for the development, operation and maintenance of the water supply and water works in Rarotonga. The division is headed by an engineer supported by one trainee engineer, a certificated water quality technician, 2 certificated trainee hydrologists and a field operations team consisting of a supervisor, two foreman and six experienced pipe fitters. The division maintains the island's water supply system and is sometimes hired out at an uneconomic rate to undertake domestic services. MOW staff assists in the planning, development and works supervision of OI waterworks proposals, providing training to IA infrastructure staff when visiting the islands.

b. Island Administrations

230. The IA for each island of the Southern Group is responsible for the development, operation and maintenance of the water reticulation systems and the maintenance of community water storage tanks on their respective islands. The infrastructure staff of the IAs in the Northern Group maintains community water tanks that collect water off the roof catchments of public buildings. They also provide technical advice to residents if requested.

c. Landowners

231. All intakes on both Rarotonga and the OIs are on traditional land and there is a commonly held view that the water resource belongs to the people. The implications of this perception will be addressed below. After agreement with the landowners and Vaka Council or the Ariki (traditional chief), the government makes an annual leasing payment to the landowners for the use of the land where the intake is located. However, no payment is made for the water resource. Once the leasing arrangements have been settled, there are little or no further discussions between the two groups. Subsequent changing needs or increasing exploitation of the water resource are not discussed and, effectively, the traditional landowners forego ownership of their resource.

d. Department of Health

232. The Department of Health (DOH) is empowered under the *Public Health Act 2004* to provide standards for the safe use of water in reticulated supplies that comply with national regulations. In the absence of such regulations, the standards provided by the World Health Organization and by the New Zealand Ministry of Health's *Drinking Water Standards for New Zealand 2000* are used for microbiological and non-microbiological compliance. In the past, samples were taken monthly from the Rarotonga system and tested for microbiological and non-biological compliance at the laboratory of the Rarotonga Hospital. However in recent years, budget constraints have resulted in this service being significantly reduced. The department provides one health inspector for each of the OIs but their effectiveness is hindered by lack of funding and technical skills.

e. National Environmental Services (NES)

233. Operating under the *Environmental Act 2003* NES is responsible for monitoring both the environmental and sustainability issues related to potable water. The efficient discharge of these responsibilities is however hindered by the lack of relevant capacity and expertise within NES whose technical staff consists of six young graduates with qualification in one of

biology, geography, land management and law. There are five other experienced non-graduate technical staff. There is currently no monitoring of catchment and intake areas.

f. Office of the Minister for Islands Administration

234. As with the road sector, due to lack of staff, technical capacity and funding OMIA faces major constraints in being directly involved in its designated functions of facilitating the maintenance of existing infrastructure in the islands and to anticipate and plan for additional demands resulting from new developments. OMIA has only one civil engineer on staff responsible for the provision of technical support and advice to the OIs for all the utility sectors. OMIA is therefore reduced to providing a focus for liaison and contact between each of the IAs and Waterworks Division of MOW. The latter's staff either work directly with IAs or in partnership with international and regional agencies and private contractors.

2. Issues and Options

a. Institutions

235. The lack of skilled water professionals mitigates against duplication and therefore MOW should remain as the agency responsible for waterworks. Strategic planning and design in the water sector has historically been provided directly from New Zealand or by overseas consultants. This has left little institutional memory and a lack of planning and little design skills within MOW. MOW has the limited design and operations skills, but would require a few more staff and existing staff would need to be provided with training in the strategic planning of assets, loss reduction, and accounting and customer relations.

236. The IAs for the southern islands with reticulation systems should continue to run island waterworks but they have a serious deficiency of skills particular in the maintenance and operation of the distribution pipe networks. OI staff would also need training in design, strategic planning of assets and in accounting and customer relations.

237. IAs should continue to be the responsible agency for water in the northern group. As with the staff of the south, lack of skills and access to training is a major constraint. However, because of the nature of the water systems in the northern group, the primary focus of training should be on how to advise and assist households to size and maximize their water catchment and improving and maintaining water quality. In addition, they may need to have skills in piping water from community tanks to household.

238. It is noted that because of their isolation and the scarcity of resources, efficient use of water and conservation are part of the culture of the people of the OIs. This is especially applicable in the Northern Group where the people have highly developed water conservation and demand management systems. These traditional systems should provide an example of best practice to Rarotonga consumers. Consumers in Rarotonga are characterised as very wasteful of water.

239. Unlike in the consumers in the southern group who are served through piped networks, the government is not providing water to households in the northern islands. It is therefore suggested that government should, as part of its duty to provide access to clean water to all consumers, supply every household in the northern islands with a 6,000 L water tank and replace the tank say every 7-10 years instead of establishing a centralised water supply system. This will eliminate the affordability issue that often prevents poorer households owning tanks. The system would not negate the fact that other households may wish to purchase additional water storage capacity at their own cost. Responsibility for the maintenance for the water tanks would rest with householders with technical assistance provided by the IAs.

b. Partnerships

240. Improve collaboration between NES, MOW, DOH the private sector and communities is essential to eliminate duplication and pool scarce technical and financial resources and address environmental, water quality, supply and demand management issues. The recent donor funded Water Safety Plan Workshop recently established Catchment, Quality, Supply and Community working groups. However given the scarce resources the groups should be integrated into a single water group that deals collectively or as sub-groups with these issues. A model for such collaborative action would be the sewage and wastewater group, which involves the same three agencies as well as the private sector.

241. There is no institutionalised system for water quality testing. The facilities of Ministry of Health's (MOH's) laboratory at the Rarotonga Hospital are the most sophisticated available in the country capable of testing essential elements of the currently used WHO standards. Lack of funding has resulted in the curtailment of any regular testing by this laboratory. The Water Works Division of MOW employs a Water Quality technician with access to very limited testing facilities. An ongoing testing programme coordinated by MOW is essential. Testing facilities should be centralised and Rarotonga Hospital's facility should be provided the funding and capacity to undertake this function.

c. Legislations and Regulations

242. The *Rarotonga Waterworks Ordinance (11 of 1960)* needs updating. A TA is reported to have recently adapted legislation from Vanuatu and prepared a draft Water Resources Bill. All three agencies report that this draft legislation needs both simplification and better adaptation to the local conditions. A similar situation appears to exist for the legislation drafted for Disaster Management. Legislation preparation by external TAs is probably the only solution to the current lack of drafting capacity. However Terms of Reference (TORs) and contracts for such activities should include processes that provide for time to permit local technical personnel to comment on drafts and require the consultant to produce an acceptable redraft based on these comments.

243. It is recommended that a process similar to that undertaken with the recently drafted sewage legislation be undertaken with the draft Water Resources Bill whereby relevant sections were are revised and appropriate regulations developed for catchments management, water management, water tariffs and associated penalties.

244. The draft legislation calls for the creation of a Water Board similar to TAU or the Airports Authority. Given the scarce technical resources within the country this concept should not be given further consideration.

d. A User-Pays System for Islands with Centralised Water Systems

245. The introduction of a user-pays system for water is reported to be politically sensitive, however all politicians consulted agree that it is necessary. No tariffs are currently charged for consumers on islands with reticulation systems. It is reported that Rarotonga consumers did pay water tariffs in the past and though some domestic consumers and commercial establishments such as the Pacific and Edgewater Resorts are metered no readings are being taken. Landowners argue that the water belongs to them; they are not compensated for its use and question why government should charge for water. This line of logic is reasonable for domestic users but does not preclude water used for commercial purposes especially hotels catering for international visitors. On the other hand the government has made a large investment in piping the water to consumers and needs substantial funds to operate, maintain and upgrade the network.

246. Options for the introduction of a user-pays system for water in Rarotonga and islands where there is a reticulated water distribution system are discussed below.

247. The first option is a do nothing (status quo) option that is not sustainable and not recommended. The underlying philosophy is that government owns the resource and will continue to use the taxation system to provide free water to all consumers. However, for improved efficiency there will be a need to adjust the taxation system to cover recurring costs and full cost recovery of all investments. This implies that the operating agencies will need to get a better understanding of the nature of their costs. In order that the operation of the systems is not a drain on the national budget, there will be a need to put in place more efficient operations management practices. A performance based funding system will need to be introduced whereby the annual budget allocated to MOW for O&M and the IAs that manage water distribution networks would depend on performance efficiency targets including reduction in unaccounted for water. This will improve the efficiency of use of water and will make the operation more sustainable, but the disadvantage would be that there would be no incentive for consumers to recognize that water is a valuable resource, and conserve it. Because the water is free they would continue to see repair of leaking taps and cisterns as a cost rather than savings.

248. The second option would be a variation to the above and involve the introduction of a tariff based on a volumetric charge to commercial premises and not to charge a tariff to domestic households. This would allow some recovery from large users and in effect take into account the community attitude that the water is “theirs” so its free but visitors and commercial users would pay according to use.

249. A third option would be to introduce a user pays principle whereby consumers pay for the water they use and taking into account local cultural values, traditional land owners and or vakas would be paid a raw water payment. The charge to consumers would cover O&M and full cost recovery of assets. Tariffs changes would be subject to approval of Cabinet or a tribunal to ensure affordability. Consumers would have an incentive for efficient operation of the system including the repair of their own in-house leakages.

3. Suggested Institutional Improvements

a. National Level

250. Due to severe shortage of professionals with technical skills in the Cook Islands, it is recommended that resources be centralised by establishing a core technical group of water engineers. The Waterworks Division of MOW in Rarotonga is recommended as the national centre for water supply and management. The primary function of the group would be to provide technical advice and support to the OIs through either OMIA or the IAs.

b. Rarotonga

251. The operation and management of water supply on Rarotonga should continue to be the responsibility of the Waterworks Division of MOW. However, capacity building is required to improve the delivery of its service to consumers. An institutional strengthening program should focus on improvements in operational efficiency, financial management and customer relations. The Division would also need additional staff if it is to be promoted to being the national centre for technical advice in water supply management.

252. As part of the efficient use of resources, Government, through AMD and MOW, should develop strategies for the introduction of a user-pays system commencing initially with metered water use and volumetrically varied tariffs for commercial users. As a second

step, introduce a variable volumetric tariff for all domestic consumers based on a standard minimal use levied so as not to disadvantage the economically challenged.

253. AMD and MOW will need to:

- Conduct a tariff and billing system study;
- Following Cabinet approval, put in place water tariffs;
- Develop a Cabinet Policy Paper for the introduction of the system;
- Establish the number of properties that would require metering and develop a tender document for the purchase of meters, advertise, evaluate, select the successful and procure;
- Develop and organise for the delivery of training for MOW staff in meter installation, calibration and reading and data recording; and
- Consolidate a register all consumers and develop management and accounting systems.

254. It is suggested that government establish a Water Working Group comprising of representatives of MOW, MOH, NES, community and private sector to:

- Strengthen collaboration strategies;
- Review the draft Water Resources Bill. Extract and revise relevant sections, them to better suit local conditions and develop appropriate regulations for catchment management, water management, water tariffs and associated penalties.
- Develop a draft Water Policy
- Develop and implement a demand management information campaign; and
- Establish and maintain a forum for on-going communication between themselves and with community and the private sector.

c. Southern Islands Group

255. It is proposed that:

- The IAs continue to manage their island's water system;
- A strategic plan be similar to that for Rarotonga be developed for the introduction of a user-pays system;
- A capacity building program be established for IA staff with an emphasis on operations and management, finance and accounting and customer service; and
- The functions of strategic assets planning and design management.

d. Northern Islands Group

256. It is proposed that:

- ADM and OMIA, as part of government's duty to provide access to clean water to all consumers, tender for the supply to every household in the northern islands a 6,000 L water tank and plan for a 7-10 year replacement cycle;
- The primary responsibility for water remains with householders;

- Training programmes be developed and implemented for IA staff with a primary focus on how to advise and assist households to maximize their water catchment and improve and maintain water quality
- That community tanks continue to serve as emergency supplies in times of extended dry periods, and not piped to the households.

VII. ENERGY

A. Introduction

257. There is a need to address the issues associated with improving the supply of electricity in the Cook Islands, both in terms of the infrastructure assets and institutional aspects. The focus will be for improvements in the outer islands in the immediate and short term.

B. Status

258. Te Aponga Uira (TAU) power station has a total capacity of 4670kW. At present the peak demand is 4400kW. (*ref. TAU*). The gensets consumes 20,000 L of diesel fuel per day and has a seven-day fuel storage capacity.

259. Aitutaki power supply is also a state owned enterprise and has its own Board, which reports annually to the Board of CIIC on the management and status of assets. At present it is operating using hired gensets from NZ Generator Hire. The existing generators are obsolete and unserviceable.

260. Renewable energy use on Rarotonga utilizing solar for hot water supply is common among domestic households and business facilities. There is a proposed wind power generation project currently managed by the Energy Division of MOW with technical assistance provided by SOPAC.

261. The power supply in the Outer Islands is administered by the Island Administration who is responsible for management, operation and maintenance. OMIA also plays a part in the maintenance process including the overhaul of gensets and sometimes the coordination of the procurement of parts on behalf of the Island Administration. Diesel fuel for power supply is tendered to suppliers on an annual basis. The cost of the fuel is subsidized by the Government and at present OMIA facilitates the tender process. The power supply is produced for 24 hours on some islands and 18 hours on other.

262. There is a wind power generation pilot project currently being implemented on Mangaia. There are currently technical issues associated with this project. There have been visits to the island by TAs to address these issues.

263. There are proposals to install wind monitoring towers on Rarotonga, Aitutaki and Rakahanga islands. The Rarotonga project is already underway.

C. Proposed Level of Service Standard

264. A suggested minimum level of service standards that may be adopted for prioritizing power supply projects over the planning period are:

- All households have minimum 18 hours per day electricity supply
- Have stand-by generator facilities as back-up supply
- Have 90-day fuel storage capacity
- Power generating facilities are adequately protected from cyclones
- Power lines are located underground to minimize risk from cyclone damage

D. Needs Assessment

1. Asset Rehabilitation

265. A comprehensive rehabilitation and continuous maintenance program of the gensets and reticulation on the outer islands is a priority need. A rehabilitation program could be drawn up as part of an asset management plan for each island.

266. On Pukapuka there is urgent need to replace the solar batteries for the individual households. The study conducted by UNDP/ENESCO in 2004 highlighted several options for upgrading the power supply in Pukapuka. The study illustrated the upgrading of individual households as the cheaper option for a 24 hour electricity supply using a photovoltaic system. This however, places an unfair burden on households as the cost of batteries is expensive and that of electrical appliances which run on DC power is approximately three times the cost of similar units running on conventional AC power. There is also the option to assess the feasibility of having a centralized photovoltaic system for the island. The power generation will be managed by a Government agency.

2. System Operations Efficiency Improvements

267. Apart from Rarotonga and Aitutaki there is a need to improve the efficiency of the operations of power stations in the other islands. This can be achieved through appropriately upgrading the generation setup, and up-skilling of the staffs involved with the management, operation and maintenance of the power station and associated facilities.

268. In view of the low loading rate on Penrhyn there is a need to replace the existing 25 kW and 35 kW gensets with say three 15kW units to improve operational efficiency.

3. Training

269. There are usually one or two technicians/mechanics on some of the outer islands who are responsible for the operation and maintenance of the power supply system. Their skill level however, is limited to routine maintenance and basic repairs. They are also constrained by the lack of proper tools and spare parts apart from basic items. Consequently, breakdowns require mobilizing technicians from Rarotonga or sending the equipment to Rarotonga for repairs and overhaul. Both alternatives are subject to scheduled shipping transport timetables and can mean delays of weeks or months.

4. Research

270. The Energy Division of MOW is currently facilitating research into the use of renewable energy sources as a means of supplementing the existing systems in place. These energy sources include the well established solar and wind energy. The research should be extended into covering the emerging technologies such as energy derived from ocean currents, waves and tides. It is noted with interest that recent trials with ocean current generators indicate electricity yields of up to 2.5 MW per hectare could be achieved. Given the abundance of oceans in the Cook Islands, this form of energy is a very promising alternative to the traditional oil-based energy sources, which have to be imported.

271. To take full advantage of global research by organizations which have greater technical and financial resources than CIGOV, it is suggested that strategic partnerships be formed with leading institutions to carry out joint-research into identifying technically feasible and financially viable alternative energy sources in the Cook Islands, especially those that are based on the ocean as the source of energy.

E. Project Identification

272. There is currently a proposal in place for TAU to expand the power generation to 6,000 kW within the next ten years. The project will be implemented in three stages and costs \$9.7 million. Stage 1 construction is already in progress.

273. Funding to upgrade Aitutaki Power has been approved. The cost of the project was estimated at \$6.4 million with the implementation to be carried out in the next two years. The project involves replacing of the gensets, distribution components and upgrading of the reticulation system.

274. Project proposals to carry out feasibility studies with consideration for upgrading the existing power supply system have already been approved. These will be carried out in the short term on the islands of Manihiki, Rakahanga and Mangaia.

F. Institutional Assessment

1. Ministry of Works

275. The Energy Division of MOW (ED) operates under the *Energy Act 1998* and regulates and monitors standards for safety, quality, quantity and efficiency of electricity generation, transmission and distribution and the quality of petroleum and other fuels. They monitor tariffs and research, develop and promote the use of alternate sources of energy. The division has installed and maintains wind and solar generation systems in both Rarotonga and some of the outer islands.

276. ED has developed the draft *Cook Islands Electricity Regulations 2005* under which the Inspections functions operate. The regulations govern the licensing, technical and safety requirements for power generation, distribution and consumer premise wiring and the qualifications and technical skill requirements for the registration and licensing of various grades of electrical workers. This latter function is administered through the Cook Islands Electrical Workers Registration Board, which is chaired by the CEO for TAU, and has representation from MOW and the private sector.

277. ED has strong and productive partnerships with the Department of National Human Resource Development (DHRD) and the private sector for the development and implementation of training programmes linked to the skill requirements for the different grades of electrical workers. The systems for the training, regulation and registration of electrical workers provide an excellent model for other utility areas and are currently being emulated by the liquid waste sector. The head of ED and the chief inspector are qualified and registered electricians.

2. Te Aponga Uira

278. TAU is a State owned enterprise that generates, transmits and distributes electricity to all of Rarotonga Island and operates under the *Te Aponga Uira Act 1991*. The enterprise has its own Board and reports annually to the CIIC on the management and status of assets. Prior to its corporatisation, TAU was the provider of all power in the Cook Islands. TAU now provides support to the Island Administration on a contract basis as and when requested. TAU has a total number of staff of 41 (power station – 21, distribution system – 11, Billing – 5, Administration – 4). It receives subsidy on diesel fuel for the gensets.

3. Aitutaki Power Supply

279. The Aitutaki Power Supply (APS) operates under the same structural arrangements as TAU but with no legislative backing. Established with the objective of being a self-sustaining commercial entity, APS is hampered by continued government interference in issues of staffing and tariffs and is unable to operate as a truly commercial enterprise, requiring continued government subsidisation. The head of APS is an electrical mechanic. ATP purchases its diesel fuel directly from New Zealand shipped in tanktainers.

4. Island Administration

280. Each IA has an Energy Division that is responsible for the generation and distribution of power and headed by an Energy Manager. As there are no private electricians in the majority of islands, IA staff install and upgrade electricity supply for buildings when required. There is a lack of skilled electrical workers in the OIs and a lack of enforcement of regulations by an understaffed and under funded inspectorate in Rarotonga. While the Island Secretary for Mauke is a qualified electrician, only Mangaia has a qualified electrician working in its Energy Division. The Inspectorate provides unqualified IA energy workers with interim registration to enable them to continue to carry out the required functions and receive indemnity from prosecution. DHRD provides basic electrical skills short courses for OI energy workers and some linesmen have undertaken attachments with TAU. Both TAU and OMIA highlight serious safety issues related to distribution and consumer systems.

5. OMIA

281. OMIA is currently responsible for the provision of planning, policy and technical assistance to IA energy divisions. OMIA's capacity to successfully undertake this responsibility is limited. They have on staff one electrical engineer who is a United Nations Volunteer (UNV) whose contract ends in 4 months. OMIA's workshop, which reconditions and repairs OI power generators in well equipped and efficient. Its staff includes an automotive mechanic and two unqualified staff who have several years of field experience and receive hands on training on the floor of the workshop. OMIA organises tenders for fuel for power generation and liaises with TAU to occasionally provide assistance for the OIs.

6. Office of Human Resources Development (OHRD)

282. Strong partnerships between the public and private sector in the power sector has led to a human resource development and regulation regime that is model for other utility sectors. Detailed skills based regulations for registration of a variety of levels of electricity professionals are reflected in courses offered by the OHRD. The sectors workers can qualify as basic linesmen, electricity workers, electricity mechanics and fully-fledged and internationally recognized electricians. The stepwise recognition of progress and certification allows individuals to practice their trade at a variety of levels and is said to contribute to professional standards as well as encouraging the retention of skilled workers in the country.

283. OHRD in conjunction with ED provides basic-skills short courses to IA energy workers as well as school programmes to introduce and attract students to the sector.

7. Private Sector

284. Rarotonga's private sector is well serviced by 25 electricians and 4 electrical mechanics. There is one qualified electrician in each of Aitutaki, Atiu and Manahiki and one electrical mechanic in Aitutaki.

G. Issues and Options

1. Institutions

a. Outer Islands

285. The ED develops policy and strategic planning, undertakes research, regulates fuel quality and costs and regulates the setting of standards for electricity generation, distribution and household wiring. It is also responsible for inspecting all aspects of the system. The division operates for all intents and purposes as it did when it was a ministry in its own right. A drastic lack of qualified electricians within the division and on the OIs has resulted in serious safety issues in many of the islands. There are no inspectors on any of the islands other than Aitutaki. The Inspectorate has provided interim registration to unqualified energy workers on all islands so as to facilitate connections to buildings and to indemnify workers.

286. IAs are, ostensibly, with the advice and assistance of OMIA, responsible for the design and construction of their energy systems but, in reality, operate systems that were developed by TAU prior to devolution.

287. The IAs own and operate generation and distribution systems and because there are private sector operators on most of the islands wire and service household, business and institutional electrical systems. IAs operate their own billing systems, reading meters, issuing bills and collecting revenue. OMIA operates an efficient workshop that reconditions OI generators and engages TAU on a commercial basis to provide technical advice and assist in design, construction and upgrading of existing and new networks and distribution systems.

288. The equipment used in the OIs is not standardized and many of the generators are old and fuel inefficient. Some islands have as yet not converted to underground distribution systems and are as such susceptible to damage during extreme weather.

289. Maintaining the status quo for the institutional arrangements OI energy sector will not address either the efficiency or safety issues.

290. Another option is for the re-creation of a Ministry of Energy with responsibility for all of the current roles of the ED and strengthening the capacity of IAs and OMIA. The drastic shortage of skilled energy professionals in the country militates against such an option.

291. A further option would be to:

- Maintain the ED with all current functions as part of the MOW but ensure independent budget allocations;
- For IAs to continue to be responsible for the generation and distribution of electricity;
- Have ED plan and implement in conjunction with IAs, OMIA and DHRD a comprehensive capacity building programme for IA electrical workers;
- Have TAU take on the responsibility for the provision of all technical advice and support to the IAs on a commercial basis. This would include an initial input to repair and upgrading of all systems to ensure safety and improved efficiency, ongoing technical support and the planning and design of system improvements;
- OMIA provide a central liaison point for all IA contacts with TAU. (See expansion of this concept in the Institutional Action Plan in section 14 of this report).

292. Other options for institutional re-engineering include:

- The transfer of all responsibility for the functions relating to power generation and supply in the OIs to TAU, and
- The establishment of an Energy and Telecom Ministry responsible for policy, strategic planning and regulatory functions, under the Office of the Prime Minister.

293. The rationale for the latter suggestion is that both energy and telecommunications are monopolies requiring large investment and are fundamentally different in nature to other municipality services such as roads and water. Both are rapidly developing sectors necessitating frequent technology upgrades.

b. Cost Recovery

294. CIGOV's *National Energy Policy of 2003* dictates full cost recovery for TAU and OI consumers, while conforming to any loan covenant requirements. The policy required that cross-subsidies between business and household consumers in Rarotonga and the OIs be eliminated by 2007. In recognition of the service responsibility of government the policy requires that lifeline tariffs be introduced so as not to disadvantage low-income earners.

295. TAU has been able to continue operations on a full cost basis. However because of government's reluctance to increase the tariffs of household consumers, they are still subsidized by business consumers. A recent tariff change raised household rates nearer to those for businesses. TAU management is concerned that continued cross-subsidies could raise business tariffs to a level such that their largest customers may decide that it is more economical to generate their own electricity.

296. None of the OI operations fully recover costs. The APS is the nearest to achieving this target but required government approval to change tariffs. IAs and Island Councils were pleased to accept the responsibility for electricity generation and supply and believed that the activity would be a cash cow. A reducing population, high fuel and shipping costs and low technical capacity have resulted not only in a deteriorating and increasingly dangerous service but also one that needs heavy subsidies, estimated by OMIA to be over 50%.

297. It is essential that a sustainable tariff regime be put in place to achieve the cost recovery targets of the government without driving commercial customers to seek alternate energy production. Tariffs should be allowed to vary from island to island so as to affect the true worth of generating energy. This will force people to conserve and /or look for alternative sources of energy and provide an incentive for the responsible government agency to undertake research and development into sustainable alternatives.

c. Renewable Energy

298. CIGOV is committed to the utilization of indigenous energy sources wherever practical and financially feasible. The ED continues to work with non-government organizations (NGOs) and other organizations to shift towards the use of alternative energy sources. However a lack of technical expertise, weak institutional structures, a lack of understanding of the renewable energy resources potential, a lack of financial commitment and a lack of private sector investment have resulted in ad hoc activities and a reliance on aid-funded projects. These constraints leave the sector exposed to activities that are externally driven.

299. A solar photovoltaic (PV) system funded through a loan from the French Government has been trialed on Pukapuka but it is reported that the Energy Division has never sighted a review undertaken by SPC in 2001. The Mangaia IA reports that an SPC funded SOPAC pilot wind energy electricity generator has never worked because of the lack of essential

equipment. SOPAC is planning to pilot wind energy electricity generators in Aitutaki, Rakahanga and Rarotonga.

300. Economic analysis show that rising oil prices will lead to the favouring of alternative energy sources such as PV systems. However these analysis need to consider the additional consumer costs such as the need for DC batteries, transducers or high cost DC appliances.

301. The current ad hoc mechanisms for implementing CIGOV policies for renewable energy are ineffective and inefficient. A technical body with representation from the relevant government agencies and the private sector needs to be established.

2. Recommended Institutional Arrangements

302. It is recommended that the agency responsible for energy policy planning:

- Commission a cost recover study;
- Establish a technical committee with representation from the relevant government agencies and the private sector to evaluate and advise on alternative energy options and strategies; and
- Enter into partnership with international institutions such as universities to pursue research in sustainable local alternative energy sources.

303. It is recommended that consultations be held with relevant agencies including PSC and ADM to discuss and develop a preferred institutional arrangement for the provision of safe and efficient energy services to the outer islands.

304. It is recommended that AMD (or the organization established by government to coordinate development projects) contract TAU to:

- Undertake a survey of the safety audit of all OI (other than Aitutaki) electrical generation and distribution systems; and
- Undertake works necessary to ensure that all OI generation and distribution systems meet accepted safety standards.

305. It is recommended that the agency responsible for energy regulation and inspections:

- Develop a capacity building programme in conjunction with DHRD and TAU to ensure that every IA has the services of a qualified electrician to supervise the operation and basic maintenance of generation and distribution systems and install and inspect consumer electrical services.

VIII. SANITATION SECTOR

A. Sector Overview

306. There has been a good improvement in sanitation since 1991 and by 2001 about 80% of the households nationwide had access to flush toilets. Lagoon toilets have all but disappeared and even the use of pit latrines has generally declined with both being replaced by more hygienic and environmentally friendly systems. However, as in the water supply sector, there is a disparity between the quality of service on Rarotonga and the outer islands. (Ref: *Cook Islands Millennium Development Goals National Report, June 2005*). Health statistics imply that a lack of hygiene is still significant on the outer islands, especially in the Northern Group. More than two thirds of the skin sepsis and a third of the reported diarrhea cases in the Cook Islands are from the Northern Group. The country is expected to reach its Millennium Development Goals of all of the population having access to hygienic sanitation facilities. The more relevant issue is the standard of that service.

307. The sanitation sector has the noticeable distinction of being the only sector not receiving any funds for capital expenditure in fiscal year 2005/06 either from the general government budget or donors. (Source: *Cook Islands Appropriations Amendment 2005-2006*). This is not to say that all is well and no further developments are needed. Rather, it highlights the low priority allocated to the sector by the government and the lack of demand by the community.

308. The sector suffers from poor understanding of the nature of the health and environmental risks associated with the lack of proper sanitation facilities. At the community level people still see waste as a “throw away product” and they do not make the link between personal hygiene, environmental contamination and inadequate facilities. In turn, at the government level, this lack of appreciation is reflected in the fact that three government agencies have responsibility over the construction of sanitation facilities, yet none have the policy ownership. There is a widespread philosophy that sanitation is primarily a private responsibility and for this reason, government involvement in sanitation is a low priority. Residential and commercial establishments are expected to build their own on-site wastewater treatment systems and conform to poorly enforced public health regulations. In summary, there is a need for an extensive awareness campaign about health and hygiene at all levels which will generate demand for the service and appropriate levels of funding.

B. Objectives

309. The CIGOV objectives in the sanitation sector are to provide basic facilities to all households in the Cook Islands which will minimize the health risks associated with poor hygiene and mitigate adverse environmental impacts. The National Sustainable Development Plan Targets directly affecting infrastructure development are summarized in Appendix B.

310. The aims in the sanitation sector under this project are to establish an investment program that will enable the CIGOV to reach its stated objectives through the construction of appropriate infrastructure that will allow the management of wastewater in an environmentally sustainable manner and will raise the public awareness about the need for sanitation and hygiene.

C. Existing Status

311. Existing sanitation assets and their condition on each island and observations made during the field visits under this project are summarized in Appendix C. A brief description of

the existing status of wastewater management in Rarotonga and the outer islands is presented below.

1. Rarotonga

312. Nearly all households on Rarotonga have septic tanks for the treatment and disposal of their liquid wastes. All wastes are passed through the tanks without any attempt to reduce the load through separation of black (toilet and kitchen) and grey water (bathroom, laundry). Treated effluent is disposed via absorption or soakage beds. Septic sludge (septage) is cleaned out infrequently when households notice that the system is not working either because of blockage, excessive odours or water logging of the disposal area – all indicators that the tanks should have been cleaned out a long time ago. Maintenance and desludging of the tanks are the responsibilities of the owner, and are not mandatory by regulation. The cost of pump out of septic tanks is borne by the owner.

313. Some of the larger commercial premises such as hotels have small package treatment plants that provide a secondary level of treatment of the wastewater before discharging it into the environment – usually the lagoon. The performance of these on-site systems is not monitored by any of the government agencies.

314. A small pilot sewerage system with a package treatment plant serves about 30 households on the uphill side of the Avarua airport in Nikao. The plant is in need of some maintenance as neighbours report odours emanating from the plant from time to time. Discharge of treated effluent is into the stormwater drainage system.

315. A new septage treatment facility funded under an ADB loan has just been completed. The septage plant is located just downhill of the new municipal landfill site at the Waste Management Centre in Arorangi. Reclaimed water from the plant is discharged to the nearby creek. The plant capacity is adequate to treat all septage generated on the island over the next 10 years or so. As part of that project a septage management plan was prepared for Rarotonga in 2004, but to date the plan has not yet been put in place.

316. Health Department, the agency taking the initiative with managing domestic sanitation, advised that its health inspectors visit and inspect all properties on a semi-annual basis, but at this stage they do not check on the performance or condition of the septic tanks and disposal fields.

2. Outer Islands

317. The situation on Aitutaki is similar to that on Rarotonga. A septage plant, funded under the same ADB loan, is about to be commissioned. As the island also has a thriving tourism industry there are several hotels, each with its own on-site package treatment plant. Residents rely on domestic septic tanks and absorption fields for their wastewater management.

318. Pit latrines are the dominant form of onsite wastewater systems on the other islands of the Southern Group, except on Mitiaro where all but 10% of the households have upgraded to septic tanks. On Mauke some 90% of households still use pit latrines. None of the islands have a septage treatment facility and tanks are only cleaned out once they are full. Cleaning out usually involves emptying the tank and burying the sludge in the ground nearby without any form of treatment or leaching prevention.

319. On the islands of the Northern Group the extensive damage caused by the recent cyclones has been a catalyst for upgrading onsite wastewater management facilities. Today, the majority of households use septic tanks with soakage fields for effluent disposal however

pit latrines are also used to a lesser extent. Lagoon toilets are still in usage only on Manihiki, but there too it is gradually being replaced by septic tanks. As in the Southern Group, there are no septage treatment facilities on any of the islands and accumulated septic tank sludge is disposed of in the same manner.

D. Proposed Minimum Level of Service Standards

320. A suggested minimum level of service standards that may be adopted for prioritizing sanitation projects over the planning period are:

- All the population has access to hygienic facilities;
- Facilities do not pollute the water supply sources (particularly in the case of groundwater being the source of supply);
- Septage (septic tank sludge) treatment facilities exists on the island.

E. Needs Assessment in the Sector

1. Health Risk Reduction

321. The high number of cases of skin sepsis, diarrhea and other water-borne diseases suggests that together with unsafe water, sanitation and hygiene are still important issues that need addressing in the northern islands. In terms of sanitation, the installation of flushing toilets in all households should be made a national target, and regular desludging of septic tanks made compulsory and auditable. The desludging of tanks should be carried out every two years, or more frequently if the need arises, to ensure proper performance. The practice of shoveling out sludge from septic tanks and burying nearby should also be discouraged as the practice is a health risk to the person carrying out the task.

322. The routine inspection of properties by health inspectors should include a cursory visual check of the septic tank and disposal area for signs of poor performance. The findings should be reported to the owner and responsible agency for follow up actions. The measures above would help to reduce risk to public health from the sanitation systems.

2. Environmental Impact Mitigation

323. Because septic tanks provide only primary treatment (mostly removal of solids and some reduction in biochemical oxygen demand or BOD) and there is little further purification of the septic tank effluent through the coral sand, much of the nutrients find their way into the underlying water table and eventually the lagoon. On Rarotonga this, combined with general rainfall runoff from urbanised and agricultural land, has led to a situation where algal blooms are noticeable in the lagoon from time to time. Poisoning from eating fish caught in the lagoon is on the increase as well. These are signs that the absorptive capacity of the lagoon is being exceeded and measures need to be taken to reduce the amount of waste entering the lagoon. The effects of effluent seepage into the lagoons were also noticed in Rakahanga. Therefore, at least in flat coastal areas the use of absorption beds for the disposal of treated effluent and/or primary treatment alone is considered inappropriate and contributors to environmental degradation.

324. The above problem is also relevant to the islands of the Southern Group where groundwater is used as a primary source of water supply and so the potential contamination of the water table is a concern. While the typical depths to the aquifers are in excess of 10 m, the highly porous coral sand offers little additional treatment for the percolating effluent. This is especially relevant areas where pit latrines are used as these units do not treat the

raw sewage. It is recommended that pit latrines be gradually phased out in favour of septic tanks and absorption or evapotranspiration beds.

325. The islands of the Northern Group are flat atolls with small land area and low elevations. Consequently, fresh water accumulates as a lens under the atolls at depths typically 2 - 5m below the surface. As such, these lenses are susceptible to contamination from land-based activities such as effluent discharge from pit latrines and septic tanks. The highly porous coral sand on the atolls provides negligible additional treatment for the infiltrating effluent. Therefore, as in the coastal areas of Rarotonga, the use of absorption areas for the disposal of treated effluent is considered unsuitable and a potential source of contamination to the water lenses.

326. Alternatives that would be more appropriate to coastal areas and atolls include effluent disposal by evapotranspiration and improving the quality of the effluent through secondary treatment. Under the former the absorption trenches could be modified to serve as evapotranspiration beds relying on evaporation and plant uptake of the effluent rather than absorption into the soil below. The system would still be susceptible to overflows during heavy rainfall periods, but then dilution of the overflow would mitigate the adverse impact. The overall effect on the environment would still be beneficial since in the dry seasons partially treated effluent would not enter the water table or the lagoon. The second option would be to change over the septic tanks to more advanced treatment units which provide nutrient removal and disinfection. This, however, would be costly and would require skilled technicians for maintenance who are in short supply in the Cook Islands at present.

327. There is insufficient data on the impact of wastewater discharges on the groundwater table and the environment. It is suggested that a national program be commenced to periodically sample water quality of the ground water and lagoons on all of the islands. Annual samplings would be adequate on the outer islands, but due to the higher population and the greater threat the lagoon on Rarotonga the test perhaps could be carried out semi-annually.

3. Rarotonga Wastewater Management Strategy

328. The population densities of the village areas of Avarua, Arorangi and Muri and their proximity to the lagoon warrant the consideration of centralized sewerage systems. A feasibility study is required to establish the extent of service coverage, the most appropriate treatment processes and effluent management, and the economic viability and financial sustainability requirements of such a scheme. The location of the treatment facilities and the mode of treated effluent disposal will be socially sensitive issues which will require extensive community consultation. In fact, it is strongly recommended that community consultation and participation be made a central feature of the project from the outset. Experience from other countries suggests that if the community does not take ownership of the project its attitudes will not be supportive, and there would be a high probability of failure of the scheme.

329. Effluent disposal is a controversial issue, but if it is appreciated that the Cook Islands includes nearly 2 million km² of territory of which only some 240 km² is land, than it becomes obvious that the scarce resource for habitation is land, not water. Therefore, provided that the wastewater is adequately treated, disposal of the treated effluent to sea beyond the reef, where there are ample depths and ocean currents for dilution and dispersion, would make a lot of sense. Inland disposal would bring up land issues and require pumping. It is also noted that there is abundant water on Rarotonga and so the need for reuse is less than it would be on the smaller outer islands.

330. In inland areas away from the coast, use of septic tanks and absorption beds is acceptable and should be continued. However, for the reasons mentioned in the section on

Environmental Impact Mitigation, it is suggested that in the coastal areas which are not to be connected to a centralised sewer system, absorption trenches be modified for use as evapotranspiration beds or the septic tanks be replaced by more advanced treatment units. The latter option would have large capital and O&M cost implications – it would place a large cost on households, especially those who recently invested in upgrading their septic tanks, and would need trained technicians for regular maintenance. The evapotranspiration bed option is considered as a reasonable interim solution suitable for the short to medium term. The treatment unit upgrade will be better in the medium to long term and should also be mandatory for new developments in the coastal zone as it is cheaper to install as part of an integrated site development than retrofitting an existing developed site.

331. Irrespective of what form of on-site systems are to be adopted, the disposal of effluent should be modified to divert some of the effluent away from the disposal bed to a drip irrigation system thus making beneficial use of the nutrient-rich water. This would comprise small diameter polyethylene pipeline, drip tubes and possibly a small solar powered pump if the topography does not allow gravity operation. The net effect would be a reduction in the amount of effluent discharged to the environment and better plant growth.

4. Septage Management Plan

332. A national septage management plan has been developed in 2004 under the ADB-funded National Waste Management Study by Maunsell of New Zealand. The plan calls for regulating the periodic pump out of the septic tanks. It is recommended that the plan be put in force as a matter of priority.

5. Biosolids Management Plan

333. There is no residuals (or biosolids) management plan for the sludge from the septage treatment ponds on Rarotonga or Aitutaki. As the septage ponds are not expected to need desludging for 5-7 years, there is ample time to develop a biosolids management strategy. In the interim, MOW intends to dispose of the accumulated residuals in the nearby sanitary landfill. There are a number of options that are worthwhile investigating as part of the ultimate strategy including composting of the residuals for reuse: as soil conditioner on Rarotonga and Aitutaki, to make soil supplement for other islands with poor soils and possibly engineering landfill. It is recommended that the feasibility of such reuse be investigated and candidate options trialed. A biosolids management plan needs to be developed and put in place within the next five years.

334. As previously mentioned in the section on Environmental Impact Mitigation, on the outer islands people just bury the raw septage in a pit. However, these residuals are a valuable resource that could help to improve the poor soils of the northern islands. The septic tank residuals could be recycled by composting to turn them into a soil supplement which when combined with bark mulch and compost from household food scraps, could produce fertile soil in significant quantities over a few years. The product could be used for the hydroponic plants in the short-term.

6. Sanitation Facilities for Emergency Centres

335. The CMC need adequate sanitation facilities in the case that people need to stay there for prolonged periods, say 3-5 days. It is during such events that community diseases, like typhoid, are most likely to break out due to overcrowding, unhygienic environment and lack of sanitary facilities. To avert such incidence, the septic tank at the CMC should be made flood proof to prevent it being inundated during intense rainfall or storm surges. The treated effluent could be discharged to a holding pond with capacity equivalent to waste generated by the refugees for 3-5 day. The pond would have to have sufficiently high

enough banks to reduce the risk of inundation and overflows. It may be necessary to use a small stand-by pump for transferring the treated effluent into the pond.

7. Community Awareness Campaign

336. There is an urgent need to increase community awareness about the need for sanitation and personal hygiene. An ongoing public education campaign must be implemented. This could comprise information on what kinds of wastes can and cannot be put in septic tanks, the impact on the environment and health risks associated with poorly functioning systems and what can the householder do to maintain the system in good condition. The hygiene awareness program is needed so as to educate the people about the health reasons why cleanliness is needed and to make people aware about the need for and how to improve their personal hygiene. The ongoing campaign should be started immediately and be repeated from time to time.

8. Developing Plant Operator and Maintenance Skills

337. With the introduction of new technologies for wastewater management, such as the neighborhood treatment plants in Rarotonga and the more advanced systems for use by households in environmentally sensitive areas, there will be a need for skilled operators who can audit, maintain and repair such units. A pool of such technicians will be needed. As the course for a licensed operator takes at least 12 months, the training process should be commenced once the feasibility studies have been approved for implementation.

F. Project Identification

338. A suggested list of projects in the sanitation sector under a 20-year master is included in Table 16. Cost estimates will be prepared once the broad thrust of the plan is agreed.

Table 16: Summary of Suggested Projects in the Sanitation Sector

Island	Suggested Projects		
	Immediate (1-3 years)	Medium to Short Term (3-10 years)	Long Term (10-20 years)
Rarotonga	<ul style="list-style-type: none"> Put in force the national septage management Plan (making desludging of septic tanks mandatory) Commission a wastewater collection, treatment and disposal feasibility study for Rarotonga focusing on Avarua, Muri and Arorangi areas Trial evapotranspiration beds in foreshore areas Research and set national planning, design criteria for wastewater systems Commence an ongoing community education campaign on sanitation and hygiene 	<ul style="list-style-type: none"> Design and construct sewerage schemes for Avarua, Arorangi and Muri villages and peripheral areas Improve septic tank/absorption bed systems in foreshore area (if trial of evapotranspiration beds successful) Develop and put in force a national biosolids management plan Review effectiveness of national septage management plan Conduct operator and maintenance technician training programs Set up an ongoing groundwater (in foreshore areas) and lagoon water quality monitoring program Ongoing community education campaign on sanitation and hygiene 	<ul style="list-style-type: none"> Upgrade wastewater master plan for the island Expansion of village sewerage systems and treatment facilities Review of effectiveness of national septage and biosolids management plans Periodic skill upgrade and training of plant operators and maintenance technicians Ongoing groundwater and lagoon water quality monitoring program Ongoing community education campaign on sanitation and hygiene
Southern Group	<ul style="list-style-type: none"> Install flushing toilets in all households Convert pit latrines to septic tanks Review adequacy and upgrade sanitation facilities at all CMC Commence an ongoing community education campaign on sanitation and hygiene 	<ul style="list-style-type: none"> Design and construct septage treatment ponds on each island (except Aitutaki) Commission a wastewater management strategy study for Aitutaki Enforce national septage management plan Enforce national biosolids management plan 	<ul style="list-style-type: none"> Review and update adequacy of wastewater management system on each island Construct centralized sewerage scheme for developed areas of Aitutaki Periodic skill upgrade and training program for plant technicians
Southern Group (continued)		<ul style="list-style-type: none"> Set up an ongoing groundwater and lagoon water quality monitoring program Ongoing community education campaign on sanitation and hygiene 	<ul style="list-style-type: none"> Ongoing groundwater and lagoon water quality monitoring program Ongoing community education campaign on sanitation and hygiene

Island	Suggested Projects		
	Immediate (1-3 years)	Medium to Short Term (3-10 years)	Long Term (10-20 years)
Northern Group	<ul style="list-style-type: none"> • Install flushing toilets in all households • Review adequacy and upgrade sanitation facilities at all CMC • Trial evapotranspiration beds for effluent disposal • Commence an ongoing community education campaign on sanitation and hygiene 	<ul style="list-style-type: none"> • Design and construct septage treatment ponds on each island • Pilot conversion of residuals to soil • Enforce national septage management plan • Enforce national biosolids management plan • Set up an ongoing groundwater and lagoon water quality monitoring program • Ongoing community awareness education campaign on sanitation and hygiene 	<ul style="list-style-type: none"> • Review and update adequacy of wastewater management system on each island • Renew septic tanks and disposal beds as required • Periodic skill upgrade and training of plant technicians • Ongoing groundwater and lagoon water quality monitoring program • Ongoing community education campaign on sanitation and hygiene
Overall Indicative Cost Estimates	None currently planned/committed		

Source: Estimates based on Consultant's analysis

G. Institutional Assessment

1. Stakeholder Agencies

339. The review undertaken through ADB TA 4273-COO identified a fragmented institutional arrangement that lacked coordination between the three government agencies involved, and an ineffective regime for managing the pollution caused by poorly placed and constructed or inadequately maintained septic tanks and sewage treatment systems. In this section the key stakeholders are

a. Department of Health

340. *Public Health Act 2004* provides for the DOH to monitor devices and facilities, plants and systems that treat sewage and regulate the removal and disposal of liquid waste.

341. The National Septage Management Plan was developed under the ADB loan-funded National Waste Strategy project in 2004 and has not yet been adopted. New draft regulations and institutional frameworks to control the siting, construction and operation of septic tanks and sewage treatment systems on residential and commercial properties were developed under ADB TA 4273-COO in early 2006. These were reviewed and revised by stakeholders at a recent workshop funded jointly by ADB and NZAID. The document is currently being reviewed under this project for integration into proposed institutional action plan. Under these regulations MOH has the responsibility for the entire process commencing with applications to build systems, through to site inspections, approval and continued monitoring. Under the new regulations the Secretary for Health will appoint persons with the necessary technical qualifications, including fee charging private sector inspectors to undertake site inspections, supervise construction and monitor operations.

b. Ministry of Works

342. The *Building Control and Standards Act 1991* and the *Building Control and Standards Regulation 1991* require the MOW to inspect the construction of septic tanks. Specifications for construction are included in the *Building Code*. Under the proposed new regulations the role of MOW in the control of sewage systems is significantly reduced. MOW does however manage the Rarotonga Waste Management Centre (RWMC) that includes a septage treatment system.

343. In current practice, MOW issues the permit for construction of a building. However, issuance of such a permit is dependent upon other things the developer/owner obtaining a permit from the DOH for the design and construction of a wastewater treatment facility, typically a septic tank for residential housing, and from the National Environment Services if an environmental impact assessment report is required.

c. National Environment Services

344. *The Environment Act 2004* authorizes the National Environment Services (NES) to deal with "Specific Areas of Concern" regarding the protection of foreshores, inland and Cook Island coastal waters from the discharge from septic systems and septage processing facilities. However it is reported that NES's reported lack of capacity has led to the new regulations providing NES with little or no responsibilities in this area.

345. Several of the issues discussed under solid waste in relation to the Rarotonga WMRU (see Section on Solid Waste Management Sector) are germane to the sanitation sector responsibilities of MOW and NES.

d. Island Administrations

346. The *Outer Islands Local Government Act 1987* provides for the Island Councils to make by-laws to regulate and control septage collection and disposal but no known by-laws are in place. The Aitutaki Island Council is understood to be preparing to enact the recently developed septic system regulations mentioned above. The Aitutaki IA operates the WMRU similar to that in Rarotonga. While an increasing number of OI residents are changing from lagoon and pit toilets to the more hygienic flush toilets and septic systems, none of the other islands currently have septage treatment facilities.

e. Private Sector

347. Private sector plumbing services construct septic systems on Rarotonga and Aitutaki. While there are no organized plumbing businesses on the OIs, private persons with some skills construct septic systems. Private sector contractors provide a septic tank sludge pump out service to householders on Rarotonga. Householders pay for this service which includes the cost of transport and dumping the sludge into the septage pond at the WMRU.

2. Institutional Issues

348. MOH must be praised for taking the initiative of providing leadership in this severely neglected sector. To adequately carry out this service however, MOW will in the future need to acquire the services of appropriately skilled professionals such as structural and sanitation engineers. The placement of such technical skills in MOH would be an inefficient use of scarce resources.

349. The institutional arrangements widely practiced overseas would place the responsibility for planning, design approval and supervision of construction of septic systems with an institution equivalent to MOW. The environmental agency (NES in the Cook Islands context) would be responsible for issuing permits for the discharge of treated effluent from septic systems and septage treatment plants and for their ongoing monitoring. The health authorities (MOH in this case) would have the marginal role of setting appropriate standards for effluent quality for parameters which may affect public health.

350. Given the institutional ownership of certain professionals in MOH and the lack thereof in other agencies, the current institutional arrangements may, in the short term, work best for Rarotonga. However, MOH does not have the capacity to provide the necessary policy, planning and technical leadership and support to the OIs.

351. When a sewerage reticulation system will be eventually introduced on Rarotonga the capacity of MOW in this sector will be expanded. That may then be the best time to consider the transfer of septic system responsibilities to MOW.

352. Currently, the health inspector on each OI is responsible for the acceptance of applications to construct septic systems, to supervise the construction and inspect and monitor existing systems. It is considered that health inspectors on the OIs lack the capacity despite having received some training under the ADB/NZAID co-funded Marine Resources project. Even if this responsibility is eventually shared with the infrastructure specialists in the IA, ongoing some capacity building will be required. It is noted in this context that health inspectors effectively do not control the burial of septage on site next to the septic tank even though the practice poses health and environmental risks.

353. Increasing numbers of OI households are installing flush toilets and constructing septic systems. OMIA does not have the capacity to provide the technical advice and support necessary to assist and strengthen the ability of IAs to develop policy, strategic

plans and implement, manage and operate safe and sound septic and septage systems. MOH does not have the engineering capacity to provide support and assistance to the IAs. On the other hand, MOW could, with additional capacity and resources provide this service to the infrastructure staff on OIs. Indeed, it makes for institutional efficiency having the central agency providing IAs with the policy, planning and technical support for water and solid waste to also provide the same services for wastewater management.

3. Suggested Institutional Improvements

354. While the current institutional arrangements may, in the short term, work best on Rarotonga given the institutional ownership of certain individuals in MOH, it is essential that the capacity of both MOW and NES be developed so as to permit them to effectively discharge their legitimate roles and responsibilities.

355. It is recommended that AMD (or the organization established by government to coordinate development projects) seek funding for:

- A comprehensive capacity building package to strengthen the capacity of MOH, NES, MOW, IA and MOH staff to develop policy and strategic plans for, and implement and support the ongoing operation, maintenance and monitoring of, sewage and septage systems in Rarotonga and the OIs; and
- Technical assistance to provide initial support to island wide awareness of the relationships between sewage and liquid waste disposal, the limited and shallow ground water resources and public health.

IX. SOLID WASTE MANAGEMENT SECTOR

A. Sector Overview

356. There have been some big improvements in the solid waste management sector in recent years with the commissioning of municipal landfill sites on the two most populous islands of Rarotonga and Aitutaki. Wisely, CIGOV is promoting waste separation and recycling. Despite these big improvements there is still much to be done, especially on the outer islands where solid waste is still either burnt or disposed at open dumps, often just behind the beach. The management of hazardous waste is an emerging problem that will need attention in the coming years. CIGOV set a target of 30% reduction in the waste disposed to landfill by the year 2010 under its Millennium Development Goals (*Ref: Cook Islands Millennium Development Goals National Report, June 2005*). Overall, the sector is in a manageable state and with some modest investment and a good community awareness campaign, most of the infrastructure problems could be easily reduced.

357. Solid waste management is another sector with low budgets. In fiscal year 2005/06 only \$30,000 was allocated for capital expenditure in this sector. (*Source: Cook Islands Appropriations Amendment 2005-2006*). Perhaps it is in the wake of large investments in the sector with the two landfill sites and waste recycling station, and perhaps it also highlights the low priority allocated to addressing the same issues on the outer islands.

358. The performance of the sector as a whole is hampered by limited human resources and skills, a fragmented institutional structure and initiatives that lack inter-agency coordination and dialogue. This is evident in the outer islands where many works are carried out on an ad hoc basis in response to short-term needs rather than within a clear strategy framework. As with the other municipal service sectors, there is a need for institutional strengthening through a comprehensive sector policy review and operational efficiency improvement.

B. Objectives

359. The CIGOV objectives in the sector are to provide communities with sustainable and appropriate waste management practices that will minimize public health risks and adverse environmental impacts. The National Sustainable Development Plan Targets directly affecting infrastructure development are summarized in Appendix B.

360. The aims in the solid waste management sector under this project are to establish an investment program that will enable the CIGOV to reach its stated objectives through the construction of appropriate infrastructure that will allow solid waste to be managed in an environmentally sustainable manner and which will raise public awareness about the need for minimizing waste.

C. Existing Status

361. Existing solid waste management assets and their condition on each island and observations made during the field visits under this project are summarized in Appendix C. A brief description of the existing status of solid waste management on Rarotonga, Aitutaki and the other outer islands is presented below.

1. Rarotonga and Aitutaki

362. New landfill sites on Rarotonga and Aitutaki, funded under an ADB loan, will meet the solid waste management needs of these islands in the medium term. The sites are well engineered and operate smoothly, although the cover of the Rarotonga site was damaged

by the 2005 cyclones. Garbage is collected from households twice per week on Rarotonga and fortnightly on Aitutaki. Most households burn their green waste.

363. There is also an active waste separation and recycling program under which plastic bottles and paper are collected, compressed and bundled for shipment to New Zealand. Scrap metal is collected separately on Rarotonga and shipped to North East Asia for recycling.

2. Other Outer Islands

364. There are no engineered landfill sites on any of the other islands. On the southern islands, waste is collected by the solid waste section of the Island Administrations and taken to a central municipal dump site. Collection is typically weekly. Some form of waste separation is being introduced on all islands in the Southern Group.

365. In the Northern Group a municipal dumps exist only on Manihiki and Rakahanga. On all other islands, households use private pits or burn the rubbish. Medical waste including needles are either burned in 44-gallon drums or dumped at the rubbish tips.

D. Proposed Minimum Level of Service Standards

366. A suggested minimum level of service standards that may be adopted for prioritizing solid waste projects over the planning period are:

- Sustainable rubbish disposal facilities exist – either as on-island disposal or shipment off-island;
- In case of on-island disposal, waste is not causing health problems for community;
- In case of on-island disposal, waste is not polluting the water supply sources.

E. Needs Assessment in the Sector

1. Health Risk Reduction

367. Most of the rubbish dumps are uncovered and attract wandering pigs, flies and other vermin. These are vectors for disease and so pose a community health risk. As none of the sites are lined (except for the new engineered landfill sites), contamination of the groundwater by leachate is a major concern. This in turn affects water quality and so poses another health risk. Periodic cover of the landfill sites with sand would help to reduce the vermin problem.

2. Environmental Impact Monitoring

368. The municipal dump sites on outer islands are unlined and do not have perimeter cut off drains or site runoff interceptor drains. Consequently, site runoff and leachate contaminate the local environment. The main concern is with contamination of the freshwater lens which is the potential back up water supply source for the communities. The contaminants would eventually find their way into the lagoons and pose a treat to the eco-system. An environmental monitoring program is needed comprising annual checks on groundwater quality along the perimeter of the dump sites. For all new landfill sites, liners should be used to contain the leachate.

3. Landfill Sites on all Islands

369. New landfill sites are required on all islands. It is recommended that a suitable site be identified on each island immediately with a view to establishing a simplified landfill operation in the next 3-5 years. At the minimum, site development would involve proper drainage system, liners and environmental monitoring wells. The operation and capacity of all facilities will need to be reviewed periodically.

4. Medical Waste Management

370. Medical waste disposal practices are a major health risk at present. During the field visits hospital staff advised that typically they burn the medical waste along with general rubbish, and sharp objects are usually discarded at the municipal dump or garbage pits. Options for safe disposal of medical wastes need investigation.

5. Hazardous Waste Management

371. One of the major concerns on the outer islands is the disposal of old electrical and electronic appliances, batteries, cars and other plant and equipment. The hazardous wastes are bulky and difficult to bury as well, so most are left exposed to rust in the open. It is suggested that a small study be conducted to look at the feasibility of removal of such waste from each island, say once a year, by a cargo vessel and transporting it to Rarotonga for further processing at a central facility before shipment to its final destination offshore.

6. Composting Plan

372. In view of the poor soils especially on the northern islands, composting of degradable waste offers an opportunity to improve naturally occurring soils, in fact to make soil. The biodegradable material could be composted and blended with bark mulch and composted septic tank residuals, to produce fertile soil in significant quantities over a few years. The product could be used for the hydroponic plants in the short-term. It is suggested that a pilot plant be set up in the northern group to assess the feasibility of the scheme.

7. Community Awareness Campaign

373. There is an urgent need to increase community awareness about the need for proper disposal of garbage. The program should be combined with the sanitation and personal hygiene. An ongoing public education campaign must be implemented. The program should also include the "3R campaign" – reduce, recycle and reuse. This is essential if the government's millennium development goal of 30% reduction in waste disposed at landfill sites is to be achieved.

8. Developing Plant Operator and Maintenance Skills

374. There needs to be periodic training for plant operators to refresh their skills and to learn the latest trends and practices in solid waste management.

F. Project Identification

375. A suggested list of projects in the solid waste management sector under a 20-year master is included in Table 17. Cost estimates will be prepared once the broad thrust of the plan is agreed.

Table 17: Summary of Suggested Projects in the Solid Waste Management Sector

Island	Suggested Projects		
	Immediate (1-3 years)	Medium to Short Term (3-10 years)	Long Term (10-20 years)
Rarotonga	<ul style="list-style-type: none"> • Repair cover at landfill site damaged by the 2005 cyclone • Commence ongoing 3R (reduce, reuse recycle) campaign • Medical waste disposal options study 	<ul style="list-style-type: none"> • Review efficiency and needs of waste collection fleet • Conduct operator skill upgrade and training program • Construct medical waste disposal facility • Review and upgrade solid waste management master plan • Continue ongoing environmental monitoring program • Ongoing 3R campaign 	<ul style="list-style-type: none"> • Upgrade solid waste management master plan • Design and construct expansion of landfill facilities • Procure replacement and additional garbage collection vehicles as needed • Continue ongoing environmental monitoring program • Periodic skill upgrade and training program for operators • Ongoing 3R campaign
Southern Group	<ul style="list-style-type: none"> • Commission national hazardous and recyclable waste management strategy study (covering all islands) • Identify location for new landfill sites on each island except Aitutaki • Establish environmental monitoring program on each island • Commence ongoing 3R (reduce, reuse recycle) campaign 	<ul style="list-style-type: none"> • Review collection and disposal efficiency on Aitutaki • Review and upgrade solid waste management master plan for Aitutaki • Implement annual collection of hazardous and recyclable waste from all islands and ship to central plant • Construct new sanitary landfill site on each island • Establish compost facility on each island • Conduct operator skill upgrade and training program • Continue ongoing environmental monitoring program • Ongoing 3R campaign 	<ul style="list-style-type: none"> • Review solid waste management strategy for all islands • Design and construct expansion of Aitutaki landfill facilities • Plan and construct expansion of landfill sites or locate new sites for other islands • Procure replacement and additional garbage collection vehicles as needed • Annual collection of hazardous and recyclable wastes from all islands • Continue ongoing environmental monitoring program • Periodic skill upgrade and training program for operators • Ongoing 3R campaign

Island	Suggested Projects		
	Immediate (1-3 years)	Medium to Short Term (3-10 years)	Long Term (10-20 years)
Northern Group	<ul style="list-style-type: none"> • Identify location for new landfill site on each island • Establish environmental monitoring program on each island • Pilot village composting facility and feasibility of soil production • Commence ongoing 3R (reduce, reuse recycle) campaign 	<ul style="list-style-type: none"> • Implement annual collection of hazardous and recyclable waste from all islands and ship to central plant • Construct new sanitary landfill site on each island • Establish compost facility on each island • Conduct operator skill training • Continue ongoing environmental monitoring program • Ongoing 3R campaign 	<ul style="list-style-type: none"> • Plan and construct expansion of landfill sites or locate new sites for other islands • Procure replacement and additional garbage collection vehicles as needed • Annual collection of hazardous and recyclable wastes from all islands • Continue ongoing environmental monitoring program • Periodic skill upgrade and training program for operators <p>Ongoing 3R campaign</p>
Overall Indicative Cost Estimates	None currently planned or committed		

Source: Estimates based on Consultant's analysis

G. Institutional Assessment

1. Stakeholder Agencies

a. Ministry of Works

376. The *Supportive Services Act 1994* requires that the MOW provide public facilities required for the development of the Cook Islands. The *Rarotonga Island Council: (Empowering Public Works and services) Ordinance (4 of 1959)* empowers the Councils to provide refuse disposal facilities and to levy such charges as necessary to carry out the works.

377. The Waste Management and Recycling Unit (WMRU) of MOW is responsible for the operation of landfill and recycling facilities designed and constructed under the ADB Waste Management Project. The Unit's staff includes one engineer and four site workers. A similar facility was constructed on Aitutaki under the project. The latter facility has not yet been issued with a completion certificate. It is intended that the responsibility for the monitoring of the facility will be handed over to NES as soon as the completion certificate is issued.

378. MOW currently provides a technical advisory service on solid waste disposal to the OIs on request. Assistance is currently provided to Aitutaki, Atiu and Mangaia and MOW would like to extend this service to all OIs and include capacity building in both technical matters and policy and strategic planning for the disposal of solid waste.

b. National Environment Services

379. The NES is the responsible for policy and strategic planning of solid waste disposal and is empowered under the *Environment Act 2004* to deal with "Specific Areas of Concern" regarding pollution from solid waste disposal sites. A Cook Islands National Waste Strategy (NWS) was developed in 1993 by an ADB TA and in accordance with its roles and functions NES has responsibility for its endorsement. The NWS has to date not been endorsed. It is reported that the delay in endorsement is due to the lack of cyclone debris strategies.

380. There is currently little collaboration between NES and OIs. The development of a corporate plan will assist NES in the development of technical and operational capacity to extend their responsibilities to support OIs.

c. Department of Health

381. The *Public Health Act 2004* provides for the MOH to issue permits for and oversee the construction and engineering of waste disposal sites and issue permits and monitor the collection of waste and its treatment and disposal. As part of its monitoring role MOH undertakes regular site visits to the Rarotonga and Aitutaki facilities to check for leaks and pests. MOH conducts regular spraying for flies. Health Inspectors on each of the OIs have the responsibility to monitor solid waste disposal though a lack of training and funding militates against their effective participation.

d. Island Administrations and Councils

382. IAs are responsible for the policy, planning and implementation of solid waste disposal on each of their islands. All IAs provide free weekly collection of solid waste from households. Landfill dumps are operated away from villages. There is no separation of organic and inorganic waste nor organised recycling on any of the islands except Mangaia where a NGO did conduct a pilot recycling project. Vaka Councils in Rarotonga have no

formal responsibilities but have taken the initiative to assist in the controlling of roadside waste and in assisting households to dispose of household waste.

e. Private Sector

383. The private sector is involved in various contracts and self generated activities in Rarotonga in support of waste management. Private contractors collect household solid waste collection in both Rarotonga and Aitutaki for delivery to the waste disposal facilities. Householders are required to separate organic and recyclable waste for collection. Private contractors are engaged on an as need basis to spread and compact solid waste at the two waste disposal facilities. Other private sector initiatives include waste oil recovery system, aluminium cut-offs and cans and scrap metal recycling for export and recycling of soft drink bottles.

f. Communities

384. The management of waste should be a partnership between government, communities and the private sector. There are in Rarotonga several community initiatives for the protection of the environment and recycling of solid waste. Waste management campaigns at the school and community levels should focus on behaviours based on reduction, reuse, recycling, and residual.

2. Issues and Options

a. National Level

385. The current institutional arrangement for solid waste is fragmented and lacks coordination between the three government agencies involved who fail to manage and implement an effective regime for managing the pollution from solid waste. The current Waste Committee chaired by the Chief of Staff of the Office of the Prime Minister with heads of MFEM and relevant ministries was established to manage and monitor the ADB Waste Management Project. It is reported that there is a lack of interdepartmental coordination and communication at the technical level. There have been discussions for the establishment of a single body to oversee national waste disposal issues, set priorities, evaluate proposals, give direction, and monitor a sustainable waste management plan for the Cook Islands. Such a body needs to be established and include private sector and community representatives. The body should be serviced and advised by a formalized technical group that includes the private sector and civil society.

386. There is currently no accepted strategy, management plan or regulatory mechanisms to address the issues of solid waste reduction and disposal.

b. Rarotonga

387. The original plan for the Rarotonga Waste Disposal Centre was that MOW would manage the site for a year and then contract out or privatise the operations with NES taking over responsibility for monitoring of the site.

388. Full privatisation of the centre is reported not to be a viable option at present as operations are uneconomical and prices that would need to be charged to make it so would be unacceptable. However it is reported that a mix of contracting out of operations and management and privatisation of the recycling centre is a possibility. This operation is currently run at a loss but is reported to be potentially a profitable enterprise. Similar measures should also be considered for the Aitutaki facility.

389. The contractors conducted some training of MOW and NES staff on testing procedures however no testing has been conducted since the original testing took place more than a year ago. Analysis of the initial tests was undertaken in-house by MOW, at the DOH laboratory at Rarotonga Hospital and in New Zealand. A suggested regime for testing prepared by the contractors is reported to be too complex and NES has as yet not taken over the facility and has therefore not assumed responsibility for testing. A comprehensive capacity building package including assistance developing an acceptable testing regime and training for NES, MOW and Aitutaki IA staff in sampling and testing and equipment is required.

c. Outer Islands

390. IAs have little or no capacity to develop policy, strategic plans and implement, manage and operate safe solid waste disposal systems. OMIA does not have the capacity to provide the technical advice and support necessary to assist and strengthen the ability of IAs. MOW is currently assisting some islands on a request basis. Options include the maintaining of the status quo, the strengthening of OMIA's capacity to provide technical and other services to the IAs or transferring the role of provision.

d. Cost Recovery

391. The service of solid waste collection on Rarotonga and the OIs is provided free of charge to consumers by MOW and IAs respectively. This service is contracted out to the private sector in Rarotonga and Aitutaki and undertaken by IAs in other OIs. In Rarotonga and Aitutaki people taking their own solid waste to the facilities are charge a nominal fee. Current estimates by MOW for the continued cost of operation of the Rarotonga and Aitutaki waste disposal facilities place full cost recovery beyond consumer capacity. Fees could however be charged for the collection of solid waste service provided in Rarotonga and the OIs.

3. Suggested Institutional Improvements

392. It is recommended that:

- The current Waste Committee of the ADB Waste Management Project be reconstituted to form a permanent body with representation from private sector and community representatives and be serviced and advised by a technical group that also includes the private sector and civil society;
- MOW's WMRU be provided with the capacity and resources to extend its services to all OIs; and
- A cost recovery and tariff study be undertaken for solid waste disposal services in Rarotonga and the OIs.

393. It is further recommended that AMD (or the organization established by government to coordinate development projects) seek funding for the development of a project to provide:

- Technical assistance to facilitate the adoption of the NWS and support for the development of a waste management plan and draft support regulations;
- Technical assistance to provide initial support to island wide waste minimisation campaigns involving schools, NGOs, Churches and local councils to be developed identifying roles and responsibilities of various groups and activities they could undertake; and

- A comprehensive capacity building package to strengthen the capacity of NES, MOW and IA staff to develop policy and strategic plans for, and implement and support the ongoing operation, maintenance and monitoring of solid waste disposal in Rarotonga and the OIs.

X. TELECOMMUNICATIONS

A. Objective

394. There is a need to reduce the isolation of the OIs and to provide reliable and affordable infrastructure and social services to sustain economic development and to improve the social well-being of all islands. Telecommunications plays an important role in connecting the islands and, given today's technology, it should be possible to provide a uniform high standard of telecommunications to all islands.

B. Status

395. Telecom Cook Islands (TCI) is the sole provider of telecommunications to the Cook Islands. It is a privately owned company with Telecom New Zealand (TNZ) holding 60% shares and the CIGOV holding the remaining 40%. TCI provide Internet and, local, national, and international telecommunication services to all islands except Suwarrow, which uses HF Radio as a means of communications. In 2004, Nassau received its first telephone system. Table 18 below provides an indication of the take-up of communication facilities in privately occupied dwellings as reported by census participants in 2001.

396. Table 18: Private Occupied Dwellings & Communication Facilities

Island	Telephone	Facsimile	Cellular Phone	Internet Access
Rarotonga	2,227	314	556	486
Aitutaki	308	36	2	18
Mangaia	159	11	1	1
Atiu	119	7	-	3
Mauke	80	3	-	1
Mitiaro	35	2	2	1
Palmerston	1	-	-	1
Pukapuka	62	4	-	-
Nassau	-	-	-	-
Manihiki	64	20	-	-
Rakahanga	26	2	-	-
Penrhyn	66	10	-	1
Suwarrow	-	-	-	-
Total	3,147	409	561	512

Source: Cook Islands 2001 Census of Population & Dwelling, Main Report, Statistics Office

C. Proposed level of service standard

397. It is envisaged for the telecommunications sector, that each household have basic access to telephone, facsimile, and Internet facilities. It is also recognized that receiver stations should be cyclone proof, and that during emergency warnings, public broadcasts should reach all households. Although these proposed levels of service are very basic standards, some islands still do not meet these minimum requirements. An example of this is Palmerston Island.

D. Needs Assessment

398. With telecommunications available on all populated islands, there is a need to ensure that these facilities are reliable and affordable. In the OIs Internet access has been identified as one of the major shortfalls of this sector with 28kbs dial up Internet access. In most instances however, users have found it very difficult to get connected and find the system very slow. Due to the delay time, connections are terminated; the user has to redial the connection, and is therefore charged again for Internet access.

1. Education

399. In today's information and communications technology world, there is a need to address the issue of improving Internet services in the OIs. This will assist with the education system enabling distance learning as a mode of study. On most OIs, parents send their children to Rarotonga or overseas to further their education which is a large expensive to families, with travel costs, living costs (food, clothing, accommodation, daily subsistence allowances), and school fees.

400. Distance Education could be used as a mode of study for adult education, as well as for primary and secondary school levels. A study was conducted in 2002, identifying national training needs for the Cook Islands. With reliable Internet access, it would be possible to increase OIs training capacity, bringing communities to a level similar to that on Rarotonga.

401. The Ministry of Education has developed an Edu-Net system – a development for distance education. This system has been established to assist the formal education sector to offer a variety of subjects. New servers have been provided and the project is currently under re-evaluation as there are some minor glitches in the system administration. TCI have been involved with assisting the Ministry with the implementation of the project.

2. Health and Other Government Services

402. A Telehealth system has been implemented by the Ministry of Health that allows Resident Doctors on the OIs to be able to communicate with Doctors in Rarotonga and in New Zealand (Counties Manukau District Health Board) for patient diagnosis and treatment. Again TCI has assisted the Ministry in implementing this project.

403. An E-Government project jointly funded by the CIGOV & UNDP project was established in 2005. E Government is the delivery of services to citizens (G2C), businesses (G2B), and other government agencies (G2G). E-islands will be introduced at a later date to connect the OIs with the E-Government system.

404. An ICT Border Control Management System is a new project that is currently under consideration by the CIGOV through the Ministry of Foreign Affairs & Immigration, as calls mount to tighten border security in and out of every country in the wake of the September 11th tragedy and the rising threat of terrorism to the region.

405. The above projects are still ongoing and more work on the implementation stage need to be addressed by the various agencies in conjunction with Telecom.

3. Private Sector

406. Reliable Internet access can also assist business development in the OIs, whereby the private sector is able to advertise their goods and services on line. This can contribute

significantly to economic development on each island. It also allows purchasing on line for consumers and businesses alike.

4. Public Radio

407. At present each island has the ability to receive public broadcasts of the AM Radio Station in Rarotonga, which is decoded and used to a feed a FM transmitter configured to provide coverage to the island. This project is a joint effort between the CIGOV and TCI. The rationale behind this project is to supply the OIs with a good quality national radio broadcast signal to be able to receive reliable news broadcasts, and in times of natural disasters, emergency warnings.

408. For those remote islands that only have public phone access (Palmerston, Nassau) or depend on relay services (Atiu-Mitiaro, Manihiki – Rakahanga), alternative sources need to be determined at the earliest in case of system failure.

409. With TCI being a monopoly of telecommunication services, there is a major risk of system failure right around the Cook Islands. Government now needs to explore various options in this sector taking into consideration alternative service providers that can provide reliable and affordable services.

410. With access to Internet, there is a need to adopt a legal framework encompassing privacy and security of data, legal sanction of new forms of storage and archiving, and laws that accept paperless transactions. With the assistance of Telecom Cook Islands, the Australian Department of Information & Communication Technology & Arts (DCITA), has agreed to draft model legislations for small Pacific Island countries which will cover a wide range of ICT topics and issues.

E. Project Identification

411. The basic telecommunications infrastructure is already in place in each island. The primary need is to improve Internet service to support government operations, education and health services and private sector commercial activities. The most pressing requirement is to provide high-speed Internet service (either broadband, ADSL or wireless) to the IAs, hospitals and schools on each island. This should be provided by the government to enable the introduction of high-speed services, following which the private sector may purchase the services it needs from TCI.

F. Institutional Analysis

412. Agencies involved in the Telecommunications sector, are TCI, government ministries, island administrations, and the private sector. It should be mentioned that Cabinet are still reviewing the extension of an Exclusive License for TCI to operate as a monopoly in the Cook Islands. A decision has yet to be made, and this could have a major effect on the sector as a whole should the current situation change.

1. Telecom Cook Islands Limited

413. Telecom Cook Islands Ltd (TCI) is the sole provider of telecommunications in the Cook Islands. TCI is a private company owned by Telecom New Zealand (TNZ) Ltd (60%) and the CIGOV (40%).

414. TCI has a presence on all islands except Suvarrow providing local, national and international telecommunications as well as Internet access. Telecom technicians are

stationed in all islands except Mitiaro and Palmerston (served from Rarotonga) and Rakahanga (served from Manihiki).

2. Government and Island Councils

415. Local television services are owned and operated by Island Councils in all of the southern islands except Aitutaki and in Manihiki and Penrhyn. Using their own satellite dishes the stations record and rebroadcast a selection of material from Australia (ABC) and US (CNN) as well as locally produced amateur material and public service announcements. News and other items produced by Cook Islands Television (CITV) in Rarotonga are recorded and air shipped to OIs (particularly in the Southern group) for rebroadcast.

3. Other Private Sector

416. CITV and Radio Cook Islands are owned and operated by Elijah Communications, a subsidiary of the Pitt Media Group (PMG). PMG has also been given a licence for an FM Station, but not taking up an option to broadcast FM to the outer islands.

417. Cook Islanders may have a second television station within six months, and at least two new FM radio stations. The government's approval of a five-year licence for the new station ends an eight-year monopoly enjoyed by CITV. The new station's owner has a video company, Te Digital Factory, which has been in production for 12 months and is reported to have held talks with Television New Zealand and Australian Broadcasting Corporation on developing the new service which is looking at using different technologies like UHF, digital TV and fibre optics.

418. There are privately owned Internet cafes in both Aitutaki and Rarotonga.

4. Options and Recommendations

419. The government's recent decision to open the media sector to more competition will provide consumers with both wider choice and the benefits of competition. Time will answer the question as to how successful new private sector media ventures will prove in what is probably one of the world's tiniest media markets.

420. TCI's monopoly of the telecommunications market however remains, providing at some of the worlds highest prices, what is at best a reasonable service in Rarotonga but marginal in the OIs. Government's reluctance to open the market to other providers and its seeming lack of concern for the high cost to consumers is in no small part the result of the lucrative dividends it receives from TCI.

421. According to the TVNZ report, TNZ made an annual profit of around NZ\$8 million representing windfall of NZ\$667 per user from a country with a GDP of around NZ\$8,000 per capita. This is reported to be a handsome return on TVNZs equity and the dividends to CIGOV are a significant proportion of its annual earnings.

422. It is reported that TCI's current monopoly agreements with government are due to expire and that negotiations are underway. A TVNZ report alleges that TNZ has offered CIGOV NZ\$4, a considerable cash incentive to maintain the telecommunications monopoly. Undoubtedly CIGOV is considering the effects to both consumers and its own budget before deciding between continuing the monopoly or opening the network to other providers.

XI. OUTER ISLAND OPERATION AND MAINTENANCE FACILITIES

A. Objective

423. There is a need to increase and improve the serviceability and prolong the useful life of plant and equipment on the OIs, through safe operation and regular maintenance. In order to achieve this, the Island Administrations require adequate maintenance facilities equipped with the appropriate tools and spare parts.

424. The infrequent shipping and air services to the Northern Group islands poses a special problem. Equipment has to be transported to Rarotonga for major repairs and parts require weeks or months to arrive by ship or air. There is a need to reduce the waiting time for repairs and spare parts by establishing a centralised maintenance repair shop and stores depot in one of the northern islands.

B. Status

425. In the OIs, especially in the Northern Group and some of the Southern Group islands, there is great concern over the welfare of machinery procured to implement and maintain infrastructure projects. At present the only maintenance facilities or mechanical workshops, as they are commonly called are operated by the Government through the Island Administrations. These are mainly small buildings located on Crown Land with basic equipment to tend to simple mechanical repairs. There are no shelters for heavy machinery and they therefore end up being left out in the open and exposed to severe weather conditions such as rain and sea spray.

426. In the absence of the appropriate tools and equipment, heavy maintenance or overhaul works on machinery such as power generators are carried out at the OMIA workshop on Rarotonga. Some of the major maintenance works are even carried out in New Zealand. This means shipping the equipment or machinery to Rarotonga or from Rarotonga on to New Zealand to be overhauled or repaired and then returning them to the island by sea. It is apparent that there are huge costs involved with these arrangements.

427. The Island Administrations do not normally stock spare parts for their machinery due to limited operating budget appropriations. Therefore, if there are breakdowns to any of the heavy machinery, spare parts are either purchased from Rarotonga or New Zealand.

428. Some of the Islands Administrations rely on OMIA to carry out their supplies procurement on their behalf. Most of the time it takes about six weeks for parts to arrive to the islands by boat. In some cases the Island Administrations have resorted to other sources such as the private sector or public service personnel who had experienced in this line of work for assistance to do the procurement for them. These islands are comfortable with the latter arrangement and sometimes considered it more efficient.

429. Apart from the simple asset register operated by the Island Administration as part of its fiscal responsibilities, there are no asset management plans in place. Some Island Administrations had argued that because of the limited budget given to them annually it is very difficult to effectively follow or implement a maintenance plan and to a wider scope, an asset management plan.

430. Furthermore, the operating budgets for the respective Island Administrations are appropriated annually from the national budget. These are however considered inadequate as they do not cover the essential services that are essential to the operation of the Island Administration activities such as running the mechanical workshop, purchasing parts or stocking spare parts for routine maintenance of machinery and equipment.

C. Proposed Minimum Maintenance Facility Requirement

431. There is a need on each island to build maintenance facilities with the following minimum considerations;

- Complies with the Cook Islands Building Code or the applicable international standards;
- Equipped with the relevant equipment and tools for mechanical repairs and maintenance works on machinery;
- Secure storage area for spare parts;
- Sheltered area for heavy plant;
- Telephone and a convenience area for canteen, toilet and washing facilities;
- In the absence of reticulated water supply water storage facilities should be included as part of the building.

432. The facility should also be big enough to house the minimum number of machinery that is required by the island to operate and maintain its infrastructure facilities.

433. The facility should be able to provide repair and maintenance services to government machinery and equipment. Unlike Rarotonga, the OIs have at present varying pieces of machinery and equipment on the respective islands.

434. There is a need for the islands to have the minimum requirements for machinery and equipment, adequate to maintain infrastructure facilities. The plants and equipment to be purchased for the islands will be standardised. This would make it relatively cheaper to purchase parts or stock spare parts for other infrastructure sectors or even other islands.

D. Needs Assessment

435. The condition of existing maintenance facilities on Rarotonga and in the OIs including basic upgrade requirements is summarized in Table 19 below.

Table 19: Infrastructure Maintenance Facilities

Island	Existing Conditions	Minimum Upgrade Requirements
Rarotonga	Most of the infrastructure sectors have either their own facility to carry out maintenance and repair works or otherwise they use the private sector.	Maintain the status quo.
Aitutaki	Too small and inadequate to cater for the maintenance activities	Build new maintenance facility and equip with the necessary equipment, tools and personnel
Atiu	Too small, structurally deteriorating	Build new maintenance facility and equip with the necessary equipment, tools and personnel
Mangaia	Too small, structurally deteriorating	Build new maintenance facility and equip with the necessary equipment, tools and personnel
Mauke	Structurally deteriorating, multiple occupancy	Refurbish, upgrade and equip with the necessary equipment, tools and personnel
Mitiaro	Structurally OK but too small	Refurbish, upgrade and equip with the necessary equipment, tools and personnel
Manihiki	Small shed in Tauhunu Village and nothing in Tukao Village	Build a centralized facility in Tauhunu Village to cater for the whole island. Build a small facility in Tukao to carry out basic maintenance and repair works
Nassau	No facility	Build new maintenance facility and equip with the necessary equipment, tools and personnel
Palmerston	No facility	Build new maintenance facility and equip with the

Island	Existing Conditions	Minimum Upgrade Requirements
		necessary equipment, tools and personnel
Penrhyn	Structurally fine	Upgrade and refurbish to include concrete floor, walls and equip with the necessary equipment, tools and personnel
Pukapuka	Structurally fine	Upgrade, refurbish and modify to suit the purpose of the proposed facility, and equip with the necessary equipment, tools and personnel
Rakahanga	Concrete foundation available at the power station	Upgrade, refurbish and modify to suit the purpose of the proposed facility, and equip with the necessary equipment, tools and personnel

Source: Estimates based on consultant's analysis

436. There is a need to protect all plant and equipment from adverse weather conditions, especially those currently used to maintain infrastructure facilities in the OIs.

E. Project Identification

1. Outer Island Maintenance Facilities Improvements

437. The requirements of each island are summarized in the above table. At present no cost estimates are available. There is a need to prepare project proposals for funding assistance and conduct feasibility studies to verify the viability of upgrading the existing facilities or building new maintenance facilities on the respective islands.

438. The project proposals should also include considerations on the viability of establishing a central maintenance facility for the Northern Group islands.

2. Central Workshop and Spares Depot in the Northern Group

439. The remoteness of the Northern Group islands from Rarotonga and the weight limitation of airfreight cargo make it difficult to complete maintenance activities on time and according to a maintenance plan. It takes about six weeks for new parts to arrive by boat. There is therefore a need to address the remoteness issues through a centralized maintenance facility on one of the islands.

440. The option of constructing a centralised facility on one of the islands in the Northern Group should be considered carefully. The facility should adhere to the needed minimum standards/considerations. That means it should be a one stop facility with the appropriate equipment, specialised tools, and personnel to service, maintain, and repair heavy machinery and equipment, especially those that cannot be repaired on the other islands. It should also have a secure storage area for spare parts and fuel supply.

441. The movement of the heavy machinery by sea from the islands to the central facility and back should be considered as part of the central facility requirements. Some of the considerations will include the type of sea vessels, lifting equipment on the vessel on each harbour.

442. Two location options have been identified; Omoka Village in Penrhyn and Tauhunu Village in Manihiki. In Penrhyn the facility will have access to a port where the ship can berth at the harbour, and to an air service. The availability of land however, is currently an issue. In Manihiki, the location is ideal in terms of the geographical location of the other islands, availability of land, access to a seaport, and access to an air service via sea travel across the lagoon. Issues relating to lifting equipment at the wharf will need to be considered.

443. The facility should have similar minimum design considerations as the maintenance facilities listed previously. Additional space will be required to provide a one stop facility with the appropriate equipment, specialised tools, and personnel to service, maintain, and repair heavy machinery and equipment, especially those that cannot be repaired on the other islands and storage for spare parts to serve the Northern Group requirements.

444. The transportation of the heavy machinery from the islands to the central facility and back should be considered as part of the facility requirements. Some of these considerations will include; transportation on land, the type of sea vessels, lifting equipment on the vessel and at the loading and offloading ports, the other functions of the sea vessels when not being used for the above activities.

445. The movement of the heavy machinery by sea from the islands to the central facility and back should be considered as part of the central facility requirements. Some of the considerations will include the type of sea vessels, lifting equipment on the vessel on each harbour.

F. Institutional Assessment

446. All of the mechanical workshops in the OIs are operated by the National Government through the respective IAs. The IAs received annual budget appropriations from the National Government but these have always been considered as inadequate to effectively carry out its operating activities including the operation of the mechanical workshops.

447. After consultations with the IAs, the option of providing machinery and equipment for the OIs to maintain infrastructure facilities is favourable. If a centralised pool of machinery is established on one of the islands, issues such as transportation, management and priority of use by island or by project will be encountered.

448. The management of the new or upgraded maintenance facilities in the OIs shall be the responsibility of the IAs, unless of course other arrangements are decided and agreed upon. More stringent asset management policies or operations are required to be put in place to ensure that the operation of the machinery and maintenance facilities are sustainable and independent of external interferences or influences.

449. Further discussions on institutional matters pertaining to the operation and maintenance facilities will be included in the Outline Institutional Plan section of the report.

XII. EMERGENCY MANAGEMENT FACILITIES

A. Objective

450. Emergency management (also known as disaster management) in the Cook Islands has been identified as one of the options of facilitating economic growth and social wellbeing. The objective of this section of the report is to streamline its attention and concentrate on reducing the risks imposed by emergencies and disasters in the Cook Islands. One option identified for achieving this is the provision of appropriate, reliable and affordable Emergency Management Centres (EMC) formerly referred to as cyclone management centres (CMCs) for the people of the Cook Islands. The immediate focus will be on the Northern Group Islands and subsequently to the islands in the Southern Group in the short term. It is expected that the people residing on these islands will gain economic benefits from the improved infrastructure and hence enhance their confidences in being able to achieve their aspirations for a more secure future.

B. Status

451. In recent years numerous documents had been prepared to address the issues associated with emergency management in the Cook Islands. In 2000 the “*10 Year Plan for Improving Cyclone Shelter in the Outer Islands*”. This plan had taken the devastation caused by Tropical Cyclone Martin on Manihiki in 1997 and the reconstruction projects afterwards as a benchmark for considering options for building shelters as a means of temporary refuge for the people during periods of tropical cyclones. There have been no follow-up documents in subsequent years supporting or extending the scope of this plan.

452. The reconstruction project for Manihiki involved completing two EMCs, one in each village and seventy-three micro shelters (MC) scattered over the two villages on Manihiki.

453. In 2005, an ADB funded technical assistance (TA) prepared the report “*Strengthening Disaster Management and Mitigation in the Cook Islands*”. The purpose of the TA was to follow up and report on the establishment of the “*Disaster Risk Management Plan*” as agreed by Cabinet, and the development of a new National Disaster Risk Management Plan with the supporting Legislation for the Cook Islands. The report had also illustrated various works that were carried to support and / or improve emergency management in the Cook Islands with consideration of the response and recovery activities that were carried out as a result of the five tropical cyclones that struck the Cook Islands in early 2005.

454. The physical characteristic of the islands in the Southern Group are commonly raised volcanic mountains with low lying coastal fringes on Rarotonga and a combination of low lying coastal areas and raised coral plateaus on the other islands. The low lying areas of Rarotonga are susceptible to the impact of sea surges during cyclones. Those islands with raised coastal geological formations have some form of protection from the impact of sea surges. All islands are susceptible to the impact of the high winds during cyclones. It is therefore common for people with structurally weak or unstable houses to move into buildings already identified as shelters during cyclones.

455. The islands in the Northern Group are low lying coral atolls with an average elevation of about 5m above sea level at the highest points. With this physical characteristic the people and properties on these islands are susceptible to damages by both sea surges and high winds during periods of tropical cyclones.

456. With the exception of Manihiki and Suvarrow islands, there are currently no buildings in the OIs specifically custom built for cyclone management purposes. The National Disaster Management Office (NDMO) however, has identified buildings on these islands, (e.g. school buildings, and community halls) for people to go to for shelter if required during cyclones. On the islands of Rarotonga and Aitutaki there are currently no specific buildings identified to relocate tourists from tourism facilities should an emergency evacuation occur.

C. Proposed Level of Service Standard

457. The EMCs shall be constructed, located and operated to function with the following minimum design parameters as guidelines:

- Appropriately located and within a kilometre of settlements;
- Comply with the Cook Islands Building Code or the applicable international standards;
- Be at least two storeys high;
- Allow for communal and basic accommodation;
- Have its own water supply facility utilising rainwater harvesting;
- Storage facilities for emergency food and medical supplies;
- Washing and sanitary facilities;
- Standby electricity power supply; and
- Communication systems.

458. The size of the building will be determined by the number of people most likely to be evacuated from their homes. In the case of the people being located in more than one village then the size of the EMC will also be determined accordingly.

D. Needs Assessment

459. There is a need to carry out a stock take in the form of a study of the facilities currently identified as EMCs and also identify other buildings that can be used for EMC purposes in the Cook Islands. The study will investigate:

- The structural capability of the buildings in terms of stability and occupancy space;
- The availability and suitability of facilities for water supply and sanitation
- Standby electricity power supply;
- Storage space for food and medical supplies, and
- A dedicated communication system for emergency purposes.

460. Furthermore the study would determine the location of the facilities with consideration of accommodating both residents and non-resident evacuees.

461. The study will also need to consider and investigate all infrastructure facilities to determine their vulnerability to damage from disasters such as cyclones. With this information it will be relatively easier to develop alternative plans for emergency purposes if some of the infrastructure facilities are damaged during a disaster.

E. Project Identification

1. New Emergency Management Centres

462. The provision of new EMCs especially for the Northern Group Islands excluding Manihiki and Suwarrow apparently will have one main constraining factor and that is funding. There is currently a process in place setting criteria for how to access funding for projects that have been prioritized and endorsed by Cabinet. The AMD and the Ministry of Finance Economic Management Division (MFEM) administer the process, which basically follows the project cycle. That is, it will go through the feasibility study stage, the design stage, the tender and contracting stage, and finally the construction stage.

463. Project proposals for funding assistance from NZAID are already in the pipeline to build EMCs for the Northern Group islands of Palmerston, Penrhyn, Pukapuka, Nassau and Rakahanga. The implementation and priority schedule will depend on the feasibility studies that are yet to be conducted. The feasibility study for the EMC in Palmerston was completed in 2004. This is yet to be reviewed to verify its viability to be endorsed prior to progressing to the next stage of the project cycle.

464. It is important that the EMC is appropriately located on the respective island. Land acquisition will therefore need to be completed and documented, which will include adequate consultations with the community and stakeholders, and at the same time taking into account the requirements by the land owners or the traditional chiefs prior to committing funds from the aid funding agencies. Table 20 below summarises the status of existing EMCs and the minimum upgrade requirements that are required for new EMCs.

Table 20: EMC Status and Requirements

Island	Current Situation	Minimum Upgrade Requirements
Rarotonga	Structurally fine but some lack some basic facilities	Upgrade, refurbish and equip with the necessary equipment. Identify other new buildings if required
Aitutaki	Structurally fine	Upgrade, refurbish and equip with the necessary equipment. Identify other new buildings if required
Atiu	Structurally fine	Upgrade, refurbish and equip with the necessary equipment. Identify other new buildings if required
Mangaia	Structurally fine but some lack some basic facilities	Upgrade, refurbish and equip with the necessary equipment. Identify other new buildings if required
Mauke	Structurally fine but some lack some basic facilities	Upgrade, refurbish and equip with the necessary equipment. Identify other new buildings if required
Mitiaro	Structurally fine but some lack some basic facilities	Upgrade, refurbish and equip with the necessary equipment. Identify other new buildings if required
Manihiki	One available in each village apart from the micro shelters	Repair works on the EMCs and equip with the necessary facilities and equipment
Pukapuka	Structurally fine but some lack some basic facilities	Build new EMC and equip with the necessary facilities and equipment
Palmerston	Structurally fine but some lack some basic facilities	Build new EMC and equip with the necessary facilities and equipment
Rakahanga	Structurally fine but some lack some basic facilities	Build new EMC and equip with the necessary facilities and equipment
Penrhyn	Structurally fine but some lack some basic facilities	Build new EMC and equip with the necessary facilities and equipment
Suwarrow	Structurally fine	Check on condition of structure and equipment

Source: Estimates based on Consultant's analysis

2. Existing Emergency Management Centres

465. To verify the suitability of the current EMCs for emergency purposes, it is important that project proposals for funding are developed and approved so that investigations can be

carried on the respective islands. This will not only update any current documentation for emergency management plans but also identify alternative options of how the plans may be implemented during emergencies.

3. Emergency Management Plans

466. According to the Emergency Management Cook Islands Office (EMCI) there is a need to revisit and update all documents and programmes related to and including the National Emergency Management Plan. This will ensure that the plans and proposed programmes are applicable to the respective island given the particular emergency circumstances.

467. According to the National Disaster Management Office (NDMO) it will be coordinating, in collaboration with the appropriate line ministries and NGOs, public awareness and training programmes for the month of September and October 2006 as a means of preparing the communities for the coming cyclone season.

F. Institutional Assessment

468. At present the OPM is responsible for the management of all national emergencies and disasters including meetings by the National Disaster Management Committees and Sub-committees. The EMCI office is currently accommodated at the Police Maritime Centre at Avatiu. It has one staff (Director). Therefore it may be appropriate to include the EMCI office as a unit of the OPM.

469. There is a proposal to change the name National Disaster Management Office (NDMO) to Emergency Management Cook Islands (EMCI). Apart from this however, there is a need to review the responsibilities of the EMCI in terms of policy development, administration, planning, resource capacity, human resource development, and dissemination of information. Furthermore, the links of this office with the National Committees, Sub-committees, Vaka Councils and the OIs need to be clarified.

470. It is vital that all EMCs that are custom build for emergency management purposes, especially in the OIs are appropriated annual operating and maintenance budgets through the respective IAs. This will ensure that resources are procured and the annual maintenance works are carried out on the EMCs.

471. The operation or use of the EMCs for purposes other than emergency related events, especially outside the cyclone season should be approved by the relevant authority but with considerations that in case of emergencies, the later prevails. This will ensure that the buildings are continuously used instead of sitting idle.

XIII. OUTLINE INFRASTRUCTURE MASTER PLAN

472. An initial outline of the infrastructure master plan is shown in Table 21. Clearly it is a work in progress but the main framework is becoming evident. Projects are divided into four time periods:

- i. Immediate (0-2 years): the highest priority infrastructure improvements in each sector required to meet urgent needs in the outer islands, as well as projects that are under way or have committed funding and are scheduled to start shortly.
- ii. Short Term (2-5 years): infrastructure improvements to improve level of service and correct operational deficiencies. Generally they are relatively low-cost projects with immediate benefits.
- iii. Medium Term (5-10 years): investment projects to provide long-term economic benefits and/or protect against adverse environmental impacts. Detailed feasibility studies and environmental assessments will be required before investment decisions can be made.
- iv. Long Term (10-20 years): major expansion or upgrading of infrastructure to meet the long-term demands of economic growth and changing environmental and climate impacts. Projects involve large expenditures and may require staged implementation over an extended period. Detailed feasibility studies and environmental assessments will not be required until much later but sector plans and programmes should take account of these future projects.

473. The master plan contains new construction, upgrading and rehabilitation works; these are normally viewed as investments and included in the development budget. Routine and periodic maintenance works which would be funded in the recurrent budget are not included.

474. Table 20 does not show all the technical activities associated with the management of each sector. These include the many on-going and proposed performance monitoring and evaluation, project planning and programming, national and community programmes and O&M activities in each. Also, it is assumed that feasibility studies, environmental assessments, engineering investigations and designs, stakeholder consultations, land acquisition, procurement and construction administration will be required to prepare and implement each project.

475. Cost estimates are far from complete but the picture which is emerging is for a requirement in the order of \$300 to \$400 million (at 2006 prices) over 20 years or \$15 to \$20 million per year. This compares to the current 2005/2006 capital expenditure (from all sources) of \$19 million therefore the proposed outline plan appears to be do-able.

476. The need to 'smooth' capital expenditure over a number of years to match the available funding will lead inevitably to projects being postponed: immediate projects will become short-term projects and so on. This is to be expected but it is essential that the government does not lose sight of the fundamental objectives of the master plan – to identify and prioritize projects required to support national economic development, provide minimum levels of service to all islands, protect the natural environment and mitigate against climate change impacts. Consequently it is essential that the government create an objective and transparent process for evaluating projects, establishing priorities and ordering projects in a pipeline for implementation as funding becomes available.

477. The master plan projects are based on optimistic expectations for future population and economic growth. It is assumed that the populations of Rarotonga and the outer islands will remain at their present levels or increase at moderate rates, therefore requiring the types of infrastructure improvements identified in the master plan. Similarly, the projects identified are aimed at supporting continued economic growth in Rarotonga and Aitutaki and

stimulating a reversal of economic trends in the outer islands. It is argued that the immediate and short-term projects are required regardless of what future scenario is assumed because these projects are aimed at providing a minimum standard of service and eliminating operational deficiencies. The scope and timing of the medium- and long-term projects will depend on population and economic growth assumptions therefore more detailed feasibility studies will be needed prior to making any decisions on the level or timing of investments.

Table 21: Infrastructure Master Plan

Time Period	Air Transport	Marine Transport	Roads	Water Supply	Energy	Sanitation	Solid Waste Management	Telecommunications	Outer Island Maintenance Facilities	Outer Island Emergency Management Facilities
Immediate 0-2 years	Improve Northern Group and Atiu airports	Improve Outer Island harbours	Upgrade inner ring road from Avarua to Pokoniu in Rarotonga	On-going replacement of Rarotonga ring main	Complete on-going power upgrading project in Aitutaki	Implement national septage management plan and trial evapotranspiration beds in Rarotonga	Repair damage at Rarotonga and Aitutaki landfill sites	Provide high-speed internet to Outer Islands	Rehabilitate or construct maintenance workshops in outer islands	Construct EMCs in Pukapuka, Palmerston
				Construct reticulation system in Mangaia. Rehabilitate systems in Aitu, Mauke and Mitiaro	Provide power to all HHs in Pukapuka – feasibility study required	Install flush toilets and convert pit latrines to septic tanks in all HHs in Southern Group	Pilot village composting facilities in Northern Group			Provide minimum water storage, standby generator and other emergency equipment at all EMCs
				Complete community and EMC storage in Northern Group		Install flush toilets in all HHs in Northern Group				
	\$5.5 million	\$12 million	\$7 million	\$4.7 million						

Time Period	Air Transport	Marine Transport	Roads	Water Supply	Energy	Sanitation	Solid Waste Management	Telecommunications	Outer Island Maintenance Facilities	Outer Island Emergency Management Facilities
Short Term 2-5 years	Improve Rarotonga terminal, replace nav aids and lighting. Implement cyclone mitigation measures	Stage 3 of Avatiu harbour improvement plan	Implement traffic management measures in Avarua area in Rarotonga	On-going rehabilitation of Rarotonga system and install metering. Construct water treatment facilities in Rarotonga	National programme to repair and rehabilitate generators, switchgear and distribution systems in Outer Islands	Construct sewerage schemes for Avarua, Arorangi and Muri villages in Rarotonga. Improve septic tank/absorption bed systems if trials successful	Construct medical waste disposal facilities in Rarotonga. Aitutaki and Outer Islands		Construct central workshop and spares depot for the Northern Group	Construct EMCs in Rakahanga and Penrhyn
	Improve Aitutaki terminal and runway	Improve Aitutaki port facilities	Implement road safety programme in Rarotonga and Aitutaki	Upgrade intake structures in Aitutaki. Install metering in Southern Group	Rehabilitate distribution system in Atiu	Construct septage ponds in all Outer Islands	Construct new sanitary landfill sites in all Outer Islands			
		Meet IPSC security requirements in Rarotonga and Aitutaki		Provide rain-water tanks to all HHs in Northern Group. Install first flush systems to improve water quality. Pilot water gallery in Palmerston			Implement annual collection of hazardous and recyclable waste from all islands to a central plant			
	\$10.0 million		\$0.7 million							

Time Period	Air Transport	Marine Transport	Roads	Water Supply	Energy	Sanitation	Solid Waste Management	Telecommunications	Outer Island Maintenance Facilities	Outer Island Emergency Management Facilities
Medium Term 5-10 years	New Mangaia airport and Atiu terminal	Incremental improvements to Rarotonga facilities	Upgrade road capacity in Avarua area in Rarotonga	On-going implementation of short-term projects	Replace existing generators with fuel efficient models in all islands	On-going implementation of short-term projects	On-going implementation of short-term projects			
		Improve outer island harbours to handle container landing barges	Rehabilitate main and inner ring roads in Rarotonga		Pilot projects of solar, wind and tidal power generation systems					
	\$3.5 million		\$22 million							

Time Period	Air Transport	Marine Transport	Roads	Water Supply	Energy	Sanitation	Solid Waste Management	Telecommunications	Outer Island Maintenance Facilities	Outer Island Emergency Management Facilities
Long Term 10-20 years	New passenger terminals at Manihiki and Penrhyn	Avatiu port and harbour expansion to handle large container and cruise liners	Complete inner ring road	On-going rehabilitation of distribution system and upgrade water treatment facilities in Rarotonga	Implement feasible alternative energy systems in staged programme	Expand village sewerage and treatment facilities in Rarotonga	Expand landfill sites in Rarotonga and Aitutaki as required			
	New Rarotonga international departures building			On-going rehabilitation of distribution systems in Southern Group		Construct centralized sewerage scheme in developed areas in Aitutaki	Expand landfill sites in all Outer Islands as required			
	New Aitutaki international passenger terminal			Construct distribution system for non-potable use from groundwater sources in Northern Group		Renew septic tanks and disposal beds in Outer Islands as required				
	New Manihiki and Penrhyn passenger terminals									
	\$30 million		\$10 million							
Total	\$49 million		\$39.7 million							

Source: Estimates based on Consultant's analysis

XIV. INSTITUTIONAL ACTION PLAN

A. Introduction

478. The purpose of this section is twofold. Firstly it is hoped that the section will initiate debate to obtain direction and convergence on issues relating to the roles and responsibilities of agencies and changes needed to improve infrastructure management. This will strengthen national capacity to coordinate, plan, prioritize, implement and manage infrastructure projects and provide better support to Island Councils and Island Administrations in their efforts to provide safe and sustainable services to their people. This debate will also include the philosophical and socio-politically sensitive subject of user-pay systems for services. Secondly the section will commence the development of an institutional action plan outlining a timeline for organizational reform, capacity building, socio-economic studies, user-pays and cost recovery, private sector involvement and policy, legislation and regulation. An outline of the Institutional Action Plan follows in Table 22.

479. The driving forces behind recommendations for institutional change are the geographically dispersed nature of the Cook Islands and the acute shortage of professionals and the limited technical capacity. There are currently only six engineers working for the technical agencies of government.

480. It is important to begin the discussion of institutional re-engineering with the statement that changes recommended will not undermine the basic philosophy of devolution of management powers and authority to the Island Councils. Rather, the recommended changes are based on the principle of improving the ability of central agencies to strengthen and assist the capacity of the Island Councils and Island Administrations to plan, construct, operate and maintain their own infrastructure.

B. Improvements in Institutions Efficiency and Effectiveness

1. Institutional Change

481. The institutional assessments of the different sectors in the previous chapters have highlighted the need for changes in the roles and responsibilities of various agencies. For example, the inclusion of responsibility for airports and transfer of responsibility for the safety and efficiency of power supply in all islands will require institutional changes within CIAA and TAU respectively. These and other institutional change mechanisms will be addressed in detail in the final report while the mid-term report will concentrate on the institutional efficiencies relating to the provision of infrastructure.

2. Management of Outer Islands Infrastructure

482. OMIA, or more correctly its predecessor the Ministry for Outer Islands Development (MOID), was established to facilitate the devolution process from the central government to the OIs and provide support and advice to the Island Councils and Island Administrations on governance, financial management and infrastructure development and operations and maintenance. While OMIA has continued to provide the former services its lack of technical skills has resulted in OMIA no longer being directly involved in infrastructure, other than the overhauling of electrical generators (at its workshop situated in MOW) and the contracting out of the repairs of heavy machinery. MOW and TAU have provided technical assistance to the OIs but neither

has the establishment or budget to take into account this service and they provide them on the basis of “if able to” at present. This is not a satisfactory situation and reports from the OIs reflect this dissatisfaction, wrongly laying the blame for slow response on OMIA.

483. OMIA should continue to provide support for the development of governance and management of IAs and ICs. This is of particular importance in the areas of planning, communications and financial planning (budgets), monitoring, analysis and reporting. The establishment of efficient communications networks between OMIA and IAs will facilitate these responsibilities. OMIA should also continue to be responsible for the identification of capacity gaps and the development and implementation of capacity building programmes (in cooperation with other agencies).

484. The following are options for the continued involvement of OMIA in its support of IAs in infrastructure development, operation and maintenance:

a. Maintain the Status Quo

485. Maintaining the status quo will institutionalise the current constraints and will do little to improve the situation.

b. Strengthen OMIA’s Technical Capacity

486. This option would provide OMIA with additional capacity to deliver the technical support services needed by the IAs to operate and maintain their mechanical, energy, water, sanitation, roads and harbour assets. Given the limited number of technical staff in the central government of the Cook Islands this option would only be viable if the government agreed to hire additional technical staff for OMIA.

c. Centralizing Technical Assistance to IAs

487. Another option is to attempt to improve the utilisation of government’s scarce technical resources by providing central support to the IAs using existing resources in MOW and TAU who would be contracted to provide their services on a fee-for-service basis. MOW would be responsible for supporting IAs with planning, construction, operations and maintenance for water, sanitation, solid waste, roads and mechanical services. TAU would provide similar services for energy. The drawback of this arrangement is that it may be beyond the also-limited capacities of MOW and TAU and therefore it would be necessary for those organizations to contract out some of the services to the private sector where feasible.

488. This option would mean that OMIA would no longer need staff with technical skills, thereby allowing it to focus on administrative, financial and legal support to the ICs and IAs. ICs and IAs would develop their own budgets for infrastructure related activities in consultation with the respective technical agencies. IAs could deal directly with the assigned liaison staff in each of the technical agencies, however this would be inefficient and a duplication of scarce resources. A preferred option for IA – technical agency liaison would be to have OMIA act as the expeditor and contact between the OIs and the technical agencies. OMIA could assign two staff with management skills for this purpose, one for the Northern Group and one for the Southern Group.

489. IAs will remain responsible, with OMIA assistance, for managing their own technical staff and budgets. There would need to be agreements made in advance

on the expected work required in each island in order to (1) determine the budgets required and (2) for the central agencies to plan their OI support programmes. OMIA would coordinate these activities. The technical agencies would then be able to organize their staff and financial resources with the knowledge that they would be called upon to provide technical services to OIs. The need for additional contracting to the private sector would also be identified.

d. Island Councils and Island Administrations

490. The principle of OIs being responsible, within the constraints of their capacities, for the planning, construction, operation and maintenance of island infrastructure is central to the institutional arrangements recommended above. The vision is one of an incremental improvement of the OIs' ability to: manage their planning; develop and manage budgets; and manage and implement projects. Paramount therefore is an ongoing assessment of IA skills and regular capacity building of their technical and administrative staff.

3. Project Implementation

491. The following model is proposed for implementing major projects, based on discussions with several government agencies and in view of the constraints on human resources in government agencies. This model will be further discussed at the mid-term workshop and subsequently at a consultation with relevant agencies. The recommendation is made in full cognisance of the detailed institutional processes developed in the agreement for implementation of NZAID/AusAID projects. These processes are increasingly being used for implementation of projects funded under the government's own capex budget. The government indicates that it is looking for a process that can be used (with minor additions to meet loan covenants) for the implementation of all future major projects.

492. A Project Coordination Unit (PCU) is to be established based around AMD in MFEM. The PCU will act as an overall 'Executing Agency' to ensure that the national infrastructure master plan programme is implemented in a timely manner and that funds from the various sources (government, donors and external loans) are made available as required. The PCU's primary function will be to ensure that government and donor requirements are met and it will report through the PCC to Cabinet. The PCU will regularly monitor and report on the progress of all major projects.

493. Projects will be implemented through various 'Implementing Agencies' which are expected to include MOW (roads, water supply, sanitation and solid waste management in Rarotonga), TAU (power in Rarotonga), CIAA (airports in Rarotonga and Aitutaki) and CIPA (ports and harbours in Rarotonga and Aitutaki). This more or less follows existing arrangements where MOW, CIAA and CIPA have or are implementing major road, airport and port development projects.

494. The best arrangement for implementing projects in the OIs (excluding Aitutaki) is not clearly defined at present. In the past MOW and OMIA have been responsible for implementing some projects in the OIs such as road surfacing and construction/rehabilitation of maintenance facilities. Several options are possible and need to be investigated further:

- Assign OI projects to the relevant sector central agencies as described above;

- Assign OI projects to the PCU so it becomes an Implementing Agency as well;
- Assign OI projects to OMIA;
- CIIC is taking on a greater role in project implementation and could become an Implementing Agency for OI infrastructure master plan projects. However, it does not have the engineering capacity to manage such projects and some form of inter-agency agreements may be required to provide the needed project management capacity.

495. In each option the Implementing Agencies will need to strengthen their project management capacity. Some agencies such as MOW already have the organization structure, staffing and well-established business processes for project planning and implementation. Other agencies such as the CIAA are involved mostly in operations and maintenance of their facilities and would require assistance to carry out major development projects.

496. Whichever arrangement, or combination, is chosen it is expected that the Implementing Agencies will need to supplement their capacity by engaging consultants for project management, feasibility studies, engineering designs and cost estimates, tender document preparation, tender evaluation and construction supervision.

497. Major works will be constructed by private sector contractors and minor works could be constructed with direct labour. Every effort should be made to support domestic contractors and construction labour.

4. The Principle of User-Pays and Cost Recovery

498. While people generally accept the principle of paying for electricity and telecommunications, there are historical and cultural constraints in the Cook Islands to the charging of fees for municipal services such as water and sewage and solid waste disposal. However, the increased development of infrastructure requiring large capital and operational investment requires strategies for cost recovery including interest, charges, depreciation, aftercare, and monitoring. This is therefore an opportunity to raise the issue as to how these will be funded.

499. There are generally two philosophical approaches. The first puts the onus on government to recover all costs through the general tax system and the second is the introduction of user-pay systems. These two systems are briefly discussed below.

500. There is a case to be argued that for a small population such as the CI, municipal services should be paid for out of general taxation. This would require a study to estimate the full cost of these services and may necessitate changes in the tax regime. The downside of having municipal services met through indirect taxation is that there is no incentive for people to conserve and maintain household installation such as fixing leaking taps. The increased tax burden will be inequitably spread and people will not pay for what they actually use. Such a system will limit the government's ability to invest in extensions and improvements and institutionalise the current disparity between Rarotonga and the OIs.

501. A user-pays system will require mechanisms such as meters and the introduction of accounting and billing systems. Such a system would eliminate cross subsidies and may result in a reduction in general taxes as a means of compensation

for the shift of funding responsibility directly to users. The advantage of such a system is that it would be more equitable and people would pay for what they use. It would encourage conservation, a sense of ownership of assets and a greater commitment by consumers to maintain and repair in-house installations. The disadvantages of such a system would be the perceived greater household expenditure of net incomes and potential disadvantaging to low income earners. The introduction of a user-pays system will no doubt become a political issue. Options for cost recovery are discussed in several of the preceding sector chapters and will not be discussed here.

502. The user-pays system is the preferred model overseas, however it is strongly suggested that before its introduction government should initiate extensive community debate.

Table 22: Outline Institutional Action Plan

Action	Immediate	Short Term (2-5 years)	Medium Term (5-10 years)	Long Term (10-20 years)
Organisational Reforms	<ul style="list-style-type: none"> • Develop agency responsibilities for project implementation (AMD/CIIC/MOW/OMIA/IAs) • Review roles and responsibilities of OMIA, MOW, TAU, CIAA, IAs • Review Corporate Plans and business processes of above • MOUs for Inter-agency coordination 	<ul style="list-style-type: none"> • Monitor performance of sector agencies 	<ul style="list-style-type: none"> • Review and update Corporate Plans and business processes as required 	<ul style="list-style-type: none"> • Review and update Corporate Plans and business processes as required
Detailed Project Preparation and Implementation	<ul style="list-style-type: none"> • Project preparation for immediate projects identified in master plan • Develop detailed implementation plans for each sector • Begin implementation of immediate projects 	<ul style="list-style-type: none"> • Project preparation for short term plans identified in master plan • Review implementation plans for each sector • Begin implementation of short term projects 	<ul style="list-style-type: none"> • Review implementation plans for each sector • Review of master plan • Project preparation for medium term plans identified in master plan • Begin implementation of medium term projects 	<ul style="list-style-type: none"> • Review implementation plans for each sector • Review of master plan • Project preparation for long term plans identified in master plan • Begin implementation of long term projects
Capacity Building Programmes	<ul style="list-style-type: none"> • Develop CB programmes for sector agencies as identified in sector analysis; • Develop and commence training programmes for O&M staff in each sector as identified in sector analysis; • Training of management and professional staff in all related agencies in policy, strategic planning, project preparation, implementation and contract management 	<ul style="list-style-type: none"> • On-going • On-going • On-going 	<ul style="list-style-type: none"> • Review organisational and sector performance and capacity and review and revise CB and training programmes as required 	<ul style="list-style-type: none"> • Review organisational and sector performance and capacity and review and revise CB and training programmes as required
Socio-Economic Studies and user pay systems	<ul style="list-style-type: none"> • Cost recovery studies for energy and municipal utilities (water, solid waste and wastewater) • National debate user-pay for municipal utilities. 	<ul style="list-style-type: none"> • Preparatory work for introduction of a user pay system for municipal utilities as agreed • Introduction for municipal utilities as agreed 	<ul style="list-style-type: none"> • Review of user-pay systems 	<ul style="list-style-type: none"> • Review of user-pay systems

Action	Immediate	Short Term (2-5 years)	Medium Term (5-10 years)	Long Term (10-20 years)
Private Sector Involvement	<ul style="list-style-type: none"> • Assess private sector capacity in all sectors • Identify opportunities for contracting out works to the private sector • Identify opportunities for equipment O&M • Assess opportunities for private-public partnerships as detailed in sector reviews • Reconsideration continued monopoly status of CI Telecom 	<ul style="list-style-type: none"> • on-going • Implement private-public partnerships as decided 	<ul style="list-style-type: none"> • On-going • On-going 	<ul style="list-style-type: none"> • On-going • On-going
Policy and Planning	<ul style="list-style-type: none"> • Conduct policy studies as recommended in each sector; • Transport policy study for OIs is a priority; • Establish priorities and adopt infrastructure plan as guidelines for investment decisions. 	<ul style="list-style-type: none"> • On-going 	<ul style="list-style-type: none"> • On-going • Review priorities and master plan 	<ul style="list-style-type: none"> • On-going • Review priorities and master plan
Legislation, regulation	<ul style="list-style-type: none"> • Establish permanent sectoral working groups including private sector and civil society for interagency dialogue, legislative and regulation review and efficiency improvement; • Working group (govt and the private sector) to evaluate and advise on alternative energy options and strategies 	<ul style="list-style-type: none"> • On-going • On-going 	<ul style="list-style-type: none"> • On-going • On-going 	<ul style="list-style-type: none"> • On-going • On-going

Source: Estimates based on Consultant's analysis

APPENDIXES

APPENDIX 1: COOK ISLANDS DEMOGRAPHICS

Table 1: Historical Population Statistics

Island	Area (km ²)	Total Population			Resident Population			Visitor Population		
		1991	1996	2001	1991	1996	2001	1991	1996	2001
Rarotonga	67.1	10,886	11,225	12,188		10,374	9,451		851	2,737
Southern Group	145.2	5,463	5,424	4,013	0	5,258	3,777	0	166	236
Aitutaki	18.3	2,357	2,389	1,946		2,272	1,743		117	203
Mangaia	51.8	1,214	1,108	744		1,083	739		25	5
Atiu	26.9	1,006	956	623		942	600		14	23
Mauke	18.4	639	652	470		643	469		9	1
Mitiaro	22.3	247	319	230		318	226		1	4
Manuae	6.2									
Takutea	1.3									
Northern Group	24.4	2,259	2,454	1,826	0	2,439	1,789	0	15	37
Palmerston	2.1	49	49	48		49	48			
Pukapuka	1.3	670	779	664		778	662		1	2
Nassau	1.3	102	99	72		99	72			
Manihiki	5.4	663	668	515		656	497		12	18
Rakahanga	4.1	262	249	169		249	158			11
Penrhyn	9.8	503	606	357		604	351		2	6
Suvarrow	0.4	10	4	1		4	1			
Total Cook Islands	236.7	18,608	19,103	18,027	0	18,071	15,017	0	1,032	3,010
EEZ	1,830,000									

Source: Estimates based on Consultant's analysis

Table 2: Number and Size of Households

Island	Households			Households Size		
	1991	1996	2001	1991	1996	2001
Rarotonga	2,222	2,569	2,531	4.9	4.0	3.7
Southern Group	1,035	1,127	965	5.3	24	3.9
Aitutaki	440	496	435	5.4	4.6	4.0
Mangaia	228	237	197	5.3	4.6	3.8
Atiu	192	197	161	5.2	4.8	3.7
Mauke	120	133	110	5.3	4.8	4.3
Mitiaro	55	64	62	4.5	5.0	3.6
Manuae						
Takutea						
Northern Group	420	457	384	5.4	5.3	4.7
Palmerston	10	11	12	4.9	4.5	4.0
Pukapuka	112	120	124	6.0	6.5	5.3
Nassau	18	21	15	5.7	4.7	4.8
Manihiki	134	149	117	4.9	4.4	4.2
Rakahanga	44	42	32	6.0	5.9	4.9
Penrhyn	101	113	83	5.0	5.3	4.2
Suvarrow	1	1	1	10.0	4.0	1.0
Total Cook Islands	3,677	4,153	3,880	5.1	4.4	3.9

Table 3: Seasonal Variation in Population

Quarter	Population		
	Total	Resident	Visitor
2000			
Mar	15,100	14,000	1,100
Jun	14,600	14,000	600
Sep	15,400	14,000	1,400
Dec	14,800	13,400	1,400
2001			
Mar	15,000	13,500	1,500
Jun	14,600	13,300	1,300
Sep	15,400	13,400	2,000
Dec	17,800	15,000	2,800
2002			
Mar	17,700	15,000	2,700
Jun	17,200	14,600	2,600
Sep	18,300	14,600	3,700
Dec	17,700	14,100	3,600
2003			
Mar	17,700	13,800	3,900
Jun	17,200	13,300	3,900
Sep	18,500	13,600	4,900
Dec	18,600	13,500	5,100
2004			
Mar	18,600	13,500	5,100
Jun	18,600	13,100	5,500
Sep	20,100	13,100	7,000
Dec	19,500	12,900	6,600
2005			
Mar	19,200	12,500	6,700
Jun	18,900	12,100	6,800
Sep	20,500	12,100	8,400
Dec	18,300	12,000	6,300

Source: Estimates based on Consultant's analysis

Table 4: Rarotonga Population 1976-2001

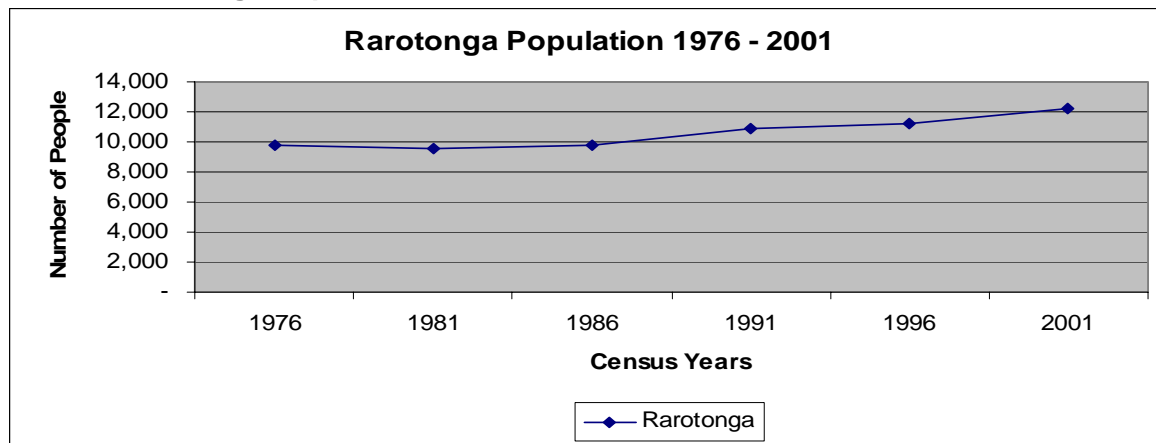


Table 5: Population 1976-2001 for Southern Cook Islands

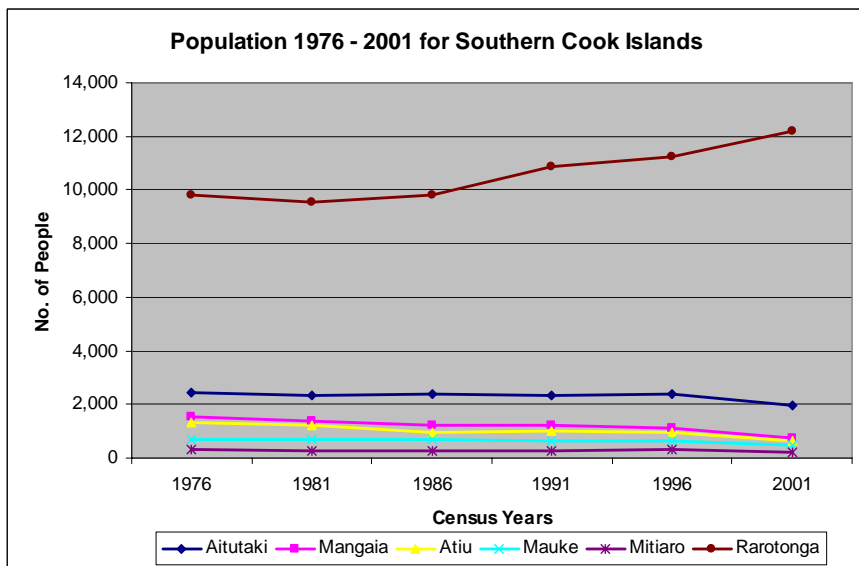
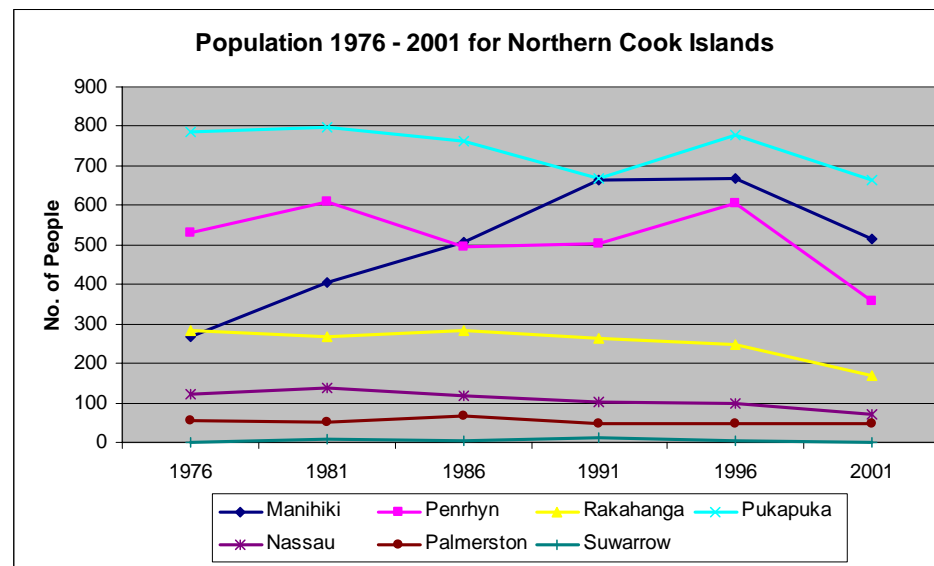


Table 6: Population 1976-2001 Northern Cook Islands



APPENDIX 2: STATUS OF UTILITIES

Table 1: Overview of Existing Water Supply Services – Southern Islands Group

Item	Rarotonga	Aitutaki	Mangaia	Atiu	Mauke	Mitiaro	Manuae	Takutea
Source	12 streams	Groundwater via 8 bores	3 streams; rainwater; groundwater	Groundwater via 2 wells	Groundwater via 5 boreholes	1 spring; rainwater	These two islands are uninhabited, so no permanent infrastructure present	
Distribution	Gravity pipe network	Pumped pipe network	Pumped pipe network to houses, public standpipes; domestic water tanks	Pumped pipe network coverage 86%; 14% rely on water carts & rainwater	Pumped pipe network to all houses	Pumped pipe network to houses, public standpipes; community water tanks		
Coverage	Over 97%	Over 97%	Over 97%	Over 97%	Over 97%	Over 97%		
Adequacy	Adequate quantity for now; however, water quality is not potable as there is no disinfection of the supply	Inadequate as need to apply rationing from time to time. Water quality does not meet micro-biological standards	Adequate for now where supplemented with rainwater; inadequate in areas where supply is augmented with groundwater due to frequent pump failure	Adequate for now, supplemented by rainwater	Adequate for now	Adequate for now with rainwater as supplementary source		
Issues	Finite resources; large seasonal flow variation; supply not disinfected; no metering; high losses; corroded pipes; significant in-house losses; water also used for agriculture; no metering	Groundwater depletion a concern; need continuous supply as island is a tourist destination; supply not disinfected; no metering; no incentive to conserve water	Contamination of streams by animals; turbid after rain; water also used for agriculture; no metering; high leakage and wastage losses; no incentive for conservation	Groundwater depletion a concern; supply inadequate in prolonged dry periods; water also used for agriculture; high losses due to leakage & wastage; no metering	Groundwater depletion a concern; pump failures frequent; water also used for agriculture; high losses due to leakage and wastage; no metering	Groundwater brackish; not enough storage for prolonged dry periods; pumping failures; water also used for agriculture; no metering; high losses due to leaks, wastage		

Source: Estimates based on Consultant's analysis

Table 2: Overview of Existing Water Supply Services – Northern Islands Group

Item	Palmerston	Pukapuka	Nassau	Manihiki	Rakahanga	Penrhyn	Suvarrow
Source	Rainwater harvesting	Rainwater harvesting	Rainwater harvesting	Rainwater harvesting	Rainwater harvesting	Rainwater harvesting	Island uninhabited, so no permanent infrastructure present
Distribution	Community and household tanks	Community and household tanks; piped to government buildings	Community and household tanks	Community and household tanks	Community and household tanks	Community and household tanks	
Coverage	Over 97%	Over 97%	Over 97%	Over 97%	Over 97%	Over 97%	
Adequacy	Adequate for now; inadequate in prolonged dry (no rainfall) periods	Adequate for now; inadequate in prolonged dry (no rainfall) periods	Adequate for now; inadequate in prolonged dry (no rainfall) periods	Adequate for now; inadequate in prolonged dry (no rainfall) periods	Adequate for now; inadequate in prolonged dry (no rainfall) periods	Adequate for now; inadequate in prolonged dry (no rainfall) periods	
Issues	Limited supply during drought; not enough storage for prolonged dry periods; supply not disinfected so need boiling	Limited supply during drought; not enough storage for prolonged dry periods; supply not disinfected so need boiling	Limited supply during drought; not enough storage for prolonged dry periods; supply not disinfected so need boiling	Limited supply during drought; not enough storage for prolonged dry periods; supply not disinfected so need boiling	Limited supply during drought; not enough storage for prolonged dry periods; supply not disinfected so need boiling	Limited supply during drought; not enough storage for prolonged dry periods; supply not disinfected so need boiling	

Source: Estimates based on Consultant's analysis

Table 3: Overview of Existing Wastewater Management Services – Southern Islands Group

Item	Rarotonga	Aitutaki	Mangaia	Atiu	Mauke	Mitiaro	Manuae	Takutea
Type of treatment	Septage treatment pond; package treatment plant for neighbourhood scheme; on-site systems	Septage treatment pond; On-site systems; big hotels have onsite package treatment plants;	On-site systems, pit latrines still being used	On-site systems; pit latrines still being used	On-site systems; pit latrines still being used	On-site systems; pit latrines still being used	These two islands are uninhabited, so no permanent infrastructure present	
Coverage	Onsite system covers 99%; neighbourhood scheme covers 30 households	Onsite system covers 98%;	On-site system coverage 98%; pit latrine usage 45%	On-site system coverage 98%; pit latrine usage 60%	On-site system coverage 98%; pit latrine usage 90%	On-site system coverage 98%; pit latrine usage 10%		
Adequacy	Ok for now;	Ok for now	Ok for now	Ok for now	Ok for now	Ok for now		
Issues	Effluent management is an emerging problem; algal blooms in lagoon; frequent fish poisoning; should review draft national sewage regulations	Risk of groundwater contamination; desludging of septic tanks not regular; nutrients in lagoon; water-borne diseases common; national sewage regulations	Risk of contaminating groundwater supply source; risk of polluting lagoon; no septic tank desludging program; no septage treatment facilities	Risk of contaminating groundwater supply source; risk of polluting lagoon; no septic tank desludging program; no septage treatment facilities	Risk of contaminating groundwater supply source; risk of polluting lagoon; no septic tank desludging program; no septage treatment facilities	No desludging program for septic tanks, groundwater contamination		

Source: Estimates based on Consultant's analysis

Table 4: Overview of Existing Wastewater Management Services – Northern Islands Group

Item	Palmerston	Pukapuka	Nassau	Manihiki	Rakahanga	Penrhyn	Suvarrow
Type of treatment	On-site systems, pit latrines	On-site systems, pit latrines, lagoon Practice	On-site systems, pit latrines	On-site systems, pit latrines; lagoon toilets	On-site systems, pit latrines	On-site systems, pit latrines	Island uninhabited, so no permanent infrastructure present
Coverage	Onsite systems 100%; plus 50% still have put latrines	Onsite systems coverage 98%; pit latrines 4%	Onsite systems coverage 98%; pit latrines 40%	On site system coverage 90%; pit latrines 2%; lagoon toilet 10%	On site system coverage 98%; pit latrines 12%;	98%	
Adequacy	Ok for now	Ok for now	Ok for now	Ok for now	Ok for now	Ok for now	
Issues	Contamination of freshwater lens beneath atoll is an emerging problem; risk of polluting lagoon; no septic tank desludging program; no septage treatment facilities	Contamination of freshwater lens beneath atoll is an emerging problem; risk of polluting lagoon; no septic tank desludging program; no septage treatment facilities	Contamination of freshwater lens beneath island is an emerging problem; risk of polluting lagoon; no septic tank desludging program; no septage treatment facilities	Risk of Contaminating groundwater; Risk of polluting lagoon; significant waterborne diseases on island; no septic tank desludging program; no septage treatment facilities	Contamination of freshwater lens beneath atoll is an emerging problem; risk of polluting lagoon; no septic tank desludging program; no septage treatment facilities	Contamination of freshwater lens beneath atoll is an emerging problem; risk of polluting lagoon; no septic tank desludging program; no septage treatment facilities	

Source: Estimates based on Consultant's analysis

Table 5: Overview of Existing Solid Waste Management Services – Southern Islands Group

Item	Rarotonga	Aitutaki	Mangaia	Atiu	Mauke	Mitiaro	Manuae	Takutea
Type of treatment and disposal	Municipal landfill; recycling centres	Municipal landfill	Municipal dumps; recycling centre	Municipal dumps;	Municipal dumps	Municipal dumps	These two islands are uninhabited, so no permanent infrastructure present	
Collection	Domestic collection 1-2 times per week; commercial at own cost as requested; separation at source practiced; recyclables shipped to NZ; metals collected separately and shipped to north east Asia	Fortnightly collection; otherwise as for Rarotonga	Weekly collection by Island Council; separation and recycling being practiced	Weekly collection by Island Council; recycling and separation slowly being introduced and practiced	Fortnightly collection by Island Council; recycling and separation slowly being introduced and practiced	Weekly collection by Island Council; bottles are banned; recycling and separation introduced and practiced; recycling programs used to raise funds for schools		
Adequacy	Adequate	Adequate	Adequate for now	Adequate for now	Adequate for now	Adequate for now		
Issues	separation at source needs improvement through more public awareness;	Contamination of aquifers if leachate not managed properly; as for Rarotonga	Groundwater contamination risks; separation at source needs improvement through more public awareness; no fees collected	Groundwater contamination risks; need to raise public awareness for improving separation at source; no fees collected; disposal of old appliances	Groundwater contamination risks; need to raise public awareness for improving separation at source; disposal of old appliances	Contamination of groundwater risks; need to raise public awareness for improving separation at source; disposal of old appliances		

Source: Estimates based on Consultant's analysis

Table 6: Overview of Existing Solid Waste Management Services – Northern Islands Group

Item	Palmerston	Pukapuka	Nassau	Manihiki	Rakahanga	Penrhyn	Suvarrow
Type of treatment and disposal	Rubbish is buried on site or communal pits	No municipal dump; have municipal compost site; composted material reused; households burn plastics, paper	Private pits	Private and municipal dumps	Private and municipal pits	Private and municipal pits	Island uninhabited, so no permanent infrastructure present
Collection	No collection; disposal by households	Regular collection by Island Council when household drums are full;	No collection; disposal by households	Weekly collection by Island Council in Tukao only; elsewhere disposal by households	Weekly collection by Island Council; disposal by households in communal pits is widely practiced	No collection; disposal by households	
Adequacy	Adequate for now	Adequate for now	Adequate for now	Inadequate; new dump site needed	Adequate for now	Adequate for now	
Issues	Groundwater contamination risks; disposal of old appliances and hazardous material	Groundwater contamination; potential health hazard from to households from burning plastics; customary land issues for landfill; disposal of old appliances and hazardous material	Groundwater contamination risks; wandering pigs and flies a problem with open rubbish dump sites; composting and waste minimization program needed; disposal of old appliances and hazardous material	Groundwater contamination risks; in Tauhunu disposal pits pose health hazards and attract wandering pigs and flies; waste minimization and composting program needed; disposal of old appliances and hazardous material	Groundwater contamination risks; wandering pigs and flies a problem with open rubbish dump sites; composting and waste minimization program needed; disposal of old appliances & hazardous material	Groundwater contamination risks; wandering pigs and flies a problem with open rubbish dump sites; composting and waste minimization program needed; disposal of old appliances and hazardous material	

Source: Estimates based on Consultant's analysis

Table 7: Overview of Existing Electricity Supply Services – Southern Islands Group

Item	Rarotonga	Aitutaki	Mangaia	Atiu	Mauke	Mitiaro	Manuae	Takutea
Electricity								
Source	Diesel gensets	Diesel gensets	Diesel gensets; 24 hrs/day supply; pilot wind power generation	Diesel gensets	Diesel gensets; 19 hrs/day supply	Diesel gensets; 19 hrs/day supply	These two islands are uninhabited, so no permanent infrastructure present	
Distribution	By TAU (state owned enterprise); overhead low and underground high voltage lines;	By APS (state owned enterprise); underground high and overhead low voltage lines;	By Island Council; overhead lines	By Island Council; overhead lines	By Island Council; overhead lines	By Island Council; both overhead and underground lines		
Coverage	All; over 97%	Over 97%	Over 95%	Over 95%	Over 95%	Over 95%		
Adequacy	Adequate	Adequate; some outages	Adequate; some outages	Some outages	Some outages	Inadequate; some outages		
Issues	Could put lines underground for better cyclone protection;	Security of supply; CIC overseeing its privatization;	High O&M costs, high user costs, limited technical capacity	Maintenance costs high; wooden power poles need replacement; genset failures; limited technical capacity	Maintenance costs high; distribution system needs better maintenance; genset failures; limited technical capacity; supply limitations	Maintenance costs, genset failures; limited technical capacity; supply limitations; demand management		

Source: Estimates based on Consultant's analysis

Table 8: Overview of Existing Electricity Supply Services – Northern Islands Group

Item	Palmerston	Pukapuka	Nassau	Manihiki	Rakahanga	Penrhyn	Suvarrow
Source	Diesel genset; supply 19 hrs/day	Diesel genset for public buildings (9 am – 3 pm) and as emergency back up; solar power used otherwise;	Diesel genset; supply 19 hrs/day	Diesel genset; supply 19 hrs/day	Diesel genset/battery bank (hybrid); supply 24 hrs/day	Diesel genset; supply 24 hrs/day	Island uninhabited, so no permanent infrastructure present
Distribution	Reticulated and private	Reticulated and private	Reticulated and private	Reticulated and private	Reticulated	Reticulated and private	
Coverage	Over 95%	Over 95%	Over 95%	Over 95%	Over 95%	Over 95%	
Adequacy	Adequate for now	Adequate for now	Adequate for now	Adequate for now	Adequate for now	Adequate for now	
Issues	Maintenance, lack of technical capacity	Solar batteries near end of useful life; high capital costs for solar units; converters for household appliances too expensive; maintenance of assets; lack of technical capacity	Maintenance, lack of technical capacity	Maintenance; lack of technical capacity	Maintenance; lack of technical capacity;	Maintenance; lack of technical capacity	

Source: Estimates based on Consultant's analysis

Table 9: Overview of Existing Telecommunication Services – Southern Islands Group

Item	Rarotonga	Aitutaki	Mangaia	Atiu	Mauke	Mitiaro	Manuae	Takutea
Network services	Underground land lines; GSM network; 56 kbs dial up Internet; 256 kbs ADSL broadband Internet	Land lines(u/g); GSM network; 56 kbs dial up Internet; 115 kbs IDSL broadband Internet	Land line (u/g); 28 kbs dial up Internet access	Land line (u/g); 28 kbs dial up Internet access	Land line (u/g); 28 kbs dial up Internet access	Land line (u/g); 28 kbs dial up Internet access	These two islands are uninhabited, so no permanent infrastructure present	
Coverage	84% dwellings	80% dwellings	84% dwellings	80% dwellings	84% dwellings	80% dwellings		
Cyclone warning	Broadcast on local FM radio; rebroadcast on HF radio	Broadcast on local AM radio; rebroadcast on HF radio	Broadcast on local AM radio; rebroadcast on HF radio	Broadcast on local AM radio; rebroadcast on HF radio	Broadcast on local AM radio; rebroadcast on HF radio	Broadcast on local AM radio; rebroadcast on HF radio		
Adequacy	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate		
Issues	Residents content with level of service; no issues; 2% broadband user target	As for Rarotonga	Residents content with level of service; no issues; 2% broadband user target	As for Rarotonga	Residents content with level of service; no issues; 2% broadband user target	As for Rarotonga		

Source: Estimates based on Consultant's analysis

Table 10: Overview of Existing Telecommunication Services – Northern Islands Group

Item	Palmerston	Pukapuka	Nassau	Manihiki	Rakahanga	Penrhyn	Suvarrow
Network services	Only public phones/faxes; Internet centre	Land line u/g); Peacesat station link up with Rarotonga and Nassau; 28 kbs dial up Internet access	Only public phones/faxes; Peacesat station link up with Rarotonga and Pukapuka; Internet centre	Land line (u/g); 28 kbs dial up Internet access; 4-channel satellite television	Land line (u/g); 28 kbs dial up Internet access	Land line (u/g); 28 kbs dial up Internet access;	Island uninhabited, so no permanent infrastructure present
Coverage	80% dwellings;	80% dwellings;	80% dwellings;	80% dwellings;	80% dwellings;	80% dwellings;	
Cyclone warning	Broadcast on local AM radio; rebroadcast on HF radio	Broadcast on local AM radio; rebroadcast on HF radio	Broadcast on local AM radio; rebroadcast on HF radio	Broadcast on local AM radio; rebroadcast on HF radio	Broadcast on local AM radio; rebroadcast on HF radio	Broadcast on local AM radio; rebroadcast on HF radio	
Adequacy	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate	
Issues	Maintenance;	Maintenance;	Maintenance;	Maintenance;	Maintenance;	Maintenance; no television service;	

Source: Estimates based on Consultant's analysis

APPENDIX 3: NATIONAL SUSTAINABLE DEVELOPMENT PLAN

National Sustainable Development Plan

In 2003 the CIGOV held a National Development Forum to develop a framework to guide national development into the future. Based on the country's needs and priorities expressed in this Forum CIGOV, with the assistance of its development partners, has evolved an National Sustainable Development Plan (NSDP). The document is in final draft form and is expected to be published and distributed during 2006. The following extract from the Prime Minister's foreword summarises the chief purpose of the NSDP:

“Government's reliance on its annual planning process as the basis for national budget allocation was deemed inadequate. Ministries and departments struggled to embrace the country's priorities for each approaching fiscal year whilst the corresponding Budget Policy Statement was often found wanting as a result of political uncertainty, changing needs and resulting policy inconsistency. Government and its partners in the private sector and the wider community agreed at the 2003 Development Forum that the country required more coherence, consistency and predictability in terms of long-term goals and objectives and a greater degree of consensus and participation for initiatives to move forward beyond the political will of the day and reflect the will of the people.

The NSDP promises to help us to move beyond the limits of political intervention and ensure our development efforts are guided by principles of good governance and sustainable development and focused on the welfare of all Cook Islanders, irrespective of power allegiances. The NSDP also promises to provide us with a solid platform to engage with our development partners and seek targeted, coordinated and harmonised development assistance based on our national priorities.”

The primary objective of the NSDP is:

“To build a sustainable future that meets our economic and social needs in partnership with government, the private sector and local, regional and international stakeholders, without compromising prudent economic management, environmental integrity, social stability and the needs of future generations.”

The NSDP sets out nine sustainable development goals:

1. Well-managed private sector-led economic development: macroeconomic management and private sector development
2. Well-educated, healthy and productive people: education, health, human resource development, youth, gender, social welfare and sports
3. Sustainable use and management of our natural resources and environment: marine, land, agriculture, environment, waste and water
4. Strengthened and affordable basic infrastructure, transport and utilities to support national economic development: information, communication and technology, energy, road, sea and air Transport, airports and harbours

5. A society built on law and order and good governance at all levels of government, private sector and local communities: parliamentary and whole of government governance, outer island development, public finance governance, law and order
6. Strengthened national coordination and information system for development planning, monitoring and evaluation: information systems and statistics, institutional coordination
7. A society that treasures cultural heritage, values and identity while respecting cultural diversity: history, culture, language, heritage sites, traditional knowledge and practices
8. An effective foreign affairs policy that meets the needs and aspirations of the Cook Islands: international relations, aid effectiveness, Council of Regional Organizations (CROP) effectiveness
9. A safe, secure and resilient Cook Islands: all hazard risk management, immigration and border control, transnational security

For each goal the NSDP provides (1) key baseline indicators, (2) set outs a series of strategies and (3) provides key outcome target for 2006-2010.

The NSDP can be viewed as an 'umbrella' under which policy, planning, priority-setting and resource allocation should take place. The NSDP contains a specific goal, No. 4, for basic infrastructure development. In addition, attainment of several other goals will depend directly on the successful development of supporting infrastructure, especially: 1. Economic Development; 3. Sustainable Natural Resources and Environment; and parts of 9. A safe Cook Islands.

The NSDP provides a number of quantified targets for the period 2006-2010 as summarised in the Table 1 below.

Table 1: Summary of NSDP Targets Directly Affecting Infrastructure Development

Goal	Sector and Strategy	Quantified Outcome Targets by 2010
4. Strengthened and affordable basic infrastructure	ICT: encourage private sector-lead Information, Communications and Technology development to provide universal access	<ul style="list-style-type: none"> Increased ICT literacy by 50%
	ICT: strengthen e-government initiatives for increased public sector efficiency	<ul style="list-style-type: none"> Electronic public access to government information by 50%
	Energy: rationalise management of the energy sector by developing and implementing CI Energy Strategic Plan for all islands	<ul style="list-style-type: none"> Decreased per capita energy consumption by 20% Increased use of renewable energy by 30%
	Transport: provide a national road transport system for each island that is safe and efficient	<ul style="list-style-type: none"> Land transport strategy for each island developed by 2007 with priority actions commencing in 2008
	Transport: provide safe, efficient and affordable air and sea transport to all islands in partnership with the private sector	<ul style="list-style-type: none"> Air and sea transport strategic plan developed and implemented by March 2007
	Airports and Harbours: provide and maintain safe and secure airport and port facilities and services on all islands	<ul style="list-style-type: none"> A prioritised plan for improving airport facilities and services developed and implemented by end 2007 including reliability of new navigation aids and air traffic systems improved 90% by 2008 Airports improved to ICAO standards and management responsibility transferred to the CI Aviation Authority by 2010 A prioritised plan for upgrading and maintaining port facilities to meet domestic and international shipping needs; A plan to meet international shipping and port security codes
1. Well-managed private sector-led economic development	Private Sector Development: promote and enhance private sector-lead development of the tourism industry that recognises the importance of the natural environment and cultural heritage of the CI	<ul style="list-style-type: none"> A prioritised National Tourism Strategy by end 2006 that emphasises tourism growth of 5%
3. Sustainable use and management of natural resources and environment	Marine: strengthen CI Marine Resources Strategy incorporating guiding principles and strategies agreed in Pacific Islands Regional Oceans Policy and other regional/international guiding fishing management instruments	<ul style="list-style-type: none"> Increased gross value of product from the marine sector by 30%
	Marine: develop and implement Offshore Fisheries Management Plan in partnership with Tuna Industry Association and other stakeholders	<ul style="list-style-type: none"> Increased industry value by at least 20%
	Marine: sustainable ecosystem management of inshore fisheries and increased community management of the resource	<ul style="list-style-type: none"> Increased area of well managed community based Rai's by 25%

	<p>Environment: implement National Environmental Strategic Action Framework ensuring use and management of natural resource and environment reflect a balanced economic, social and environmental consideration across all sectors and at all levels</p>	<ul style="list-style-type: none"> • Short-term priorities listed in NESAF in relation to each of the broad thematic areas such as biodiversity conservation, land, waste and climate change relevant to coastal zone and freshwater resources
	<p>Water: develop and implement a comprehensive freshwater management plan of action to guide supply and demand of water on each island to ensure universal access to safe drinking water</p>	<ul style="list-style-type: none"> • Increased access to safe drinking water on Rarotonga by 10% • Action plans for sustainable water management developed and implemented for at least the main OIs by 2008 • Increased access to sustainable, reliable and quality water services to the people by 40% • Improve the governance of water management by reviewing relevant legislation as appropriate by 2007 focusing on developing public private partnerships in the supply of water and demand side management including the adoption of user pay principles and encouraging households to also use rainwater.
	<p>Waste: improve management of solid, liquid and other forms of wastes, minimising the human health effects and the impacts on the environment</p>	<ul style="list-style-type: none"> • A prioritised solid waste management plan increasing recycling and reducing residual solid wastes going to landfill by 30% • a harmonised and integrated liquid waste management policy for reducing water borne diseases and environmental costs
9. A safe, secure and resilient Cook Islands:	<p>All Hazard Risk Management: establish a coordinated and effective national risk reduction management system for all hazards</p>	<ul style="list-style-type: none"> • A prioritised National Risk Plan of Action for Disaster Risk Reduction and Disaster Management developed and implemented by 2007 • for natural hazards such as cyclones and droughts associated with climate change and variability, develop and implement a country focused action plan by 2007 including: • mainstreaming disaster risk management in the national planning and budgetary process and • reduced costs of average natural disaster events by 20%
8. An effective foreign affairs policy that meets the needs and aspirations of the CI	<p>Aid Effectiveness: Increase effectiveness of development partner financial and technical assistance</p>	<ul style="list-style-type: none"> • Achieving coordinated and harmonised donor support including: • at least 50% of development support to CI reflects immediate and short-term national and sector priorities by 2007
	<p>Aid Effectiveness: limit vulnerability to development assistance by mobilising aid for strengthening national capacities at all levels</p>	<ul style="list-style-type: none"> • Proportion of aid allocated to targeted national capacity development increased by 20% • 30% reduction in transaction costs on development partner projects to CI by 2008

Source: Estimates based on consultant's analysis