

ASIAN DEVELOPMENT BANK

DRAFT FINAL REPORT

TA 4605-COO: STRENGTHENING DISASTER MANAGEMENT AND MITIGATION (COMPONENT 2: PREVENTIVE INFRASTRUCTURE MASTER PLAN)



VOLUME 1: MASTER PLAN OVERVIEW

November 2006



The **MPC** Group International
MICROFINANCE • PLANNING • COMMUNITY

In association with



CURRENCY EQUIVALENTS

(as of 2 November 2006)

Currency Unit	–	New Zealand Dollar (NZ\$)
NZ\$1.00	=	US\$0.67
US\$1.00	=	NZ\$1.48

ABBREVIATIONS

AADDT	Average annual daily traffic
AC	Asphalt concrete
ACC	Aid Coordinating Committee
ADB	Asian Development Bank
ADSL	Asymmetric Digital Subscriber Line
AMD	Aid Management Division
APS	Aitutaki Power Supply
AS/NZS	Australian Standard/New Zealand Standard
ATC	Air Traffic Control
AusAID	Australian Agency for International Development
AVG	Average
BOD	Biochemical oxygen demand
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
CIANGO	Cook Islands Association of NGO's
CIGOV	Cook Islands Government
CIIC	Cook Islands Investment Corporation
CIMMRISP	Cook Islands Ministry of Marine Resources Institutional Strengthening Project
CIPA	Cook Islands Port Authority
CISD	Cook Islands Statistics Office
CITTC	Cook Islands Trade Training Center
CITV	Cook Islands Television
CLIMAP	ADB Climate Change Adaptation Program for the Pacific
COPEP	Concrete coastal protection device
CROP	Council of Regional Organizations
CRRP	Cyclone Recovery and Reconstruction Program
CRP	Climate Risk Profile
DBST	Double Bituminous Surface Treatment
DME	Distance Measuring Equipment
DNHRD	Department of National Human Resource Development
DOH	Department of Health
DPA	Development Partnership Agreement
DRM	Disaster Risk Management
EC	Evacuation Center
ECIL	Express Cook Islands Agents
EIA	Environmental Impact Assessment
EMC	Emergency Management Center
EMCI	Emergency Management Cook Islands

ENSO	El Niño/Southern Oscillation
FY	Financial Year
GCM	Global Climate Model
GDP	Gross Domestic Product
gensets	Generator sets
GHD	GHD Consultants
HRD	Human Resource Development
IA	Island Administration
IC	Island Council
ICAO	International Civil Aviation Organization
ICT	Information, Communications and Technology
IEE	Initial Environmental Examination
IGCI	International Global Change Institute
ILS	Instrument Landing System
IMP	Infrastructure Master Plan
IPCC	Intergovernmental Panel on Climate Change
JICA	Japan International Cooperation Agency
LBGES	Labor-based Government Equipment Supported
LPG	Liquefied Petroleum Gas
MC	Micro Shelter
MDG	Millennium Development Goals
MFEM	Ministry of Finance & Economic Management
MMR	Ministry of Marine Resources
MOH	Ministry of Health
MOT	Ministry of Transport
MOW	Ministry of Works
MSL	Mean Sea Level
NBC	National Building Code
NDB	Non-directional Beacon
NDMO	National Disaster Management Office
NDRMC	National Disaster Risk Management Council
NDRMP	National Disaster Risk Management Plan
NED	National Energy Division
NEDS	National Economic Development Strategy
NES	National Environment Service
NGO	Non Government Organization
NIWA	National Institute for Water and Atmospheric Research
NSDP	National Sustainable Development Plan
NWS	National Waste Strategy
NZ	New Zealand
NZAID	New Zealand Agency for International Development
O&M	Operations & Maintenance
OHRD	Office of Human Resources Development
OI	Outer Islands
OICDU	Outer Islands Infrastructure Development Unit
OIDP	Outer Islands Development Program
OMIA	Office of the Minister of Island Administration
OPEX	Operating Expenditure
OPM	Office of the Prime Minister
PAB	Project Adaptation Brief
PCC	Project Coordinating Committee
PD	Police Department
PDU	Project Development Unit
PERCA	Public Expenditure Review Committee and Audit

PFL	Pacific Forum Line
PICCAP	Pacific Islands Climate Change Assistance Program
PIU	Project Implementation Unit
PMG	Pitt Media Group
PPP	Public-Private Partnership
PPU	Policy and Planning Unit
PSC	Public Service Commission
REAP	Rarotonga Environmental Awareness Program
RIC	Rarotonga Island Council
ROW	Right-of-way
SBST	Single Bituminous Surface Treatment
SLIS	Survey and Land Information Service
SOE	State Owned Enterprises
SOPAC	Pacific Islands Applied Geoscience Commission
SPC	Secretariat to the Pacific Community
SPCZ	South Pacific Convergence Zone
SRES	Special Report on Emissions Scenarios
TA	Technical Assistance
TAU	Te Aponga Uira
TCI	Telecom Cook Islands
TEU	Twenty foot equivalent unit
TNZ	Telecom New Zealand
TOR	Terms of Reference
TVNZ	New Zealand Television
UNDP	United Nations Development Program
VASIS	Visual Approach Slope Indicator System
VOR	Variable Omni-range
WDC	Waste Disposal Center
WHO	World Health Organization
WMRU	Waste Management and Recycling Unit
WWD	Water Works Division

WEIGHTS AND MEASURES

g	gram
g/c.d	gram per capita per day (waste generation)
ha	hectares
kL	kiloliter
km	kilometer
km ²	square kilometers
L	liters
L/c.d	liters per capita per day (water use)
kbs	kilobytes per second
kg/c.d	kilogram per capita per day (waste generation)
m	meters
m ²	square meters
m ³	cubic meters
mg	milligram
mg/L	milligram per liter (concentration)
m/s	meters per second
mm	millimeters
°C	degrees centigrade

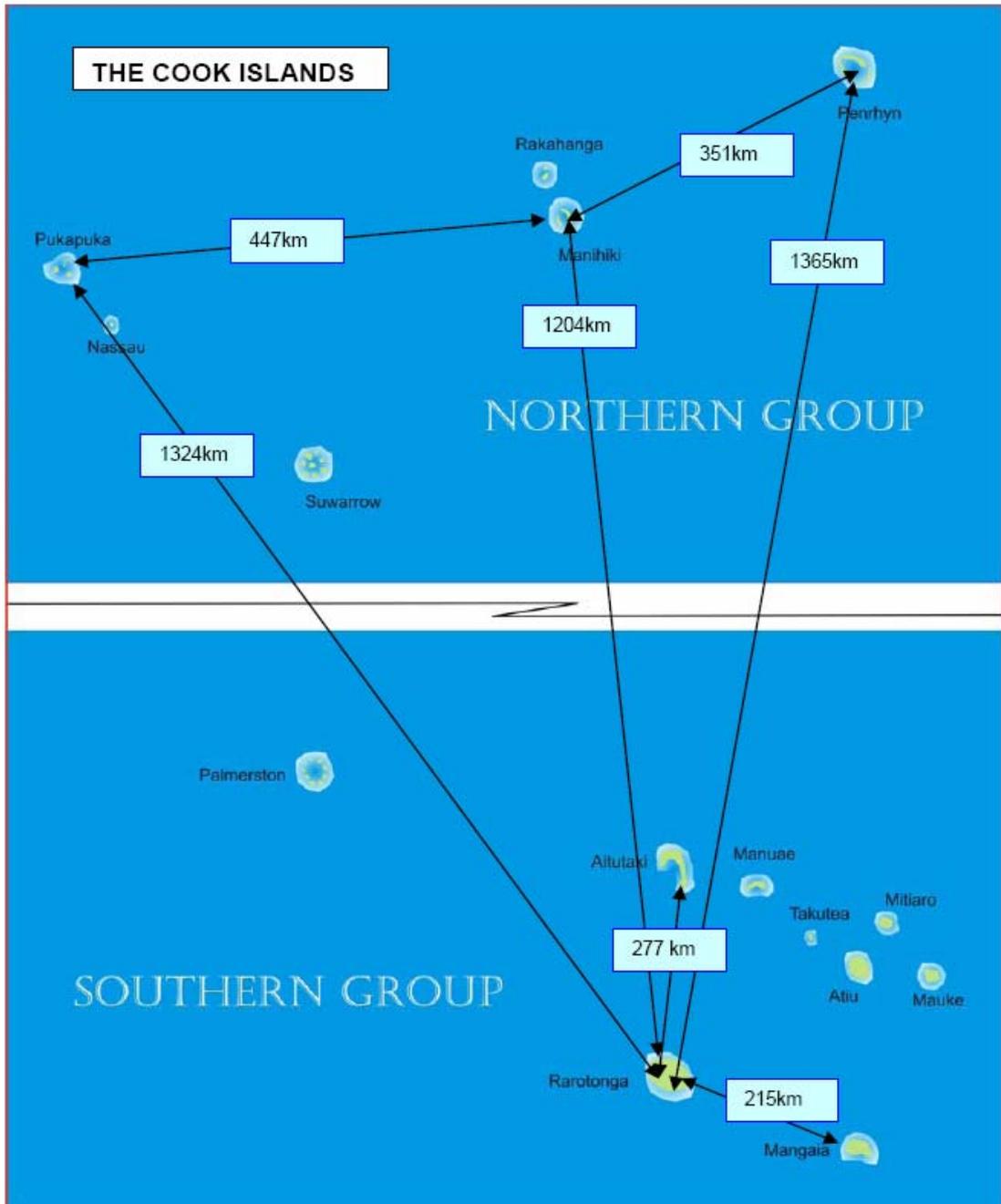
NOTES

- (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., FY2006/2007 ends on 30 June 2007.

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Map: Cook Islands



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

I. INTRODUCTION

A. Background to TA

1. Between 4 February and 8 March 2005, the Cook Islands experienced five damaging cyclones within a period of five weeks, 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 necessary 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) 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, i.e. to enhance 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 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;
- To develop a far-reaching and a systematic approach to mitigating the country's vulnerability to adverse weather conditions;

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

- 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 robust disaster management operation and control mechanisms to support efficient and effective implementation of the Cyclone Emergency Assistance Program Loan as well as strengthen preparedness for 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:

1. Component 1

8. Immediate establishment of a rapid, effective and robust response capability through efficiently coordinated networks of skilled personnel to administer disaster mitigation operation. This is being undertaken by the Pacific Islands Applied Geoscience Commission (SOPAC).

2. Component 2

9. 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 Status

10. Component 1 was completed in April of 2006.

11. The subject of this Report – Preventative Infrastructure Master Plan – is the product of Component 2. It is due to be completed in December 2006. Together, the two components will result in a Master Plan for infrastructure development and institutional and organizational considerations that will assist the Cook Islands (CI) Government to effectively prepare its nation for future disasters and climate change events, in addition to normal growth, social and economic development

E. Next Steps

12. The next steps for this TA – Preventative Infrastructure Master Plan - are as follows:

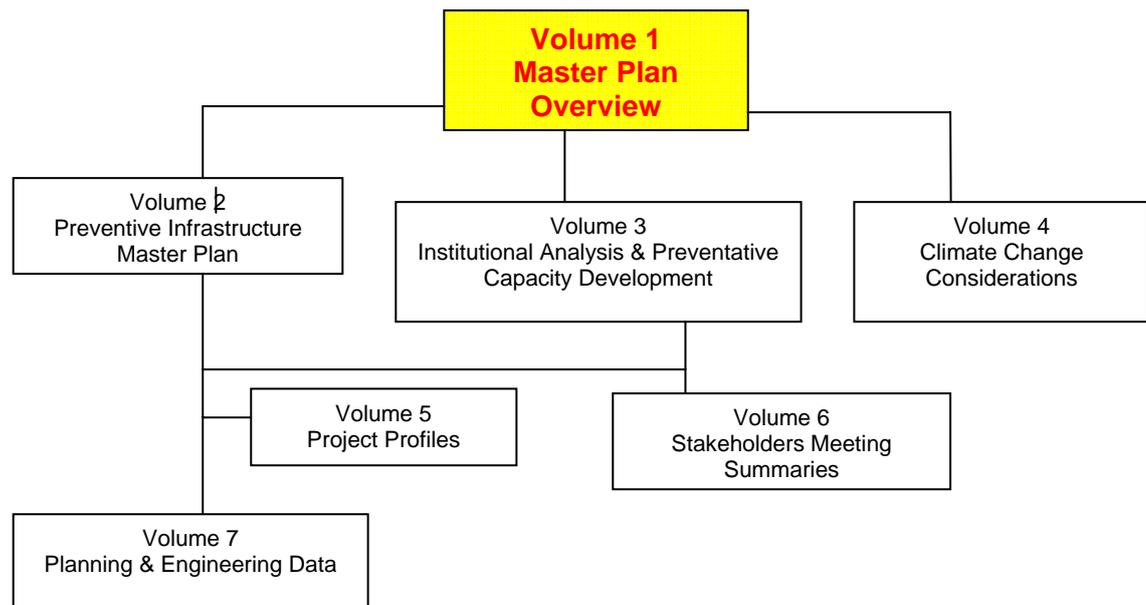
- November 15, 2006 – Submission of Draft Final Report. Posting on MFEM website for public comments.
- December 8, 2006 - Submission of compiled Comments from the Ministry of Financial & Economic Management (MFEM) to consultant
- December 15, 2006 – Submission of Final Report to CI Government/ADB

13. It is expected that the report will then be used by the Government to assist in the prioritization of infrastructure; dialogue with donors and the private sector; and, more importantly, as part of its on-going national development strategy efforts.

II. ORGANISATION OF FINAL REPORT

14. The Final Report is organized into 7 volumes as shown in Figure 1. Each volume is designed to be a stand-alone document, so that they can be used independently by each relevant agency.

Figure 1: Organization of Final Report



15. **Volume 1 – Master Plan Overview** – is an executive summary of the entire TA, and draws together key sections of the other volumes, and information from the Inception and Mid Term Reports. It attempts to address, in a single volume, the requirements of the Project TOR.

16. **Volume 2 – Preventative Infrastructure Master Plan** – is one of the main volumes of the project and provides the background and rationale for the proposed infrastructure in each of the sectors. It ends by proposing a comprehensive, phased Infrastructure Master Plan across each of the designated sectors.

17. **Volume 3 - Institutional Analysis & Preventative Capacity Development** – forms the other key section of the project. It reviews existing institutional arrangements and considers alternatives for change that would enable new infrastructure initiatives to be more effective.

18. **Volume 4 - Climate Change Considerations** – The basis for the project has been the issue of climate change. This volume updates the Cook Islands Climate Risk Profile and examines the climate change implications on each of the proposed infrastructure projects in the Master Plan. A further section provides a consideration of changes that should be made to the building code of the Cook Islands.

19. **Volume 5 - Project Profiles** – This volume is an assembly of each of the proposed infrastructure project profiles together with tracking information.

20. **Volume 6 - Stakeholders Meeting Summaries** – This volume is a documentation of all key stakeholder meetings undertaken during the TA. It is included as a reference document to be used by future consultants (and government) as a supplement to their own investigations.

21. **Volume 7 - Planning & Engineering Data** – This volume contains all the cost and engineering data used by the team in the development of the Master Plan profiles.

III. APPROACH

A. Initial Assessment

22. The project began with an initial assessment of infrastructure throughout the islands, and a review of on-going plans and projects. The initial review identified a long list of infrastructure development needs which may be summarized as follows:

- projects under construction which require further investment before they can be completed (e.g. completion of Tauhunu Harbor on Manihiki)
- projects with funding but requiring feasibility studies and detailed engineering design before implementation can proceed (e.g. Avarua-Pokoinu Road)
- a broad range of infrastructure needs identified by the CI government and Island Administrations which require further investigations and feasibility study before the project scope can be defined (e.g. projects listed in the Outer Islands strategic plans and business plans)
- replacement of existing infrastructure nearing the end of its design life (e.g. Rarotonga water ring mains and radio navigation aids at Rarotonga International Airport)
- infrastructure needs not yet identified to support economic development targets in the National Sustainable Development Plan (NSDP) (e.g. harbor development to support a goal of increasing marine sector product value by 20%)
- infrastructure needs not yet identified to preserve the environment and protect the islands against climate change impacts.

23. Given the limited CI government capital budget and donor funding, there was a need to closely identify the total infrastructure needs of the country in the foreseeable future (20 years), estimate their costs, and establish priorities.

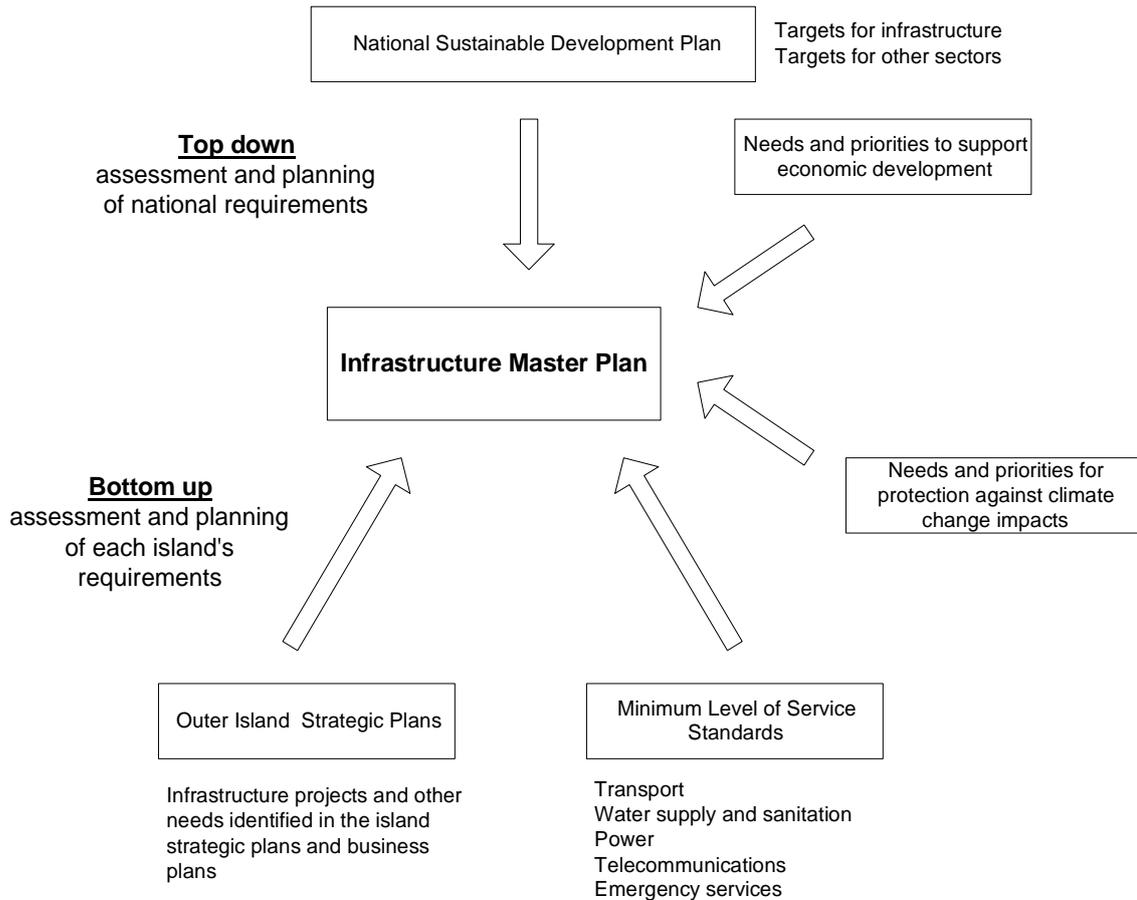
B. Overall Approach

24. The TA used a four-pronged approach in the study as summarized in Figure 2 below encompassing:

- **Top down assessment** of requirements needed to support economic development of the entire country. The assessment sought to develop strategies and identify infrastructure projects which will support attainment of the Outcome Targets contained in the NSDP.
- **Bottom up assessment** of requirements already identified by the Island Administrations and proposed in their strategic plans.

- Provide a **minimum level of service** in the transport, water, sanitation, power and telecommunications sectors to every household in the country.
- **Climate proofing:** additional infrastructure development needed to preserve the environment and protect the islands from climate change impacts.

Figure 2: Overall Approach



C. Methodology

25. The master planning process involves the following steps:

1. Review Existing Projects and Plans

26. This step was completed in the inception phase, and documented in the Inception Report.

2. Create Infrastructure Inventory and Condition Database.

27. The team collected and reviewed all available design and field-measured data pertaining to infrastructure. This was augmented by the hands-on knowledge of our own local team members and discussions with national and local government officials. As a starting point, in each sector, they compiled a summary of the state of the infrastructure for each island detailing its condition, adequacy and the main issues relating to that sector. They also undertook a field assessment of the infrastructure on key islands to verify the reliability of the collected information.

28. The team worked closely with the parallel NZAID-funded project (that started in early May 2006) which included an assessment of ports and harbors in the outer islands. The team also held discussions with the operators and maintenance technicians of key public and private infrastructure to assess practical issues and difficulties that they face. We considered this an important step as the islands are remote and often spare parts, and even advice to solve a problem, can take several weeks or sometimes months to reach where they are needed. The operators and local residents were also able to provide an insight into the needs of the Outer Islands. The information thus gained was used to identify capacity building needs in drawing up training programs, and was valuable in ensuring that processes recommended are simple and appropriate for local conditions.

29. As some of the current assets are nearing the end of their design life, in assessing the condition of the various plants and structures, the team estimated the timing for their eventual replacement. This in itself formed a significant investment over the study planning horizon.

30. The data sheets, outlining the status of existing infrastructure, are contained in the Inception Report.

3. Forecast Socio-economic Development and Infrastructure Demand

31. Our adopted philosophy for this study is that infrastructure development should support and facilitate economic development, not vice versa. Our intent is not to develop an economic development plan or strategy, but rather to take existing visions and strategic plans and augment them with assumed development where necessary. Therefore as a first step, we identified in broad terms the socio-economic settings, and known or planned economic developments for each island. This was based on the current island strategic plans, the NSDP and discussions with the national and local governments. Where no plan existed or it was unclear or ambiguous, we assumed an economic development direction for planning purposes.

32. The assumed economic development scenarios became the basis for the planning of the infrastructure on each island. We discussed the scenarios with the relevant stakeholder agencies, and where appropriate, the communities, in order to seek their concurrence prior to proceeding with appraising the infrastructure needs and priorities.

33. The above approach enabled the projection of populations and types of transport needs and impacts that would influence the infrastructure development. In particular, we identified key activities such as tourism, aquaculture, fisheries and agriculture as these affect the numbers and movements of populations on the islands as well as power and water needs which are often the constraint on development or expansion of industries.

34. Next, based on the economic development scenarios, we prepared population forecasts, which in turn became the basis for establishing the demands and planning parameters for utility services – water supply, sanitation, solid waste and energy supply and telecommunication infrastructure. These projections are contained in Volume 2- Master Plan.

35. Demand projections for transport infrastructure will depend on the expected flow of goods and visitors to the islands. Therefore, based on the adopted economic development scenario for each island, we prepared estimated projections of the volumes of shipping and aircraft together with the types of vessels needed to meet forecast demands.

4. Define Minimum Levels of Service in Key Sectors

36. The infrastructure Master Plan should provide every island with a minimum level of service in the water, sanitation, power, telecommunications and transport sectors. Minimum standards for each sector are discussed in Volume 2 – Master Plan. This equity principle is not specifically referred to in the NSDP but it is inferred in the many goals and targets described in the document.

37. These minimum standards were used as a checklist in evaluating the numerous projects being proposed for the outer islands. They assisted in identifying gaps in the provision of infrastructure and assisted in setting priorities to ensure that no island or settlement is 'left behind'.

38. The requirement to provide every Cook Islander with a minimum level of service involves a substantial cost and depending on how the equity principle is applied, will affect the prioritization process. It also will require commitments on the part of the government and Island Administrations to provide a minimum annual level of expenditure on operations and maintenance.

5. Consultations with stakeholders

39. A series of workshops and consultations were undertaken throughout the TA to provide stakeholders with a direct input into the master planning process. Participating stakeholders and details of relevant meetings and workshops are outlined and collated in Volume 6 – Consultations.

6. Develop updated Climate Risk Profile for Cook Islands

40. An updated Climate Risk Profile was prepared by IGCI and is contained in Volume 4 – Climate Risk Considerations.

7. Review Building Code and Recommend Changes

41. The National Building Code for the Cook Islands was last updated in September 1990. The performance requirements and deemed-to-satisfy provisions are based on or refer directly to NZ and Australian standards for design, construction and materials. A review was made of NZ and Australian standards to identify all updates and determine which may require a specific revision of the CI Building Code. In addition, Australia has prepared specific provisions for strengthening structures to withstand cyclones. These were reviewed along with the Climate Risk Profile updated in Task 6 and recommendations were made on changes needed in the Building Code. These are also contained in Volume 4 – Climate Risk Considerations.

8. Project identification

42. As discussed above, infrastructure requirements were identified and the scope of projects developed using four methods:

- a top down approach taking account of national social economic development plans and targets as laid out in the NSDP
- a bottom up approach to address the infrastructure requirements identified in the island administrations' strategic and current business plans
- a requirement to provide a minimum level of infrastructure for each sector on each island
- infrastructure requirements identified in response to the Climate Risk Profile to be prepared by the TA.

43. The project identification process was based on data and projections developed from the following sources:

- inventory and condition of infrastructure on all islands developed in Step (ii) above;
- assessment of infrastructure requirements identified within the work done by GHD Consultants;
- forecasts of population, economic activities and income levels developed in Step (iii) above which will be transformed into quantitative levels of demand in each sector on each island;
- existing studies and long-term plans prepared by various sector agencies such as the Ministry of Works (MOW), Cook Islands Airport Authority (CIAA), Cook Islands Ports Authority (CIPA), CI Telecom and Te Aponga Uira (TAU), (electricity company).

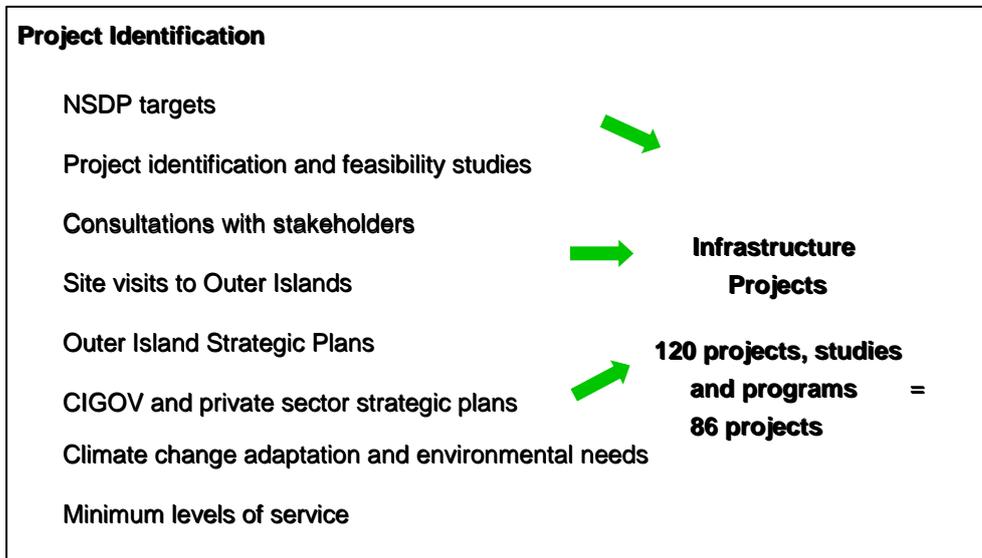
44. Most projects identified in the various documents reviewed were intended for implementation in the short or medium term (0-5 or 5-10 years). As mentioned earlier, the Master Plan designed by the team has a longer time horizon of 20 years. In certain sectors this required agreement on a national strategy for infrastructure development because of the high costs involved.

45. The Climate Risk Profile (CRP) has two significant implications for infrastructure development in the Cook Islands. First, it revealed that the design standard and condition of much of the existing infrastructure was inadequate to withstand the more frequent, more extreme weather events forecast in the future. Therefore one aspect of project identification was refurbishment or replacement of existing infrastructure to meet future climate conditions.

46. Second, the CRP revealed the need for new infrastructure to protect the islands against climate change impacts, as opposed to supporting economic development. Construction of foreshore protection of strategic assets, such as the airport, is an example.

47. The project identification process is outlined in Figure 3.

Figure 3: Project Identification



9. Cost estimates

48. The TA estimated construction costs for all identified projects. However, these are broad order-of-magnitude costs only, based on recent project experience, unless specific cost estimates are available from feasibility studies or engineering designs. Costs are expressed in 2006 prices. The costings used are all contained in Volume 7 – Engineering and Planning data – and can be used as a basis for detailed costing during feasibility and design.

49. Annual operating and maintenance (O&M) costs were estimated in a similar fashion to provide an indication of the annual recurrent expenditure required for the project. The implementation of expensive infrastructure capital works, without Government committing to annual budgeted maintenance costs is a serious and on-going issue in all Pacific Island states.

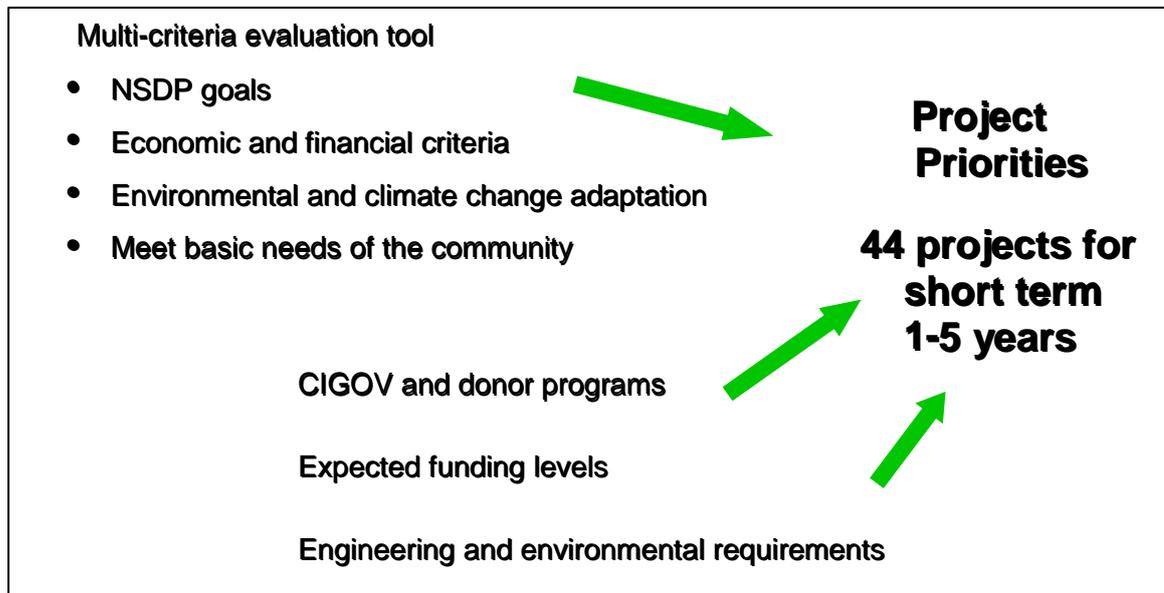
10. Project Prioritization

50. A multi-criteria analysis was carried out for projects in each sector. It was not possible to carry out an economic analysis of the identified projects. This can only be done during the feasibility study stage of project implementation.

51. Projects already programmed for implementation under the Outer Islands Development Program were placed at the top of the priorities list. We do not expect to adjust programs which are under way. However, projects which are in the pipeline but not yet committed were subject to analysis and prioritization the same as other newly identified projects.

52. Elements of the multi-criteria evaluation tool are illustrated in Figure 4 below. More details of the project prioritization process are outlined in Section 8 – Prioritization and Ranking Tool of this volume; and Volume 2.- Master Plan.

Figure 4: Multi-criteria Evaluation Tool



11. Develop Schedule of Investment Requirements

53. The team utilized the ranking tool and consultations to develop an indicative investment program based on the priorities and construction costs established in the previous steps beginning in FY 2007-2008. A more detailed fully ranked action plan of planned and new projects was also developed based on a 5 year rolling master plan time frame. This was based on an annual budget of about \$10 million per year over the 5 year period. These comprise an indicative annual CI government Capital budget of \$5 million, committed NZAID budget (over 5 years) of \$20 million, and other potential bilateral and multilateral funding.

54. It is expected that each year, a review of the 5 year rolling Master Plan will occur. New projects would be identified and added to the list which would then be subject to additional review and ranking. This would include a re-application of the interactive ranking tool by the stakeholder focal group. It is essential that this annual review occurs as events such as natural disasters, revised policies and economic conditions alter needs and priorities.

IV. INTERACTIVE RANKING METHOD

55. Project ranking of projects for implementation under the project was carried out with the aid of a prioritization tool. Generally, such rankings are agreed through dialogue and discussed within a national working group comprising senior government representatives and Cabinet members to reflect “technical” needs” (as identified at the line agency level) and policies of government. However, given the

large number of projects, and at the request of MFEM a prioritization tool was developed under this TA to assist with the process of ranking projects for implementation over the short to medium term.

56. The tool is based on a multi-objective criteria evaluation process with the aim of enabling quick prioritization of projects in the “absence” of a detailed national economic policy being in place. It is noted that the tool is not a substitute for objective assessment and it is not a project feasibility evaluation mechanism. It is assumed that projects that have been identified and submitted to MFEM for implementation have already been scrutinized at the line ministry level and their feasibility has been, or will be, determined before the final decision for execution. Seven criteria have been adopted to assist with the evaluation of projects. These are:

Type of Criterion (quantity)	Assessment in terms of contribution to
Economic (2)	national economic growth
Social (2)	social harmony
Environmental (1)	protecting or improving the environment
Private sector (1)	private sector development
General (1)	meeting the National Sustainable Development Plan (NSDP)

57. While developing this tool, the following underlying aspects were taken into consideration in an attempt to maximize understanding and ease of use for those who will be using this system to assess projects.

- Has to be easy to use – has to have a balance between complexity/detail and simplicity
- Be suitable for all sectors – the evaluation must incorporate cross-sectoral issues and/or criteria
- Be able to be adjusted to reflect national priorities (such government policy) and extraordinary events (such as national disasters)

58. Project assessment was carried out by a focal group which was a representative cross-section of the government and civil society so as to incorporate a range of perspectives and interests with regards to infrastructure in the outer islands. It is suggested that in the future, the focal group comprise high level persons that are able to make decisions for the sector that they represent. Civil society and the private sector must be incorporated to ensure a balance in the group.

59. In cases where the priority of Government changes according to national policies, there is the ability to adjust weighting factors accordingly. Should Government wish to focus on social or economic factors, the policy factor within these criterion can be increased to show that it is of high priority. There is also a special adjustment factor that alters the ranking of projects due to unforeseen circumstances, for example natural disasters.

60. As the tool is used through future iterations, there is a need for a ‘sanity check’ on the prioritization process to ensure that the tool is robust enough to withstand all conditions. There is also a need to qualify the results to ensure that the ranking of projects does, in actual fact, reflect the priorities of Government and the people of the Cook Islands according to national policies.

61. Volume 5 of this Master Plan gives a full description of the multi criteria prioritization process, with narratives for users on how to rate projects. An example of the scoring form is also given in this volume.

62. Once a project has been identified, a project profile must be created as this will assist the focal group with the assessment and evaluation of projects. A lot of thought should be given when filling in these project profiles, as this will give all relevant information pertaining to each project. The rationale, objectives and features for a project are key information for assessment.

63. Project profiles are also given in Volume 5, and clear instructions of how one would develop a project profile, is also included. These should assist those in sectors who are creating projects, to be able to provide a detailed description of the scope of works that will be presented to the focal group for assessment.

64. Details of the tool are shown in Figure 5.

Figure 5: Project Profile Tool

<p>1. Will the project contribute towards meeting National Sustainable Development Plan goals?</p> <ul style="list-style-type: none"> • Goal 1 – equal opportunity for health and education towards establishing an inclusive and vibrant society • Goal 2 – society built on law and order and good governance at all levels • Goal 3 – innovative and well-managed private sector-led economy • Goal 4 – sustainable use and management of natural resources and environment • Goal 5 – strengthened and affordable basic infrastructure, transport and utilities to support national development • Goal 6 – a safe, secure and resilient community • Goal 7 – an effective foreign affairs policy that meets the future needs and aspirations of the Cook Islands people <p>2. Will the project contribute to national economic development and growth?</p> <ul style="list-style-type: none"> • Low cost/direct beneficiaries • Savings for users relative to the cost of the project investment • Directly addresses performance constraints <p>3. Will the project contribute to national revenue?</p> <ul style="list-style-type: none"> • Boost to revenue relative to the cost of the investment in the project • Share of operation and maintenance costs <p>4. Will the project lead to improved living standards?</p> <ul style="list-style-type: none"> • Contributes to meeting minimum level of service standards • Leads to health improvements • Provides social and cultural amenities • Contributes to increasing national knowledge base <p>5. Will the project contribute to a better environment?</p> <ul style="list-style-type: none"> • Mitigates against or adapts to climate change • Improves the physical environment <p>6. Will the project provide an enabling environment for private sector involvement?</p> <ul style="list-style-type: none"> • Contributes to developing the private sector • Increases the skill level of the private sector <p>7. Will the project promote community support and involvement?</p> <ul style="list-style-type: none"> • Addresses concerns of traditional leaders • Addresses concerns of civil society groups e.g. NGO's & religious leaders • Involves community contribution to equity

V. POLICY AND PLANNING REVIEW

65. The key documents reviewed in the course of this project are briefly outlined here.

A. National Sustainable Development Plan

66. In 2003 the CI government 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, government with the assistance of its development partners, has evolved a National Sustainable Development Plan (NSDP). The document is in final draft form and is expected to be published and distributed during 2006.

67. 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.”

68. The NSDP sets out nine sustainable development goals:

- Well-managed private sector-led economic development: macroeconomic management and private sector development.
- Well-educated, healthy and productive people: education, health, human resource development, youth, gender, social welfare and sports.
- Sustainable use and management of our natural resources and environment: marine, land, agriculture, environment, waste and water.
- 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 harbors.
- 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.
- Strengthened national coordination and information system for development planning, monitoring and evaluation: information systems and statistics, institutional coordination.
- A society that treasures cultural heritage, values and identity while respecting cultural diversity: history, culture, language, heritage sites, traditional knowledge and practices.
- 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.
- A safe, secure and resilient Cook Islands: all hazard risk management, immigration and border control, transnational security

69. For each goal the NSDP: (i) provides key baseline indicators, (ii) sets out a series of strategies and (iii) provides key outcome targets for 2006-2010.

70. 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: (No. 1) economic development, (No. 3) sustainable natural resources and environment and parts of (No. 9) a safe Cook Islands.

B. Budget Policy Statement 2006-2007, March 2006

71. The policy statement identifies six key areas on which the government will focus, in accordance with the National Sustainable Development Plan:

- Governance and Law & Order
- Economic Development
- Social Cohesion
- Outer Islands Development
- Infrastructure Development
- Environmental Sustainability

72. The Infrastructure Master Plan (IMP) focuses on three of these priorities: outer islands development, infrastructure development and environmental sustainability, while taking account of the remaining three priorities as well.

C. Outer Island Strategic Plans

73. As part of ADB TA 3795-COO Preparing the Outer Islands Development Program in 2003, socio-economic profiles and five-year strategic plans for 2000-2005 were prepared for each island (some were later revised to cover 2003-2008). The strategic plans, in addition to defining the island's aspirations for future development, also identified a list of specific needs in various sectors, including specific infrastructure improvements. In subsequent years each island administration prepared an annual business plan as part of the budgetary process. The annual business plans contain a request for implementation of high-priority projects identified in the strategic plans as well as new projects.

74. The island profiles were summarized in the Inception Report together with a list of infrastructure projects contained in their 2003-2008 strategic plans and their FY2006-2007 business plans.

D. Outer Islands Development Program

75. The CI Government, the New Zealand Agency for International Development (NZAID) and the Australian Agency for International Development (AusAID) have established a program for the period 2005-2008 to develop infrastructure on the outer islands. This is described in the Development Partnership Agreement (DPA) signed between the three governments. The NZAID and AusAID funding is NZ\$6 million spread over three years. In addition, the CI government budget provides approximately NZ\$2.5 million CAPEX (capital expenditure) funding for outer island infrastructure and equipment purchases. Taken together there is approximately NZ\$4 million per year available for infrastructure development over the next three years.

76. The CI Government has encountered problems in implementing infrastructure development projects in the outer islands: construction works have been started but not completed and preparation of projects for implementation has lagged behind available funding. The Aid Management Division (AMD) of MFEM provides

secretariat support to the Aid Coordinating Committee (ACC)² and is responsible for program management of aid funds. MFEM has proposed that an Outer Islands Infrastructure Project Development Unit (PDU) be established within the AMD to prepare and implement projects under the DPA. This is discussed further under institutional arrangements.

VI. CLIMATE CHANGE CONSIDERATIONS

77. The world is warming. The effect of a warmer world on low lying island countries such as the Cook Islands can be significant. Climate change conditions are envisaged already as impacts from extreme events such as tropical cyclones, intense periods of rainfall or droughts and extremely high winds, or air temperatures that have been felt across the country over the past decade. The effect of these impacts across a widely scattered group like the Cook Islands means that normal conditions of climate which comprise a southern and northern group of islands affected by trade winds, medium probability of cyclone activity in the summer season, and generally moist conditions throughout, will change by exceeding the current "normal" extreme event occurrences. These maritime influenced conditions will contribute to an increased development of extreme events both during and outside current climate seasons, e.g., such as cyclone season, affecting already vulnerable areas and sections of society who reside on these islands.

78. During El Nino events, the South Pacific Convergence Zone (SPCZ) drifts eastwards, warmer than normal ocean water temperatures fuel cyclonic activity further east than usual, thus affecting the northern group of islands as an area of formation, and the southern group of islands at higher risk than usual because of the shift eastwards of cyclone tracking. A climate change scenario points toward this effect as a more common feature around the Cook Islands with at least a 20% increase in cyclonic activity both within and outside of current cyclone seasons.

79. Climate scenarios based upon Global Circulation Models outline that in this region of the Pacific extreme events will increase along with significant impacts upon the people and their environment. The Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report (2003) outlined that for small island states in the Pacific region, the following scenarios could be identified with some confidence. The scenarios are:

- (i) **Rise in sea level.** Sea level may rise 0.5meter (in a best-guess scenario) to 1meter (in a worst case scenario) by 2100.
- (ii) **Increase in surface air temperature.** Air temperature could increase 1.6°-3.4°C by 2100
- (iii) **Changes in rainfall.** Rainfall could either rise or fall by about 20% from current rates in 2100 leading to more intense floods or droughts.
- (iv) **Increased frequency of more El-Nino like conditions.** The balance of evidence indicates that El Nino conditions may occur more frequently, leading to higher rainfall in the central Pacific and northern Polynesia.
- (v) **Increased intensity of cyclones.** Cyclones may become more intense in the future, with wind speeds increasing by as much as 20%; it is unknown whether cyclones will become more frequent.

² Establishes the priorities for the use of aid funds in consultation with ministries.

80. Within the context of socioeconomic development, climate change thus has a profound impact upon current and future development initiatives. A wide range of scientific, technical, and research oriented initiatives have been undertaken over the past decade to try to better define what these effects could be and to quantify the cost of the impacts.

81. The Cook Islands is a vulnerable country already at risk from changes in social, political, economic, and environmental factors. Taking into account climate change exacerbates vulnerability under each of these risk areas.

82. Understanding how to manage climate change risk reduction is embedded into a process which follows a parallel then convergent pathway to the current project design and development processes. Each step in the climate risk reduction process delves into more site specific information and data requirements enabling the level of the climate risk to be assigned to a project to be identified, and in turn as project feasibility is examined, working closely with project engineers, and other experts, identifying least cost solutions to address the risks. Quantifying the cost of climate change risk is an end result of the process.

83. The Climate Risk Profile in Volume 4 provides an initial snapshot of how the current climate may change and to what effect these changes may have on the Cook Islands. Economic development in the Cook Islands is at risk from both current climate conditions as well as changing climate conditions in the future. These risks can be highlighted specifically by identifying how project developments may be affected by current climate parameters, such as rainfall, temperature, high winds, cyclones, and sea-level rise, among others. In other words how sensitive are the possible projects to a range of climate parameters, and if possible changes do occur to those parameters, what will be the impact and flow-on effect to the project and the surrounding environment.

84. The profile scopes out the identified projects under the Infrastructure Master Plan framework for their climate sensitivity and recommends that those projects most at risk from the identified climate parameters will need to undergo a further assessment once more project information is developed. The required assessment, called a Project Adaptation Brief provides for a preliminary detailed assessment of the conditions that could affect the project into the future over and above current normal conditions.

85. Once undertaken and completed, the Brief results in a set of terms of references for a climate expert to undertake detailed feasibility as part of a project feasibility team on the specific project, with resultant options or solutions available for modifying the proposed project to ensure climate impacts are minimized, reduced, or addressed. The TOR and the individual selected to undertake this assessment are integral parts of the feasibility team and work closely with the key expertise available for the project design, e.g., engineers, financial managers, etc. This resultant work “climate proofs” the project to an acceptable level of risk and least cost design and implementation.

86. The climate proofed project thus paves the way for a least cost design and implementation procedure integrated or mainstreamed into existing planning, design and implementation processes that takes into account increased risk from climate change. The quantification of the difference between developing the project without taking into account climate change, and developing the project with climate change risk taken into account is called the “incremental cost”.

87. The consequences of inaction or not taking into account climate change risks in an already vulnerable situation escalates overall project O&M costs, including any rehabilitation costs which are likely to occur during the lifetime of the project. There is also an increased impact on potential benefits to the surrounding environment and people.

VII. INSTITUTIONAL & ORGANISATIONAL CONSIDERATIONS

A. Outline

88. The objective of the TA's institutional component was to assess the governance, effectiveness and policy frameworks for the delivery of essential basic services; to assess the management of infrastructure assets and the management and disbursement of disaster recovery funds and make recommendations for changes to improve effectiveness and efficiency.

89. The results of this component are contained in Volume 3 – Institutional Assessment. The volume contains a review of all policy and planning; an evaluation of current institutions; a discussion of cross-sectoral, government-wide issues and potential solutions; and a detailed analysis for each sector. Existing policy, legislation and regulation have been assessed. Business plans and the responsibilities and performance of participating stakeholders have been reviewed. The analysis has identifies institutional constraints, discusses alternative strategies for addressing these constraints and makes specific recommendations for improved sector efficiency and service delivery.

B. Background

90. Faced with a financial crisis that included difficulties meeting loan repayments and a Treasury struggling to make fortnightly salary payments, the Cook Islands Government undertook a wide ranging restructure and reform of agencies between 1996 and 1998. The number of government ministries and departments were drastically reduced through rationalization and consolidation.

91. Part of the restructure was the incorporation, as state owned enterprises (SOE) of the financially sustainable activities of the provision of electricity to Rarotonga and the operation of international airports and harbors for Rarotonga and Aitutaki. Coupled with the restructure and downsizing of the public service was the significant decentralization of functions to Island Governments. Difficulties with capacity soon resulted in the recentralization of both education and health services except for Palmerston and Rakahanga Island which maintain full devolution for all Government Services.

C. Institutional Strategy

92. Volume 3 outlines and analyses the institutional and governance constraints facing Government as it plans, implements and maintains infrastructure. It suggests strategies to address the constraints which are based on the following philosophy:

- Well resourced agencies responsible for the functions of policy and planning; implementation (engineering and construction), operations and maintenance; and monitoring and enforcement;

- The establishment of pools of technical skills in government or technical ministries with funds available to provide fly-in services to the OIs as needed;
- Outsourcing of design, construction, operations and maintenance of works to either government agencies or the private sector;
- Key agencies such as AMD and the Office of the Minister of Island Administration (OMIA) having the funds to outsource works to other government agencies or the private sector on a fee for service basis;

93. During the course of the TA, the team met with many stakeholders throughout Government, the private sector, island communities and NGO's. The logistics of these meetings are detailed in Volume 6 – Consultations. Following the identification of key constraints to institutional efficiency and effectiveness, the team discussed options for change and improvement. The results of these discussions were presented and debated during three workshops over the course of the TA. The findings and options were met with support, but also the realization that much has to be done to progress them in conjunction with the development of the physical infrastructure. The results of these discussions, and preliminary outlines of how they could be adopted are presented in Volume 3

94. The strategic approach proposed is founded upon the following criteria:

- Develop and put in place an effective and realistic economic development strategy;
- Develop sectoral policies that are instructed by and support the national economic strategy;
- Develop, maintain and enforce an effective system for monitoring and evaluating performance;
- Develop and implement a policy for outsourcing of services and create a stable enabling environment for its achievement;
- Pursue policies to build up private sector capacity so as to maximize private sector involvement in the construction, operation and maintenance of infrastructure;
- Government to invest in capacity building so as to achieve its medium and long term targets;

VIII. MASTER PLAN PROJECTS

A. Master Plan Considerations

95. It is important to re-state the boundaries of the study and the eventual Master Plan as developed under this TA:

Defined by ADB TOR

- The study will cover strategic infrastructure sectors of Transport, Water, Sanitation and Solid Waste, Energy, Telecommunications.
- The TA will focus on Outer Islands.
- Master Plan excludes Health, Education, Agriculture, Fisheries and other sectors.

Defined by CI Government

- Included Emergency Management Centers (EMCs) and Maintenance Facilities as essential infrastructure.

- CI government funding limit for Master Plan sectors = \$NZ 50 million in next 5 years.
- Includes projects in donor pipelines e.g. NZAID-funded Outer Islands Development Program (OIDP) and Cyclone Recovery and Reconstruction Program (CRRP), and Chinese assistance.
- Excludes recurrent expenditures, periodic maintenance and equipment replacement.
- Includes capital expenditures for improvements, major repairs and reconstruction.

Defined by Team

- Capital cost estimates are in NZ\$, 2006 prices, and provide 15% contingency and 10% for engineering
- Master Plan excludes asset replacements funded from SOE commercial borrowing (e.g. CIAA nav aids, TAU generators, all CI Telecom projects).
- Annual O&M costs in CI government recurrent budget are included
- Annual O&M costs in SOE budgets are excluded

B. Project Identification and Priorities

96. The Infrastructure Master Plan comprises the projects in 10 sectors. Project Profiles have been developed based on an assessment of short and long term needs in Rarotonga, Aitutaki and the remaining Outer Islands. Profiles for 111 projects have been compiled on a sector basis. They include 82 capital works projects and 5 studies for funding through the Government (either from the annual budgets, loans or grants from donor agencies). In addition, Profiles have been included for 20 energy projects to be funded from Te Aponga Uira's (TAU) capital expenditure budget and for 4 projects to be funded from Telecom Cook Island's (TCI) capital expenditure budgets.

97. The capital works projects have an estimated capital cost of \$237 million. The CI government requested that priorities should be assigned to projects with a view to identifying high-priority projects which could be implemented in the next five years with a funding limit of approximately \$50 million. Priorities were established in each sector based on:

- the multi-criteria evaluation tool described in Section VI of this Volume 1 and also in Volume 5.
- adjustments to recognize urgent technical needs as identified by Government and at workshops.
- Projects approved for construction or in donors' pipelines were given highest priority.

98. The prioritization resulted in the identification of 44 projects with an estimated capital cost of \$55 million. These include projects funded by NZAID's Cyclone Recovery and Reconstruction Program and Outer Island Development Program and the inner ring road project assisted by China.

99. Capital and Operating and Maintenance (O&M) costs were estimated for all projects. Costs are expressed in NZ\$, 2006 prices, and capital costs include 15% physical contingency and 10% for engineering. Projects and costs (tabulated by sector and by island) are shown in Tables 1 and 2 and in Figure 6.

C. Explanatory Notes

100. **Sectors:** The Master Plan does not cover all infrastructure in the Cook Islands. It covers the sectors named in the Terms of Reference (TOR) agreed between the ADB and CI government as those which require the greatest investment in infrastructure. These are Transport (air, marine and roads), Water Supply, Sanitation, Solid Waste Management, Energy and Telecommunications. The Master Plan excludes infrastructure for Health, Education, Agriculture, Fisheries, Marine Resources and other sectors. Government may wish to add supporting infrastructure for these sectors into the Master Plan at a later date.

101. **Maintenance and Emergency Management Centers:** Maintenance Facilities and Emergency Management Centers were added when it became evident that investment was required in these facilities in order to (1) support maintenance of the infrastructure in the Outer Islands and (2) achieve one of the key objectives of the Master Plan namely protection against climate change impacts. The Master Plan includes maintenance buildings and workshops in the Outer Islands and test laboratories essential for operation and maintenance of infrastructure. The Master Plan excludes offices for government agencies or state-owned enterprises.

102. **Focus on the Outer Islands:** The TOR directed that the Master Plan focus on the Outer Islands, and the emphasis in the short term is to repair cyclone damage and correct infrastructure deficiencies in the Outer Islands. The needs of Rarotonga and Aitutaki were also assessed in detail and tend to predominate in the longer term as described below.

103. **Scope of Projects:** The Master Plan includes major repairs, rehabilitation and reconstruction of infrastructure which has been damaged by cyclones, deteriorated from insufficient maintenance or simply reached the end of its design life. The Master Plan generally excludes periodic maintenance and replacement of plant and equipment, although new plant and equipment are included as part of many projects.

104. **Climate Change Adaptation:** The Master Plan has marked projects which are especially at risk from extreme weather events and identified the type of adaptation measures required. At-risk projects will require additional study (a Project Adaptation Brief) at the feasibility or detailed engineering design stage to determine the appropriate adaptation measures and associated costs. The capital costs shown for the Master Plan projects represent best international practice but, except for the 15% physical contingency, do not include the cost of climate change adaptation measures.

105. **State Owned Enterprises:** The Master Plan includes major investments in infrastructure operated by SOEs which will require CI government funding assistance. This includes a covered Departures building at Rarotonga Airport and a second generator station for TAU. The Master Plan excludes replacement of assets which SOEs such as CIAA, CIPA and TAU will fund from reserves set aside for this purpose. Examples include the Instrument Landing System (ILS) and VOR/DME at the airport and new generators for TAU.

106. **Telecommunications:** was included in the Master Plan TOR and was reviewed with the other sectors. However, telecommunications are provided by Telecom CI (TCI), a private company, therefore investment and O&M costs are excluded from the Master Plan.

107. **O&M Costs:** The Master Plan estimates the additional O&M requirements and costs associated with each project which will need to be added to Government's recurrent expenditure budget. However, the additional O&M costs of SOE infrastructure projects are not included – on the assumption that those costs will be incorporated into SOE operating plans. For example, the O&M cost of the Avatiu Harbor western basin development will be absorbed into CIPA's budget. The exception is the Outer Island airports taken over by CIAA after improvement. They will require specific O&M budget support from the government.

D. Sector Commentary

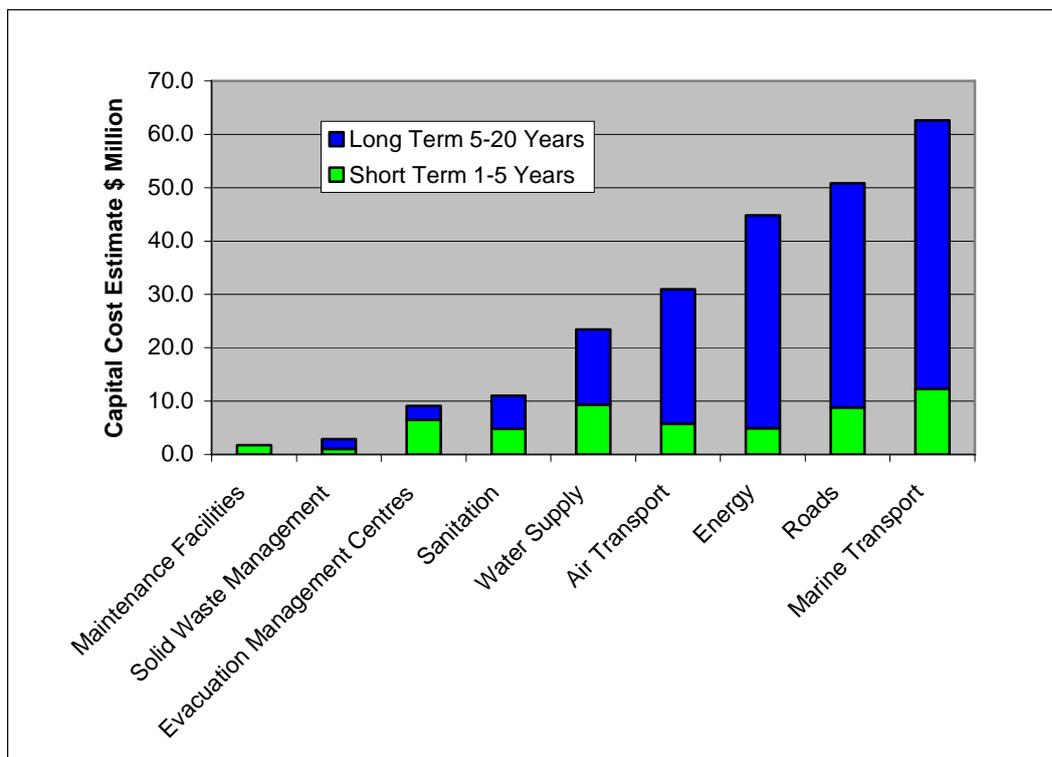
108. **Marine Transport** has the highest capital cost requirement. In the short term the major need is to reconstruct the Outer Island harbors damaged by cyclones. The construction costs are high but the facilities should operate for many decades. In the long term the high capital cost is for improvements to Avatiu Harbor and protection of Rarotonga's north coast from the airport to Avarua which has been included in the Marine Transport Sector.

109. **Roads** have the second highest cost requirement because of the high cost of improving the inner ring road in Rarotonga and roads in Aitutaki and Outer Islands in the short term, and the cost of rehabilitating the main ring road in Rarotonga in the long term.

Table 1: Capital and O&M Costs By Sector

Sector	No. of Projects	Short Term 1-5 Years			Total 20 Years		
		Capital Cost \$ million	%	O&M Cost \$ million	Capital Cost \$ million	%	O&M Cost \$ million
Air Transport	10	5.8	10.4%	0.23	31.0	13.1%	0.53
Marine Transport	15	12.3	22.3%	0.58	62.6	26.4%	0.73
Roads	7	8.8	16.0%	0.44	50.8	21.4%	0.78
Water Supply	18	9.4	17.0%	0.13	23.5	9.9%	1.07
Sanitation	9	4.8	8.7%	0.27	11.0	4.6%	0.59
Solid Waste Management	5	1.0	1.8%	0.08	2.9	1.2%	0.23
Energy	13	4.9	8.9%	0.18	44.8	18.9%	2.40
Maintenance Facilities	5	1.8	3.2%	0.59	1.8	0.7%	0.59
Evacuation Mgt Centers	4	6.5	11.7%	0.09	9.1	3.8%	0.34
Total	86	55.2	100.0%	2.58	237.5	100.0%	7.25

Figure 6: Capital Costs By Sector



110. **Energy** project priorities include the rehabilitation of power systems in the Outer Islands in the short term. The high cost in the long term is created by the need to construct a second power generation plant in Rarotonga which will require government funding. Total Energy sector costs are much higher than shown if TAU's capital improvement program is included but because it will be internally funded it is excluded from the Master Plan.

111. **Air Transport** priorities are to improve the Northern Group airports for Saab 340 service and provide a separate departures area in Rarotonga Airport. Longer term capital costs are to implement cyclone protective measures at Rarotonga and continue improvements to the Outer Island Airports.

112. **Water Supply** improvements are needed in all islands and are given a high priority. Capital costs of individual projects tend to be less than the civil works costs associated with harbor or airport improvements. Over the 20 year period O&M costs are proportionately higher.

113. **Sanitation** improvements are needed in all islands with highest priority given to treatment plants in Rarotonga. Overall capital costs are not as high as other sectors therefore it should be possible to achieve all targets for the Sanitation sector. The same principle applies to Solid Waste Management.

114. Provision of **Emergency Management Centers** in all islands is one of the highest priorities and has the fourth highest capital cost in the short term. Equally, Maintenance Facilities have to be provided in all Outer Islands in the short term to improve the Island Administrations' capacity to maintain all other infrastructure.

E. Island Commentary

115. The distribution of capital costs across the islands is shown in Table 2. In the short term about 60% of costs are for projects in the Outer Islands (excluding Aitutaki) with only 32% in Rarotonga and 8% in Aitutaki. This is to be expected given the Outer Islands' needs in all sectors and the high capital costs of harbor and airport projects in current programs.

116. In the longer term, projects in Rarotonga represent 67% of total capital cost, Aitutaki 12% and the Outer Islands 21%. After priorities in the Outer Islands are satisfied in the next five years the focus must be redirected to addressing major investments required in nearly all sectors. Several projects such as coastal protection, road rehabilitation and harbor improvements involve high capital costs and will require staging over several years.

Table 2: Capital Costs by Island

Island	Short Term 1-5 Years		Total 20 Years	
	Capital Cost \$ million	%	Capital Cost \$ million	%
Rarotonga	17.8	32.21%	159.9	67.33%
Aitutaki	4.6	8.24%	29.1	12.23%
Atiu	1.9	3.38%	2.6	1.10%
Mangaia	4.0	7.32%	9.4	3.97%
Mauke	2.9	5.29%	3.7	1.55%
Mitiaro	3.3	5.98%	4.1	1.71%
Manihiki	3.5	6.41%	3.5	1.49%
Nassau	0.3	0.60%	0.3	0.14%
Penrhyn	1.7	3.08%	1.7	0.72%
Pukapuka	3.3	5.89%	3.5	1.48%
Rakahanga	0.1	0.14%	0.1	0.05%
Outer Islands	2.8	5.11%	2.8	1.19%
Southern Group Islands	0.8	1.49%	5.5	2.32%
Northern Group Islands	8.2	14.86%	11.3	4.74%
Total	55.2	100.00%	237.5	100.00%
Rarotonga	17.8	32.21%	159.9	67.33%
Aitutaki	4.6	8.24%	29.1	12.23%
Outer Islands	2.8	5.11%	2.8	1.19%
Southern Group	12.9	23.45%	25.3	10.65%
Northern Group	17.1	30.98%	20.5	8.61%
Outer Islands Subtotal	32.9	59.54%	48.6	20.45%
Total	55.2	100.00%	237.5	100.00%