

ASIAN DEVELOPMENT BANK

FINAL REPORT

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



VOLUME 1: MASTER PLAN

March 2007



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

In association with



CURRENCY EQUIVALENTS
(as of 23 March 2007)

Currency Unit	–	New Zealand Dollar (NZ\$)
NZ\$1.00	=	US\$0.71
US\$1.00	=	NZ\$1.41

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
AWF	Aitutaki Waste Facility
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
CEAL	Cyclone Emergency Assistance Loan
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
EXCIL	Express Cook Islands Line Agency Ltd
EIA	Environmental Impact Assessment
EMC	Emergency Management Center
EMCI	Emergency Management Cook Islands
ENSO	El Niño/Southern Oscillation
FY	Financial Year or Fiscal 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	South Pacific Islands Applied Geoscience Commission
SPC	South Pacific Commission
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	Television New Zealand
UNDP	United Nations Development Program
VASIS	Visual Approach Slope Indicator System
VOR	Variable Omni-range
WDC	Waste Disposal Center
WHO	World Health Organization
WMD	Waste Management Division
WWD	Water Works Division
RWF	Rarotonga Waste Facility

WEIGHTS AND MEASURES

g	Gram
g/c.d	Gram per capita per day (waste generation)
Ha	Hectares
kL	Kiloliter
Km	Kilometre
km ²	square kilometres
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	Millimetres
°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.

ABSTRACT

Recent studies have shown that the Cook Islands' social infrastructure has limited preparedness against weather-related vulnerability. 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, both by the construction, operation and maintenance of suitably planned resilient infrastructure and by the development of strengthened capacities for this purpose and for disaster management and mitigation.

The TA established a Preventive Master Plan that sets out the path to long term preparedness of the islands to respond to disaster by minimizing the potential harmful effects of future emergencies, and to climate change. Master Plan preparation began with an initial on-site assessment of infrastructure throughout the islands and a review of on-going plans and projects. A long list of infrastructure development needs was identified, which included projects already conceived and either planned or under construction; projects that answer principal needs as identified by the Government and Island Administrations; replacement of critical infrastructure; and, future infrastructure that will be needed to address the requirements arising from economic growth and climate change impacts.

The TA used a four-pronged approach to set priorities and conceptualize the master plan, based on a top-down assessment of infrastructure requirements, a bottom-up assessment by islanders, the provision of agreed minimum level of service in each sector, and consideration of means of climate proofing. These were reinforced by means of infrastructure condition surveys, socio-economic development and demand forecasting, development of a climate risk profile, and extensive consultations. A series of workshops and consultations were undertaken throughout the TA to provide stakeholders with a direct input into the Master Planning process.

Following project identification, broad cost estimates were applied, covering both capital and ongoing operation and maintenance costs. A multi-criteria analysis was carried out to broadly identify priority projects. An interactive ranking method was then applied to rank projects through dialogue with key stakeholders. Profiles of each project were prepared.

Institutional and organizational considerations, for the governance, legal provision and policy frameworks for the delivery of essential basic services were assessed and recommendations developed. In order to address constraints faced by the government, an institutional strengthening strategy was developed that addressed the progressive development of well resourced agencies and pools of technical skills, utilizing, where appropriate, external resources through outsourcing, and special resource allocation to key agencies. Legal and regulatory provisions for climate proofing were also addressed by a review of the building code and legislative provisions governing planning and siting of infrastructure.

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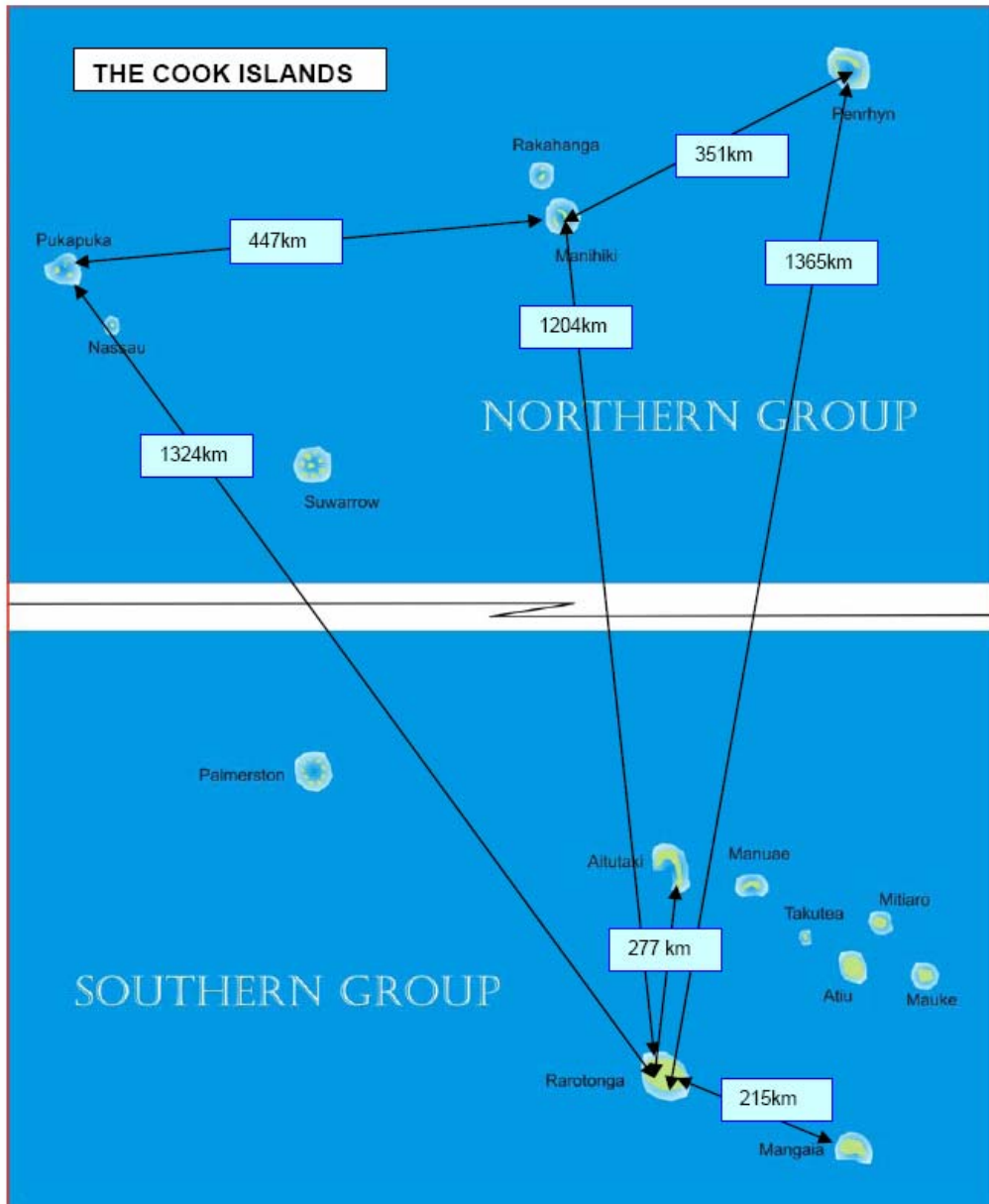
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Map: Cook Islands



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

EXECUTIVE SUMMARY

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 5¹ 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 (CEAL) 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 Pacific. 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) was 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 Category 5 - Their wind speeds exceeded 200 kilometers per hour (kph) with cyclone Meena peaking at 280 kph; cyclone Nancy at 241kph; cyclone Olaf at 259 kph and cyclone Percy at 212 kph. Four of the 5 cyclones were given the maximum severity rating of category 5 (RRP:COO 39118 June 2005:1)

- 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 has developed, through a consultative process, 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 to 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 was 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.

2. Component 2

9. Preparation of a comprehensive and integrated environmentally sustainable preventive 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.

II. APPROACH

A. Initial Assessment

10. 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.

11. 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

12. The TA used a four-pronged approach in the study as summarized in Figure 1 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.

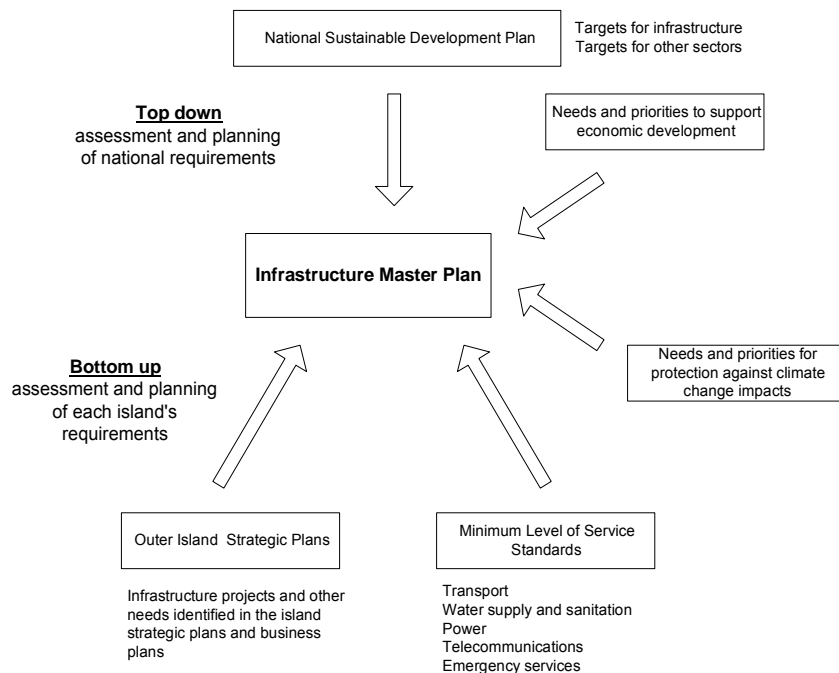
C. Methodology

13. The master planning process involved the following steps:

1. Review Existing Projects and Plans

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

Figure 1: Overall Approach



2. Create Infrastructure Inventory and Condition Database.

15. 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.

16. The team worked closely with the parallel NZAID-funded GHD 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.

17. 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.

3. Forecast Socio-economic Development and Infrastructure Demand

18. The adopted philosophy for this study was that infrastructure development should support and facilitate economic development, not vice versa. Existing visions and strategic plans were taken into consideration and augmented with assumed development strategies where necessary. Therefore as a first step, the team 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.

19. The assumed economic development scenarios became the basis for the planning of the infrastructure on each island. The team 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.

20. The above approach enabled the projection of populations and types of transport needs and impacts that would influence the infrastructure development. In particular, key activities such as tourism, aquaculture, fisheries and agriculture were identified 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.

21. Next, based on the economic development scenarios, population forecasts were prepared, 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 Part 1.

22. 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, estimated projections were prepared 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

23. The Infrastructure Master Plan should provide every island with a minimum level of service in the water, sanitation, power, telecommunications and transport sectors. Minimum performance standards in each sector were addressed in the Inception Workshop with input from a wide range of public and private sector representatives from all sectors. The Inception Workshop results are summarized in Appendix 8 – Stakeholder Meeting Summaries. Performance standards for each sector are described in Part 1 – 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.

24. 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'.

25. 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

26. 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 Appendix 8.

6. Develop updated Climate Risk Profile for Cook Islands

27. An updated Climate Risk Profile was prepared by IGCI and is contained in Part 3.

7. Review Building Legislation and Recommend Changes

28. 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 Cook Islands National Building Code. In addition, Australia has prepared specific provisions for strengthening structures to withstand cyclones. These were reviewed along with other key legislation governing buildings and recommendations were made on changes needed in the National Building Code. These are also contained in Part 3.

8. Project identification

29. 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.

30. 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), (Rarotonga Electricity company).

31. 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.

32. 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.

33. 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.

34. The project identification process is outlined in Figure 2.

