SOPAC

EU-SOPAC (EDF9) Project Report 76
Reducing Vulnerability of Pacific ACP States

NAURU
REPUBLIC OF NAURU KRA 2 (WATER) MISSION REPORT

27th October to 05th November 2006

Nauru – Reinforced concrete water storage tanks (derelict)

Compiled by:

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SOPAC Secretariat

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IMPORTANT NOTICE

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CONTENTS

1. INTRODUCTION

During October – November 2006, a four-week period of duty travel covering the North and Central Pacific nations was undertaken to refine and rationalise the EDF9 work plans pertaining to the in-country KRA2 (Water) tasks and enhance the available synergies and support within the CLP (Water) programme. The mission initially targeted Palau (2 weeks), before moving on to Majuro, Republic of the Marshall Islands (RMI) (1 week) and completing in Nauru (1 week).

This document is a record of the proceedings of the in-country mission to Nauru, undertaken by Mr Stephen Booth, EDF8/9 Senior Advisor (Water) from 27th October to 05th November 2006. The specific objective of these consultations was to help identify Project tasks appropriate to Key Result Area 2 (KRA 2) interventions of the EDF9 – Nauru Work Plan. The five working days actually achieved in Nauru were significantly compromised by transportation difficulties, resulting from a combination of cancelled international flights, an almost total lack of available diesel fuel on-island and difficult, partially-flooded road conditions due to heavy rainfall events.

With a land area of just 21 km^2 Nauru is by far the smallest, and arguably the most vulnerable, of the fourteen nations within the EDF8/9 Project and a "whole-of-island" approach is therefore considered appropriate to water sector tasks.

2. OBJECTIVES

The ***general*** mission objectives were:–

- to initiate (Nauru) and maintain (Palau & Majuro) Project momentum within the KRA2 (Water) sector following on from:–

  (a) the SOPAC Deputy Director's North Pacific mission in April 2006 for "whole-of-government consultations" [this trip excluded Nauru];
  (b) the Water Safety Plan Scoping Mission in Palau in June 2006; and
  (c) the Water Quality Management & Water Demand Management scoping missions (EDF9-funded) to Majuro in July 2006.

- to clarify and rationalise Project KRA2 tasks as appropriate to enable pragmatic forward planning to achieve realistic deliverables within the remaining Project timeframe, and

- where existing KRA2 tasks are well-defined, to undertake primary fieldwork and technical assistance as appropriate.

The ***specific*** mission objectives provisionally envisaged for **Nauru** were originally outlined in proposals submitted (see Annex J) by SOPAC for consideration by the EU Delegation in Suva during January 2006, and this mission proceeded on the basis of these as follows:–

- Following on from the initial EDF9 multi-stakeholder meeting(1) and consultations completed in Nauru in July 2005, to further engage with primary government, non-government and community stakeholders with respect to Nauru's water sector to initiate, develop and define work plan tasks within the context of existing land use and development planning constraints, rainwater harvesting options, aquifer vulnerability and source protection zoning, and groundwater monitoring data holdings.

- To introduce and explore the provision of assistance through the current EU-funded programmes of SOPAC in conjunction with the programming of Nauru's B-Envelope funds (see Annex K), also under the 9th EDF. Should a draft plan of action for implementation

appear feasible, it was considered that focal areas for development may include one or more of the following:–

- Development of a RS/GIS/GPS database of all properties and associated roof catchments to accurately identify the condition of rainwater harvesting infrastructure assets such as roofing materials, guttering, downpipes and storage tanks.

- Conjunctive use of available water resources through maximising rainwater harvesting and groundwater resource abstraction. Firstly, rainwater harvesting and storage improvements can be made in the immediate to short-term, both at the domestic and communal/institutional level and be considered as major components under the B-envelope. Secondly, groundwater abstraction is envisaged as a long-term investment for which a thorough investigation of current aquifer conditions and baseline monitoring is required. A proposal[(2)] for a groundwater investigation programme was completed for AusAID in February 2003 and could be considered for implementation under Nauru's B-Envelope

- Transfer of SOPAC's Technical Guidelines for the implementation of rainwater harvesting systems as well as the Manual for community participation developed for rainwater harvesting in Pacific Islands.

- Provide guidance and assistance in the location and identification of potential hazards to the groundwater quality such as septic tanks, fuel tanks and landfill sites. These will prove critical precursors to the aquifer risk assessment process and source protection development planning required for initial introduction to Nauru of Water Safety Plan concepts.

- The general condition of the current reticulated water supply system at the ex-NPC area is in need of assessment. Replacement of pumps, valves, pipes could be considered under the B-Envelope. A water demand management plan could be established that includes leak detection and hydraulic analysis of the whole central system. GIS development will assist in the hydraulic modelling of the reticulated system.

- Locate and review the National Water and Sanitation Plans (drafted by WHO through Nauru MOH – see Annex B). Subject to status, a comprehensive Water and Wastewater Management Strategy could be developed with the various stakeholder groups through a consultative process. This could lead to the development of a National Water and Wastewater Policy and National Action Plan, which should strengthen the institutional arrangements for water resources management on Nauru. The Pacific Programme for Water Governance can provide guidance on developing such a process.

- Review feasibility of small-scale, reverse osmosis desalination plants for specific users where high-quality water is necessary, such as the hospital or for individual needs or private enterprises such as hotels, where cost recovery can be obtained.

- In parallel with all of the above suggestions, it is essential that community awareness and education on water conservation, sanitation and hygiene are undertaken in collaboration with suitable NGO's or community organisations. SOPAC is able to assist in this regard through the provision of awareness and education materials through its Water Supply, Hygiene and Sanitation (WASH) programme.

3. LIST OF PEOPLE

	Name	Telephone (+674)	Email	Designation
NAURU STAKEHOLDERS				
1	Porthos Bop	444 3845	w.tsitsi@cenpac.net.nr	Director of Lands and Survey
2	Wes Tsitsi	444 3845	w.tsitsi@cenpac.net.nr	A/D of Lands and Survey
3	Tyrone Deiye		tdeiye@cenpac.net.nr	Secretary for IDI
4	Bryan Star	444 3133 [312]	bryanstar@cenpac.net.nr	Project Officer IDI
5	Abraham Aremwa	–	aremwa2002@yahoo.com.au	Utilities Manager [power, fuel and water]
6	Raphael Ribauw			Utilities Water Supervisor
7	Geoffrey Thoma			Utilities Assistant,
8	Charmaine Scotty			Acting Secretary for Health & Sec for Home Affairs (Media/Lands & Survey/Womens/Lands Committee)
9	Raymond Itsimera			Environment?
10	Pene Agadio			Environment Officer – IDI
11	Ian Mackay	444 3864	mms@cenpac/net.nr	Property owner MM's front of Maqua Cave
12	Joe Hiriam	444 3822	labenhiriam@yahoo.com	Engineering Manager – RONPHOS.
13	Charisse Buramen			RONPHOS Lab technician (rain gauge readings)
14	Jun Nuqui		Jun_nuqui007@yahoo.com	RONPHOS Engineering Assistant
15	Elkoga Gadabu		popsnauru@yahoo.com	UNEP Project Co-ordinator - POPS
16	Vinci Clodumar	444 3200	nrcceo@cenpac.net.nr vinmar51@gmail.com	CEO Nauru Rehabilitation Corp'n
17	Robert Deidenang			Chf Draughtsman, NRC
18	Lockley Denuga		Denuga@gmail.com	ICT, NRC
19	Andrew Kalerua		Ak4771@excite.com Arcs2@bom.twp.arm.gov	Atmospheric Radiation Measurement; US DoE
20	Ipia Gadabu	444 3133 [255]	bos@cenpac.net.nr	Bureau of Statistics
21	Percy Prosianos			UN FAO (Livestock)
22	Chitra Jeremiah	444 3133 [321/322]	amu@cenpac.net.nr; amu@naurugov.nr	PIFS Rep (PRAN) & Director of Aid Management Unit
23	Doug Melvin	444 3381	Doug Melvin@dfat.gov.au	1st Secretary, AusAid,
24	Mary Thoma		amu@cenpac.net.nr	Asst. Director, AMU
25	Pyon Deiye	444 3133 [242]	pdeiye@cenpac.net.nr	DFA [Foreign Aid]
26	Creiden Fritz	444 3133 [237]	creiden_fritz@yahoo.com.au	DFA [International Affairs]

4. EXECUTIVE SUMMARY

Through a combination of site visits and direct engagement with primary government, non-government and community stakeholders, this mission:–

- explored the provision of assistance through the current EU-funded programmes of SOPAC in conjunction with the programming of Nauru's B-Envelope under the 9th EDF, in an endeavour to avoid duplication and ensure synergy with a number of other water sector aid initiatives. Discussions with the PIFS Representative of the Pacific Regional Assistance to Nauru (PRAN) Aid Management Unit highlighted the fact that many different aid donors are also currently active, or propose to be in the near future, within the Nauru water sector. Of particular note are:–

- ***AusAID*** *– Essential infrastructure and contingency support in water sector – undertaken under MoU agreements between Nauru and Australia including the refurbishment of a RVO unit for water supply – A$600K;*

- ***ADB*** *– Technical assistance, including strategy for reform of the water and power sector. Government of Nauru (GON) to undertake review and reform of water and power sector in consideration of ADB reports and recommendations;*

- ***JICA*** *– Provision of 3x6000 l water tanks to each of 15 communities = 45 tanks in total – USD100,000;*

- ***UNDP/SPREP PACC Project*** *– USD 500k potential input into the water sector; and*

- ***SOPAC*** *– System of intervention in line with disaster preparedness (drought risk) "B-Envelope" funding – At the donors roundtable November 2005, EU agreed to provide up to Euros 500k for Nauru within the project to be managed by SOPAC.*

- held exploratory discussions regarding RS/GIS/GPS surveys and training by the Project to provide a database of all properties and associated roof catchments to accurately identify the condition of rainwater harvesting infrastructure assets such as roofing material, guttering, down-pipes and storage tanks. An asset condition survey of this nature would allow production of engineering specifications and associated bill of quantities to identify the infrastructure refurbishment and replacement opportunities under the EU B-Envelope funding. Subsequent provision and installation of sufficient domestic & community rainwater storage facilities will contribute directly to reducing Nauru's population vulnerability to drought risks.

- achieved data capture from RONPHOS (ex-NPC) consisting of old engineering drawings (Annex C), rainfall records (Annex F), National Water and Sanitation Plan (drafted by WHO through Nauru MOH) (Annex B) and made site observations of the general condition of the current reticulated water supply system.

- achieved further data capture from Government Statistics regarding current/future population trends from the 2002 Census and, in the light of recent significant changes in Nauru's population demographics, identified the need for a revised water demand assessment.

- discussed with the Nauru Rehabilitation Company (NRC) the proposed groundwater investigations (Ecowise Consultancy) and abstraction envisaged – a thorough investigation of current aquifer conditions and baseline monitoring is planned and appears eminently suitable to be considered for co-funding implementation under Nauru's B-Envelope risk management "drought" funds.

5. GENERAL DISCUSSIONS & CONSULTATIONS

Friday, 27 October 2006

- Following arrival in-country, late afternoon initial briefing with Creidon Fritz, Bryan Star & Pyon Deiye. Unfortunately the SOPAC MCR Kim Hubert was away at a Forum meeting in Nadi, therefore again unable to meet personally. Request alternative meeting be arranged with Mr David Adeang, Acting Secretary for Foreign Affairs & NAO. It was clarified that the ex-Nauru Phosphate Company (NPC) was restructured in late 2005 into three key business areas, namely PORTS AUTHORITY; RONPHOS (covering Mining); and UTILITIES (covering Power & Water).

Monday, 30 October 2006

- Morning briefing with Ms Chitra Jeremiah, PIFS Representative & Director of Aid Management Unit (AMU) – many other water sector initiatives are clearly proposed (refer to comments in Executive Summary of this report) or active in-country. Obtain hard copy of Nauru National Sustainable Development Strategy.(7)

- Mid morning to Lands and Survey to meet Wes Tsitsi (Porthos Bop just gone on long leave), followed by another meeting with Bryan Star to arrange tentative meeting schedule for remainder of week. Electronic transfer to Bryan Star of SOPAC's Technical Guidelines for the implementation of rainwater harvesting systems as well as the Manual for community participation developed for rainwater harvesting in Pacific Islands.

- Early afternoon discussion with Ms Charmaine Scotty, Acting Secretary for Health and Secretary for Home Affairs (portfolio covers Media/Lands and Survey/Women/Lands Committee).

- Late afternoon arrange with Secretary of Finance for urgent release of diesel from Government Store for rental vehicle.

Tuesday, 31 October 2006

- Early morning locate Mr Abraham Aremwa (Utilities Manager) at his home and arrange meeting in his office tomorrow.

- Mid-morning visit Maqua Cave with Raymond Itsimera. Cave lies to the rear of Ian Mackay's shop – he will search for old sample analyses.

- Early afternoon meeting with Mr Vinci Clodumar, at Nauru Rehabilitation Company – they have Tony Falkland advising on drilling investigation, but needs extra funds to initiate. Data capture of drilling proposals and Draft National Water Plan(3) (**reproduced in Annex B)** workshop held by Dr Wallis (WHO) in September 2001.

- Late afternoon visit RONPHOS – discussions with Joe Hiriam, Engineering Manager. Further data capture – old engineering drawings of NPC's water distribution system (**reproduced in Annex C**).

Wednesday, 1 November 2006

- Early morning discussions with Mr Elkoga Gadabu, POPS Co-ordinator, in Environment office.

- Mid-morning transfer to Power & Water Utility offices for consultations with Abraham Aremwa & Raphael, Water Supervisor – some data capture achieved **(recent consultancy reports [4] partially reproduced in Annex D).**

- Early afternoon, undertake site visit to Topside, guided by Vinci from NRC. Return to NRC offices for GIS discussions with Robert Deidenang, Chief Draughtsman for NRC – they have operated an ArcView GIS system for some years – CD data capture of colour imagery.

- Late afternoon return to Lands & Survey to meet Mr Porthos Bop who has interrupted his personal leave – had just received EDF9 MapInfo package and requested training, stating that he and rest of Lands & Survey are way behind NRC staff in GIS abilities.

Thursday, 2 November 2006

- Early morning – guided around a comprehensive site visit by Mr Raphael Ribauw (Water) and Mr Geoffrey Thoma (Utilities), inspecting the condition of ex-NPC water distribution facilities and failing storage network **(original storage schedule reproduced in Annex E)**.

- Late morning – return to offices of RONPHOS to complete data capture of old drawings of water distribution network. Whilst there located and updated recent 2003-06 monthly rainfall records from Laboratory rain gauge; partial/intermittent readings only, could be quite significant error margins.

- Early afternoon – visited Atmospheric Research Measurement (US-DoE site) with Andrew Kalerua. They also have rainfall-recording equipment. Obtained historic monthly rainfall record (Excel) from 1915-2002. Updated with monthly records 2003-2006 obtained this morning from RONPHOS Lab rain gauge **(reproduced in Annex F)**.

- Late afternoon – transfer back to government office complex for discussions with Mr Ipia Gadabu, Bureau of Statistics, obtaining population and 2002 census[5] data capture **(partially reproduced in Annex G)**.

- Late afternoon – return to Maqua Cave for photos (unfortunately no historic analyses records located by Mr Mackay).

Friday, 3 November 2006

- Early morning return to RONPHOS Laboratory library for photo data capture of 1972 AGC report[6].

- Late morning undertake final debriefing meeting with Ms Chitra Jeremiah and Ms Mary Thoma (Asst. Director of AMU) and Doug Melvin, 1st Secretary of AusAID. Noted that Australia provides A$2million per annum to GON as part of their “compact” agreement (compensation for phosphate extraction & usage?), which has about 11 years remaining to run.

- Midday check in at airport informed that outward flight cancelled by Our Airlines (technical fault, plane had to go to Kwajalein from Majuro).

- During the afternoon return to GON offices to debrief Pyon Dye; subsequently trying to locate information on rainwater tank locations proposed within the AusAID and Japan aid packages – Bryan Star will endeavour to collate and supply later. Again strongly encourage and emphasise the availability of EDF9 funds to support the Nauru Country Intern position (**Annex H – TOR left with Bryan to action asap**), which would also ideally fulfil other forthcoming water sector intervention (HYCOS and IWEM) focal point requirements.

6. KEY RESULT AREA 2 – TASK REVIEW

There is a considerable body of historic information concerning recommended water supply and management approaches to resolve Nauru's water problems. Interventions of particular note have included the following:–

- July 1972 — Australian Groundwater Consultant's Pty Ltd report to NPC on "*Groundwater for Industrial & Domestic Supply" (copy located in RONPHOS Lab Library and digital photo record obtained during this mission)*
- 1987-88 — Extensive hydrogeological study completed by Jacobson & Hill.
- 1998-2000 — Persistent 3-year drought & failure of desalination plant = an "emergency" water supply situation declared.
- May 2001 — Dr Ian Wallis (WHO) collaborates with MOH & NPC to report on the "emergency" and formulate a plan of action.
- July 2001 — Dr Wallis's draft Nauru Long Term Water Plan to be reviewed at in-country workshop.
- Sept 2001 — Draft National Water Plan workshop held by Dr Wallis (*copy of workshop notes successfully located and obtained from NRC during this mission – see Annex B).*
- Oct 2002 to Feb 2003 — AusAID utilise Ecowise Environmental Consultancy to report on Nauru Water Management, subsequently producing a project design document of Groundwater Investigation Details for Nauru Sustainable Water Supply Project.

There is potential to supply the island's freshwater needs from both groundwater and rainwater, rather than from the more expensive historic options of large-scale use of desalination (which relied on effective power generation) and periodic importation of freshwater by boat. The latter two methods of supply no longer represent sustainable options, given the extreme limitations of the socio-economic realities of Nauru's current situation compared to its historic affluence.

It is apparent that conjunctive use of groundwater and rainwater harvesting may well provide the best long-term water supply solution for Nauru. Groundwater investigations, monitoring and protection therefore warrant further study, as does an asset condition survey of the domestic and community rainwater-harvesting infrastructure.

Water conservation & awareness education remain extremely critical issues requiring input, as does the coincident investigation of the viability of cost recovery mechanisms. ***It cannot be over-emphasised that the prevailing socio-economic living conditions in Nauru present enormous challenges to the operational viability and maintenance sustainability of any***

proposals to undertake refurbishment or replacement of rainwater harvesting infrastructure.

Summary Table of Proposed KRA2 Water Intervention Tasks for Nauru

Task No.	Short-term (1-3 months)	Medium-term (4-12 months)	Long-term (greater than 12 months)
NR 2.1	Combine analysis of RS imagery (Quickbird – KRA4) with detailed GPS field survey of domestic and community properties to accurately identify current condition of rainwater harvesting infrastructure assets; primarily the available catchment area, roofing material, guttering, downpipes and storage tanks/cisterns.	Input all field survey data to Nauru GIS-GeoCMS and analyse to identify, prioritise and output provisional engineering specifications & BoQ's to assist future Aid initiatives which could allow infrastructure rehabilitation or replacement. RS/GIS/GPS training course requires planning and provision to key stakeholder groups in-country by KRA4.	Incorporation of accurate field data into any future Country implementation Plan, notably the EU EDF9 "B-Envelope" Natural Disaster Facility identifying drought risk under the NSDS Action Plan.
NR 2.2	Transfer SOPAC's Technical Guidelines for the implementation of rainwater harvesting systems (RWH) as well as the Manual for community participation developed for rainwater harvesting in Pacific Islands.	Review distribution and uptake of RWH guidelines and explore possible merits of translation/publication in Nauruan.	
NR 2.3	Identify opportunities for supporting groundwater investigations to provide conjunctive use support to RWH options.	A proposal(2) for a groundwater investigation programme was completed for AusAID in February 2003 and is again under consideration for implementation by NRC; this should be considered for essential, medium-term funding support under Nauru's B-Envelope drought risk intervention.	Groundwater abstraction is envisaged as a long-term investment for which a thorough investigation of current aquifer conditions and baseline monitoring is required. If this investigation proceeds, provide guidance and assistance in the location and identification of potential hazards to the groundwater quality such as septic tanks, fuel tanks and landfill sites – critical precursor data to the aquifer risk assessment process and source protection development planning required for incorporation within a Nauru Water Safety Plan.
NR 2.4	In view of recent significant changes in Nauru's population demographics, undertake data capture from Govt Statistics regarding current/future population trends from the 2002 Census.	Review historic water demand assessment(s), rationalise and revise to match the actual/future requirements on-island. Through SOPAC's Water Demand Management project, investigate feasibility of leakage study of old NPC reticulated water supply system. A water demand management plan could be established that includes leak detection and hydraulic analysis of the whole central system. GIS development will assist in the hydraulic modelling of the reticulated system.	
NR 2.5	Through SOPAC's Water Supply, Hygiene and Sanitation (WASH) programme, provide community awareness and education material on water conservation, sanitation and hygiene – must be undertaken in collaboration with suitable NGO's or community organisations.		

7. REFERENCE DOCUMENTS

(1) WEBB, A., BOOTH, S.K., 2006. Proceedings of the 1ST Nauru – Multi-Stakeholder Consultation, Menen Hotel, Nauru, 13th July 2005. EU-SOPAC Project Report 65. SOPAC Secretariat, Suva.

(2) FALKLAND, T. 2003. ECOWISE Environmental; Nauru Sustainable Water Supply Project – Groundwater Investigation Details for Project Design Document prepared for AusAID.

(3) WALLIS, I. 2001. Draft National Water Plan for GoN, prepared in cooperation with Ministry of Health; Workshop Powerpoint notes September 2001.

(4) SINCLAIR KNIGHT MERZ, 2005. Electricity and Water Generation Capacity Assessment; Assessment & Recommendations Report No HA00505.500 to AusAID.

(5) NAURU BUREAU OF STATISTICS & SPC, 2002. 2002 Nauru Census, Main Report (Pt1) and Demographic Profile (Pt2) of the Republic of Nauru, 1992–2002.

(6) AUSTRALIAN GROUNDWATER CONSULTANTS Pty Ltd, 1972. Groundwater for Industrial & Domestic Supply; report to NPC.

(7) REPUBLIC OF NAURU 2005. Nauru National Sustainable Development Strategy 2005 – 2025; *Partnerships for Quality of Life.*

ANNEXES

A Summary Mission Itinerary

B Draft National Water Plan: *Wallis/WHO – September 2001*

C Nauru Phosphate Corporation – copy of Drawing No 93-N32C/N1; *Freshwater Pumping, Reticulation & Storage*

D Power & Water Utility; compilation from recent consultant's reports

E Original Freshwater Storage Schedule

F Monthly Rainfall Records: Period 1915 – 2006

G Selected Population Statistics from 2002 Nauru Census plus extracts from NSDS 2005-2025

H Terms of Reference for Proposed SOPAC EDF9 Nauru In-Country Intern Position

J Nauru Water Sector Development: Copy *of outline proposals submitted by SOPAC for consideration by EU Delegation, Suva, in January 2006*

K RoN letter dated 26th July 2006 (Hon D. Adeang to EU Delegation, Suva), endorsing the use of uncommitted B-Envelope funds for disaster preparedness by addressing drought risk

ANNEX A

Summary Mission Itinerary

Friday, 27 October 2006
- Travel Majuro – Tarawa – Nauru via Our Airlines, arrive late morning.
- Passport to Immigration for visa
- Check-in Menen Hotel.
- Awaiting GON transport for initial briefing with Creidon Fritz, Bryan Star & Pyon Deiye.
- MCR Kim Hubert away at Forum meeting in Nadi.
- Request meeting with Mr David Adeang, Acting Secretary for Foreign Affairs & NAO.
- Arrange rental vehicle.

Saturday, 28 October 2006
- Collect rental vehicle and move accommodation from Menen Hotel to Capelle's s/c apartments.
- Lots of standing water, very heavy rain over weekend.

Sunday, 29 October 2006
- Lots of standing water, very heavy rain over weekend.
- Site visit to Buada Lagoon area and around island.

Monday, 30 October 2006
- Collect passport/visa from Immigration.
- Briefing with Ms Chitra Jeremiah, PIFS Representative & Director of AMU – many other water sector initiatives active!
- Land & Survey to meet Wes & Porthos.
- Bryan Star – arrange tentative meeting schedule for rest of week.
- No diesel at pumps.
- Go to Civic Centre trying for Internet access.
- Discussion with Charmaine Scotty, Acting Secretary for Health and Secretary for Home Affairs (Media/Lands and Survey/Women/Lands Committee).
- Arrange with Secretary of Finance for urgent release of diesel from Government Store for rental vehicle.

Tuesday, 31 October 2006
- Locate Abraham Aremwa (Utilities Manager) at home and arrange meeting tomorrow.
- Visit Maqua Cave with Raymond Itsimera. Cave lies to the rear of Ian Mackay's shop – he will search for old sample analyses.
- Meeting with Vinci Clodumar, Nauru Rehabilitation Company – has Tony Falkland advising on drilling investigation, but needs extra funds. Data capture.
- Visit RONPHOS – discussions with Joe Hiriam, Engineering Manager. Data/drawings capture.
- Rental vehicle tyre punctures (and finding repair facility) & very heavy rain seriously delayed afternoon programme.

Wednesday, 1 November 2006
- Mr Elkoga Gadabu, POPS Co-ordinator.
- Discussions with Abraham Aremwa & Raphael, Water Supervisor – data capture.
- Topside visit with Vinci-REHAB.
- GIS discussions with Robert Deidenang, Chief Draughtsman for REHAB – data capture.
- Lands and Survey, Porthos Bop (interrupted his personal leave) – had just received EDF9 MapInfo package – needs training – way behind REHAB staff in GIS abilities.

Thursday, 2 November 2006
- Guided by Raphael Ribauw & Geoffrey Thoma (Utilities), to inspect ex-NPC water distribution and storage network.

- Data capture from RONPHOS;,old NPC drawings of water distribution network.
- Located & updated monthly rainfall records from RONPHOS Laboratory rain gauge.
- Visited Atmospheric Research Measurement (US-DoE site) with Andrew Kalerua. They also have rainfall recording equipment.
- Population & Census data capture from Mr Ipia Gadabu, Bureau of Statistics.
- Return to Maqua Cave for photos (no analyses records located by Mr Mackay).

Friday, 3 November 2006

- Return to RONPHOS for photo data capture of 1972 AGC report then return to lab library.
- Final debriefing meeting with Chitra Jeremiah and Mary Thoma of AMU and Doug Melvin of AusAID.
- *Outward flight cancelled by Our Airlines (technical fault, plane had to go to Kwajalein from Majuro).*
- Return to GON to debrief Pyon Dye.
- Trying to locate information on rainwater tank locations proposed within the AusAID & Japan aid packages – Bryan Star will endeavour to collate and supply later.
- Return hire vehicle.

Saturday, 4 November 2006

- Our Airlines outward flight cancelled again.
- Return to Capelles.

Sunday, 5 November 2006

- Our Airlines outward flight eventually shows midday – travel Nauru – Honiara – Brisbane.

ANNEX B

Draft National Water Plan: September 2001

Government of Nauru

Draft National Water Plan

A coordinated plan to achieve a safe and reliable potable water supply in Nauru

Draft plan prepared through the cooperation of:

- Ministry of Health
- Ministry for Industry and Economic Development
- Nauru Phosphate Corporation
- Nauru Rehabilitation Corporation
- World Health Organization

September 2001

Objectives of National Water Plan

The objectives of the National Water Plan are:

1. To provide safe potable water to the residents of Nauru;
2. To ensure that the water supply is sustainable in perpetuity;
3. To provide an adequate amount of water for the needs of all residents;
4. To ensure a reliable water supply even during prolonged droughts;
5. To safeguard the environment and the ecology of Nauru;
6. To ensure potable water is affordable by all residents;
7. To make best use of existing resources, facilities and skills;
8. To conserve resources and energy; and
9. To provide a culturally acceptable water system.

Concerns about Existing Water Supply

1. The demand for potable water is estimated to be 1500 t/d; correct ?
2. The desalinator supplies 950 t/d and the remainder must come from rainwater and brackish well water;
3. When the desalinator is not operating the island faces a severe water shortage.
4. The desalinator requires periodic maintenance. A backup or alternative supply is required for these times.
5. The island has periodic droughts (about every nine years) and rainwater collection is not sufficient except in wet years to provide an adequate water supply.
6. The demand for desalinated water exceeds the supply, and many residents face persistent restrictions in the supply of water.
7. The brackish water from wells used as an alternative supply has a high dissolved solids level.
8. Extraction of too much groundwater from wells around the perimeter of the island may be causing seawater intrusion and threatening the supply of freshwater to the roots of coastal plants.
9. It is not known whether groundwater can supply water reliably or not.

Desalination Options

1. Present production of the existing desalination unit averages 950 t/d. A new RO unit of about 50 t/d, will be installed at Menen Hotel, taking total desalination capacity to 1000 t/d. There is an inexhaustable supply of seawater for desalination;
2. Desalination provides a safe water supply: the desalinated water has very low levels of salt and metals and no pathogens. There is little risk of adverse environmental effects.
3. The cost for producing water with the existing desalinator at $2.90/t is lower than for all other options.
4. The existing desalination plant is deteriorating due to exposure to sea air, power station (acid gas) fumes and lack of maintenance. Without regular maintenance the existing plant has a remaining service life of 4 to 5 years.
5. The present desalinator can only produce 950 t/d of potable water which is two-thirds of the required output of 1500 t/d of potable water.
6. A new desalination plant should have a capacity of 500 t/d. Various types of desalination processes may be suitable, including the RO process, vapour distillation or solar distillation. For this assessment, it is assumed that a new desalination plant would comprise two 250 t/d RO units installed beside the existing desalinator at the power station.
7. The cost for producing water at a new desalinator would be $4.00/t.

Rainwater Option

1. Nauru has wet years (2600 mm/yr to 4600 mm/yr rainfall) one-third of the time and dry years (500 mm/yr to 2000 mm/yr) two-thirds of the time. The 83 year rainfall record shows droughts every nine years on average, with many droughts lasting two or three years. In the most recent 1998-2000 drought, the annual rainfall averaged 463 mm/year.
2. Even in a year with average rainfall, the rainwater collected on household roofs will not meet the household demand for potable water. The situation is worse in dry or drought years.
3. The flat land beside the airport runway within the airport boundary could be developed as a rainwater catchment. The rainfall that could be collected from the airport catchment would supply over 1 t/d to each household in an average year and 0.3 to 0.4 t/d in a dry year.
4. To maximise the collection of rainwater on the island, each household should have well-maintained guttering and a large water storage tank. It is recommended that rainwater collection be developed on commercial buildings, houses and on flat land beside the airport runway to increase the capture of rainwater.
5. A backup water supply would be required for drought conditions.
6. A 30,000 t water storage is required. It may only be constructed by rehabilitating existing tanks. The available storage capacity on the island in existing tanks is 40,080 t.

Groundwater Option

1. The potential secure supply of groundwater in average or low rainfall years could be as much as 850 t/d. However in a prolonged drought the safe yield could be less than 500 t/d. Hence groundwater is not yet confirmed as a reliable long term potable water source.
2. The cost of groundwater would be about $2.35/t, which is less than other options.
3. Extraction wells must be limited to very low pumping rates (<0.1 L/s) or seawater will intrude into into the freshwater lens. A long horizontal infiltration gallery may be required to safely extract groundwater, which would have a high capital cost.
4. There is a high risk that overpumping could occur and destroy the groundwater with resultant ecological effects.
5. There is a significant risk of contamination of groundwater from human activities (rubbish dump, slime storage, new houses above).
6. Removal of groundwater from the centre of the island could increase the intrusion of seawater around the perimeter of the island, which would have adverse effects on coastal trees and other vegetation using the groundwater.

In summary, groundwater is not yet a proven supply and its sustainable extraction may prove a difficult task.

Recommended National Water Plan

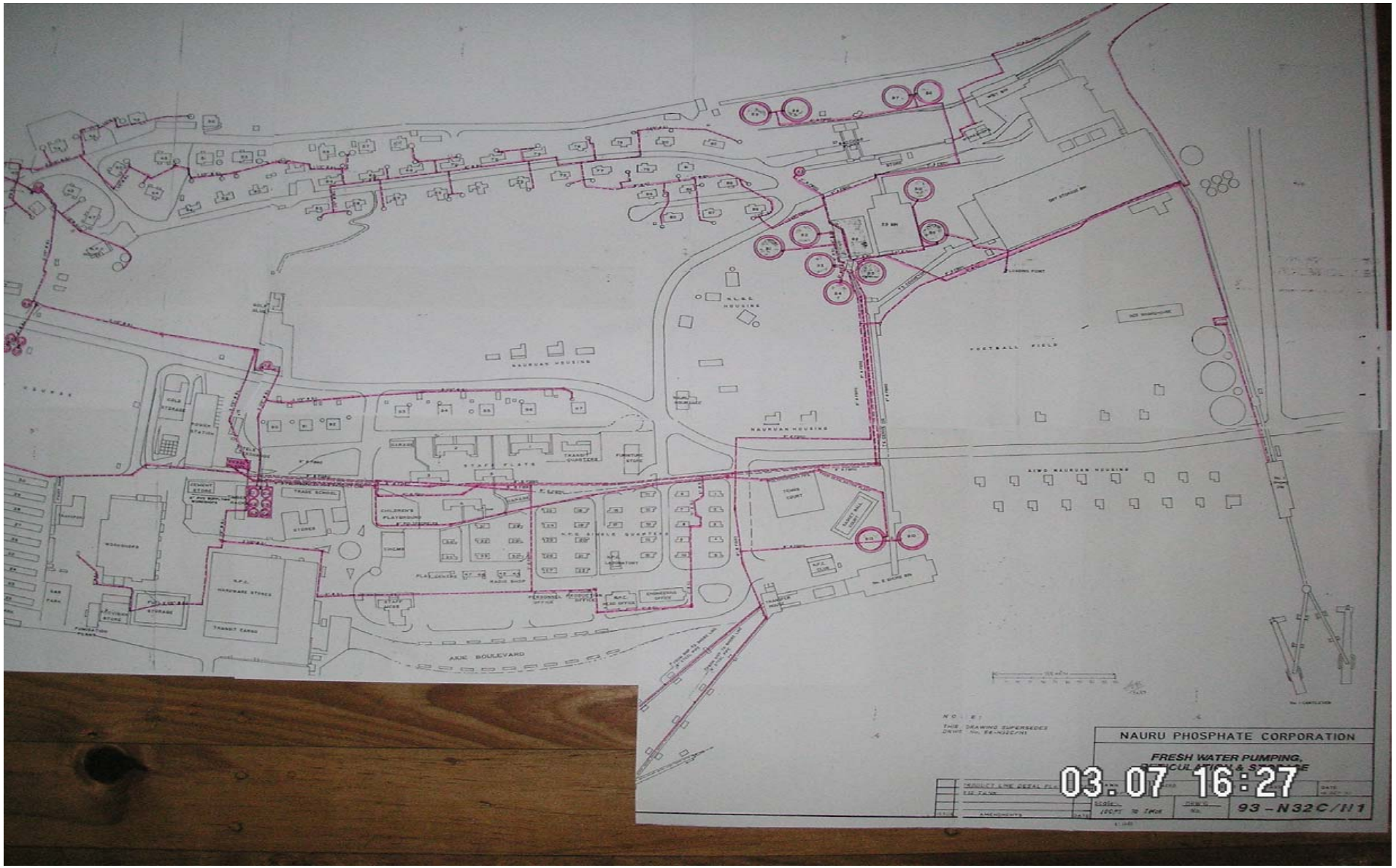
1. Continue to use the existing desalinator as the major source of potable water for Nauru.
2. Introduce water charges to maintain water supply facilities on a cost recovery basis.
3. Replace the desalinator at the end of its service life with two 500 t/d desalination units to provide greater operational flexibility and operating cost savings;
4. Rehabilitate the existing storage tanks to provide a 20-day supply (30,000 t) of water and allow for periodic down-time of the desalinator.
5. Establish the airport rainwater collection system as the next source of potable water.
6. Ensure each house and building has guttering and a large rainwater tank.
7. Investigate groundwater as a possible emergency water supply in times of droughts. Limit extraction to minimise the risk of overpumping and adverse environmental effects
8. Implement a water conservation program.
9. If the safe yield of groundwater in drought periods is too small to make up the gap between rainwater and 500 t/d, then purchase an additional desalinator of 250 t/d capacity.

Implementation of the National Water Plan

1. *Adopt a National Water Plan, including a water conservation program.*
2. *Establish a 30,000 t storage of desalinated water/rainwater as a 20-day backup for periods of maintenance of the desalinator.*
3. *Introduce charges for desalinated water (and later airport rainwater) to provide funds for maintenance of the equipment and storages;*
4. *Develop rainwater collection on commercial buildings, houses and on flat land beside the airport runway to increase the capture of rainwater;*
5. ***Conduct** a thorough study of the groundwater lens to establish the safe yield (particularly during droughts), water quality and the safe yield of brackish groundwater around the perimeter of the island. Take action to prevent the contamination of the groundwater lens;*
6. *If there is not sufficient extractable groundwater during prolonged droughts, **purchase** an additional 250 t/d reverse osmosis desalinator as a backup unit.*

ANNEX C

Nauru Phosphate Corporation-
Copy of Drawing No 93-N32C/N1; (*dated 18.10.93*)
Freshwater Pumping, Reticulation & Storage


NAURU PHOSPHATE CORPORATION
FRESH WATER PUMPING,
03.07 16:27
93 – N32C/111


03.07 16:27

ANNEX D

Power & Water Utility – compilation from recent consultant's reports

- **Sinclair Knight Merz (SKM), 2005 – Electricity and Water Generation Capacity Assessment; Assessment & Recommendations Report.**

- **Power Planning Associates (PPA), 2006; Nauru's Utility Sector: A Proposal for Reform.**

- **Power Planning Associates (PPA), 2005; Reform of NPC – Inception Report for ADB**

The Republic of Nauru launched its National Sustainable Development Strategy (NSDS) in November 2005 which clearly articulates the need for the adequate and reliable supply of power and water. The Government of Nauru has identified that a reliable supply of power and water is critical to sustaining economic growth. Nauru's current power and water situation is dire. A fundamental problem facing Nauru's utilities sector is the fact that there is no system of cost recovery. This translates into a situation of regular cash shortages, with utilities frequently running out of funds to purchase diesel to run the power generators and represents a major impediment to any development in Nauru.

Public Water Supply

Nauru's public water supply is derived from desalination. The following plant is installed at the Nauru Power Station (NPS):

- 1 x 1200 m^3/day multi-effect evaporative desalination unit installed in 1992 (not operational since 2001) - the desalination plant design utilises waste heat from three of the diesel generator exhausts, in the form of steam, as the driving force to evaporate fresh water from seawater. The residual water, or brine, is returned to the ocean outfall.

- 2 x 120 m^3/day reverse osmosis (RO) units (containerised) installed in 2004 The units are leased from Veolia under financing provided by AusAID.

A further 120 m^3/day Veolia RO unit was installed for the IOM at the Menen Hotel in 2003 and a similar unit was installed there against a purchase order from the Menen Hotel for private use only.

Potable water is not reticulated around the nation of Nauru. All potable water produced by Utilities is distributed by means of tanker trucks, each with capacities ranging from 1000m^3 to 4000m^3. Between 10 and 12 tanker loads of 4 m^3 each are distributed weekly on Nauru at present. It is not unusual for only one bowser out of three to be serviceable at any one time. Until very recently, Utilities charged around AUD $3 for the delivery of 1,000 gallons of water to a customer's premises. However, estimates put the cost of production and delivery closer to AUD $27 per 1,000 gallons. Since June 2006, this delivery charge has reportedly (Raphael Rebaun-pers.comm) been increased to AUD $15.00 to help accommodate the recovery of delivery fuel and labour wage costs (but not production costs).

Until recently, Nauru was mainly dependent on rain water harvesting and a multi-effect evaporative type desalination plant, installed in the early 1990s, for its supply of fresh water. The desalination plant was taken out of service in 2003 for a major overhaul, which included a de-scaling, the replacement of 4000 internal tubes and associated tube-plates, the removal of rust and the application of a two-pack epoxy coating. The overhaul was largely completed in the first quarter of 2004, with minor maintenance work on pumps and the ion trap continuing throughout

the year. The plant has not operated however since being taken out of service due to the lack of steam from the waste heat from the fixed diesel generator set boilers is not available and external work that NPC had committed to undertake to finalise the overhaul works has not been completed.

Reverse Osmosis Plant

A number of RO plants are installed on the island to provide potable water into Nauru's water storage system. Details are as follows:

Veolia RO Plant; Model: DS9-C; Output: 120 kL/day per unit.

No of units supplied: 4 (two at the Menen Hotel and two at the power station)

Year installed: 2003 (first 2 units at the Menen) and 2004 (second 2 units at the power station).

Approximately 4.5 years ago a private reverse osmosis (RO) desalination plant with a capacity of 120,000 litre per day (120kL/d) provided by IOM was installed at the Menen Hotel in Meneng District. Some 18 months ago, a further three RO plants of similar output were installed, one at the Menen Hotel (procured by the GoN) and two at NPS (provided by AusAID). The two reverse osmosis (RO) plants at NPS were in the process of being recommissioned after having been out of service for some time, originally due to problems associated with pumps and piping, and later due to the air conditioning units having been stolen from the plant enclosures. The Veolia engineer had installed a 23kL tank at the suction side of the high-pressure pumps to provide a flooded suction, which would improve the switching off characteristics for the plant.

Rainwater Harvesting

Rainwater is harvested from the roofs of private houses, storage areas and warehouses. The older style of rainwater tanks used for private dwellings was of concrete, galvanised iron or steel sheeting construction however more recently, newer style of tanks are being installed that are made of polyethylene in the size range from 2kl to 45kl. Rainwater is harvested from roofs many of which are made of asbestos cement sheeting. The International Water and Sanitation Centre of the Netherlands has stated that there is no evidence that rain water collected from asbestos-cement sheeting on roofs forms a health risk, however the airborne fibres from cutting or drilling the sheets do pose a serious health risk. Much of the guttering on commercial and domestic

buildings, including the power station, was found to be in poor condition and no longer suitable for rainwater harvesting.

Rain water harvested from the roofs of Toddy's warehouse and the RONPHOS workshops near the power station is fed to the main rain water catchment tanks at the power station, stored in 6 x 290m^3 tanks (C1 to C6) which are located to the west of, and immediately adjacent to NPS. The two tanks furthest away from the power station are suspected of leaking and are no longer used.

Basic water quality testing for presence/absence of coliform bacteria is undertaken at the power station weekly and prior to transfer from the six 290m^3 rain water collection tanks (C1 to C6) to the 4410m^3 main storage tank B13. From there, the water is distributed to consumers via tanker-bowser. The test kit used is the WaterWorks brand manufactured by Sensafe of the USA and requires 48 hours before a result is obtained. No testing for pH, free chlorine, alkalinity, phosphate, copper, iron, zinc or heavy metals is undertaken. No water quality records are maintained.

Rain Water Collection Tank.

The C1-C6 tanks are of concrete construction and mostly below ground level with only the open top sections above ground level. A common roof is provided over the tanks, although this is in a poor condition and needs some repair. The tanks also receive water from the RO plant.

Any solution for potable water storage will be expensive, and require significant up-front capital. GON notes that the PPA consultants' report estimates the construction of a new 10,000 kL potable water storage tank at around $7 million AUD in 2006-07 value.

There are a number of steel water storage tanks on Nauru however presently only tank B13 is serviceable as all other steel tanks appear to be corroded to such an extent that the walls are no longer watertight. An investigation into the condition of water storage tanks on Nauru undertaken in 2002 indicated that 11 of the 13 tanks are in such poor, corroded condition that there is a risk of the upper sections and roof collapsing. An inspection of water storage tanks undertaken in 2002 by a structural engineer on behalf of AusAID indicated that only approximately 12% of the available storage capacity is operational. Remedial work is not economic, as the tanks require 70% of the structure to be replaced. Tank number B13 has a usable capacity of approximately 4410 m^3.

Potable Water Storage Tank B13.

Decommissioned Water Storage Tank B12.

Corrosion in Decommissioned Water Storage Tank Walls.

Corrosion of Decommissioned Water Storage Tank Floor.

Other Sources

Other sources of water supply on Nauru include:–

- rain water collection at private and commercial dwellings,
- shallow wells at private and commercial dwellings,
- small household desalination plants used to desalinate the brackish well water for private use,
- a small RO plant at the Hospital to condition potable water for use in the kidney dialysis machines, and
- imported bottled water (for tourists, asylum seekers and expatriate workers).

Sewerage

There is currently no piped sewage system on Nauru; the sewage is collected by suction trucks upon request. A separate seawater storage and distribution system also exists on the island, which was designed mainly for the purpose of providing water for the flushing of toilets. It is unknown what the total number of cisterns connected to the system is however estimates provided by Ronphos staff indicate that this would be in the order of 1000 units. The seawater storage and distribution system for flushing of toilets in hospitals and government offices is currently non operational, as the sea water transfer pumps at NPS are out of service and the concrete storage tanks located at the highest point of the island opposite the station were empty. The piping runs underground from the pumps to the base of the hill, at the top of which the storage tanks are installed, and is largely hidden from view by dense vegetation from the base of the hill to the tanks. The three open top concrete wall seawater storage tanks appeared to be in a serviceable condition, though a more detailed inspection is recommended.

Sea Water Storage Tanks at Command Ridge.

Sea Water Storage Tank Internals

The condition of the sea water distribution piping system (down stream of the storage tanks) is unknown and is considered to be outside the scope of the present investigation.
On the basis of 1000 cisterns connected to the sea water system, each with a capacity of approximately 10 litres, and an average water consumption of 250 litres per day per cistern (say 25 flushes per day per toilet in hospitals, schools and offices) the total consumption would be in the order of 250m3 per day, which is equivalent to the total output of two RO units. Reinstatement of the sea water system has potential to reduce the demand of potable water quite significantly.

Historical and Future Water Demand

In 2001 the GON produced a National Water Strategy document, which was used as a basis for the future water requirements for Nauru. The Strategy is based on the dry period (drought) of 1998/2001 and the following population estimates:

Year	Population (Total)	Nauruan	Foreign	Asylum Seeker Camps
1999	11,180	8,280	3,000	Nil
2002	13,613	9,313	3,000	1,300
2010	12,300	12,000	300	Nil

Under non-drought conditions, rain water collection will reduce the demand for non potable water.

The Strategy document predictions for future water demands are based on the continuation of present social customs and lifestyles by the Nauruan population. Estimates are outlined below.

Water – Residential Demand	Per Capita Water Consumption	Daily Demand – Year 2010 based on a population of 12,300
Potable Water		
Basic Drinking Water	30 l/capita	369 tonnes
Additional Cooking & Washing	70 l/capita	861 tonnes
Total Potable Water		12,300 tonnes
Non Potable Water		
Non Potable Toilet flushing, cleaning, other	70 l/capita	861 tonnes
Total Non Potable Water		861 tonnes

Water Requirements in 2010	Population	Potable Water (tonnes/day)	Non Potable Water (tonnes/day)
Residential	12,300	1,230	861
Hospitals and Related Buildings		40	20
Hotels and Guest Houses		100	50
Restaurants and Cafes		40	20
Laundry and Workshop		30	15
Commercial and Offices		60	30
Power Station and Desalination Plant		100	50
TOTAL – 2010		1,600	1,046

Investments in Water (from PPA)

The least-cost solution in the water sector is to rehabilitate the MED desalination plant at the power station, at a cost of A$1.47 million. The rehabilitated plant is estimated to have a remaining economic life of 10 years, after which time groundwater and a new 500 kL/day reverse osmosis (RO) plant would be required.

The PPA report endorses the 2005 SKM report into the MED plant. However, GON is concerned that the MED plant has been sitting idle for a number of years now, and that the true cost of refurbishing the MED plant could be much more than originally estimated. It is on this basis that

the GON recommends that should it appear that the cost to rehabilitate the MED desalination plant will be much more than first estimated, it may be necessary that a full and proper study into the economic viability of refurbishing the MED plant be undertaken.

Investment in groundwater investigations would have to commence in 2011/12, with the estimated cost of A$3 million spread over 6 years.

A fleet of 35 1,000-gallon road tankers is required to distribute the water produced by Utilities, at the demand levels forecast. The introduction and operation of this large fleet is likely to present major institutional challenges.

In order to meet the WHO's recommendation of maintaining a 20-day potable water storage capacity, major storage augmentation is required, at a cost of approximately A$7.0 million. If the concrete fuel tanks cannot be rehabilitated cost-effectively, the cost would rise to about A$10.0 million.

Other water supply investments include the provision of water meters to households on the Aiwo reticulation system, repairs to leaks in the underground pipes and mains in Aiwo, and the investigation and repair of the seawater distribution system.

	Total NPV (AUD, 2006 constant)	Possible Donor	2006-07 (Year 1)	2007-08 (Year 2)	2008-09 (Year 3)	2009-10 (Year 4)	2010-11 (Year 5)	2012-13 (Year 6)	2013-2017 (Years 7-11)
Water Supply									
Refurbishment of the MED desalination plant refurbishment (assume economic life of 7 years)	TBD	AA							
Leakage detection and repair (pumps between C1-C6 and B13) and underground pipes	$ 30,000	TBD							
Study into rehabilitation of the seawater distribution system	$ 100,000	TBD							
Rehabilitation of rainwater harvesting systems on public buildings (Aiwo buildings, RoN Hospital, Nauru General Hospital) (nb; government offices and timber yard have their own water harvesting system)	$ 90,000	TBD							
Efforts to improve distribution of water to consumers (including incentives to facilitate the purchase of rainwater tanks and associated piping for household use)	TBD	TBD							
Study into an efficient and cost-effective method for water distribution to consumers	TBD	TBD							
Determination and implementation of long-term water supply options	TBD	TBD							
Water storage augmentation (new 10,000kL tank and rehabilitation of existing concrete tanks, ie; C1-C6) - *NB: If concrete tanks cannot be rehabilitated, an additional 10,000 kL tank will need to be purchased at a cost of $3m*	TBD	TBD							
Longer-Term Options									
Ground Water	$ 3,000,000	TBD							
Airport Runway	$ 4,347,000	TBD							
Residential Water Capture and Harvesting	$ 860,000	TBD							
Reverse Osmosis 500kL/day	$ 932,000	TBD							

ANNEX E

ORIGINAL FRESH WATER STORAGE SCHEDULE

TANK NO.	LOCATION	CONSTRUCTION	SIZE (INTERNAL)	SITUATION OF OVERFLOWS	CAPACITY	TANK OUTLET (SUCTION, GRAVITY)	DEAD STOCK DUE TO OUTLET
TANKS DESIGNATED "C" TO FUNCTION							
C1 C2 C3 C4 C5 C6	WITHIN HARDWARE STORE YARD	6 TANKS EX. REINFORCED CONCRETE	CIRCULAR TANKS 29.0' O X 15.65'	OVERFLOWS INTERCONNECTED 15.4' FROM BOTTOM	6 TANKS X 283 TONS TOTALING 1698 TONS	SUCTION FROM PUMP 1.7' FROM BOTTOM	6 TANKS X 31 TONS TOTALING 186 TONS
C7 C8 C9 C10 C11 C12	ON THE GOLF COURSE	6 TANKS EX. REINFORCED CONCRETE	CIRCULAR TANKS 30.7' O X 16.41'	OVERFLOWS INTERCONNECTED 15.24' FROM BOTTOM	6 TANKS X 314 TONS TOTALING 1884 TONS	SUCTION FROM PUMP 1.2' FROM BOTTOM	6 TANKS X 24 TONS TOTALING 144 TONS
C13	WITHIN B.P.C. HOSPITAL AREA	RECT. REINFORCED CONCRETE	30.5' X 40.5' X 10.8'	OVERFLOWS OVER TOP	371 TONS	SUCTION 1.0' FROM BOTTOM	34 TONS
C14			30.0' O X 11.6'		228 TONS		19 TONS
C15			30.0' O X 12.3'		242 TONS		19 TONS
C16			30.0' O X 11.6'		228 TONS		19 TONS
C17			30.0' O X 14.0'		275 TONS		19 TONS
C18			30.0' O X 10.7'		210 TONS		19 TONS
C19	WITHIN	6 TANKS EX.	30.0' O X 13.7'	ALL TANKS	269 TONS		39 TONS

C20	LABOUR HOUSING	REINFORCED	30.0' O X 9.7'	OVERFLOW FROM	191 TONS	ALL PUMP FOOT	19 TONS
C21		CONCRETE	30.0' O X 13.7'	THE TOP	267 TONS	VALVES ARE SET	19 TONS
C22			54.0' O X 13.8'		879 TONS	1.0' FROM BOTTOM	64 TONS
C23			30.0' O X 13.9'		273 TONS	THE EXCEPTION IS	19 TONS
C24			30.0' O X 13.85'		272 TONS	TANK C 19 WHICH	19 TONS
C25			30.0' O X 13.5'		265 TONS	IS SET 2.0' FROM	19 TONS
C26			30.0' O X 13.7'		269 TONS	THE BOTTOM.	19 TONS
C27			30.0' O X 13.9'		271 TONS		19 TONS
C28			30.0' O X 13.8'		273 TONS		19 TONS
C29			30.0' O X 13.9'		273 TONS		19 TONS
C30	FILED WORKSHOPS	2 TANKS EX. REINFORCED CONCRETE.	CIRCULAR TANKS 40.0' O X 11.6'	OVERFLOW 10.0' FROM BOTTOM	2 TANKS X 350 TONS. TOTALING 700 TONS	SUCTION FROM PUMP 0.6' FROM BOTTOM	2 TANKS X 21TONS TOTALING 42 TONS.
C31							
TANKS DESIGNATED "B" TO FUNCTION AS BULK STORAGE							
B1							
B2							
B3							
B4							
B5	ALL TANKS EXCEPT	12 TANKS EX.	CIRCULAR TANKS	OVERFLOWS ARE	12 TANKS X	THE OUTLET FROM	12 TANKS X
B6	B10 SITUATED	MILD STEEL	64.0' O X 51.89'	FITTED 48.75'	4363 TONS	EACH TANKS IS	37.5 TONS
B7	AROUND AREA OF	LAP WELDED		FROM THE	TOTALING 52,356 TONS	SITUATED 0.4'	TOTALING 428 TONS
B8	NO. 3 UNIT			BOTTOM		FROM BOTTOM	
B9							
B10	NEXT TO STAFF RECREATION ROOM						
B11							
B12							
TANKS DESIGNATED "S" TO FUNCTION AS STORAGE							

S1	NO. 1 CANTILEVER	REINFORCED CONCRETE	CIRCULAR TANK 101.75' O X 18.75'	OVERFLOWS OVER TOP	4,241 TONS	OUTLET - 1.58' FROM BOTTOM	357 TONS
S2	CONVERTED 2A BIN	R.C. RECTANGULAR PRISM	APPROXIMATELY 125' X 90' X 10'	OVERFLOWS OVER TOP	2,072 TONS	OUTLET FROM BOTTOM	NIL
S3	ADJACENT TO BATCHING PLANT	REINFORCED CONCRETE	CIRCULAR TANK 32.42' O X 15.75'	OVERFLOWS 14.97' FROM BOTTOM	344 TONS	OUTLET - NEAR THE BOTTOM	NIL TO SMALL AMOUNT
S4	ADJACENT TO LAUNDRY	REINFORCED CONCRETE	CIRCULAR TANK 31.25' O X 15.55'	OVERFLOWS 14.8' FROM BOTTOM	316 TONS	SUCTION - 2.0' FROM BOTTOM	42 TONS
S5	WITHIN GOLF COURSE	REINFORCED CONCRETE	CIRCULAR TANK 31.25' O X 15.55'	OVERFLOWS 14.8' FROM BOTTOM	316 TONS	SUCTION - 2.0' FROM BOTTOM	42 TONS
S6	ABOVE B. P. C. HOSPITAL	2 TANKS EX. MILD STEEL LAP WELDED	CIRCULAR TANK 29.67' O X 14.8'	OVERFLOWS FROM THE TOP	2 TANKS X 285 TONS TOTALING 570 TONS	OUTLET IS 1.8' FROM THE BOTTOM	2 TANKS X 25 TONS TOTALING 50 TONS
S7							
S8	CLIFFSIDE STAFF M.Q. 45	REINFORCED CONCRETE	CIRCULAR TANK 30.67' O X 11.8'	OVERFLOWS 11.8' FROM BOTTOM	243 TONS	SUCTION - 1' FROM BOTTOM	20 TONS
S9	ADJACENT BUADA JUNCTION	REINFORCED CONCRETE	CIRCULAR TANK 23.63' O X 15.93'	OVERFLOWS 14.68' FROM BOTTOM	190 TONS	OUTLET - 0.03' FROM BOTTOM	SMALL AMOUNT

TOTAL CAPACITY	69,986 TONS	AMENDED 2.1.70 McLEAN	
DEAD STOCK	1,714 TONS	*DEAD STOCK FIGURES FOR C1-12, B1-12 & S8 MODIFIED TO SUIT*	
USEABLE CAPACITY	68,272 TONS	*RECORDED LEVELS TO WHICH TANKS HAVE BEEN DROWN DOWN*	
ACCURACY IS ESTIMATED AT 1%			DRAWING NO. 68-N9E-N106

ANNEX F

Monthly Rainfall Records: Period 1915 – 2006

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total in mms
1915	na	na	na	na	na	92	72	8	23	0	5	32	232
1916	332	26	40	5	4	18	20	20	1	7	0	2	475
1917	10	3	5	4	10	87	57	22	129	12	11	61	411
1918	4	35	383	86	131	164	478	761	305	487	354	326	3514
1919	440	644	512	454	105	133	204	347	329	350	241	293	4052
1920	60	603	479	183	127	223	na	na	na	na	na	na	1675
1921	272	75	20	22	12	2	80	114	57	54	94	451	1253
1922	377	208	17	88	86	116	308	277	58	9	165	30	1739
1923	106	88	289	173	32	167	173	357	189	221	673	398	2866
1924	435	153	159	4	61	61	83	84	30	58	15	3	1146
1925	50	113	8	1	47	91	108	244	179	474	na	na	1315
1926	na	na	na	na	na	na	na	na	76	25	195	32	328
1927	18	7	4	41	38	98	157	105	72	12	233	396	1181
1928	549	176	26	82	12	14	77	36	125	34	139	483	1753
1929	347	394	22	22	55	74	252	248	110	99	232	528	2383
1930	466	448	561	137	82	261	281	695	688	272	335	364	4590
1931	455	185	446	120	60	183	38	171	19	94	32	173	1976
1932	860	556	438	228	103	101	210	167	80	0	2	6	2751
1933	367	115	81	169	95	162	261	94	6	57	18	0	1425
1934	32	5	34	17	38	163	129	88	18	13	13	354	904
1935	359	223	47	10	100	89	130	13	91	160	76	503	1801
1936	383	265	334	110	29	33	45	76	108	49	6	392	1830
1937	277	403	162	13	33	45	76	126	98	35	12	13	1293
1938	207	121	14	1	2	25	37	17	3	0	41	67	535
1939	37	34	33	9	70	124	182	281	209	52	330	448	1809
1940	288	374	383	519	308	305	357	263	316	409	450	na	3972
1941	na	na	388	449	248	349	338	211	383	na	na	na	2366
1942	*	*	*	*	*	*	*	*	*	*	*	*	0
1943	*	*	*	*	*	*	*	*	*	*	*	*	0
1944	*	*	*	*	*	*	*	*	*	*	*	*	0
1945	*	*	*	*	*	*	*	*	*	*	40	169	209
1946	225	258	333	366	309	346	397	195	219	459	395	228	3730
1947	369	292	9	54	24	195	129	71	13	11	186	334	1687
1948	258	387	644	481	428	300	143	111	9	37	265	305	3368
1949	588	113	390	169	44	41	59	58	25	50	30	30	1597
1950	2	36	2	6	7	13	17	51	20	10	25	91	280
1951	322	20	153	285	385	313	175	365	106	283	180	519	3106
1952	258	134	117	117	106	101	186	203	155	35	28	364	1804
1953	410	623	386	416	450	154	239	427	130	411	188	528	4362
1954	368	157	221	157	26	22	20	71	82	2	1	16	1143
1955	486	23	95	46	44	33	19	28	78	2	10	41	905
1956	104	121	78	64	53	7	20	44	16	40	82	138	767
1957	157	415	275	176	222	259	273	210	242	357	414	417	3417
1958	257	558	264	469	198	213	316	123	63	44	142	154	2801
1959	385	230	193	99	65	94	28	21	11	31	162	441	1760
1960	576	245	89	190	153	7	173	47	81	98	140	357	2156
1961	238	219	400	269	140	142	148	247	58	50	178	59	2148
1962	22	28	32	68	63	53	104	104	80	2	344	58	958
1963	34	13	26	89	68	100	52	149	272	365	132	452	1752
1964	306	568	126	3	7	4	24	75	18	1	7	282	1421
1965	400	395	134	316	104	192	345	387	325	385	356	325	3664
1966	332	441	269	302	158	114	215	40	10	106	22	133	2142
1967	64	60	14	406	47	17	81	44	49	11	16	525	1334
1968	455	374	17	51	4	14	141	15	19	6	51	146	1293
1969	0	374	548	333	100	54	32	35	0	77	87	373	2013
1970	260	641	380	474	72	105	23	26	3	8	22	0	2014

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total in mms
1971	13	4	1	115	54	108	72	0	18	28	28	160	601
1972	359	175	25	172	293	300	343	287	526	220	183	482	3365
1973	335	432	150	45	24	166	12	12	15	4	1	15	1211
1974	0	1	10	118	125	58	73	129	3	6	70	355	948
1975	781	215	199	70	75	114	96	58	72	3	2	17	1702
1976	5	201	523	320	198	213	258	285	425	275	179	408	3290
1977	369	311	421	310	152	53	316	127	369	191	456	450	3525
1978	163	0	454	377	24	28	28	27	32	16	64	29	1242
1979	205	403	316	21	160	227	119	95	46	303	420	526	2841
1980	258	444	554	301	304	300	235	198	281	493	310	188	3866
1981	277	277	471	535	50	243	49	71	19	91	134	470	2687
1982	445	168	554	311	134	179	403	300	132	354	175	223	3378
1983	175	16	4	80	174	233	407	81	36	7	1	196	1410
1984	41	4	1	31	39	55	6	22	9	166	101	196	671
1985	234	100	174	17	64	53	92	90	18	7	179	248	1276
1986	437	139	3	93	139	190	201	126	203	303	495	476	2805
1987	176	510	290	340	371	430	294	441	139	155	155	484	3785
1988	110	332	78	49	58	75	50	13	41	0	3	7	816
1989	4	6	3	35	72	94	134	77	28	21	152	253	879
1990	464	314	349	289	312	102	174	183	200	138	246	338	3109
1991	419	255	439	258	215	209	178	246	355	346	528	374	3822
1992	190	253	191	437	527	303	189	369	148	125	228	746	3706
1993	212	323	299	367	444	353	312	280	248	473	111	522	3944
1994	218	87	152	89	85	208	na	na	na	na	na	na	839
1995	371	292	180	254	93	138	16	12	24	14	23	0	1417
1996	0	0	0	0	23	24	12	3	20	66	4	150	302
1997	273	107	229	427	393	191	661	119	132	206	108	439	3285
1998	85	85	4	33	38	51	20	62	1	10	9	59	457
1999	11	1	13	61	7	46	89	103	7	9	9	5	361
2000	1	5	16	22	44	103	114	60	88	10	33	76	572
2001	77	108	35	63	146	64	274	363	128	110	151	554	2073
2002	593	348	476	382	247	275	414	228	217				3180
2003	282.3	na	na	na	na	na	239.6	190	20.4	0	163.8	138.4	1034.5
2004	425.6	139	293.8	67.2	0	0	0	na	na	na	21.4	151.8	1098.4
2005	186.1	210.2	267.4	165.8	34.6	36	79.4	151.7	108.5	0	0	62.8	1302.5
2006	6.4	27.7	0	37.1	26.6	0	0	292.6	133.6	319.5			843.5 to end Oct'06

na = No records available
0 = zero rainfall recorded

ANNEX G

Selected Population Statistics from 2002 Nauru Census plus extracts from NSDS 2005-2025

The 2002 Nauru census recorded a total ***de facto* population** of 10,065 people, which included 193 short-term visitors. Nauru's **resident population**, defined as comprising all people who have had an established residence in Nauru for at least one year, was enumerated at 9872. This compares to 9600 residents in 1992, representing a small **annual population growth** of 0.27%. Nauru's **indigenous population**, totalling 7572 people, accounted for 77% of the resident population. Compared to 6831 Nauruans in 1992, this represents an annual growth rate of 1%. The number of non-Nauruans declined from 2769 in 1992 to 2300 in 2002, and includes mainly people from Kiribati, Tuvalu and the People's Republic of China.

The population count reflects an increase of only 146 people from the 1992 census (which counted the total population as 9919). This modest net increase of 146 residents between 1992 and 2002 translates into an annual overall population growth rate of just 0.14% – by far the lowest rate since the first census was taken in Nauru in 1921. The modest overall population growth led to a small increase in Nauru's population density between 1992 and 2002, from 472 to 479 people per square kilometre.

Given the relatively high level of negative net migration (that is, far more residents leaving Nauru over the past 10 years than moving/returning to Nauru), which is not sustainable in the long run, much care is advised when interpreting these population projections. While fertility and mortality are relatively stable, which means that dramatic changes usually do not occur overnight, migration patterns and trends can change suddenly and dramatically, particularly in societies exposed to sudden or sustained economic and political uncertainties such as those currently prevailing in Nauru. Nauru's low population increase during the period 1992–2002 was mainly due to high levels of negative net migration that almost counterbalanced Nauru's natural growth. If the current economic situation prevails, this trend will most likely continue in the near future.

The area known as Location, which provides housing for mining company and government expatriate workers, represents almost 24% of the total population in 2002 – a similar proportion to 1992.

Population by district in 2002

District	Total	Proportion of total population (%)
Yaren	632	6.3
Boe	731	7.3
Aiwo	1051	10.4
Buada	673	6.7
Denig	292	2.9
Nibok	479	4.8
Uaboe	386	3.8
Baitsi	443	4.4
Ewa	397	3.9
Anetan	498	4.9
Anabar	378	3.8
Ijuw	169	1.7
Anibare	232	2.3
Meneng	1323	13.1
Location	2381	23.7
Total	10,065	100.0

Life expectancy at birth for males and females has been estimated at 52.5 and 58.2 years respectively. Life expectancy of the Nauru resident population decreased by an average of four years during the period 1992–2002 For indigenous Nauruans the changes were even more dramatic, with values declining from 55.8 to 52.6; for Nauruan males it decreased from 52.2 to 49 years, and for Nauruan females from 59.9 to 56.9 years.

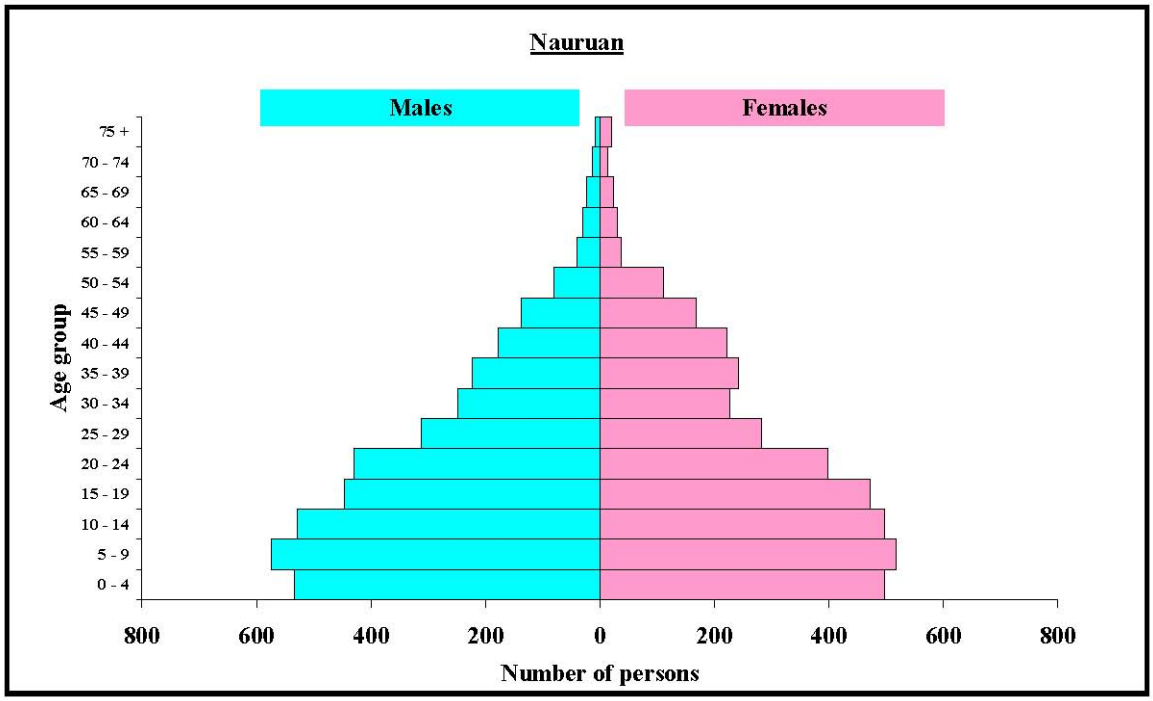
Life expectancies by sex, total resident and Nauruan population, 1992–2002.

	1992–1997		1997–2002		1992–2002	
	Residents	Nauruans	Residents	Nauruans	Residents	Nauruans
Males	56.3	52.2	52.5	49.0	54.7	50.8
Females	62.4	59.9	58.2	56.9	60.2	58.3
Total	59.1	55.8	55.0	52.6	57.2	54.3

From studies on the level of mortality presented in this profile, it seems that life expectancy at birth, especially for males, has been decreasing and is very low. This unfortunate situation could be counteracted by intensifying health advocacy/public health awareness campaigns promoting healthier lifestyles, as the low overall life expectancy seems to be caused by a growing prevalence of lifestyle diseases such as diabetes, combined with high alcohol consumption, smoking and little exercise.

Furthermore, concerted efforts should be undertaken to improve infant, child and maternal health care programmes, leading to better overall child care, as it is difficult to understand such high infant mortality rates in an environment like Nauru, which does not experience the climate, health conditions (e.g. vector-borne diseases), physical environment, inaccessibility to health services and general communication problems that are prevalent in high IMR Pacific countries such as Solomon Islands, PNG, Vanuatu and Kiribati.

A distinctive feature of the Nauru resident population pyramid is the smaller base featuring the youngest age group (0–4 years) compared to 5–9-year-olds. Such a pattern is usually indicative of a recent decline in fertility.



Population pyramid, Nauruan population, 2002.

The 2002 census enumerates a total of 1677 households in Nauru, living in 1652 private dwellings, with 24 families sharing accommodation (listed as 'Not applicable' in underlying Table) and one non-private dwelling (institution).

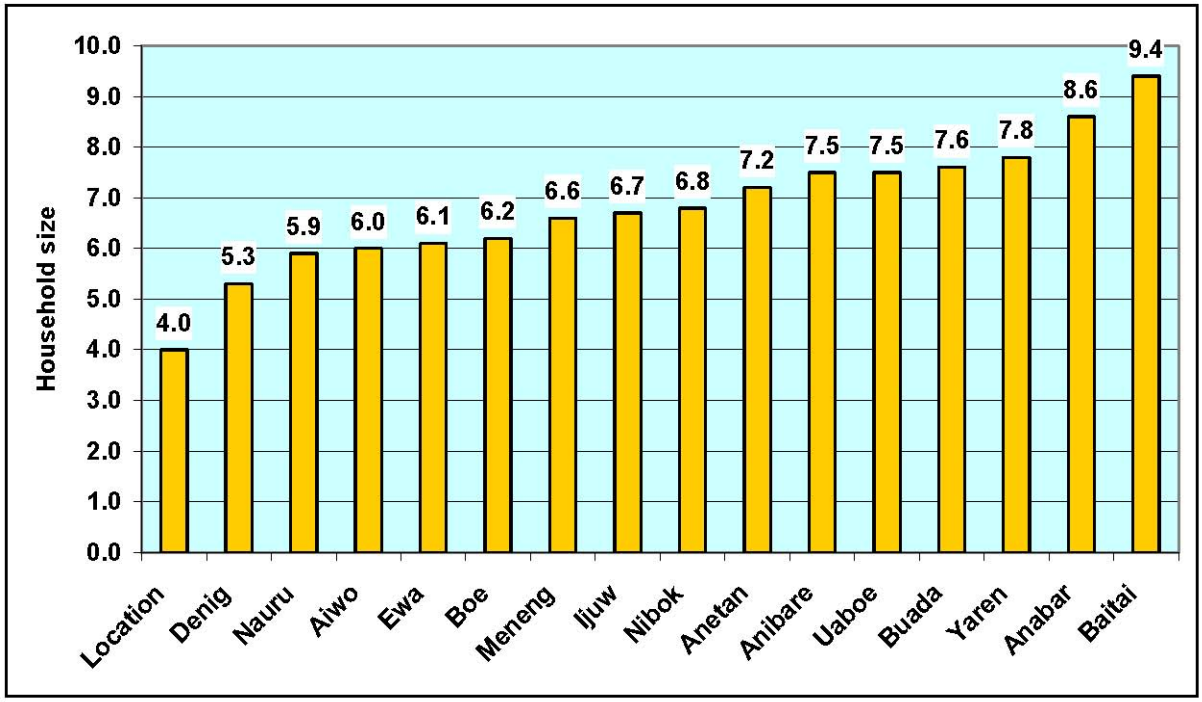
Distribution of households and dwellings by building type

Type of building	Frequency	
	Number	%
Total	1677	100.0
Permanent single	828	49.4
Permanent multiple	174	10.4
Apartment	578	34.5
Attached to shop	23	1.4
Lodging house	3	0.2
Traditional	5	0.3
Improvised	26	1.6
Other	15	0.9
Institution	1	0.1
Not applicable	24	1.4

The lowest average household size is noted in Location (four persons), while the highest is found in Baitsi with about nine persons. Location has the highest concentration of both population and households, and the lowest household size. This is because most residents in this district are foreign nationals living and working in Nauru.

Average household size by district, Nauru, 2002.

District	Resident population		Households		Household size
	Number	%	Number	%	
Total	9872	100.0	1676	100.0	5.9
Yaren	625	6.3	80	4.8	7.8
Boe	728	7.4	117	7.0	6.2
Aiwo	1042	10.6	175	10.4	6.0
Buada	673	6.8	89	5.3	7.6
Denig	283	2.9	53	3.2	5.3
Nibok	479	4.9	70	4.2	6.8
Uaboe	385	3.9	51	3.0	7.5
Baitsi	443	4.5	47	2.8	9.4
Ewa	394	4.0	65	3.9	6.1
Anetan	497	5.0	69	4.1	7.2
Anabar	378	3.8	44	2.6	8.6
Ijuw	168	1.7	25	1.5	6.7
Anibare	231	2.3	31	1.8	7.5
Meneng	1316	13.3	199	11.9	6.6
Location	2230	22.6	561	33.5	4.0



Average household size by district.

4.2% of the population lives in households comprising 1–2 people, which make up 16% of Nauru households; whereas at the other extreme, 10.5% of the population lives in households with 15 or more members, which make up 4.1% of all households.

Private dwellings by household size, and number of person per dwelling.

Household size	Private dwellings		Persons per dwelling	
	Number	%	Number	%
Total	1652	100.0	9872	100.0
1	116	7.0	116	1.2
2	148	9.0	296	3.0
3	187	11.3	561	5.7
4	243	14.7	972	9.8
5	215	13.0	1075	10.9
6	160	9.7	960	9.7
7	128	7.7	896	9.1
8	103	6.2	824	8.3
9	83	5.0	747	7.6
10	65	3.9	650	6.6
11	41	2.5	451	4.6
12	40	2.4	480	4.9
13	37	2.2	555	5.6
14	19	1.2	266	2.7
15	19	1.2	285	2.9
16+	48	2.9	738	7.5

Most private dwellings in Nauru were constructed over 20 years ago. Only two out of every 100 were constructed in the last two years, with one in 10 constructed over the past 10 years.

Water supply

Of the 1652 private dwellings, 1403 (85%) have access to drinking water with dispatches from the desalination plant operated by the government providing the main source of drinking water for 81% of private dwellings (A14). The remaining dwellings use rainwater (14%), wells or other means.

Distribution of dwellings by status of accessibility to drinking water.

Type of building	Total	Yes	No	Not stated
Total	1652	1403	234	15
Permanent single	828	669	157	2
Permanent multiple	174	141	32	1
Apartments	578	551	25	2
Attached to shop	23	16	6	1
Lodging house	3	2	1	0
Traditional	5	3	2	0
Improvised	26	14	11	1
Other	15	7	0	8

Distribution of dwellings by main source of drinking water.

Type of building	Total	Dispatch/desal. plant	Well/ground	Rain	Other	Not stated
Total	1652	1340	10	236	43	23
Permanent single	828	651	5	137	31	4
Permanent multiple	174	122	0	44	5	3
Apartments	578	520	4	46	3	5
Attached to shop	23	16	1	4	2	0
Lodging house	3	2	0	0	1	0
Traditional	5	4	0	1	0	0
Improvised	26	19	0	3	1	3
Other	15	6	0	1	0	8

Distribution of dwellings by main water supply source.

Type of building	Total	Cistern (tank) – gallons				Well brackish	Other source	Not stated
		< 3000	3000–5000	5000–10,000	10,000+			
Total	1652	240	544	321	290	40	186	31
Permanent single	828	60	205	247	211	25	65	15
Permanent multiple	174	13	43	46	56	12	4	0
Apartments	578	155	287	16	9	1	106	4
Attached to shop	23	5	2	7	3	1	4	1
Lodging house	3	1	0	1	0	0	1	0
Traditional	5	1	3	0	0	0	1	0
Improvised	26	5	2	2	9	1	4	3
Other	15	0	2	2	2	0	1	8

Distribution of dwellings with status of water share during 'dry' periods.

Type of building	Total	Yes	No	Not stated
Total	1652	625	999	28
Permanent single	828	280	537	11
Permanent multiple	174	114	60	0
Apartments	578	197	376	5
Attached to shop	23	10	11	2
Lodging house	3	1	2	0
Traditional	5	1	4	0
Improvised	26	16	8	2
Other	15	6	1	8

Distribution of dwellings with water availability during 'dry' periods.

Type of building	Total	Never	Sometimes	Frequently	Not stated
Total	1652	302	952	367	31
Permanent single	828	203	438	174	13
Permanent multiple	174	62	60	51	1
Apartments	578	21	428	125	4
Attached to shop	23	8	14	1	0
Lodging house	3	3	0	0	0
Traditional	5	0	4	0	1
Improvised	26	3	6	14	3
Other	15	2	2	2	9

Household sanitation (toilet facilities)

Most private dwellings (83%) have access to modern indoor toilet facilities (tank-flush), with a further 12% having access to external tank or pour-flush facilities. Only 2% (N=28) of private dwellings claim not to have access to a toilet facility.

Distribution of dwellings by toilet facilities.

Type of building	Total	Tank-flush inside	Tank-flush outside	Tank-flush share	Pour-flush inside	Pour-flush outside	Pour-flush share	None	Not stated
Total	1652	1378	41	87	74	4	16	28	24
Permanent single	828	694	22	28	56	2	6	15	5
Permanent multiple	174	136	6	16	5	0	10	1	0
Apartments	578	522	7	27	12	0	0	0	10
Attached to shop	23	17	2	2	0	0	0	2	0
Lodging house	3	0	2	0	0	0	0	1	0
Traditional	5	1	1	0	0	0	0	3	0
Improvised	26	5	1	11	1	2	0	5	1
Other	15	3	0	3	0	0	0	1	8

Distribution of dwellings by toilet water.

Type of building	Total	Fresh	Brackish	Well	Other	Not stated
Total	1652	517	755	34	284	62
Permanent single	828	355	386	27	36	24
Permanent multiple	174	40	119	3	8	4
Apartments	578	107	218	3	238	12
Attached to shop	23	6	12	0	2	3
Lodging house	3	1	1	0	0	1
Traditional	5	1	1	0	0	3
Improvised	26	5	14	1	0	6
Other	15	2	4	0	0	9

Distribution of dwellings by toilet flush.

Type of building	Total	Sewerage	Septic	Other	Not stated
Total	1652	649	905	26	72
Permanent single	828	118	662	19	29
Permanent multiple	174	11	158	4	1
Apartments	578	519	40	0	19
Attached to shop	23	1	18	1	3
Lodging house	3	0	2	0	1
Traditional	5	0	2	0	3
Improvised	26	0	17	2	7
Other	15	0	6	0	9

In the past, Nauruans were not known for migrating to other countries like other Pacific Islands peoples did, but this might have changed during the last few years. About 2270 more people left Nauru than established residence there during the years 1992–2002, resulting in an annual average net migration of –218.

The estimated pattern (percentage distribution by age and sex) of net migrants of the resident population of the intercensal period 1992–2002 has been used as the base for the projection scenarios based on three different migration assumptions:

Resident population size in the year 2027 according to nine projection scenarios (combination of three different fertility and migration assumptions).

Fertility assumption (TFR 2002–2027)	Migration assumption: Zero	Medium (-100)	High (-200)
Slow decline (3.9 → 3.5)	16,665 (high population growth variant)	13,394	10,077
Medium decline (3.9 → 2.5)	15,210	12,147 (medium population growth variant)	9,031
Fast decline (3.9 → 1.5)	13,555	10,711	7,827 (low population growth variant)

Scenario 1 (high population growth variant)

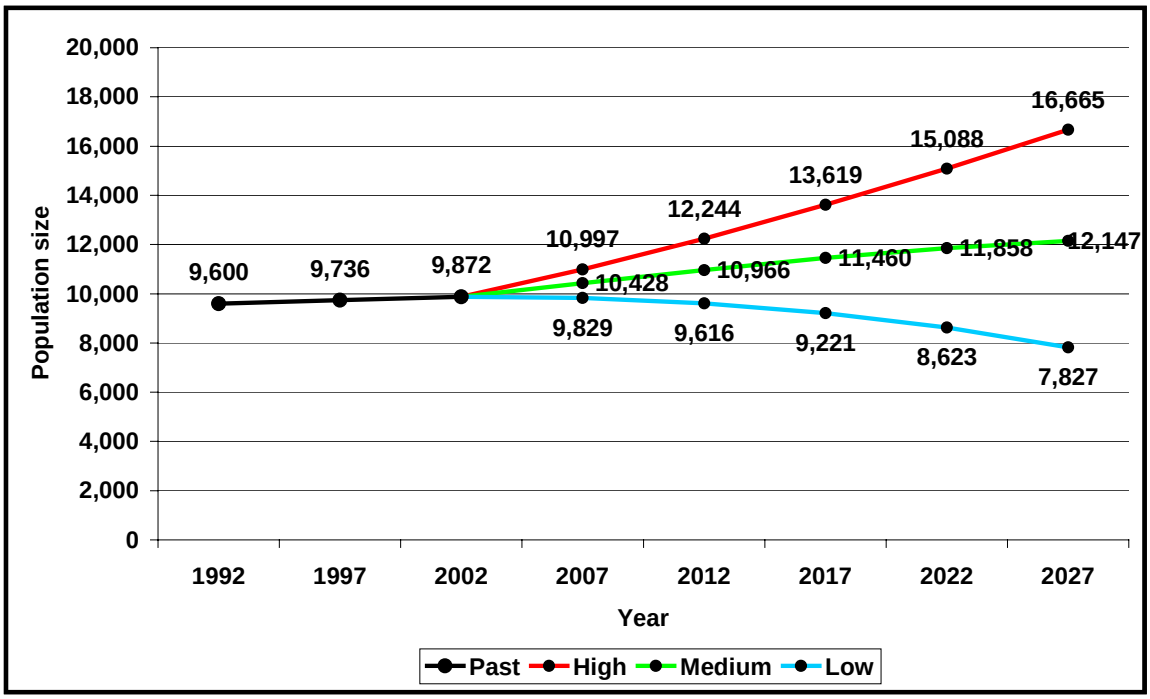
- *High fertility*: The estimated current TFR of 3.9 will slightly decrease to 3.5 until 2027.
- *Mortality*: After the period 2002–2007 of stagnating life expectancies, the estimated level of life expectancy at birth will gradually increase, from 52.5 years and 58.2 years for males and females to 62.5 years and 68.0 years respectively in the year 2027.
- *Zero migration*: Net migration is assumed to be zero.

Scenario 2 (medium population variant)

- *Medium fertility*: The estimated TFR of 3.9 in 2002 will gradually decrease to 2.5 in the year 2027.
- *Mortality*: Same as Scenario 1.
- *Medium migration*: The high level of negative net migration of the period 1992–2002 of -200 people per annum is reduced to -100 people per annum for the entire projections period 2002–2027.

Scenario 3 (low population variant)

- *Low fertility*: The estimated TFR of 3.9 in 2002 will decrease to 1.5 in the year 2027.
- *Mortality*: Same as Scenarios 1 and 2.
- *High migration*: The high level of negative net migration of the years 1992–2002 will continue for the entire projections period 2002–2027.



Future population trend according to three projection variants, 2002–2027.

General comments

The impact of fertility on Nauru's population dynamics, particularly future population growth, is less pronounced than that of migration.

Although the *low population growth variant* projection assumptions may seem drastic, it needs to be pointed out that this variant assumes migration rates that are the same as those of the intercensal period 1992–2002, and that fertility has already declined to below a TFR of two in many parts of the world (including New Zealand and Australia). While it is impossible to predict future migration patterns and levels, the *medium population growth variant* assumption appears to be the most realistic because the high levels of -200 people per annum of the period 1992–2002 were the result of many Tuvaluans and I-Kiribati leaving Nauru just before the census, and an already diminished 'pool' of potential migrants is not conducive to such sustained high negative future net migration rates. On the other hand, continued economic uncertainties as experienced on Nauru may well be conducive to continued negative migration rates for years to come.

Source:– NSDS 2005-2025 – Appendix 3
Population Projections over 20 years (Nauruans only)
Assumptions for projections

	Average births per woman	Life expectancy 2002 --- 2022	Net Migration	Population 2022 (2002 pop 7,600)
P1	Constant at 4.0	Males 53 ------ 53 Females 58 ------ 58	0	12,100
P2	Decline to 2.1 by 2022	Males 53 ------ 58 Females 58 ------ 64	0	10,800
P3	Decline to 2.1 by 2022	Males 53 ------ 58 Females 58 ------ 64	–100 people / year	8,650

P1 – Constant fertility and life expectancy, zero net migration
P2 – Fertility decline and life expectancy increase, zero net migration
P3 – Fertility decline and life expectancy increase, – 100/year emigration

Source:– NSDS 2005-2025

Millennium Development Goals and Targets: Assessment of Progress

Target 10: Halve by 2015 the proportion of people without sustainable access to safe drinking water.

Nauru: Fresh water is available from rain and well water, but desalinated water is no longer available. Constant supply is unreliable due to periodic droughts and quality is questionable. Water use management does not exist. Poor waste management threatens to contaminate the water lens.

NSDS (2005-2025) Sector Goals, Strategies and Milestones

Sector Goals	Sector Strategies	Short-term Milestones 2008	Medium-term Milestones 2015	Long-term Milestones 2025
C. Infrastructure Sectors				
Infrastructure sectors have a key role in underpinning development in the economic and social sectors of Nauru. Due to the past lack of maintenance and investment in physical infrastructure over many years Nauru's current infrastructure is very run down and on the point of collapse in some instances. While investment has been substantial over the past 4 years ongoing institutional and management problems have contributed significantly to the ongoing poor performance of this system. Major investment, coupled with a new culture of preventative maintenance and forward thinking is required for ongoing reliable functionality. In a resource restrained environment the emphasis must be on improving the management and operation of existing facilities.				
C2. Water				
A reliable supply of water provided to all households and businesses.	Better management of water resources including underground water. Improve collection and storage of water at all levels. Restore capacity for water production.	Regular supply of water available to each household and business. Refurbishment of national water storage tanks. 100 new household water tanks installed per annum. Desalination plant operational.	Quality water available to households and businesses 24 hours a day. Water storage capacity expanded.	Improved access to a reliable supply of quality water.
C3. Public Works				
C3.2 Sewerage: Raw sewerage and grey water properly managed.	Improved sewerage removal. Establish sewerage treatment plants and grey water recycling systems.	Procurement of a new sewerage truck. All household and business sewerage removed by an affordable cost effective service. Sewerage treatment and grey water recycling options determined.	Affordable treatment plants and grey water recycling systems installed.	Sewerage system well managed consistent with environment best practices.

ANNEX H

Terms of Reference for Proposed SOPAC EDF9 Nauru In-Country Intern Position

COUNTRY INTERN

The in-country Resource Information Officer will be responsible to the Project Officer for ensuring the transmission of Project philosophy and sustainability ideals to schools, local educational establishments, village-level communities and other stakeholders.

Officer Duties

The duties of the post shall include, but not be restricted to, the following principal activities:–

- Co-ordination of national activities in Nauru for the SOPAC/EU Project "*Reducing Vulnerability in Pacific ACP States*", with the SOPAC Secretariat in Suva.
- Establish and implement public awareness activities related to the Project in Nauru.
- Organise and implement community workshops.
- Prepare information documentation for use in schools and the community generally to ensure the Project information resources are accessible to and used by the community.
- Liaise with national advocacy personnel and provide briefing as required.
- Organise national stakeholder meetings between all government and non-government stakeholders.
- Work at the SOPAC Secretariat from time-to-time to develop personal capacity and optimise preparation of materials to facilitate the duties of the position.

Skills Required

- Degree in Environmental or Earth Sciences.
- IT skills in Microsoft Office applications.
- Good literacy skills in English and Nauruan.
- Good inter-personnel skills.
- Experience with community awareness Projects.

ANNEX J

Nauru Water Sector Development

Copy of outline proposals submitted by SOPAC for consideration by EU Delegation, Suva, in January 2006

In response to your letter of 15 December 2005 regarding Nauru's water needs we are pleased to discuss with the Delegation the provision of assistance through the current EU funded programmes of SOPAC in conjunction with the programming of Nauru's B envelope, under the 9th EDF.

Nauru's water and sanitation needs have been highlighted during numerous missions that have been undertaken over the past few years and funded by various development partners such as yourselves, SOPAC, WHO and AusAID. Based upon previous recommendations for water supply and sanitation improvements provided by the Government of Nauru, WHO, AusAID and through discussions during the SOPAC EDF9 multi-stakeholder consultation held in July 2005, we would suggest that a draft plan of action be developed and implemented using the B envelope in conjunction with SOPAC's ongoing work programme initiatives. We believe that any such plan of action should focus on the following aspects:

Desalination **–** In view of Nauru's financial state and lack of institutional, technical and engineering capacity for effective operation and maintenance, the continued pursuit of desalination as the island's primary public water supply is considered a non-sustainable option. Small-scale reverse osmosis desalination plants may however prove feasible for specific users where high quality water is necessary such as the hospital or for individual needs or private enterprises such as hotels, where cost recovery can be obtained. The monitoring of the current units and provision of additional maintenance assistance could be considered under the B envelope.

Rainwater Harvesting **–** Public water supply needs to focus on conjunctive use of available water resources through maximising rainwater harvesting and groundwater resource abstraction. Rainwater harvesting and storage improvements can be made in the immediate to short-term, both at the domestic and communal/institutional level and be considered as major components under the B envelope.

The SOPAC EDF9 project will be purchasing high resolution satellite imagery for Nauru and providing training to stakeholders in the application of this remotely sensed data into a Geographic Information System (GIS) that can be utilised toward improved development planning processes. One typical RS/GIS application would be to identify and develop a database of all properties and associated roof catchments and link this to associated field surveys with Global Positioning Systems to accurately identify the condition of rainwater harvesting infrastructure assets such as roofing materials, guttering, downpipes and storage tanks.

SOPAC also has Technical Guidelines for the implementation of rainwater harvesting systems as well as a Manual for community participation developed for rainwater harvesting in Pacific Islands, which can be provided to Nauru for activities under any of its rainwater harvesting initiatives.

Water Supply **–** The general condition of the current reticulated water supply system at the ex-NPC area is in need of assessment. Replacement of pumps, valves, pipes can be considered under the B envelope. A water demand management plan could be established that includes leak detection and hydraulic analysis of the whole central system. The GIS to be developed under the SOPAC EDF 9 project will assist in the hydraulic modelling of the reticulated system.

Water Resources Management – According to reports of the WHO, Nauru was in the process of drafting both Water and Sanitation Plans. Based on a review of the status of these plans a comprehensive Water and Wastewater Management Strategy could be developed with the various stakeholder groups through a consultative process. This could lead to the development of a National Water and Wastewater Policy and National Action Plan, which should strengthen the institutional arrangements for water resources management on Nauru. The Pacific Programme for Water Governance whilst focusing on 3 other Pacific Island countries can provide guidance on developing such a process.

Groundwater Development – Groundwater abstraction must be seen as a long-term investment for which a thorough investigation of current aquifer conditions and baseline monitoring is required. A proposal for a groundwater investigation programme was completed for AusAID in February 2003 and could be considered for implementation under Nauru's B envelope.

The SOPAC EDF 9 project can assist in the location and identification of potential hazards to the groundwater quality such as septic tanks, fuel tanks and landfill sites, which are critical to the aquifer risk assessment process, and source protection planning required for future groundwater resource abstraction.

Awareness – In parallel with all of the above suggestions, it is essential that community awareness and education on water conservation; sanitation and hygiene are undertaken in collaboration with suitable NGO's or CBO's. SOPAC is able to assist in this regard through the provision of awareness and education materials through its Water Supply, Hygiene and Sanitation (WASH) programme.

ANNEX K

RoN letter dated 26th July 2006 (Hon D. Adeang to EU Delegation, Suva), endorsing the use of uncommitted B-Envelope funds for disaster preparedness by addressing drought risk

Hon. David Adeang MP
Minister Assisting the President
Minister of Foreign Affairs & Trade
Minister of Finance & Economic Planning

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REPUBLIC OF NAURU

26 July 2006

Mr. Michel Gauche
Chargé d' Affaires a.i
Delegation of the European
Commission for the Pacific
Suva
FIJI

Dear Mr. Gauche,

In reference to your letter dated 06 July 2006 regarding the Regional Program in Disaster Preparedness and Risk Management Joining EU Natural Disaster Facility and National Remaining B Envelope.

I wish to offer on behalf of the Government of the Republic of Nauru, endorsement for the uncommitted funds under the B Envelope to be utilized for disaster preparedness, most specifically as recommended the completion of a Strategic National Action Plan and the implementation of a first priority under this Plan.

I further concur that a priority identified under our National Sustainable Development Strategy (NSDS) 2005 is the water sector and addressing the drought risk under the National Action Plan is the most appropriate for Nauru at this point in time.

The Government of Nauru through its Aid Management Unit and Development Planning and Policy Division look forward to working with the European Commission and SOPAC to progress on the Strategic National Action Plan at the earliest.

Yours sincerely,

David W. Adeang