

FINAL ACTIVITY REPORT FOR APN PROJECT 2002 - 16

Atoll Island Change and Linkages to Sea-level Variations in Oceania

ABSTRACT

A previous APN funded project (2000-11) identified a lack of atoll island coastal monitoring data, which can be used to assess the impact of global change in the Oceania region. The need for such data is particularly important for low-lying atoll islands, which are sensitive to coastal change in response to storms and sea-level variation at various spatial and temporal scales. Although some coastal monitoring data exist for atoll islands most of this work is focused on areas of high human impact, thus contaminating any global change signal.

In order to redress this situation, the current APN project (2002-16) was designed to develop a regional research network and support mechanism for the collation, collection and analysis of atoll island change data. It aimed to provide capacity building through training and development of atoll nation personnel to equip them with specific coastal monitoring research skills. This was done through a workshop in Fiji attended by atoll island personnel. The project also set up the first of the base-line monitoring sites in Tuvalu at a location with minimal human impact. The monitoring network covers three atoll nations and is intended to be self-supporting within the region.

PROJECT INFORMATION

Principal Investigator:

Professor Nick Harvey

Geographical and Environmental Studies

The University of Adelaide

South Australia 5005

Telephone: +61 8 8303 5923

Facsimile: +61 8 8303 3772

Email: nick.harvey@adelaide.edu.au

APN Funding

US\$22,930

Duration of the Project

November 2002 - February 2003 (*funding delays meant the project could not start until November*)

Collaborating countries

Australia, Fiji, Kiribati, New Zealand, The Marshall Islands and Tuvalu.

1 INTRODUCTION

1.1 BACKGROUND

This project arose from the recommendations of a previous APN funded project 2000-11 titled 'Recent Sea-Level Change and Coastal Management Implications for Oceania'. A key element of that project was the organisation of an atoll-based workshop focusing on atoll response to sea-level changes. The workshop, held in Kiribati, February, 2001, was attended by delegates from Pacific atoll-states and produced a number of outcomes and recommendations which are listed in the action plan of the workshop report.

One of these recommendations related to the need for a coastal monitoring training program within the atoll countries. The workshop (2000-11) identified a need for 1) a basic understanding of coastal profiling and coastal processes; 2) a mechanism for providing advice when 'in-country' staff encounter problems; 3) provision for staff to go back to the trainers or resource people for more help once they have returned to their own country and are using the techniques; 4) for sufficient follow up and support; 5) identification of a responsible government department with a clearly identified job description to ensure the profiling takes place as part of the normal work program.

The workshop (2000-11) agreed that *action should be taken to seek funds to set up a coastal monitoring training programme for the three atoll countries of Oceania*. Subsequently, an APN grant proposal, prepared and submitted in 2001; was successful for funding in the 2002 round of APN grants (2002-16). After some delay with funding, the project commenced in November 2002.

1.2 SCIENTIFIC SIGNIFICANCE AND RATIONALE FOR PROJECT

Atoll island coastlines experience pronounced morphological change in response to storms, and sea-level change at a range of time scales. Understanding the pace and scale of change is paramount for management of these sensitive low-lying islands with limited land area. Some excellent scientific data and early surveys provide a baseline against which to assess more recent changes. With some exceptions, such as the detailed re-survey of Tuvalu funded by UNDP in 1991, there has been very little

systematic monitoring of atoll island change. This has been exacerbated more recently by a reliance on remote sensed data and reduced funding for on ground monitoring.

It is apparent from a previous APN project (2000-11) that at a sub-regional level there is a paucity of atoll change monitoring data. In some countries there are no data; in other countries a significant amount of data have been collected on atoll island change but are being archived without proper scientific analysis. In part this is due to a lack of expertise to analyse and synthesise the data sets into meaningful and practical results that can be incorporated into coastal management policies and strategies. There have been some training programs through aid agencies such as World Bank or through SOPAC. However, a lack of follow up 'on ground' assistance, or a lack of 'in service' and further training compounded by staff changes has resulted in an *ad hoc* data collection. This has meant lost opportunities to support management and planning through a better understanding of atoll shoreline processes.

As a result of their geographical location and a decline in their strategic importance, atoll islands have become marginalised over the past two decades. Understanding of atoll islands is less developed than other coastal environments in the Pacific and there is limited research underway to address this. The high population densities on atoll islands and dependence on coastal resources and limited land area, creates an imperative for a greater understanding of atoll island change. It is perceived that atoll environments are more susceptible to global change than other coastal systems. However, there is poor understanding of change and dynamics in atoll environments (particularly processes of sediment production, erosion and transport that control island morphological change) with which to inform coastal managers and decision-makers. Therefore, it is important to understand the likely response of atoll island environments to future climate change and sea level.

Existing monitoring data conducted by organisations such as SOPAC tend to be focused on high human impact areas where coastal processes have been disrupted by causeways, channels, dredging, reclamation, and coast protection works. For this reason it is difficult to separate human impact on the coast from the impact of global change. In order to collect adequate coastal monitoring data linked to global change it is necessary

to set up a monitoring network on atoll islands where the coast as far as possible is removed from human influence.

1.3 AIMS AND OBJECTIVES OF THE PROJECT

This project had three main *AIMS*;

First, to develop a regional research network and support mechanism for the collation, collection and analysis of atoll island change data. The project will provide a focused global change research framework for investigating coastal response to relative sea-level change in atoll nations of Oceania, and builds on previous APN supported initiatives using the regional country team model successfully used in the PICCAP programme.

This research will be implemented 'in country' and supported by network partnerships between 'in country' researchers and experts from other countries. The main role of the Principal Investigator and Research Collaborators is to *facilitate* the initial development of skills relevant to the collection and analysis of atoll change data for policy and management in atoll nations by atoll nation researchers. The intention is that once the network has been set up, it will be entirely self-contained within the developing countries.

Second, to develop a sustainable capacity building mechanism through training within a collaborative sub-regional research network which will enable:

- Documentation and collation of historic and current changes in atoll islands.
- Design and implementation of systematic coastal monitoring programmes.
- Scientific analysis of local and country coastal change data and mechanisms of change for the purposes of upscaling to the national and sub-regional level.

Third, the project will use the scientific findings to better inform coastal management policy in three atoll nations (Republic of Kiribati, Republic of The Marshall Islands, Tuvalu). This will be done with key regional Government coastal researchers providing advice to policy makers in their respective countries.

1.4 DESCRIPTION OF THE PROJECT

A key element of the project was to run the initial atoll island monitoring workshop, and to set up the regional monitoring network as important capacity building activities for the region. Apart from the workshop and monitoring network, the APN project comprised four other elements:

i) Documentation and collation of historic and current changes in atoll islands.

The documentation and collation of historic and current atoll island change records is well underway. A data base is being compiled and although there is no single repository for this material, the data base will indicate the location and availability of key reports.

ii) Design and implementation of systematic coastal monitoring programs.

This was done at the first network meeting in Tuvalu in January, 2003. The implementation will subsequently be extended by the network to Kiribati and The Marshall Islands.

iii) Scientific analysis of local and country coastal change data and mechanisms of change for the purposes of up-scaling to the national and sub-regional level.

Scientific analysis of existing coastal change data is planned for Kiribati where a sufficiently large data set exists. It is hoped that this can commence in 2003. Once the Kiribati data have been analysed, this should provide a framework for other country data. Further investigations are needed before analysis of Tuvalu and The Marshall Island data can be undertaken.

iv) Use of scientific findings to better inform coastal management policy in three atoll nations (Republic of Kiribati, Republic of The Marshall Islands, Tuvalu).

Mechanisms will be put in place for the monitoring network to promote the use of scientific findings to inform coastal management policy in Kiribati, The Marshall Islands, and Tuvalu. Preliminary investigations have been conducted into relevant coastal policy in these three nations.

2 ACTIVITIES CONDUCTED

As noted in the above project description, a mixture of desk-top research and field or workshop-based activities took place. The documentation and collation of historic and current atoll island change records has been undertaken with research assistance in Australia together with help from the START-Oceania Secretariat which has good access to SOPAC literature and data bases. A preliminary bibliography is provided in Appendix 1 but this will be expanded and circulated through the monitoring network and START-Oceania.

Analysis of existing coastal change data for Kiribati was not possible within the time frame of the APN project but is planned for late 2003 as a direct spin off from the project using a capacity building initiative through the START Fellowship Scheme.

Results from a previous APN atoll project (2000-11) provided insights into the relevant coastal policy in the three atoll nations of Tuvalu, Kiribati and The Marshall Islands. Summaries of this material are being prepared in a suitable form to provide guidance to the monitoring network to maximise the use of scientific findings on atoll change to inform coastal management policy in those countries.

Apart from the above desk-top elements of the project, there were three main field/workshop-based activities. Each of these, conducted in separate countries (Fiji, Tuvalu and The Marshall Islands) will be discussed in turn.

2.1 ATOLL ISLAND MONITORING WORKSHOP, FIJI, NOVEMBER 2002

2.1.1 Workshop Objectives

- i) To overview a range of methods and technologies available to monitor atoll island change.
- ii) Review coastal monitoring programmes in three atoll countries to establish their utility for detecting the effects of global change on atoll islands.
- iii) To identify the most practicable (technologically feasible and financially viable) method for monitoring atoll island change.

- iv) To establish an atoll island country monitoring network.

2.1.2 Workshop Overview

The main aim of this workshop was to provide training to facilitate development of skills relevant to the collection and analysis of atoll change data for policy and management *in atoll nations by atoll nation researchers*.

The workshop was held at the University of the South Pacific in Suva, Fiji. Participants (Appendix 2) attended from countries made up of atolls or low islands – Tuvalu and the Republic of Kiribati [Mr. Tregar Albon Ishoda, from the Republic of the Marshall Islands was unable to attend due to flight cancellation]. Other participants included the APN project leader (Professor Nick Harvey), one of the key project collaborators (Dr Paul Kench), and participants from Fiji including Ms Leigh-Anne Buliruarua (START-Oceania) who was responsible for organisational aspects of the workshop in Fiji. The workshop comprised a fieldwork/training component and a series of workshop sessions, discussions and presentations. Workshop and training activities are described below.



Figure 1: From left to right: Ms Eva Lewenikuruwai (Fiji), Ms Leigh-Anne Buliruarua (Fiji), Ms Naomi Atauea (Kiribati), Mr Alan Resture (Tuvalu), Prof Nick Harvey (Australia), Mr Manuella Pilitati Falaile (Tuvalu), Prof Bill Aalbersberg (Fiji), Dr Komeri Onorio (Kiribati) and Dr Paul Kench (New Zealand).

2.1.3 Workshop Session Summaries

Session 1 – Saturday, 23 November, 2002, 0900-1030 – Prof Harvey and Dr Kench

A Powerpoint presentation was given covering a range of methods and technologies available to monitor atoll island change including:

a) Survey tools

- Simple dumpy level surveying
- Total Station Surveys
- Hydrographic surveys
- Global Positioning System (GPS) surveys: planimetric and point location

b) Frequency of monitoring

- To detect seasonal changes
- To detect longer term sea-level changes

c) Analysis:

- Determination of rates of erosion and accretion
- Calculations of volumetric change

d) Interpretation:

- Analysis and presentation of coastal change survey data
- Correlation of coastal change data with climate change over a range of timescales.

e) Examples from ongoing monitoring projects in:

- New Zealand (Parengarenga Harbour)
- Australia (Narrabeen, Moruya, South Australia)
- Maldives (atoll island monitoring)

A series of Powerpoint slides illustrating the concepts and techniques most relevant to atoll island monitoring, is attached as Appendix 3.

Session 2 – Saturday, 23 November, 2002, 1100-1230 – Dr Onorio

This session attempted to build on the introductory session on methods and techniques by reviewing coastal monitoring programmes in three atoll countries (Kiribati, Marshall Islands and Tuvalu) to establish their utility for detecting the effects of global change on atoll islands.

Of the three atoll countries participating in the project only Kiribati has maintained an ongoing coastal monitoring programme that is run largely using Kiribati resources. Tuvalu has relied on external sources to undertake monitoring and this has been episodic since 1982. There has been an over-reliance on external aid agencies or regional organisations (e.g. SOPAC) to assist with monitoring areas of anthropogenic coastal change.

Common to all monitoring has been the focus on coastal change around heavily populated coastlines. Typically, such coasts have experienced significant modification through insertion of hard structures (e.g. groynes, seawalls, causeways) that promote changes in island shorelines. Consequently, it is difficult to use these records to assess the effects of global change on islands. This constrains and frustrates managers and politicians who are increasingly looking for evidence of the impact of sea-level rise on coastal margins. It was identified that monitoring for the purpose of detecting the role of global change must be undertaken in island settings with a minimum of human disturbance.

Session 3 – Saturday, 23 November, 2002, 1400-1700

Fieldwork and Training - Dr Kench and Prof Harvey

Participants:

Prof Bill Aalbersberg (Fiji)

Ms Naomi Atauea (Kiribati)

Ms Leigh-Anne Buliruarua (Fiji)

Mr Manuella Pilitati Falaile (Tuvalu)

Ms Eva Lewenikuruwai (Fiji)

Dr Komeri Onorio (Kiribati)

Mr Alan Resture (Tuvalu)

The field training session was held at a coastal site in close proximity to the University of the South Pacific (USP). The aim of the session was to introduce participants to field survey techniques. The session comprised demonstrations of surveying equipment and field monitoring techniques. In particular, the training session demonstrated the importance of surveying the location of physical features of the coast such as the toe of beach, berm, storm ridge, and edge of vegetation rather than fixed distance measurements which may miss important features. The training session also discussed the use of alternative survey methods in remote locations where modern equipment may not be available.

After the fieldwork, the surveying techniques were illustrated back in the seminar room at USP along with explanatory handouts on both recording and interpreting data.

Session 4 – Sunday, 23 November, 2002, 0900-1030 – Dr Kench and Prof Harvey

This was an open discussion session focusing on the aims and objectives of the APN monitoring project in comparison with the adequacy of existing surveys and the availability of various methods and techniques. It was agreed that currently there were scattered monitoring studies, mostly focused on areas of high human impact and that data compilation and analysis was either patchy or non-existent.

The workshop agreed that the main goal of this project should be:

To gain a better understanding of physical changes on atoll islands.

With an aim to:

collect, analyse and communicate accurate data on coastal change in order to:

- a) Assist development of national climate change adaptation strategies.*
- b) Promote International Advocacy for Climate Change Action.*
- c) Assist monitoring and management of coasts.*

The workshop discussed the most practicable (technologically feasible and financially viable) method for monitoring atoll island change. This discussion involved de-briefing from the fieldwork along with an outline of specific technical and logistic issues relevant to individual country perspectives. Discussion items were as follows:

- Monitoring techniques

- Designing a monitoring network (national vs local)
- Determining monitoring locations
- Importance of re-establishing monitoring sites
- Benchmarks and security
- Data collation, storage and processing
- Analysis – other useful data sets (waves, wind etc) identifying trends – links to historical data.
- Reporting

Recognising the resource and technological constraints of the relevant coastal monitoring agencies in each country it was agreed that monitoring should use robust, reliable and ready available equipment. Therefore, the automatic level was identified as the most appropriate tool to undertake repetitive surveys of coastal morphology. Such surveys are commonly undertaken at a number of discrete locations on an island. To supplement these 2-dimensional surveys it was decided that where possible Global Positioning System (GPS) surveys of island planform be undertaken. Such surveys would capture the edge of the vegetation line and base of beach and allow comparison of whole island change (location on reef platform) between surveys.

Session 4 – Sunday, 23 November, 2002, 1100-1230 – Prof Harvey

Future Directions and Follow-up Work

The final session of the workshop focused on producing short and long-term outcomes and products from the project. First it was agreed that the network needed to be formalised as the Pacific Atoll Coastal Monitoring Analysis Network (PACMAN). The PACMAN approach is intended to be largely self-sustaining within the Pacific atoll island-nations. However, initial encouragement and support can be provided in a number of ways. First, it is intended to encourage further individual training through mechanisms such as the START Fellowship plan. Second, there is a need to maintain contact with the PACMAN initiative through the APN-Oceania liaison person and the START-Oceania Secretariat, including website maintenance. Third, it is recognized that personnel costs for over-stretched monitoring staff in atoll island-nations may impact on the success of the PACMAN program. For this reason it may be appropriate to provide

a small amount of funding in the first few years to assist with PACMAN-related monitoring costs.

In order to formalise a number of the tasks an action plan was produced (detailed below). This contains tasks, time-lines, directions for future support, possible funding avenues and clearly outlines responsibilities for their facilitation.

Workshop Action Plan

Task	Responsibility and deadlines																								
1. Paper for START meeting	➤ Training course participants																								
2. Determine responsible government section and personnel interested in monitoring	<ul style="list-style-type: none"> ➤ Naomi Atauea- Kiribati – Mineral Resources ➤ Alan Resture - Tuvalu- LandsDept. ➤ Naomi Atauea to write to ambassador Albon Ishoda, Republic of Marshall Islands ➤ Eva Lewenikuruwai and Leigh-Anne Buliruarua- Fiji 																								
3. Determine other groups that can assist with monitoring, for example, Peace Corps, USP, START-Oceania, SPREP, SOPAC, NGOs	➤ Komeri Onorio to determine Country Heads-Permanent Secretaries																								
4. Identify possible funding sources, for example, APN, AMSAT, SPREP, AusAID, NZAID, NTF. Linkage with existing funded projects, for example, AIACC, CIDA, IAS projects.	<ul style="list-style-type: none"> ➤ Site set up and planning (Tuvalu OK under existing project) (Mid January – 1 week) Afterward (RMI & cross-site visits US\$5000/yr) <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Country needs</td> <td style="width: 30%;">Travel</td> <td style="width: 40%; text-align: right;">US\$5000/yr</td> </tr> <tr> <td></td> <td>Equipment</td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">US\$10,000/yr for 3yrs</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">US\$5000/yr for 2yrs</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">US\$6000 GPS</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">US\$1000/yr</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">communication/supplies</td> </tr> <tr> <td></td> <td></td> <td style="text-align: right;">US\$20,000 yr 3 (analysis and communication meeting)</td> </tr> </table>	Country needs	Travel	US\$5000/yr		Equipment				US\$10,000/yr for 3yrs			US\$5000/yr for 2yrs			US\$6000 GPS			US\$1000/yr			communication/supplies			US\$20,000 yr 3 (analysis and communication meeting)
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		US\$20,000 yr 3 (analysis and communication meeting)																							
5. Regional networking through START web site of Directory of Experts	➤ Leigh-Anne Buliruarua to link PACMAN to START-Oceania website																								
6. Identify/document training needs and existing resources	➤ Komeri Onorio, Naomi Atauea, Leigh-Anne Buliruarua - START Fellowship proposal to go to START-Oceania Regional meeting																								
7. Historic data collection/bibliography	➤ Nick Harvey and Leigh-Anne Buliruarua																								
8. Site selection	➤ Tuvalu (mid Jan)																								
9. Budget Matrix	➤ Nick Harvey																								
10. Organise Tuvalu meeting (mid Jan)	➤ Nick Harvey and Leigh-Anne Buliruarua (existing APN)																								
11. Develop programme for Tuvalu meeting.	➤ Paul Kench and Nick Harvey																								

12. START Committee to be approached to play key role allowing Komeri Onorio to take lead role in coordination. Discuss possible funding avenues. Liaison with SPREP and SOPAC	➤ START-Committee meeting 25-26 Nov.
13. Actions to approach Chalapan Kaluwin and AMSAT	➤ Komeri Onorio initial approach and START to follow up by early Dec.
14. Actions to approach AIACC – Kanayathu Koshy	➤ Nick Harvey
15. Action timeframe	➤ Paul Kench, Komeri Onorio, Nick Harvey
16. Country specific database	➤ Leigh-Anne Buliruarua –SOPAC, Manuella Pilitati Falaile to check with Lands Department by early Dec.

2.2 IMPLEMENTATION OF COASTAL MONITORING, TUVALU, JANUARY 2003

Part of the project aims was to design and implement systematic coastal monitoring programs which could be used to assess the future impact of global change on atoll coastlines. For this reason, it was necessary to select a site on an uninhabited atoll island which was away from human impact or modification to its coastline. The island selected was Fatato, just south of the main island of Fongafale on Funafuti Atoll in Tuvalu.

On 20 January, 2003 five of the PACMAN members from the Fiji workshop: Prof Nick Harvey (Australia), Dr Paul Kench (New Zealand), Naomi Atauea (Kiribati); Leigh-Anne Buliruarua (Fiji); and Manuella Pilitati Falaile (Tuvalu) met in Funafuti, Tuvalu in order to conduct the first survey. Assistance in Tuvalu was given through the Director of Lands Fanoanoaga Patoro and the Senior Surveyor Fa’atasi Malologa.

Survey work was conducted on 21 and 22 January on the island of Fatato. This island was in easy reach of the main island and could be accessed by foot with a 20-30 minute walk across the reef flat at low tide (see Figure 3). Six one inch diameter steel rods of approximately 1.5 metres in length were used to create benchmarks along two cross-island transects. Each of the benchmarks was hammered into solid ground or rock and sprayed with orange paint for easy re-location. The benchmarks were then geo-referenced using accurate GPS equipment. Once this had been done, the two cross-

island profiles were surveyed and referenced to the benchmarks, relevant geomorphological features and also to water level. In addition, a continuous GPS plan survey of the whole island was conducted for the toe of the beach and line of vegetation. Data from the survey were subsequently downloaded from the GPS equipment on to a laptop computer during the field trip to produce a preliminary map (Figure 2).

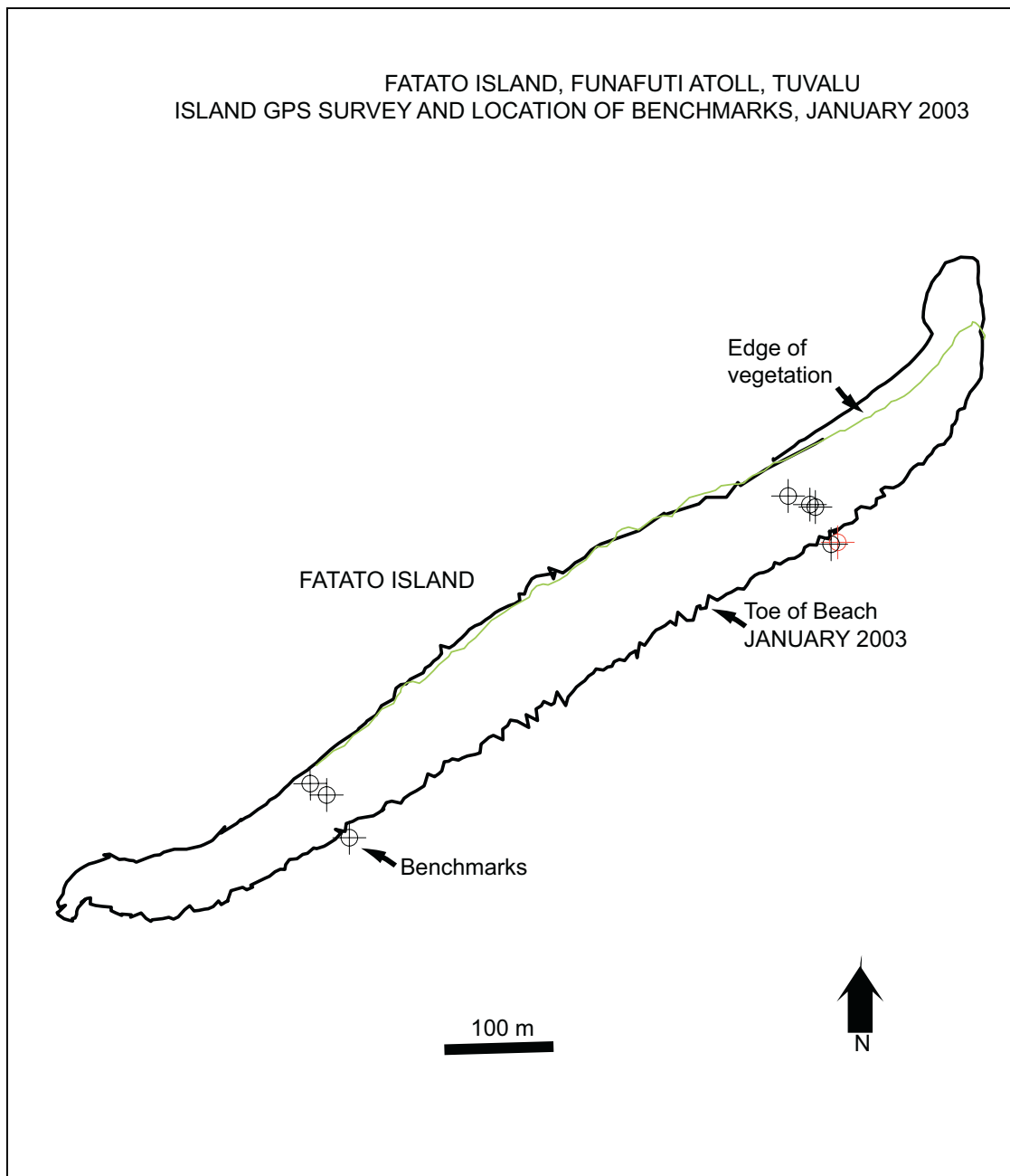




Figure 3: PACMAN team accessing Fatato Island (Tuvalu) by foot across the reef flat at low tide. The main island Fongafale in distance. Foreground Dr Paul Kench (New Zealand), middle distance Ms Naomi Atauea (Kiribati) and Ms Leigh-Anne Buliruarua (Fiji), left background Mr Manuella Pilitati Falaile (Tuvalu)



Figure 4: Windward side of Fongafale Island with PACMAN team standing from left Ms Leigh-Anne Buliruarua (Fiji) and Ms Naomi Atauea (Kiribati), crouching Mr Manuella Pilitati Falaile (Tuvalu)



Figure 5: Leeward side of Fatato Island looking across the lagoon toward the northern islands

2.3 PACMAN MEETING, MARSHALL ISLANDS, FEBRUARY 2003

On 26 February, 2003 two of the PACMAN members from the Fiji workshop; Dr Komeri Onorio (Kiribati) and Mrs Naomi Atauea (Kiribati) travelled to The Marshall Islands in order to extend PACMAN to the third atoll country involved in this project. Dr Onorio (as a Major Research Collaborator for this project) provides environmental and coastal policy expertise, together with extensive government contacts in the region. His experience complements that of Mrs Naomi Atauea who has extensive practical coastal monitoring experience and was part of the original Tuvalu PACMAN team which set up the first monitoring site on Fatato. Dr Onorio and Mrs Atauea will be making contact with coastal monitoring staff in The Marshalls, assessing the status of current monitoring programmes and determining the appropriate personnel to be involved in the Marshall Island component of PACMAN. In particular they will be assessing the potential of existing monitoring programs for global change analysis and if none are available, they will investigate the feasibility and practicality of setting up one or more separate PACMAN sites in the Marshalls. Given that the Marshall Island PACMAN trip was still underway at the time of writing this Final Project Report, it is not yet possible to report back on results.

3 OUTCOMES AND PRODUCTS

This project has produced a number of outcomes and products in accordance with the original aims and objectives. Of the three major field activities planned for the project, the third is underway at the time of writing. There are also tangible products such as the establishment of benchmarks, the first monitoring survey, documentation of background material, a website (which should be accessible by late March 2003) and a proposed conference publication. A major outcome of the project is the establishment of the network. The original objectives and corresponding outcomes are detailed below.

Objective To establish a regional atoll coastal monitoring network

A Pacific Atoll Coastal Monitoring Analysis Network (PACMAN) was created at the Atoll Island Monitoring Workshop held in Fiji, November 2002. This regional monitoring network is an important capacity building element of the project. A workshop report was prepared (incorporated in this Final Project Report) along with an action plan and subsequently a website linked to the START-Oceania website (<http://www.usp.ac.fj/start>). In addition it is planned to present a paper on the PACMAN approach to the *Australasian Coasts and Ports Conference*, to be held September 9-12, Auckland, New Zealand. This will result in a published paper in the Conference Proceedings.

Objective Documentation of historic and current changes in atoll islands

The documentation and collation of historic and current atoll island change records has been partially completed. The data base will indicate the location and availability of key reports and will be available through START-Oceania

Objective Implementation of systematic coastal monitoring programs

This was done at the first PACMAN meeting in Tuvalu in January, 2003. The first baseline monitoring survey was designed and implemented. This will be used as a basis for extending the network to Kiribati and The Marshall Islands.

Objective Scientific analysis of coastal change data

Kiribati has a sufficiently large coastal monitoring data set to conduct a preliminary analysis. It is planned to analyse these data in 2003 using capacity building opportunities through a START Fellowship. Once the Kiribati data have been analysed, this should provide a framework for other country data in Tuvalu and The Marshall Islands once sufficient investigations have been conducted for those countries.

Objective Use of scientific findings to better inform coastal management policy

Preliminary investigations have been conducted into relevant coastal policy in the three atoll nations which are the subject of this project. It is planned to document the most appropriate avenues for incorporating the scientific findings from monitoring data to better inform coastal management policy in Kiribati, The Marshall Islands, and Tuvalu.

4 CONCLUSIONS

This APN funded project achieved its objectives in delivering a capacity building approach to the monitoring of atoll island coastlines with the specific purpose of providing some accurate data for assessing the impacts of sea-level change. Although the project was delayed because of funding it was possible to run activities in three countries, including a workshop and fieldwork. The final extension of PACMAN to the Marshall Islands (currently underway) completes the linkage of the network between the three atoll nations along with a communication hub through the START-Oceania regional committee at USP in Fiji. Although the network is intended to be self-sustaining, it is recognised that some funding assistance will be required to provide occasional logistical support or additional training to maintain the momentum for this long-term monitoring project.