

Progress Report

**SAMOA INTEGRATED GEOPHYSICAL-HAZARD MONITORING
ARRAY (SIGMA) PROJECT**

**Submitted by
Ministry of Natural Resources and Environment**

for

Cabinet Development Committee

May 2007

1. Purpose of Submission

To provide CDC members with an update on the Samoa Integrated Geo-hazard Monitoring Array project to be funded by China under the auspices of China Earthquake Administration (CEA)

Objectives are:

- To upgrade the national real-time seismic monitoring network in Samoa through the deployment of new seismic and associated technologies at selected sites.
- To develop a real-time automated earthquake notification system with built-in automated tsunami prediction capability, that would complement the development of a 24/7 seismic monitoring and tsunami early warning system.
- To strengthen information technology capability within the Geophysics Section in integrated seismic software analysis, including data processing, analysis, database storage, and back-up systems through relevant training and capacity building program.
- To strengthen analytical capacity within the Geophysics Section to analyze seismic and GPS data to interpret between different geophysical hazards such as volcanoes, tsunamis, or land-creep along fault lines.
- To implement the re-structuring of the Geophysics Section to create the enabling environment needed for the maintenance of a 24/7 geophysical hazard monitoring system, as well as the refinement of timely emergency procedures against different hazards such as volcanoes and tsunamis.

2. Executing Agency

The Executing Agency for this project is the Ministry of Natural Resources and Environment (MNRE) to be implemented by the Meteorology Division mainly the Geophysics Section.

3. Implementing Agency

The Implementing Agency for this project is China Earthquake Administration (CEA)..

4. Background on Project

Samoa (formerly known as Western Samoa) is located in the South Pacific Ocean between the latitudes 13.25 S – 14.05 S, and longitudes 171.23 W – 172.50 W. It is comprised of nine volcanic islands, of which, four are inhabited. The capital of Samoa is Apia, and is located on the north coast of the island Upolu. Samoa has a total population of about 200,000 people, of which approximately 80% live in coastal low-lying areas. Culturally, Samoa is a Polynesian island country, and was the first island nation in the Pacific to obtain political independence in 1962.

Geologically, Samoa formed as a result of intra-plate hotspot processes. The active hotspot location lies approximately 60 miles east of the Manua Island Group in American Samoa (approximately 190 miles east-southeast of Upolu Island. The island chain also lies approximately 200 kilometres north of the northern tear-fault region of the Tonga subduction zone. It is this region that Samoa experiences most of its felt earthquakes ($MMI \geq 5$), which average between 9 – 15 events annually.

It is this area as well that has the highest potential of generating local tsunamis that could impact Samoa. A wave generated in this area could have a travel time of less than 10 minutes before impacting the south coast of the Samoa islands.

Volcanically, the last eruption in Samoa was on the island of Savaii. Mt. Matavanu, located on the northeast ridge of Savaii, erupted between the years 1905 – 1911. The islands are considered to be in a dormant volcanic phase, although very little is understood in this area due to the absence of quantitative information to prove otherwise.

The Samoa Meteorology Division (SMD), one of eight Divisions of the Ministry of Natural Resources and Environment (MNRE) is mandated with the role of providing meteorological and geoscientific information to relevant stakeholders for the sustainable development of Samoa's natural resources. This also includes the provision of early warnings against geohazards in the context of public safety and disaster management.

On a relative scale, national capability to increase resilience to geophysical hazards (earthquakes, tsunamis, volcanoes) at all levels in the country through efficient and effective monitoring mechanisms is limited compared to that of atmospheric hazards such as tropical cyclones and floods; even though tsunamis, earthquakes and volcanoes have been listed as priority hazards in the National Disaster Management Plan 2006 – 2008.

This document outlines in brief the existing status of seismic and geophysical hazard monitoring capability in Samoa, as well as the planned project developments being sought through technical and financial collaborations with the China Earthquake Administration (CEA).

5. Funding Sources and Conditions

The total financial support for equipment, capacity building and operation will be provided by the Chinese Earthquake Administration, the Government of Samoa the logistics and institutional arrangement.

This is a bilateral arrangement with the Republic of China, through CEA, the Memorandum of Understanding (MOU) was signed between the parties on the 1st April 2007.

6. Current Financial and Implementation Status

Not applicable – a letter of exchanges had to be signed.

A brief implementation summary is provided below.

1. *Long-period Seismic Stations:* It is envisaged that four (4) real-time long period seismic stations (broadband) be deployed and distributed at selected sites on the islands of Savaii and Upolu. The broadband stations will be useful in the detection of regional earthquakes, and will be useful in the context of providing early warnings against teletsunamis.
2. *Short-period Seismic Stations:* It is envisaged that five (5) real-time short period seismic stations (broadband) be deployed at selected sites on Upolu and Savaii. These stations will be very useful in monitoring local seismic activity; particularly useful in volcanic monitoring.

3. *Real-time CGPS Stations:* It is also envisaged that six (6) permanent continuous GPS stations be deployed at selected sites on Upolu and Savaii (Figure 4). The stations will serve to strengthen volcano monitoring in the context of land deformation, and could also be used to determine the rates of structural changes occurring on both islands; which may reveal other likely geo-hazards such as land-movement along fault lines.
4. *Processing Systems:* It is envisaged that user-friendly software and processing systems could be deployed at the SMD headquarters, which run on windows operating platform. Computer hardware is also required; perhaps 4 computers that would enable the task of monitoring earthquakes, volcanoes, and tsunamis on a 24/7 basis. This would also enable the efficient and effective processing of data, analysis, and data storage.
5. *Communications Systems:* Real-time capability is required on all the stations that will be deployed in the field. This may involve the installation of respective VSAT dishes at the selected sites, and at the SMD headquarters.

7. Outstanding Issues

Letter of exchanges between the parties: China and Government of Samoa

8. Statement of Support

This project fills the 'gap' in the monitoring of geo-hazards network, mainly in Earthquake and Tsunamis and a secondary contribution to the global and regional seismic networks.

9. Possible Implications of Project

Provide safety of Life and property of the public through the implementation of effective Earthquake and Tsunami Warning Systems..

10. Summary of Issues

- Letter of Exchanges on the project to be followed up;
- Work plan to be forwarded for consideration by the Ministry

11. Recommendations for Consideration

It is recommended that the CDC continue to support the implementation of this project.

12. Signature of Executing Agency



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13. Date: **04 May 2007**