# THE CURRENT STATUS OF MAPPING IN THE WORLD - SPOTLIGHT ON PACIFIC ISLANDS

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## ABSTRACT

This paper comprises a summary of the results of a questionnaire sent to mapping agencies in Pacific Island countries to investigate the status of mapping in those countries.

## 1. INTRODUCTION

Konecny (2013) stated that surveys of the status of mapping around the world were carried out in 1968, 1974, 1980 and 1987, the last survey revealing the status of mapping in 1986 nearly 30 years ago. Further surveys are urgently needed to document whether there has been an improvement in the map coverage. The most recent survey of mapping in Oceania, of which Australia covers the vast majority of area, revealed that 27.8% had been mapped at a scale of 1:25,000, 46.3% at 1:50,000, 100% at 1:100,000 and 100% at 1:250,000. This paper will demonstrate the current extent of map coverage in six sets of Pacific Islands. While the paper will reveal the types of mapping undertaken by each country, there is little information available on the actual percentage of coverage in each of the scales.

In order to undertake this survey, government departments responsible for mapping namely in each of the island states were approached to complete the questionnaire and responses have been received from six of them.

**Table 1 Status of Topographic Mapping in Pacific Island States**

| Jurisdiction – area of landmass/ Population | 1:10,000 & larger % coverage Approx. age | 1:25,000 % coverage Approx. age | 1:50,000 % coverage Approx. age | 1:100,000 % coverage Approx. age | 1:250,000 % coverage Approx. age | 1:500,000 & smaller % coverage Approx. age |
|---|---|---|---|---|---|---|
| **Cook Is** - 237 km² Pop 10,900 | | 100% | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | N/A | N/A | N/A | N/A | N/A | N/A |
| **Solomon Is** 28,450 km², Pop 560,000 | x | | x | | | x |
| | N/A | N/A | N/A | N/A | N/A | N/A |
| **Tonga** - 747 km$^{2,}$ Pop 105,000 | | | x | | | |
| | | | 10 yr | | | |
| **Republic of Marshall Islands (RMI) 181 km$^2$ Pop 68,000** | x | x | x | x | x | |
| | 15 yrs or more | 15 yrs or more | 15 yrs or more | 15 yrs or more | 15 yrs or more | |
| **Vanuatu** 12,200 km² Pop.250,000 | x | | x | | | x |
| | N/A | | N/A | | | N/A |
| **Fiji** - 18 274 km² Pop 880,000 | | | x | | x | x |
| | | | N/A | | N/A | N/A |

## 2. RESPONSES TO QUESTIONNAIRE

### Question 1: Scales of topographic digital data and/or map products (or series) produced and maintained & Question 2: Current Age of Existing Geodata

Summary: Most of the Island states are small in area and population as revealed by the figures for each of the countries in Table 1. There is a variety of scales of maps provided by each country. There is little information available on the actual coverage of the scales or the age of the maps.

### Question 3) Restrictions on Map Data Distribution

Cook Is – No
Solomon Is – No
Tonga – Yes
RMI - No
Vanuatu – No
Fiji – No

Summary: Generally there are no restrictions on the distribution of maps in the island states.

**Question 4) Sale of Maps: Are maps sold to the public free of charge and free to Government departments?**

Cook Is: Sold to the public, not free, not freely available to Government departments. Users need to be registered to enable them to use the data for free.
Solomon Is – Maps sold to the public, not freely available and free of charge to stakeholders. A similar pricing is used as in Australia, but in local currency.
Tonga – Sold to public, not free and not free to stakeholders, pricing being trialled.
RMI – Free of charge to public and stakeholders.
Vanuatu – Sold to public, free to stakeholders, not available online.
Fiji – Sold to public, free to stakeholders. Price in accordance to scales and file sizes.

Summary: In most cases maps are sold to the public and provided free to stakeholders. There is no indication on the price of sale of data.

**Question 5) Updating Strategy**

Cook Is - mapping update program available.
Solomon Is –revision program across all scales
Tonga – mapping program available across scales, every 5 years depending on funding
RMI – N/A
Vanuatu – complete revision of whole series
Fiji – revision program across all scales

Summary: Some island states have a revision program, although only Tonga indicated that it aimed for a 5 year revision cycle

**Question 6) Updating Methodology**

Cook Is – Field surveys, satellite images and crowd sourcing.
Solomon Is – aerial photography for 1:5000 and larger, satellite images and for smaller of scales; 3rd party data sources also used.
Tonga – field surveys
RMI – field surveys
Vanuatu – field surveys
Fiji – field surveys, aerial survey, photogrammetric

Summary: the majority of countries updated their maps by field surveys, although subsequent questions indicate that satellite imagery is also available and presumably used for updating their smaller scale maps.

**Question 7) In-house Capabilities of NMAs**

Cook Is – in-house and outsourcing from LINZ for updating 1:25,000.
Solomon Is – in-house
Tonga – in-house
RMI – N/A
Vanuatu – in-house
Fiji – in-house

Summary: Most states undertake the mapping in-house

## A) National Imagery Acquisition

**Question 8) National Aerial Imagery Program**

Cook Is. No national imagery capability.
Solomon Is – No national imagery capability, satellite images acquired from international programs, digital imagery used
Tonga – No national imagery capability, acquired internationally, no regular program
RMI – No national imagery capability, acquired internationally, no regular program, analogue
Vanuatu – No national imagery capability, acquired internationally, no regular program, digital imagery used.
Fiji – A national imagery program exists, flown internationally on a regular basis and currently analogue.

Summary: With the exception of Fiji, none of the states has a regular imagery program. Imagery is collected for all states by international contractors.

**Question 9) Satellite Imagery Used by NMA**

Cook Is – satellite imagery acquired internationally systematically and as needed.
Solomon Is – satellite imagery acquired internationally systematically and as needed
Tonga – satellite imagery acquired internationally systematically and as needed
RMI – satellite imagery acquired internationally systematically and as needed
Vanuatu - satellite imagery acquired internationally systematically and as needed
Fiji – satellite imagery acquired internationally systematically and as needed

Summary – all states acquire satellite imagery from international satellites systematically on an as needed basis.

**Question 10) Use of Radar or Lidar**

Cook Is - No other imagery acquired
Solomon Is – No other imagery acquired
Tonga – Yes, the main islands of Tongatapu & Pangai – Haápi Island Resolution with 0.2m
RMI – No
Vanuatu – Yes, lidar coverage only of some parts of main islands like Efate, Malekula and Santo for climate change
Fiji – No

Summary: generally the only other imagery acquired is for specific locations in the island states.

**Question 11) Lidar DEM**

Cook Is – No
Solomon Is – No
Tonga – Yes as in Q10
RMI – No
Vanuatu – No
Fiji – No

Summary: Lidar DEMs are derived for some countries in specific limited areas

**Question 12) Orthophoto Program**

Cook Is – No
Solomon Is – 1:5000 and 1:7500
Tonga – Yes, digital
RMI – No
Vanuatu – 1:5000 for 6 Provincial centres and the 2 main town
Fiji – 1:20,000

Summary: There is some evidence of the production of orthophotos in some states but not across all islands and there is no consistency in scales.

**Question 13) National DEM**

Cook Is – No

Solomon Is – No
Tonga – Yes
RMI – No
Vanuatu - Yes
Fiji – No

Summary: Only some countries have a program for national DEM coverage.

**Question 14) Interest in 3D technology by NMA**

Cook Is – No
Solomon Is – Yes
Tonga – No
RMI – No
Vanuatu – No
Fiji – Yes
Summary: varies with country

## B) National surveying and cadastral coverage

**Question 15) Licensed Surveyors**

Cook Is – Yes
Solomon Is – Yes
Tonga – No
RMI – No
Vanuatu – Yes
Fiji – Yes

Summary – varies with country

**Question 16) Responsibility for Cadastral Mapping and Cadastral Map Coverage**

Cook Is – There is a national program undertaken by the private sector.
Solomon Is – Undertaken by NMA
Tonga – Undertaken by other Government department.
RMI – Undertaken by NMA
Vanuatu – Undertaken by NMA
Fiji – Undertaken by NMA, except for Registrar of Titles in the Attorney General's Office.

Summary: NMAs in most countries are responsible for the cadastral mapping.

**Question 17) Use of Cadastral Maps**

Cook Is – Land registration, Titles, Conveyancing
Solomon Is – Land registration, Titles, Conveyancing, Taxation
Tonga – Land registration, Titles, Conveyancing, Other
RMI – Land registration, Conveyancing, Other
Vanuatu – Land registration, Titles, Conveyancing, Taxation, Other
Fiji – Land registration, Titles, Conveyancing, Taxation and for localities and Land Acquisition Diagrams

Summary – Cadastral maps are used for the normally expected purposes.

**Question 18) Cadastral Maps and Geodetic Control**

Cook Is – WGS84
Solomon Is – International, GUX1 Astro
Tonga – Tonga Cadastral
RMI – A local coordinates system based on UTM zone 59 on false origin
Vanuatu - Local systems but wish to change to a global system
Fiji – WGS 72 Spheroid

Summary – There is no consistency in the projection systems adopted by the various countries with several basing their mapping on local systems.

**Question 19) Monumentation of Property Boundaries**

Cook Is – Yes
Solomon Is – Yes.
Tonga – Yes
RMI – Yes
Vanuatu – Yes
Fiji – Yes

Summary – all countries use monumentation for boundaries.

**Question 20) Updating of Cadastral Maps**

Cook Is – A court order from the Ministry of Justice for changes to the original boundaries will lead to updating.
Solomon Is – When surveys for new boundaries, subdivisions, extensions or combinations is been effected
Tonga – maintenance of the cadastral master plan
RMI – Field survey

Vanuatu – A cadastral database exists for all surveys throughout the country which is updated on a daily basis.
Fiji – Each new survey results in new plans which will be reflected in the cadastral maps

Summary – Generally the cadastral data is maintained and updated regularly, in some countries on a daily basis.

**Question 21) Number of Cadastral Employees**

Cook Is – 7 surveyors in private sector and government.
Solomon Is – 13 in private sector and government
Tonga – 3 surveyors
RMI – 4 surveyors
Vanuatu – 14 government and private
Fiji – about 200

Summary – the number of surveyors tends to reflect the populations in the different countries, but apart from Fiji there appears to be serious shortage of surveyors to undertake cadastral surveys in these countries resulting in the cadastral system being poorly served.

## C) Organisation

**Question 22) National Funding for Mapping**

Cook Is – funded by Government
Solomon Is – No
Tonga – Yes
RMI – No
Vanuatu - Surveying and cadastral program – Government; Mapping – Funding Agency
Fiji – Yes

Summary – most countries provide funding for mapping programs but some countries depend on funding agencies.

**Question 23) Mapping Budget**

Cook Is – N/A
Solomon Is – N/A
Tonga – N/A
RMI – N/A

Vanuatu – National Government gives very little emphasis on funding for national mapping
Fiji – N/A

Summary – no country is able to provide details of budget for mapping. It seems that the level of funding is low.

**Question 24) NMA staff**

Cook Is – 4 staff
Solomon Is – 5 mapping staff. Tonga – About 14 drafting staff
RMI – 4
Vanuatu – 2
Fiji – about 90

Summary – as stated in Q21, apart from Fiji there are inadequate staff to undertake and revise mapping programs in most countries.

**Question 25) Legal Status of Mapping**

Cook Is – No
Solomon Is – Yes, stipulated in the Ministry Corporate Plan. Strategic Plan, Annual Plans and Individual work plans
Tonga – Under the Land Acts, the Minister for Lands has the authority for cadastral maps
RMI – Surveys are governed by the Land Surveying Act which states that there must be a Board of Land Surveyor Examiners which shall consist of five ( 5 ) members and each must have qualification or background in surveying or other related fields such as civil engineer, architect and geography. The Surveyor General who shall be appointed by the Minister is charged with the general administration of the act. In ten years or so there has been no such Board, nor a register land surveyor. However, the Office has been operated by unqualified persons.
Vanuatu – The Land Surveyor's Act mandates the Director of Lands, Survey and Registry to undertake the production of topographic mapping of Vanuatu. Since independence in 1980, there has been assistance from the Australian defence for the production of mapping for all the islands of Vanuatu.
Fiji – The Ministry of Lands and Mineral Resources is mandated by the government to capture, verify, approve and authorize the use of all data pertaining to mapping and surveying in Fiji.

Summary – There is legislation in all countries mandating mapping and the management of the data, although some countries depend on aid programs to compete their mapping while the program RMI for instance in not operational.

### Question 26) Form of Map Products Supplied

Cook Is – 60% hardcopy, 20% digital, 10% downloaded and 10% by web services
Solomon Is – 85% hardcopy, 10% digital, 5% downloaded
Tonga – 100% hardcopy
RMI – N/A
Vanuatu – N/A
Fiji – 70% hardcopy, 25% digital, 10% downloaded

Summary – generally hardcopy maps are used, but there is a trend to downloading digital data

### Question 27) Archival of Geodata

Cook Is – Hardcopy and digital
Solomon Is - Ministerial Server centralised under government ICT networking system
Tonga – Hard copies in storage, Digital topographic & GIS maps in server
RMI – N/A
Vanuatu - Digital archival for digital data and an archival for hard copy maps
Fiji – Hardcopies stored n the ministry and also in the National Archives and Soft Copies backed up in servers

Summary – hardcopy data is the major source of data

## 3. CONCLUSIONS

The paper gives a brief description of the extent of map coverage in some Pacific Island states. Overall the availability of modern technology especially satellite images, digital aerial photography and lidar should enable the island countries to provide better map products in future, but this would depend on many occasions on foreign aid. There appear to be insufficient professionals in most countries to maintain the mapping programs. Given that many Pacific Island states will be impacted by rising sea level in the future, better mapping of these countries is essential.

## REFERENCES

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