
The FIG Pacific South Island Development Symposium (SIDS) - *Policies and Practices for Responsible Governance* was held at the Novotel Lama Bay Suva – Fiji on the 18-20 September 2013. The event was organised in partnership by FIG, UN FAO, the Ministry of Lands and Mineral Resources – Land Use Unit and local member association Fiji Institute of Surveyors. Also, to enable the success of the symposium sponsorship was generously provided by the Fijian Government and Trimble.

The technical program comprised of 2 plenaries, 4 technical sessions, 4 workshops, and 2 open forums for discussion. Overall there were almost 50 presentations delivered and the event attracted 100 delegates from the South Pacific Islands.

FIG Commission 5 (Position and Measurement) and the regional committee of the United Nations Global Geospatial Information Management for Asia and the Pacific (UN GGIM AP) jointly organised and facilitated two workshops on the topic Reference Frame in Practice. The purpose and objective of these workshops was to –

- Obtain an overview of the status of geodetic infrastructure amongst the Pacific Small Islands with a focus on the present of state of geodetic / survey infrastructure and the development issues faced by each country in the region.
- Suggest fundamental improvements that will enable countries to maintain geo-referenced (ITRF / APREF based) datasets and provision of basic geodetic or positioning infrastructure and services.
- Establish a network of geodetic operational surveyors in the Pacific Islands to facilitate the exchange of professional knowledge and information on regional / national geodetic issues.

In Workshop 1 A, eight (8) nations from the Pacific Islands region were asked to generate their presentation on the following topics or themes with respect to their country –

- Existing geodetic infrastructure and what it consists of. That is, does it compromise of horizontal and vertical survey control ground marks, GNSS base stations, tide gauges, or other.
- What is the geodetic datum? Is it an ITRF or APREF based geodetic datum?
- Status of the surveying capacity. That is level of knowledge, resources, experience, equipment, software etc.
- What land information datasets are linked to your geodetic datum?
- What geodetic or positioning services are you providing or would like to provide?
- What are your issues or impediments to developing geodetic or positioning infrastructure?
- How can these issues be solved and what do you need?

The presentations were delivered by –

- Fiji – Mr. Asakaia Tabua
- Tonga – Mr. Viliami Folau
- Cook Islands – Mr. Vaipo Mataora
- Solomon Islands – Mr Jimmy Ikina

- Kiribati – Mr Romano Reo
- Samoa – Mr Safuta Toelau Iulio
- Vanuatu – Mr Martin Sokomanu
- Papua New Guinea – Mr. Richard Stanaway

All of the presentations were concise and factual. To review these presentations (and others) please navigate to the website http://www.fig.net/pub/fiji/techprog.htm . Based on the presentations and ensuing workshop discussions, a summary of the status of the numerous geodetic frameworks and their operations are as follows –

- Pacific Island Nation geodetic networks compromise primarily of passive infrastructure – a traditional geodetic framework based on terrestrial observations to survey control and tide gauges.
- There are active infrastructure such as GNSS CORS in this region however there are associated IT / communication reliability problems.
- Numerous "geodetic datums" exist, and primary datasets are 'generally' working towards becoming ITRF based but they need to be either transformed or redefined, and mathematically linked to a common ITRF / APREF epoch.
- There is a need for each Pacific Island Nation to develop an operational national adjustment to facilitate propagation of datum and transformation parameters.
- There is a need for a better understanding of the relationship between GNSS heights, geoids and local heights systems (MSL and tide gauges), including any local deformation cause by tectonic plate movement, seismic activity or other earth dynamics.
- Some Pacific Island Nations consist of numerous islands, as a consequence some of these islands need the geodetic datum to be established or integrated / densified.
- GNSS CORS based positioning services (single base or networked RTK) and applications are limited in the region.
- There is limited high level geodetic surveying capacity and existing qualified technical / operational people are having difficulty to maintain their geodetic surveying competency / knowledge and capacity.
- Most Pacific Island Nations appear to be lacking qualified "local" geodetic surveyors and this trend will continue in the future
- There appears to be a lack of educational institutions in the region providing fundamental surveying qualifications.
- Historically the Pacific region has relied on survey "consultancies" which has left some frameworks to be unsustainable. That is, although existing ITRF based geodetic datums were created via external survey consultancies or foreign assistance, it appears developing "in house" expertise in parallel with the consultancy was not performed. Thus, maintenance or having sufficient knowledge to enhance the geodetic infrastructure is now a difficult proposition
- Many Pacific Island Nations need their present geodetic equipment / hardware / firmware / software to be maintained or upgraded.
- There are limited financial resources and support to sustain / improve geodetic infrastructure due to lack of support from "decision" makers, and their inadequate general knowledge and understanding of the impacts of geospatial infrastructure.
- Land information datasets in the region need better "linkaging" to the geodetic. That is, they need to be connected to the geodetic datum, have their spatial accuracy upgraded, and be migrated from a paper based recording and visualisation system to a digital environment.

- Common datasets are – cadastre (land and maritime tenure / administration), mapping, land and geographic information systems, imagery, aviation, road networks, water, utilities, geological, environmental, resource and mining.
- There appears to be a lack of formal "business cases or drivers" to justify the allocation of scarce public resources to sustain / upgrade / modernise geodetic infrastructure. That is, there is a need for basic policy documentation to define the WHY, WHAT, WHERE, HOW, and Costs / Benefits for geodetic infrastructure!
- There is very little evidence of 'sustainable' geodetic approaches, that is strategic, operational and implementation plans to action geodetic modernisation over a period of time.
- There appears to be a lack of practical cohesion, collaboration, partnerships between local agencies and also amongst the Pacific Island Nations. It is apparent that there is a need for national / regional initiatives to enable the focussing, and unification of resources so as to avoid duplication!

In Workshop 2A the above summary was reviewed by the participants. As a result the following actions were proposed to FIG Commission 5 and UN GGIM AP representatives for consideration –

- Encourage the global survey community, and FIG / UN GGIM - AP members to identify and disseminate relevant technical information to the operational surveyors in the region.
- Facilitate interaction and the building / establishment of "networks" / "relationships" amongst the professional organisations and groups, such as the SPC Applied Geoscience and Technology Division (SOPAC)
- Support the building of geodetic survey capacity for present surveyors but also foster the development of the Young Surveyors
- Be active on the international scene by promoting and monitoring the geodetic activities / changes that are occurring in this region
- FIG Commissions, UN GGIM AP and sister organisation working groups (such as IAG) provide technical information via expert presenters for Workshops / Seminars
- FIG / UN GGIM AP / IAG to provide access to or make available technical publications such as the Reference Frame in Practice Manual, Cost Effective GNSS Techniques.
- Endeavour to organise and schedule FIG events and UN GGIM-AP meetings in the Pacific region
- FIG / UN GGIM AP sponsor or support applications for geodetic surveyors to attend relevant technical Workshops / Seminars
- FIG / UN GGIM AP to endorse regional activities or projects and policies such as a regional educational facility or program for surveying, and establishment of professional organisations to represent surveyors.

Likewise, FIG and UN GGIM AP recommend that the small Pacific Island Nations investigate the following suggestions and options as a means to moving forward on the previously articulated issues in Workshop 1A and other related geospatial challenges -

- Pacific Islands Nations or organisations should consider becoming a FIG Correspondent or FIG Affiliate member. Refer to website - http://www.fig.net/members/index.htm to find out more information about each category and how to become an FIG member
- Pacific Island Nations should consider creating a regional body or use an existing regional body to apply for Affiliate membership with FIG.
- Pacific Island Nations should consider creating a regional body or use an existing regional body that will manage the issues, from a regional perspective, of capacity building, professional development

climate change, and natural disaster management in relation to the themes of land governance, geospatial information management, and security of land tenure and property rights.

- Pacific Island Nations should consider developing a unified strategy on managing the risks associated with natural disasters and / or climate change (sea level rise) and the subsequent requirement for a modernised geospatial reference system and infrastructure, based on APREF, for the region.
- Pacific Island Nations should develop documentation to outline the local / national benefits to be gained from their collaboration or involvement in a joint regional initiative. The project documentation must specify, as a minimum, the scientific, social and economic drivers; the what, why, how, where, cost / benefits over a period of time; and the importance of geodetic frameworks in decision making as it 'underpins' most land and maritime datasets.
- Pacific Island Nations should develop strategies to re-establish a fundamental surveying technical course for the region or a scholarship program, and utilise neighbouring universities or educational institutions in Australia or New Zealand or other to assist with curriculum and / or implementation.
- Pacific Island Nations should consider implementing the following "generic" process to modernise their geodetic infrastructure –
    - Establish more GNSS CORS and derive ITRF / APREF positional information via an on-line GNSS processing service such as AusPos
    - Select an ITRF / APREF epoch for their geodetic datum
    - Establish additional primary geodetic marks at salient locations and re-observe existing primary geodetic marks using classic static GNSS measurements
    - Develop an operational geodetic network least squares adjustment dataset consisting of GNSS CORS as constraint stations and the network of primary geodetic marks.
    - Create transformation parameters from this primary dataset and over time create velocity models for this primary network
    - Observe (or re-observe) secondary geodetic network via classic static GNSS observations or high accuracy real time kinematic solutions.
    - Create a secondary geodetic network dataset; adjust the secondary network via least squares and create transformation parameters.
    - Connect as many local vertical datum (i.e. MSL / tide gauge based) marks as possible via classic static GNSS observations to derive geodetic datum heights (ellipsoidal) and their relationship.
    - Perform any additional terrestrial levelling to connect local vertical marks
    - Derive a geoid model and use a global gravity model for the zero order term
    - Observe salient marks in the tertiary geodetic network (i.e. cadastre) via classic static GNSS observations or high accuracy real time kinematic solutions.
    - Create a tertiary geodetic network dataset; adjust the tertiary network via least squares and create transformation parameters.
    - Propagate new geodetic datum through other geospatial or geo-referenced datasets / systems via transformation parameters or a grid interpolation file method.
    - Develop a maintenance program based on the above to monitor and upgrade geodetic datum over time.
    - Develop a geodetic project to manage earth dynamics for tectonic and seismic activity

Also, in Workshop 2A, FIG and UN GGIM AP also provided fundamental technical advice pertaining to modernising geodetic networks and the importance of APREF. This information was presented by Mr

Richard Stanaway and Dr John Dawson respectively. Both of these quality presentations can be found at the website http://www.fig.net/pub/fiji/techprog.htm .

It has to be noted that FIG and UN GGIM AP would like to acknowledge and appreciate the generosity of the Australian Government agency Bureau of Meteorology, who facilitate the Climate and Oceans Support Program in the Pacific (COSPPac - http://www.bom.gov.au/cosppac/ ), as they provided financial assistance to those Pacific Island Nation representatives who presented at the workshops, as well as several other colleagues who participate at this symposium. The contribution made by these delegates to the workshops was invaluable.

FIG Commission 5 and UN GGIM AP would also like to thank the Local Organising Committee for their hospitality and efforts as the Reference Frame in practice workshops, the symposium and social events were well organised, and gave us an insight into the wonderful Fijian culture.

In concluding, both FIG and UN GGIM AP facilitators believe the symposium and the workshops were a success. The technical, administrative and personnel needs of Pacific Island Nations from a geodetic perspective where identified. In order to modernise their geodetic infrastructure so as to be sustainable, fit for purpose and meet the needs of the both the geoscience and geospatial industry in the future, Pacific Island Nations need to be unified in their approach when seeking resources and assistance for this initiative. A strategic plan which articulates the benefits of an accurate, accessible and reliable unified geospatial reference system to not only the region but to each nation is the first significant milestone that must be achieved.

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**Reference Frame in Practice Workshop Photo Gallery**








INERAL RESOURCES:


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FIJI