From the Whole to the Part
Progress for Tonga’s Geodetic Infrastructure

Global, Regional and Local Geodetic Frameworks:
An essential building block for a better world

Viliami Folau

Focus of my Presentation

• Current Status of Geodetic infrastructure
• The challenges
• The engagement
• Global to National
• The opportunities
Tonga’s Geodetic Reference Frame

**Tonga Geodetic Datum (TGD2005),**
- Geocentric origin
- GRS80 ellipsoid (= WGS84)
- Static datum based on ITRF2000 as at 1 Jan 2005

**Tonga Map Grid (TMG),**
- Transverse Mercator
- Reference spheroid = GRS80
- Meridian of origin = 177W
- Latitude of origin = The Equator
- Central meridian scale factor = 0.9996
- False origin = 1,500,000E 5,000,000N

**Challenges**
- Need to review to align with Global Reference Frame
- Human resources & expertise
- CORS
- Equipment
- Legislation
- Lack of recognition by potential users
- Lack of understanding of its significance
Tonga’s Vertical Reference Frame

- **Current Status**
  - National Vertical Reference Frame not yet in place
  - MSL only on main island—but not complete

- **Challenges**
  - Human resources & expertise
  - Right technologies
  - Lack of recognition at higher level
  - Islands are spread out
  - Financial difficulties
Global Network

- UN GGIM
- FIG
Regional Network

- UN GGIM AP

Regional Network

- FIG Capacity Development Network Asia/Pacific (FIG CDN AP)
Sub-regional Network

- Started 2014
- Members: Core members are national geospatial and surveying authorities of Pacific Island countries and territories

Opportunity

- UN International Seminar on Legal and Policy Framework for Geospatial Information - Tonga, 10-13 April 2018
- Climate & Ocean Support Programme for Pacific (COSPPac) Steering Committee & Planning Meeting 5-8 March 2018
• Fourth PGSC Meeting-Tonga 9 April 2018
  ▪ Launching of PGSC 10 years Strategy

**Vision**
Sustainable development in the Pacific islands region enabled by world-class geospatial information and surveying services.

**Mission**
Pacific Island survey and geospatial services, including hazard mapping, urban planning, cadastre mapping, hydrography and other geospatial requirements for sustainable development, are sufficiently resourced to respond to member country priorities.

**Goals**
- The PGSC provides regional leadership, direction and support for member states to engage effectively and to leverage and extend the community on geospatial and surveying activities.
- Countries across the region adopt a common geospatial reference frame (GFR) and technology implementing geospatial systems and applications.
- Geospatial and surveying activities at the national and regional levels are supported by excellence and sustainability resource teams.
- The geospatial and surveying community is well-represented with a culture supportive of training, innovation and gender equity.

---

**Geoscience Australia Placement**

---

United Nations World Geospatial Information Congress
The Geospatial Way to a Better World
19-23 November 2018
Geospatial, Darwin, Australia
Tonga’s Draft Position Strategy

• Vision:
  Improved decision making, prosperity and safety enabled by world-class reference systems, geospatial information and services.

• Strategic Priorities:
  i. Modern geodetic references frame align to the global geodetic reference frame.
  ii. Modern height reference frame for the whole of Tonga.
  iii. Legal framework to empower geodetic datum modernisation

Propose CORS Network
Other Assistance

- Sets of GNSS’s gifted from Geoscience Australia
- Financial support-Government of India-for more geodetic equipments
- Land Information New Zealand (LINZ)-Support future work placement from Tonga at LINZ

GOAL 2: Countries across the region adopts a modern Geodetic Reference Frame (GRF) and improve technology underpinning geospatial systems and applications
## PGSC Strategy & SDGs

<table>
<thead>
<tr>
<th>TITLE</th>
<th>OUTCOMES/PRIORITIES ALIGNED WITH THE STRATEGY</th>
</tr>
</thead>
</table>
| SUSTAINABLE DEVELOPMENT GOALS | - SDG 5 Gender Equality  
- SDG 6 Clean Water and Sanitation  
- SDG 7 Affordable and Clean Energy  
- SDG 8 Decent Work and Economic Growth  
- SDG 9 Industry, Innovation and Infrastructure  
- SDG 11 Sustainable Cities and Communities  
- SDG 12 Responsible Consumption and Production  
- SDG 13 Climate Action Responsible Consumption and Production  
- SDG 14 Life Below Water  
- SDG 15 Life On Land  
- SDG 17 Partnerships for the Goals |

---

## Global/Regional/Sub-Regional/National

- UN Resolution Global Reference Frame
- FIG Commission Position & Measurement
- UN GGIM Global Geodetic Reference Frame
- FIG AP CDN
- UN GGIM AP
- Sub-committee on Geodesy
- SSSI
- LINZ
- NZIS
- Tonga Geodetic Survey Services
- Geoscience Australia
Why modernising Geodetic Reference Frame and Height System

- Community safety
- Accurate Topography Maps
- Improved Floodplain and Inundation Maps
- Real-Time Positions
- Smart Transportation-land & sea
- Precise Agriculture & Fishing
- Coastal Wetland Monitoring
- Improved Early Warning for Natural Hazards
- Autonomous Navigation

- Support development-Building Legislation or Building Codes:
- Mitigate risk from storm surge or flooding events and ensure that houses and buildings are set above levels which could be impacted by flood waters
- Sea level rise + low-lying islands-Sea level rise & tsunami model
- Land use planning

Conclusion

- UN GGIM & Sub-committee on Geodesy to recognise the current status of developing states-Recognise the huge gab between developed countries and SIDS
- Lesson learned SIDS to engage with global, regional, sub-regional networks
- Tonga’s progress to date: Full support of global, regional, & sub-regional networks