Government of Tonga
Ministry of Lands & Natural Resources

From the Whole to the Part

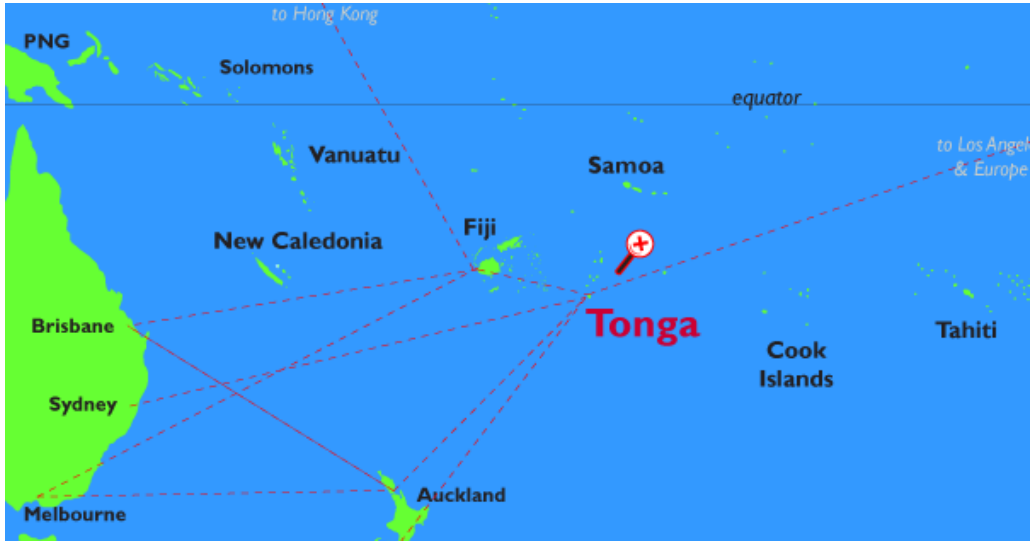
Progress for Tonga's Geodetic Infrastructure

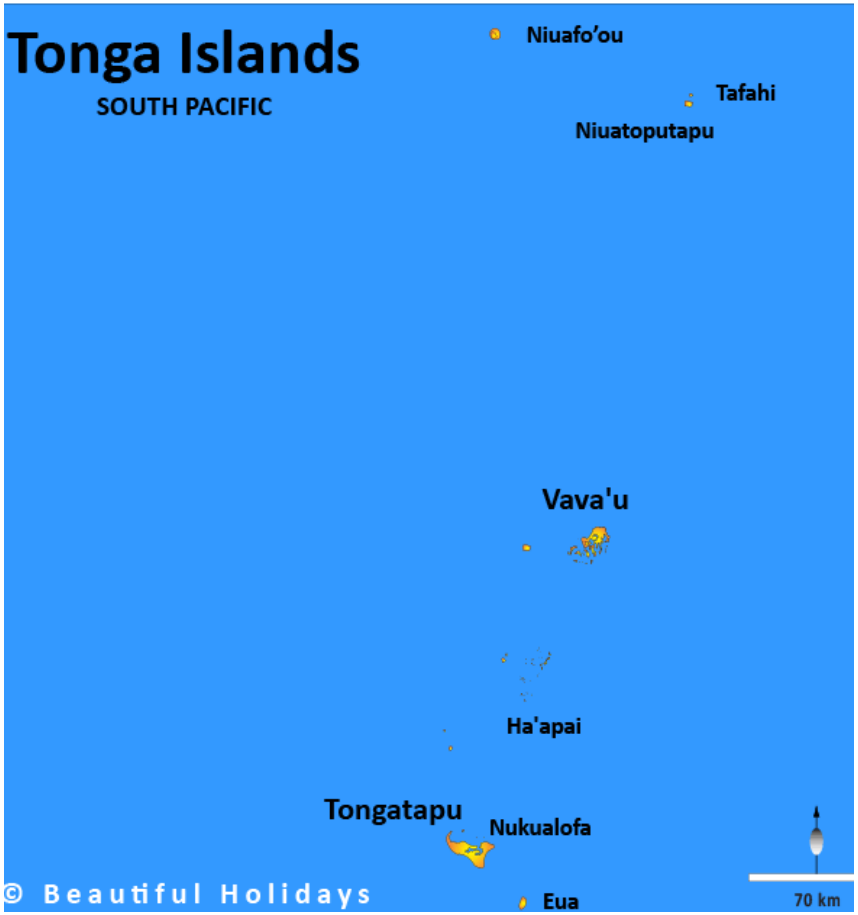
Global, Regional and Local Geodetic Frameworks:
An essential building block for a better world

Viliami Folau

Focus of my Presentation

- **Current Status of Geodetic infrastructure**
- **The challenges**
- **The engagement**
- **Global to National**
- **The opportunities**


to Hong Kong
PNG
Solomons
equator
Vanuatu
Samoa
to Los Angel
& Europe
New Caledonia
Fiji
Brisbane
Tonga
Tahiti
Cook
Islands
Sydney
Auckland
Melbourne


Tonga Islands
SOUTH PACIFIC
Niuafo'ou
Tafahi
Niuatoputapu
Vava'u
Ha'apai
Tongatapu
Nukualofa
Eua
© Beautiful Holidays
70 km

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

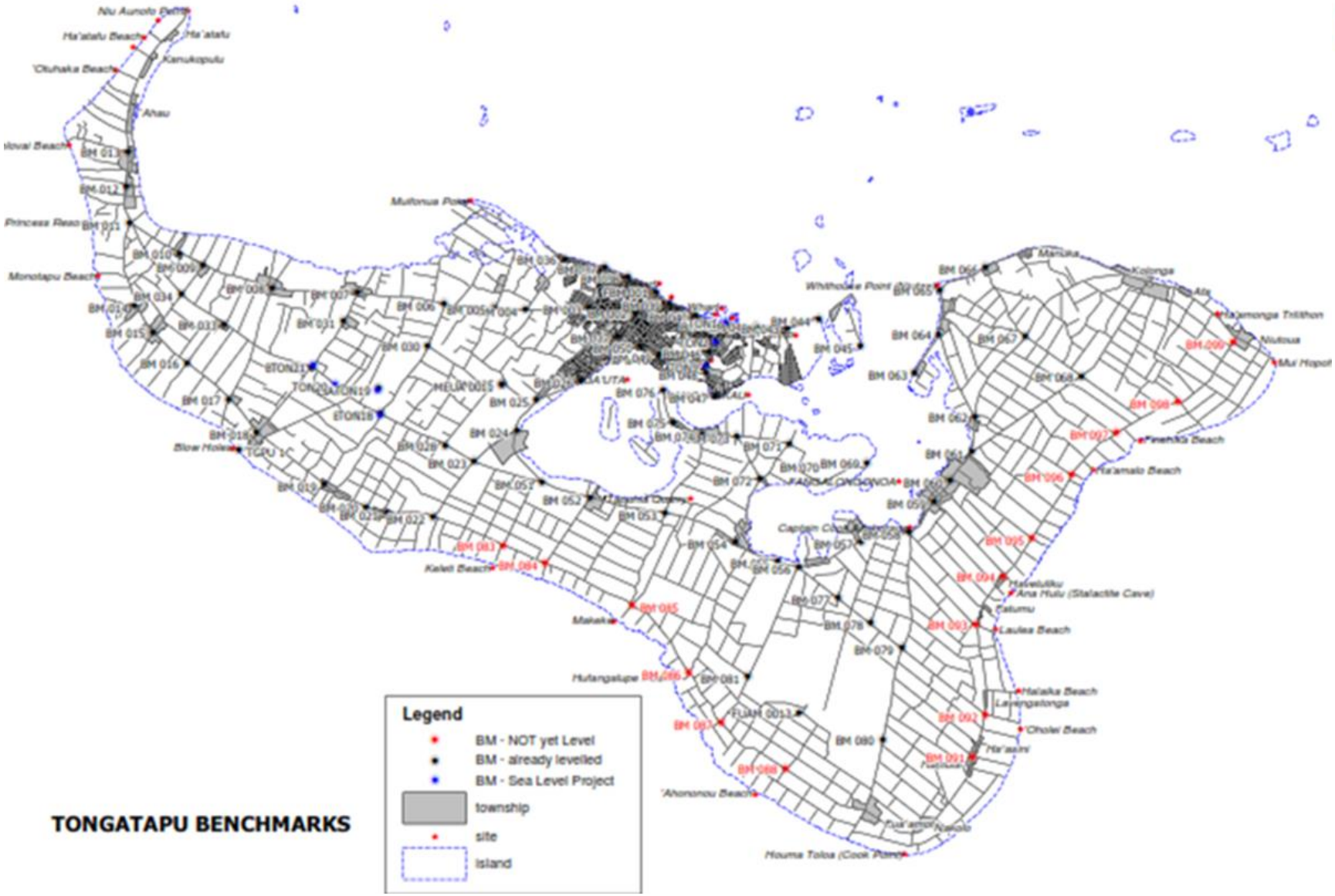
Challenges

- 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


Australian
Aid

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


Nu Aunofo Point
Ha'atafu Beach
Ha'atafu
Kanukopulu
'Oluhaka Beach
Ahau
Princess Reso
Monotapu Beach
Multonua Point
Blow Hole
Kalefi Beach
Malaekakau
Hufangalupe
'Ahononou Beach
Houma Tolua (Cook Point)
Whitehouse Point
Manuka
Kolonga
Ha'alo
Ha'amonga Trilithon
Niutoua
Mui Hopoi
Pesehika Beach
Ha'amalo Beach
Ana Hulu (Stalactite Cave)
Laulea Beach
Halaika Beach
Lavengatonga
'Oholei Beach
Ha'asini
Nukolo
Legend
BM - NOT yet Level
BM - already levelled
BM - Sea Level Project
township
site
island
TONGATAPU BENCHMARKS

Global Network

- **UN GGIM**

- **FIG**

Regional Network

- **UN GGIM AP**

Regional Network

- **FIG Capacity Development**

Network Asia/ Pacific (FIG CDN AP)

United Nations World Geospatial Information Congress

The Geospatial Way to a Better World

19–21 November 2018

Deqing, Zhejiang Province, China

Sub-regional Network

PGSC

Pacific Geospatial and Surveying Council

- **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

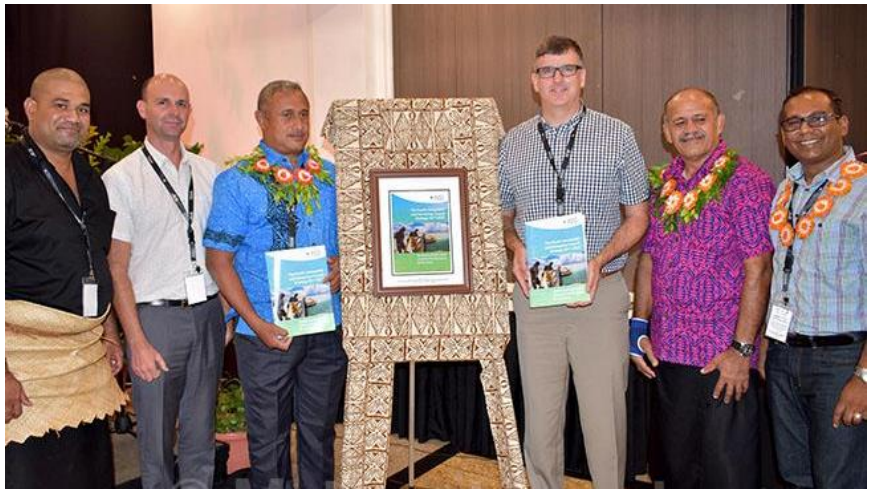
Sustainable development in the Pacific Islands region enabled by world-class geospatial information and surveying services.

Mission

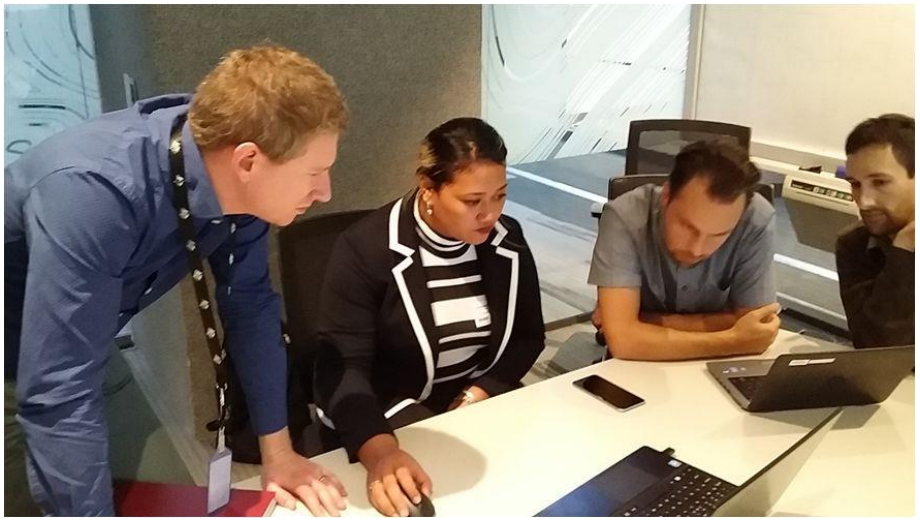
Pacific Island survey and geospatial services, including hazard mapping, urban planning, cadastre mapping, hydrography and other geospatial requirements for sustainable development, are sufficiently resourced to respond to member country priorities.

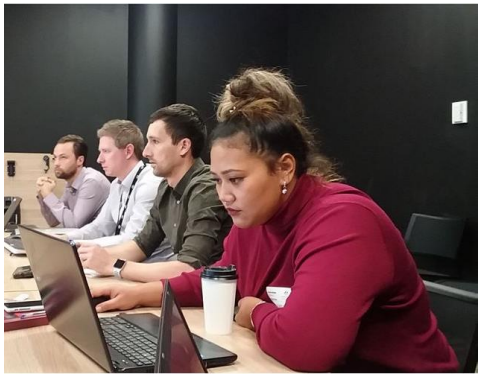
Goals

1. The PGSC enables regional leadership, direction and support for member states to engage stakeholders and the community on geospatial and surveying activities
2. Countries across the region adopt a modern Geodetic Reference Frame (GRF) and technology underpinning geospatial systems and applications
3. Geospatial and surveying activities at the national and regional level are supported by a diverse and sustainable resource base
4. The geospatial and surveying community is self-reliant with a culture supportive of learning innovation and gender equity



Geoscience Australia Placement





Tonga's Draft Position Strategy

- **Vision:**

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

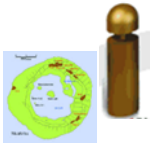
- **Strategic Priorities:**

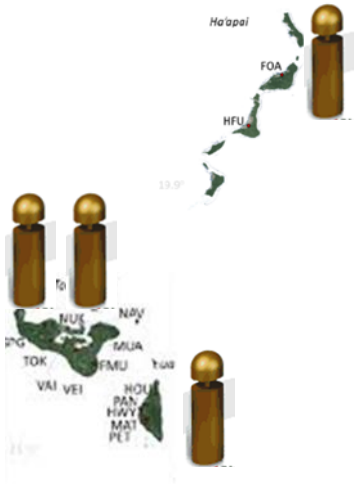
  i. Modern geodetic references frame align to the global geodetic reference frame.

  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

PGSC
Pacific Geospatial and Surveying Council

Vision

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Mission

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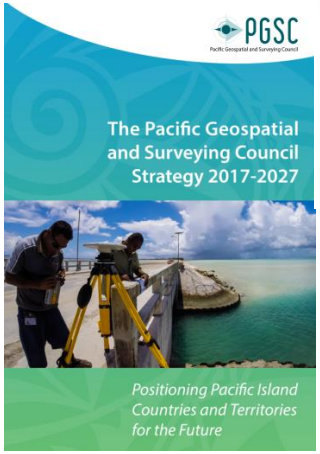


GOAL 2: Countries across the region adopts a modern Geodetic Reference Frame (GRF) and improve technology underpinning geospatial systems and applications

Positioning Strategy for the Kingdom of Tonga *(Draft)*

Modern geodetic reference frame aligned to the Global Geodetic Reference Frame

Modern height reference frame for the whole of Tonga

Legal framework to empower geodetic datum modernization

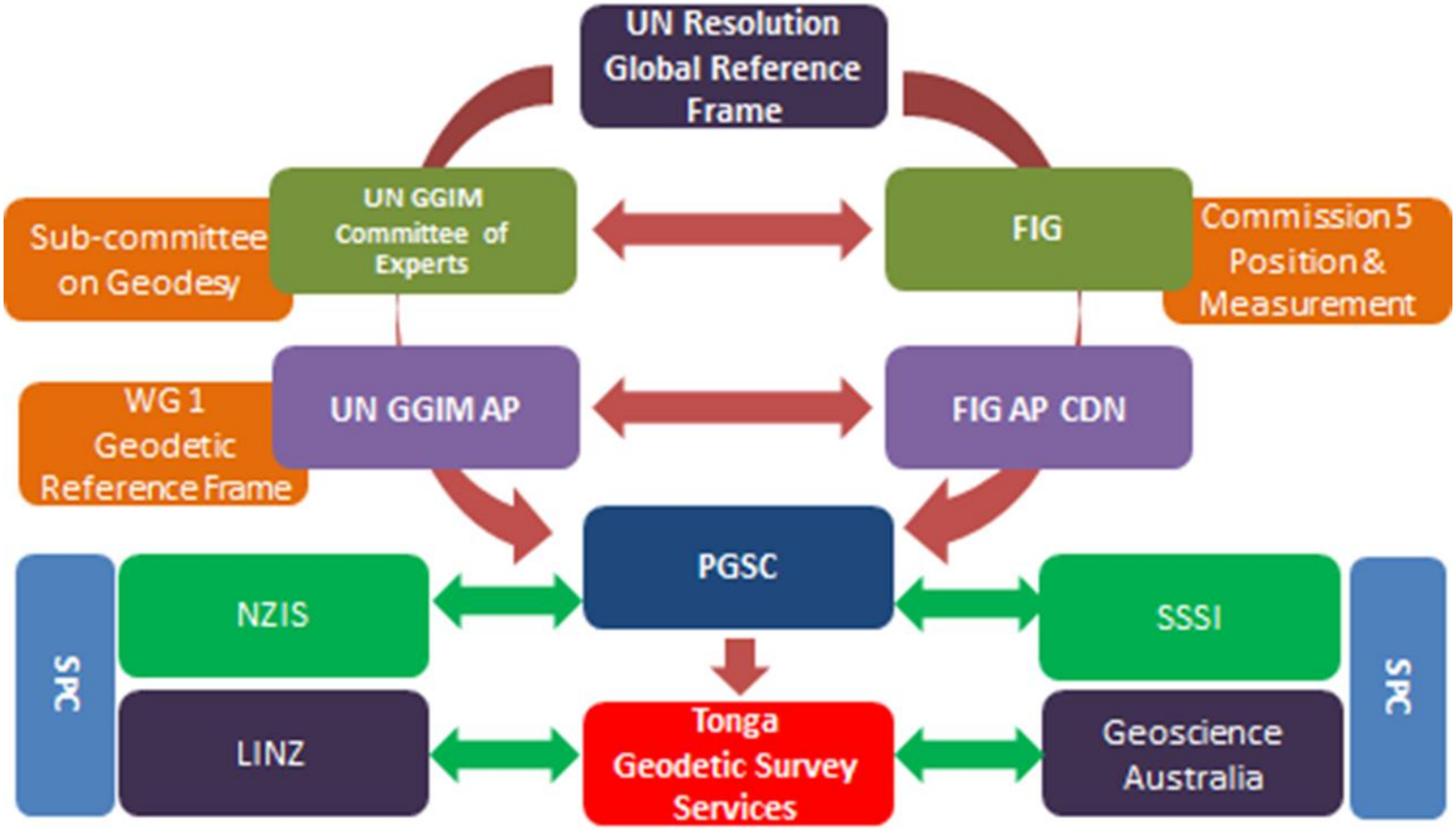
Implementation Plan

Action Plan

PGSC Strategy & SDGs

	TITLE	OUTCOMES/PRIORITIES ALIGNED WITH THE STRATEGY
	**Sustainable Development Goals 2015-2030**	• 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



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**