

Geodetic Capacity Building in Multilateral Forums

International GNSS Service

Global Geodetic Observing System

Group on Earth Observations

UN GGIM Subcommittee on Geodesy

Tools for Funding + Communication

GGIM-World Bank Integrated
Geospatial Information Framework

Sustainable Development Goals

Sendai Framework for Disaster Risk
Reduction



United Nations/Fiji Workshop on the
Applications of Global Navigation Satellite
Systems
June 24-28, 2018

NASA's Global GNSS Network

David Stowers

Product Delivery Manager, Global Observing System – GNSS

International GNSS Service + Global
Geodetic Observing System

United Nations Global Geospatial
Information Management +
Multilateral Forums

Allison Craddock

Director, IGS Central Bureau and

Manager of External Relations, Global Geodetic Observing System (GGOS)



Jet Propulsion Laboratory
California Institute of Technology

THE INHERENTLY INTERNATIONAL NATURE OF GEODESY

*“Global geodesy is dependent on contributions from nations all around the globe, since **no single country can maintain the Global Geodetic Reference Frame alone**”*

– United Nations Initiative on
Global Geospatial Information Management

- The need to know our location on earth down to the smallest possible measurement may only be satisfied by international collaborations in geodesy
- No country has the capacity, be it physical, infrastructural, analytical, or financial, to make such precise measurements on its own
- By collaborating with international partners and NGOs, we are able to collectively leverage limited assets to the top of current geodetic knowledge and capability



IGS

The International GNSS Service (IGS)



• One of four Space Geodesy Techniques and Services supported by NASA

- Very Long Baseline Interferometry (VLBI)
- Satellite Laser Ranging (SLR)
- Doppler Orbitography by Radiopositioning Integrated on Satellite (DORIS)*
- Global Navigation Satellite Systems (GNSS)



• Data used in Terrestrial Reference Frame determination (local motion)

• GNSS Sites included in regular Position/Velocity Time Series (see figure)

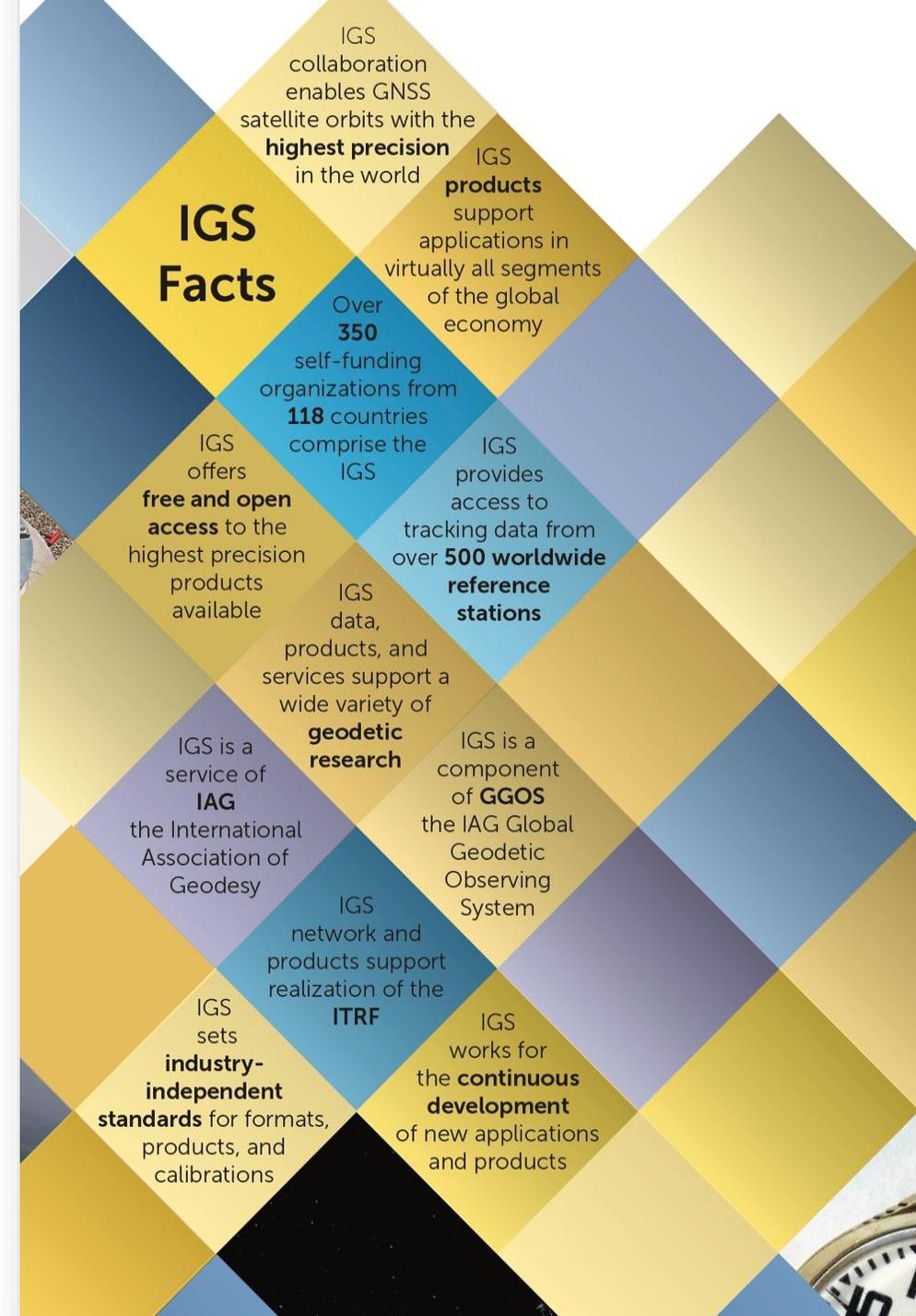


* Developed/operated by CNES in cooperation with CRGS and IGN



The IGS at a Glance

- A voluntary federation of over 200 self-funding agencies, universities, and research institutions in more than 100 countries; working together to provide the highest precision GPS satellite orbits in the world.
- Providing free and open access to the highest precision products available for scientific advancement and public benefit.
 - These products support a wide variety of applications that touch millions of users in virtually all segments of the global economy
- Producing products that support realization of the International Terrestrial Reference Frame (ITRF) while providing access to tracking data from over 500 worldwide reference stations
- Working for the continuous development of new applications and products through Working Groups and Pilot Projects
- Supporting geodetic research and scholarly publications
- Functioning as a component of the Global Geodetic Observing System (GGOS) and member of the World Data System (WDS)
- Co-chair organization of the International Committee on GNSS (ICG) Working Group on Reference Frames, Timing and Applications (WG-D)



NASA site contributions to IGS

- 66 sites, globally distributed (<http://www.igs.org/network>)
- Multi-constellation receivers, geodetic monuments and antennas



Representative examples of GNSS equipment

- Data publicly available via CDDIS (<https://cddis.nasa.gov>)
 - Files in 1s/15min, 30s/hourly, 30s/daily RINEX format with low latency*
 - https://cddis.nasa.gov/Data_and_Derived_Products/GNSS/GNSS_data_holdings.html
 - Streaming 1s data available from most sites
 - https://cddis.nasa.gov/Data_and_Derived_Products/Data_caster_description.html

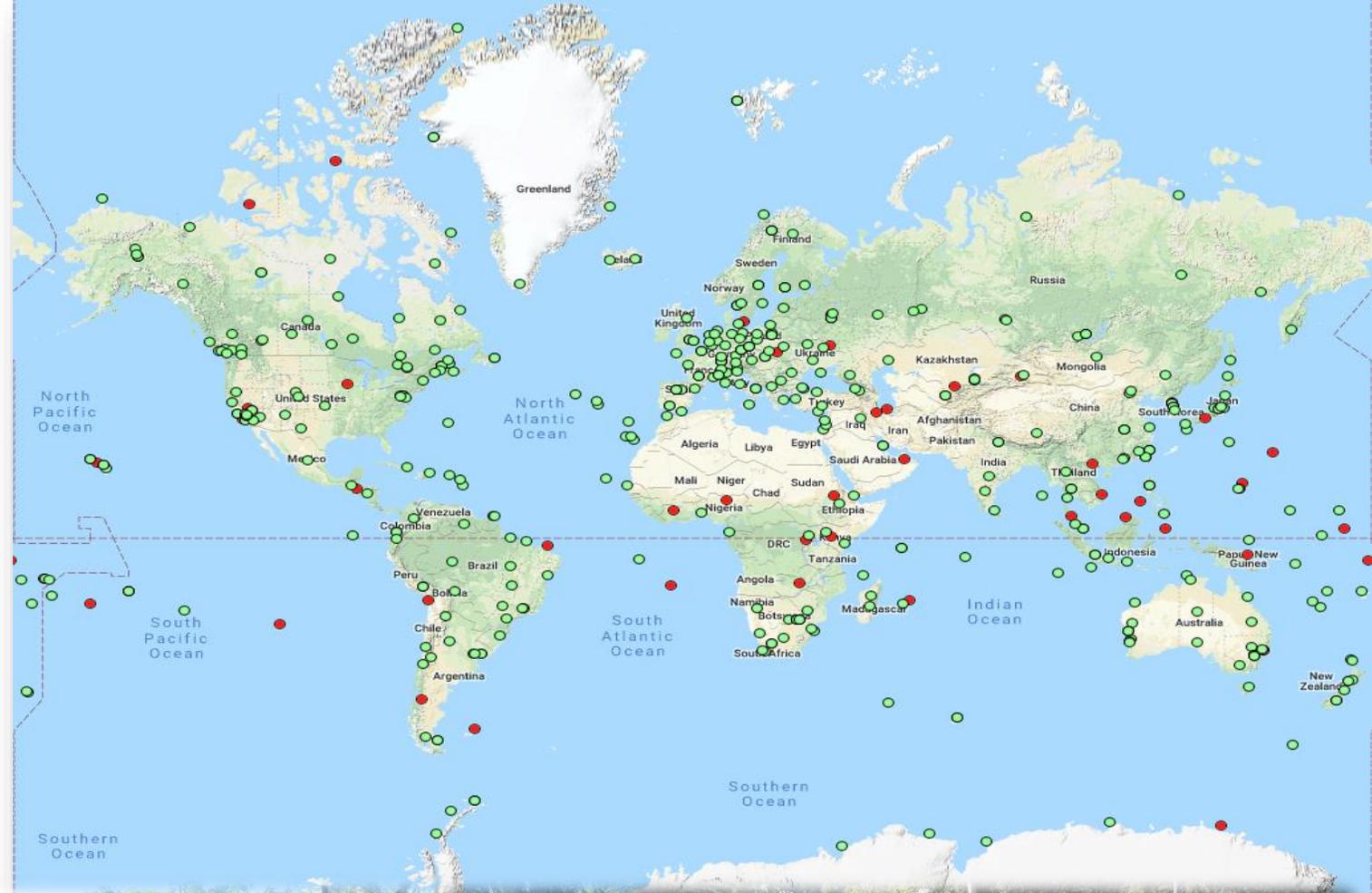
* Files also available at other IGS Global Data Centers



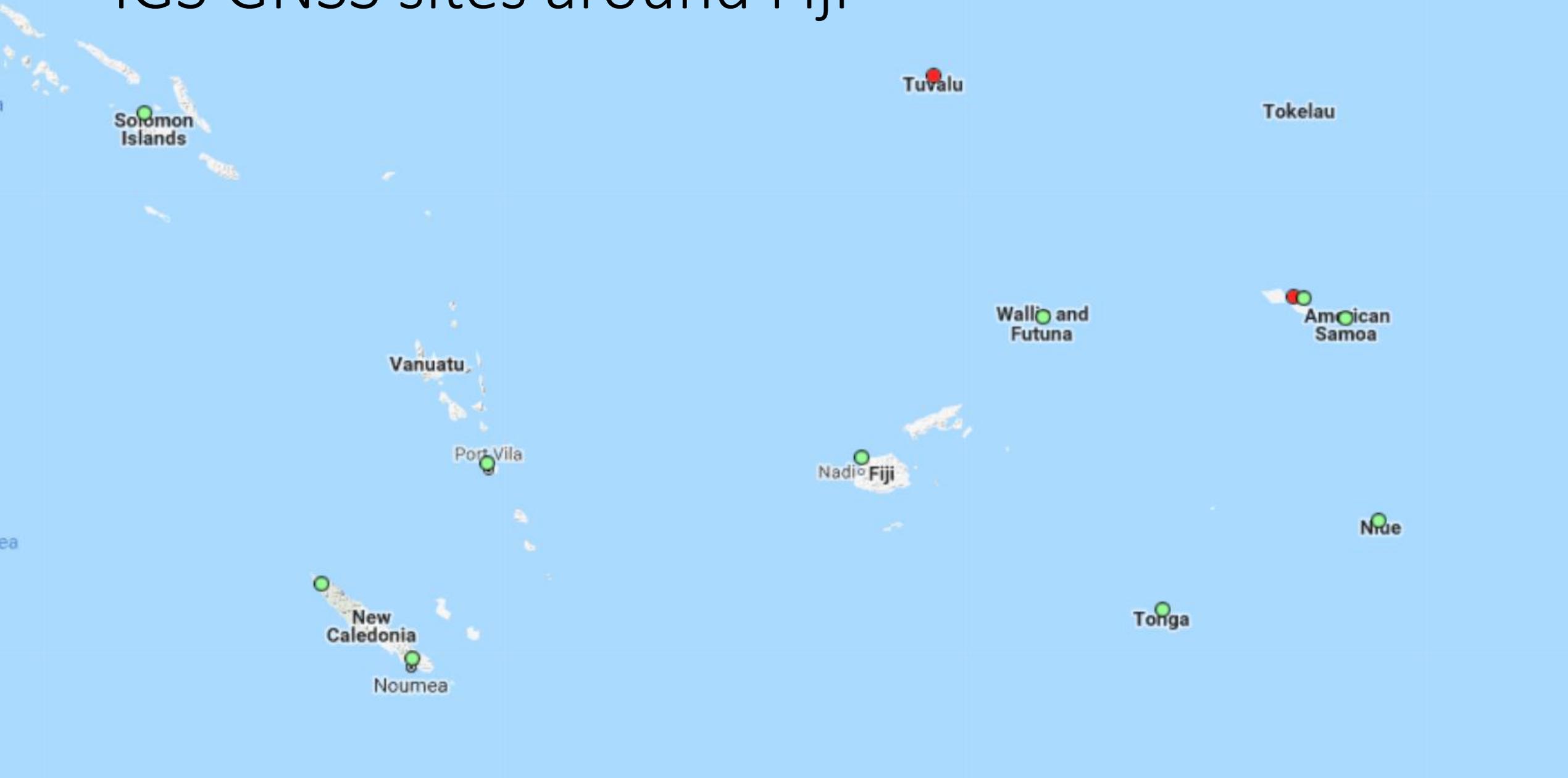
IGS INTERNATIONAL
GNSS SERVICE

Ground Station Network

509 sites participating
200 organizations
100 countries



IGS GNSS sites around Fiji



● = no data in previous 10 days

[More information on IGS Site Guidelines: https://kb.igs.org/hc/en-us/articles/202011433](https://kb.igs.org/hc/en-us/articles/202011433)

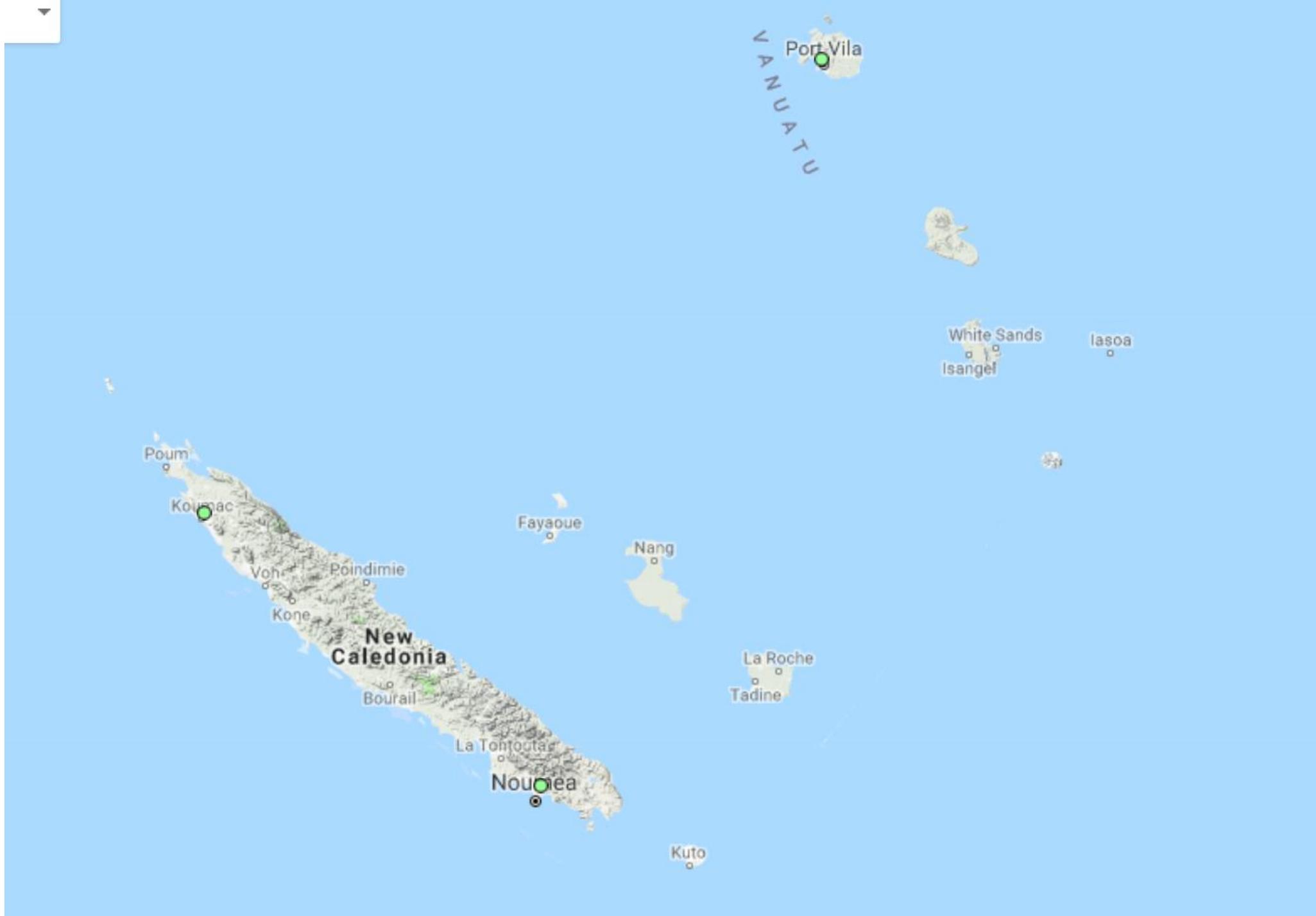


Tonga

GEOGRAPHY OF TONGA

Muitoa
Fotua
Pangai





VANUATU

Port Vila

White Sands
Isangel

Iaso

Poum

Koumac

Voh

Poindimie

Kone

New
Caledonia

Bourail

La Tontoutar

Noumea

Fayaoué

Nang

La Roche
Tadine

Kuto



Nyada
Lorengau

Kavieng

Bismarck Sea

Wewak

Rabaul
New Ireland
Lamassa

Madang

Javeku

New Britain

Buka Town

Bougainville Island
Buin

Papua New Guinea

Mount Hagen
Mendi
Goroka

Lae

Wau

Choiseul

Santa Isabel Island

Gizo

Munda

Buala

Alimo

Daru

Popondetta

Port Moresby

Solomon Sea

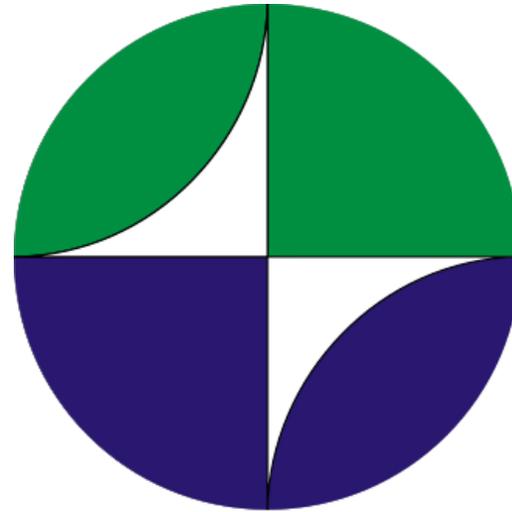
Esa'Ala

Alotau

Solomon Islands

Malaita

San Cristobal
Namuga



IUGG



Global Geodetic
Observing System

The Global Geodetic Observing System (GGOS)
of the International Association of Geodesy (IAG)



Global Geodetic Observing System (GGOS)

- **Genesis:**

- GGOS was established by the IAG, first as a Project in 2003 and then as a permanent Component in 2007

- **Vision:**

- Advancing our understanding of the dynamic earth system by quantifying our planet's changes in space and time.

- **Mission:**

- To provide the observations needed to monitor, map, and understand changes in the Earth's shape, rotation, and mass distribution
- To provide the global geodetic frame of reference that is the fundamental backbone for measuring and consistently interpreting key global change processes and for many other scientific and societal applications
- To benefit science and society by providing the foundation upon which advances in Earth and planetary system science and applications are built

GGOS External Relations Overview



United Nations



GAR

Global Assessment Report
on Disaster Risk Reduction



UN World Conference on
Disaster Risk Reduction
2015 Sendai Japan

Participation and Representation in External Stakeholder Organizations

- United Nations Global Geospatial Information Management (GGIM) Subcommittee on Geodesy (SCoG)
- Group on Earth Observations (GEO)
- Committee on Earth Observation Satellites (CEOS)
- International Council for Science (ICSU) World Data System (WDS)

Current External Relations Projects

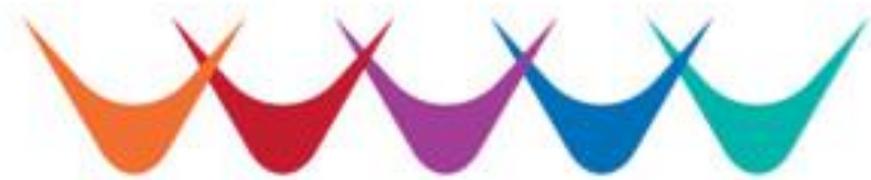
- Connecting United Nations Initiatives with the GGOS Geohazards Focus Area through the GAR19 Report
- Connecting the GEO Work Program (Sendai and SDGs) United Nations Initiatives with GGOS

Future External Relations Projects

- IAG/GGOS Geodetic Academic Network
- External Essential Variables Identification
- DOIs for Geodetic Data and Products

GGOS External Relations Near-Term Goals

Two Paths to Connect GGOS with the United Nations



UN World Conference on
Disaster Risk Reduction
2015 Sendai Japan

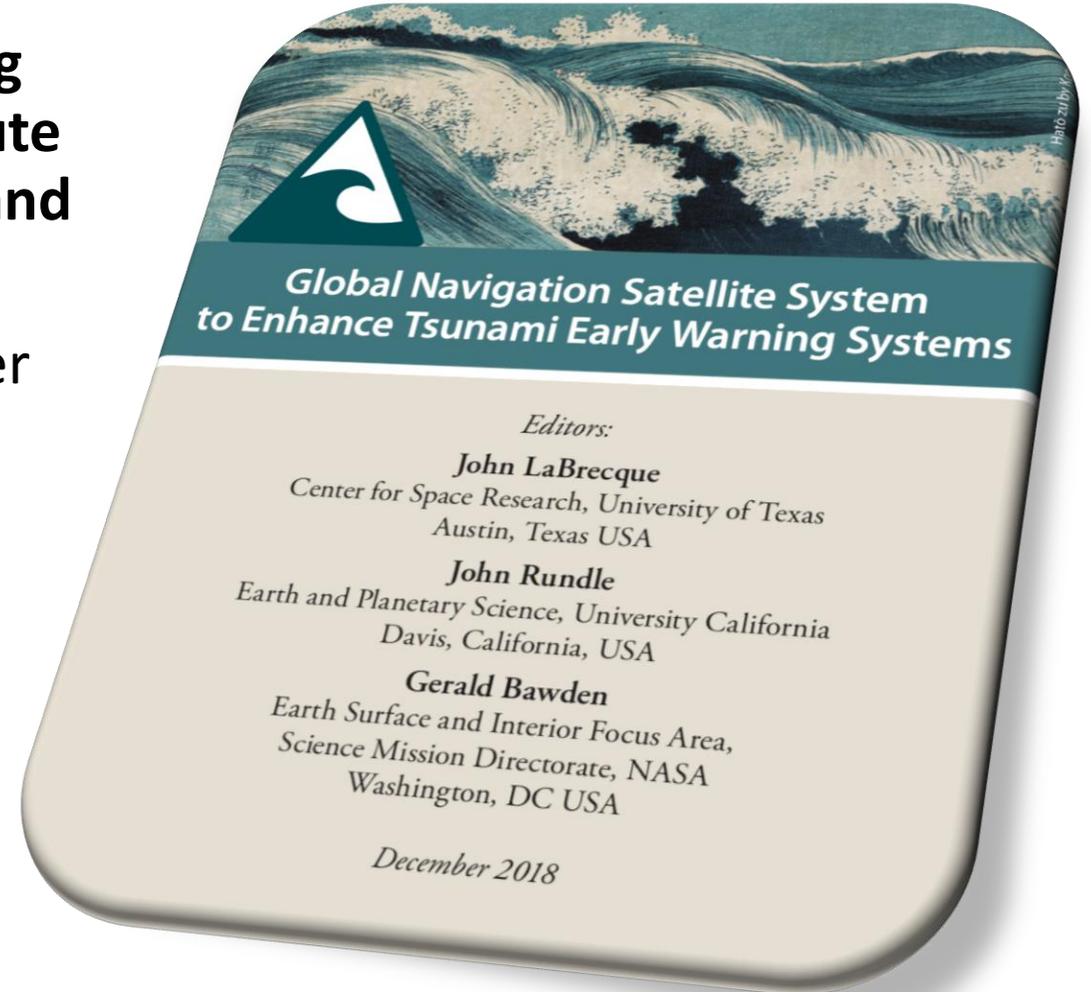
➤ Earth observations also play a major role in monitoring progress toward, and achieving, the SDGs.

➤ Geodetic observations have a clear role in helping to reduce the risk of disasters, as well as contribute to disaster preparedness with better mitigation and response.

Connecting United Nations Initiatives with GGOS: GNSS Enhanced Tsunami Early Warning Systems

Geodetic observations have a clear role in helping to reduce the risk of disasters, as well as contribute to disaster preparedness with better mitigation and response.

GTEWS has successfully submitted a chapter/paper for the 2019 UN Global Assessment Report on Disaster Risk Reduction (GAR19), which is a **major UN report addressing disaster risk reduction that contributes to regional and global platforms for disaster risk reduction, as well as the high-level political forum on sustainable development**





Group on Earth Observations (GEO)

GROUP ON EARTH OBSERVATIONS

7 continents

8 societal benefit areas

12 years

73 work programme activities

105 member governments

126 participating organizations

5,000 data providers

400,000,000

Earth observations

The Group on Earth Observations¹¹¹ (GEO) is an intergovernmental partnership working to improve the availability, access and use of EO for the benefit of society. GEO has a work programme of over 70 activities, which cover the global priority areas of the 2030 Agenda, the Paris Agreement and the Sendai Framework. Through this work, GEO has brought together the Global Earth Observation System of Systems,¹¹² which makes available more than 400 million units of data, information and resources.¹¹³

What does GEO do?

Disaster Risk Reduction in the GEO Work Programme



Earth observations contribute to disaster mapping, better mitigation and response, working with the Sendai Framework on Disaster Risk Reduction

Initiatives

- Climate Change Impact Observation on Africa's Coastal Zones (GEO-CCIOoACZ)
- Data Access for Risk Management (GEO-DARMA)
- GEO Cold Regions Initiative (GEOCRI)
- GEO Geohazards Supersites and Natural Laboratories (GSNL)
- GEO Global Network for Observation and Information in Mountain Environments (GEO-GNOME)
- GEO Global Water Sustainability (GEOGLOWS)
- GEO Human Planet Initiative: Spatial Modeling of Impact, Exposure and Access to Resources
- Global Urban Observation and Information
- Global Wildfire Information System (GWIS)

Community Activities

- African Geochemical Baselines
- Chinese Tsunami Mitigation System
- Earth Observations for Disaster Risk Management
- Earth Observations for Geohazards, Land Degradation and Environmental Monitoring
- Global Ecosystem and Environmental Observation Analysis Report Cooperation (GEOARC)
- Global Flood Awareness System (GloFAS)
- Global Flood Risk Monitoring
- Land Cover and Land Cover Change
- TIGGE (Thorpex Interactive Grand Global Ensemble) evolution into a Global Interactive Forecast System (GIFS)

GEO Societal Benefit Areas

- Biodiversity and Ecosystem Sustainability
- Water Resources Management
- Sustainable Urban Development
- Public Health Surveillance
- Infrastructure and Transportation Management
- Food Security and Sustainable Agriculture
- Disaster Resilience
- Energy and Mineral Resource Management

Value of EO for DRR

Earth Observations for Disaster Risk

EO data and information can provide a broad overview of large disaster-affected areas quickly. Using EO data and technology, disaster risks can be identified and assessed, and risks can be prevented or mitigated.



Disaster Risk Reduction

A GEO Priority Engagement Area

GEO supports Disaster Risk Reduction by improving coordination of Earth observations to increase ability to disaster forecasting, preparation, mitigation, management and recovery.



@GEOSEC2025
www.earthobservations.org

The Sendai Framework for Disaster Risk Reduction



- Sendai Framework for Disaster Risk Reduction 2015-2030 adopted at the Third UN World Conference in Sendai, Japan, on 18 March 2015.
- Supported by the United Nations Office for Disaster Risk Reduction (UNDRR) at the request of the UN General Assembly.
- Significant focus on disaster risk management as opposed to disaster management.
- Focus is on natural and man-made hazards and related environmental, technological, biological hazards and risks.

The Sendai Framework and Global Assessment Report

The Sendai Framework addresses the risk of small-scale and large-scale, frequent and infrequent, sudden and slow-onset disasters caused by natural or man-made hazards...

...and environmental, technological and biological hazards and risks.

The Global Assessment Report on DRR is a biennial snapshot contextualising progress in realising the global targets of the Sendai Framework, and contributes to the High Level Political Forum on Sustainable Development.



Download report and more information: <https://gar.unisdr.org>

The Sendai Framework for Disaster Risk Reduction: How Earth observations fit in



Leveraging disaster-related geospatial and Earth observation data

The 2030 Agenda requires data to understand needs, to study and define solutions, and to monitor progress. The leveraging of disaster-related geospatial and EO data and tools in the pursuit of SDGs and the goals and targets of the Paris Agreement, NUA and other related agreements is essential.

Advancements in open data provided from satellites have made more advanced models possible. Landsat and Copernicus are the two contemporary examples by the United States Geological Survey/NASA and ESA, respectively. Landsat provides the longest temporal records of moderate resolution multispectral data of the Earth's surface, while Copernicus is providing the highest-resolution imagery available openly and globally. In 2014, the Sentinel-1 mission provided a polar-orbiting, all-weather, day and night radar imaging mission for land and ocean services. In 2015, Sentinel-2A was launched followed by Sentinel-2B in 2017, providing spatial resolutions of 10, 20 and 60 m. This has improved the resolution previously available and provides high-resolution imagery to be used in various hazard models. The fact that the data is open has resulted in a boom in scientific research based on satellite data.

Supporting Sendai

Coordinating Earth Observations for Disasters

GEO supports implementation of Sendai Framework targets E,F and G through engagement with UNISDR.

E: Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;

F: *Substantially enhance international cooperation to developing countries* through adequate and sustainable support to complement their national actions for implementation of the present framework by 2030;

G: Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

**United Nations Global Geospatial Information Management
Subcommittee on Geodesy
Education, Training and Capacity Building Efforts in support
of the GGRF Roadmap Implementation Plan**

*Progress on the Proposed Five-Year Education, Training, and Capacity Building
Implementation Plan*

Mikael Lilje (Sweden), Working Group Lead,

Augustin Bamouni (Burkina Faso), Graeme Blick (New Zealand), Allison Craddock (United States), Paul Cruddace (United Kingdom), Ryan Keenan (Septentrio), Basara Miyahara (Japan), Maria Cristina Pacino (International Association of Geodesy), Dan Roman (United States), Robert Sarib (Australia), Sharafat Gadimova (UNOOSA International Committee on GNSS)

June 2019



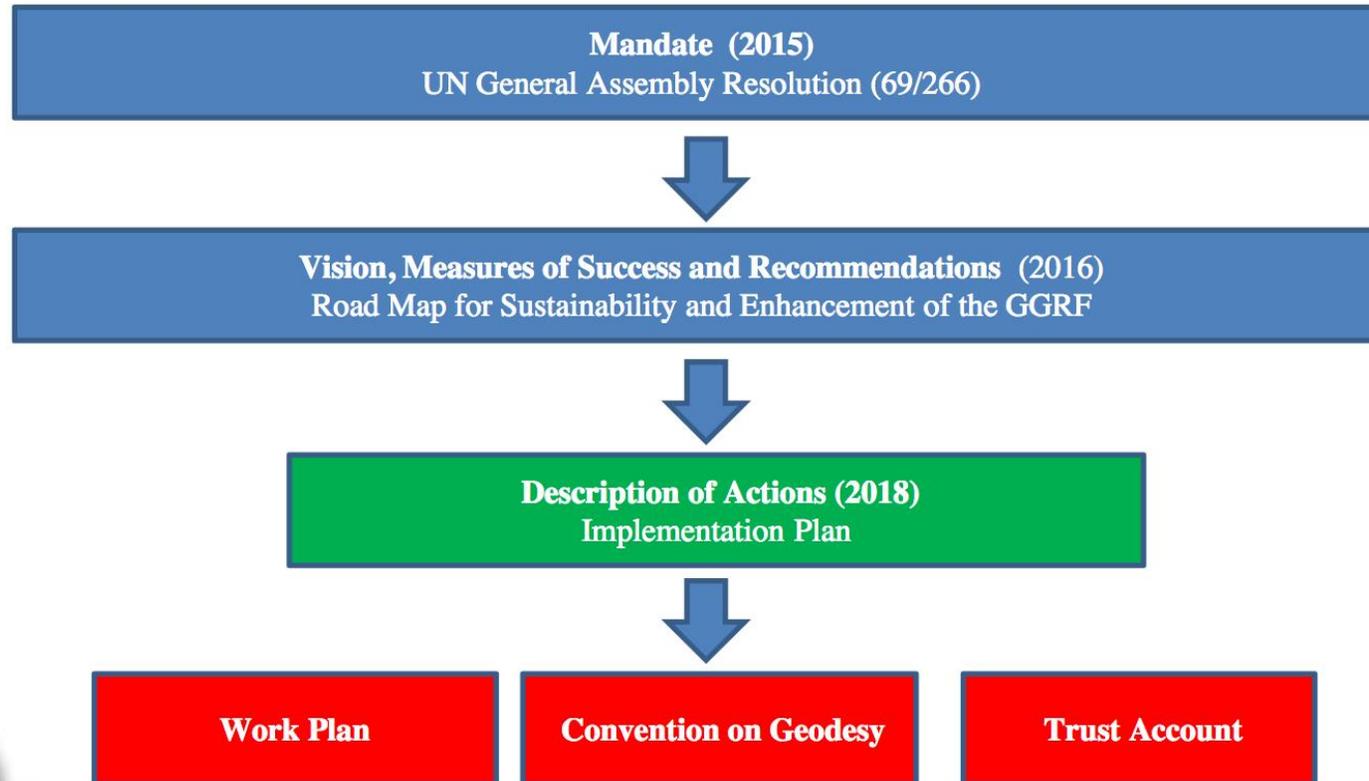
**United Nations General Assembly Resolution 2015:
Global Geodetic Reference Frames
for Sustainable Development**

New York, 26 February 2015

Photo: Kyoung-Soo Eom

Sub-Committee Progress

- Recognising its importance the UN General Assembly adopted resolution 69/266 in February 2015, entitled 'A Global Geodetic Reference Frame for Sustainable Development'
- At the 6th session of UN GGIM, the Road Map for the development and sustainability of the Global Geodetic Reference Frame was endorsed by the CoE, who then requested the development of an implementation plan, and a Position paper on Governance





**An accurate, sustainable and accessible
Global Geodetic Reference Frame
to support science and society**

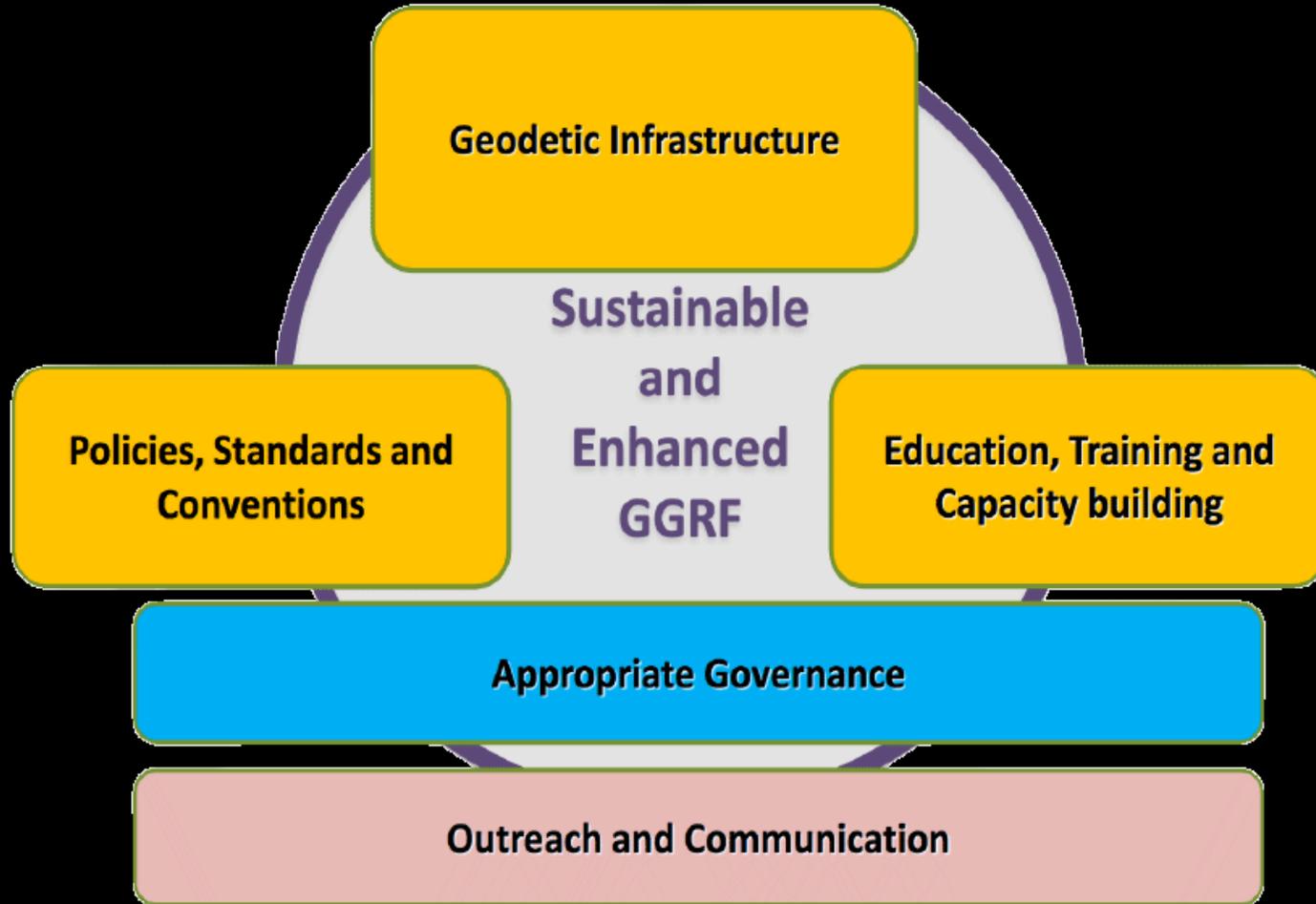
*“A global reference frame is key if you want to be able to compare data from all continents; and to **empower** scientists from all parts of the world – to really give precise information, to make the planet a better place.”*

– Erik Solheim, Executive Director

United Nations Environment Programme

Road Map VISION

An accurate, sustainable and accessible Global Geodetic Reference Frame to support science and society



ATTACHMENT 1



United Nations Committee of Experts on
Global Geospatial Information Management

Road Map for the Global Geodetic Reference Frame for Sustainable Development Implementation Plan



Photo: Bjørn-Owe Holmberg

Developed by the
UN-GGIM Subcommittee on Geodesy
July 2018

GGRF Roadmap Recommendations Highlights

- ❖ Actions must be taken to maintain and upgrade current national infrastructure and secure all Member States accurate access to the Global Geodetic Reference Frame (GGRF)
- ❖ Member States are urged to support efforts to develop geodetic standards, and more openly share their data, standardized operating procedures, expertise, and technology
- ❖ **Actions must be taken to raise geodetic competence and skills, as a lack of geodetic capability currently limits utilization of the GGRF in many countries; and hinders their achievement of the UN Sustainable Development Goals (SDGs). It also threatens the development and sustainability of the GGRF**
- ❖ Actions must be taken to raise the general awareness around the value proposition of the GGRF
- ❖ Actions must be taken to improve the GGRF governance mechanism, as this is needed to ensure the sustainability and improvement of the GGRF

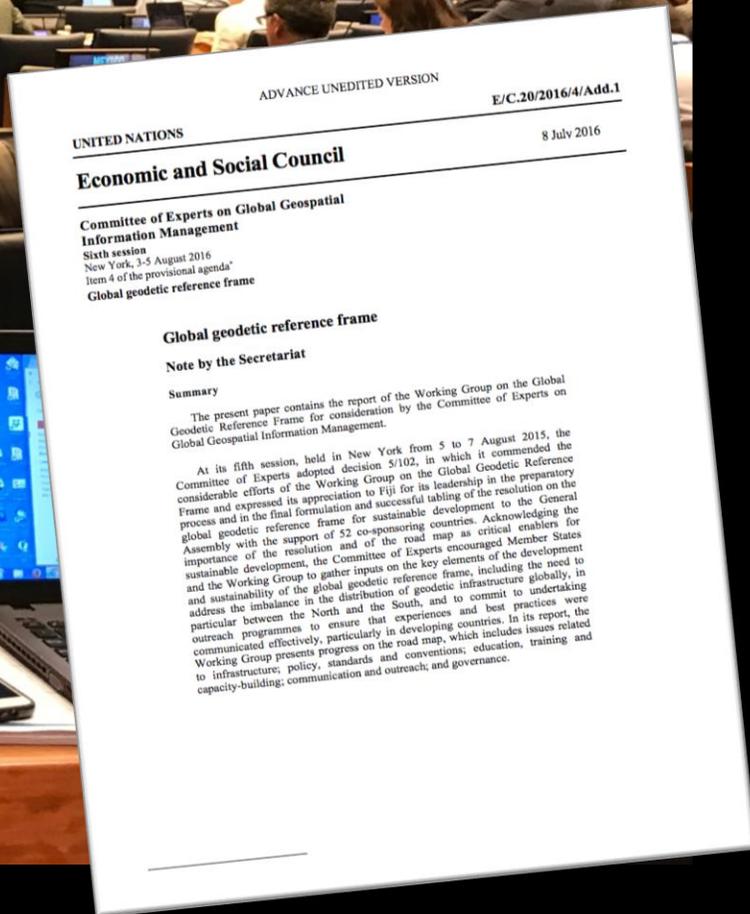


Subcommittee on Geodesy 2018 Accomplishments

Within the past year, the work of the Subcommittee has started transitioning from ideological to implementation-based

2018 Accomplishments (tabled at UN CoE GGIM 8)

- ✓ **GGRF Road Map Implementation Plan**
 - ✓ Sections on each Focus Group (except Governance)
- ✓ **Position Paper on Appropriate Governance Arrangements**
 - ✓ Recommends Subcommittee investigate the establishment of a UN Convention on Geodesy
- ✓ **Revised Terms of Reference adopted**
 - ✓ To enable increased working capacity of Subcommittee



Education, Training and Capacity Building

The ETCB working group seeks to

- ❖ **Assess the current availability** of education, training, and capacity building resources
- ❖ **Identify gaps** in capacity or other areas of need
- ❖ **Propose** short- and long-term **solutions** to realize the full scientific and social benefit of the Global Geodetic Reference Frame.



Photo: Geoscience Australia

Think Globally – Act Regionally

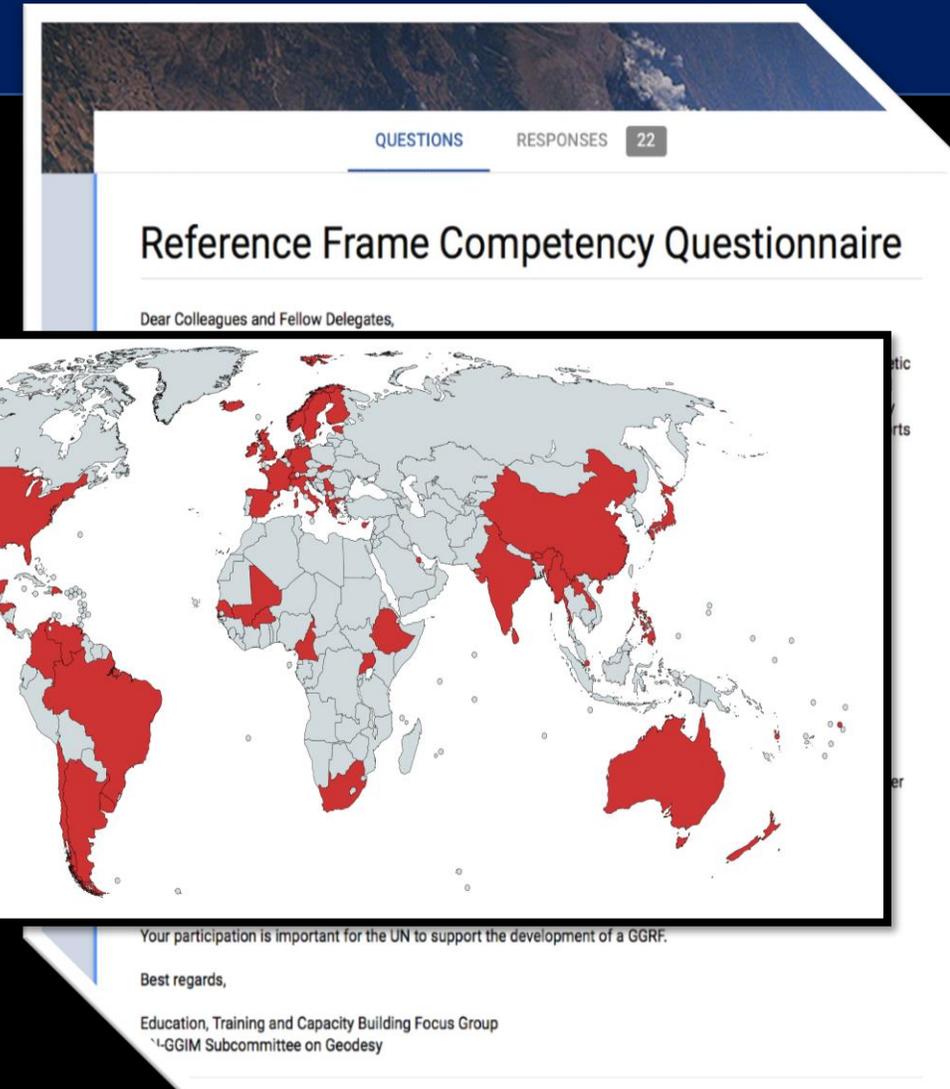
- ❖ Even though basic ETCB needs are global, a **regional focus strategy is essential!**
- ❖ The nature, size, and variety of **challenges differ regionally** and may include linguistic, technological, economic, and cultural impediments.
- ❖ It is also clear that **access to highly skilled personnel varies widely** among Member States, thus necessitating the need to ensure that knowledge and competence is readily and openly shared.
- ❖ A key to optimizing the efficiency of the group's objectives is to identify and make existing educational and **capacity building resources easily discoverable.**

Pilot Initiative:

Provide a framework for Member States to identify their 'Level' of competency requirements

- First version has been available for participation since April 2018; will continue to accept responses.
- Some 80 Responses from 50 countries

Survey available here
<http://bit.ly/scogsurvey>



The image shows a screenshot of a survey interface. At the top, there are tabs for 'QUESTIONS' and 'RESPONSES' with a count of '22'. The main title is 'Reference Frame Competency Questionnaire'. Below the title, it says 'Dear Colleagues and Fellow Delegates,'. A world map is displayed below the text, with several countries highlighted in red, indicating participation. At the bottom of the survey interface, there is a closing message: 'Your participation is important for the UN to support the development of a GGRF. Best regards, Education, Training and Capacity Building Focus Group, IGGIM Subcommittee on Geodesy'.

| Level | Competency Requirements | Training provided by | |
|-------|---|--|--|
| 1 | Basic understanding of: <ul style="list-style-type: none"> • GNSS • Reference frames, including geoid models, vertical and horizontal datums | <ul style="list-style-type: none"> • Educational institutions – universities and polytechnic institutes • Government mapping agency • Private companies | Countries that might have one CORs and maintain a traditional geodetic network of reference marks – e.g. small Pacific Island Nations? |
| 2 | The above plus knowledge of: <ul style="list-style-type: none"> • Constructing, building and running a small CORs network • GNSS processing using standard software - e.g. Trimble, Compass Solution (ComNav), LGO(Leica),.... • Least squares processing and provision of datum access • Geoids models, precision, determinations and basic implementation • Implementation of a vertical datum including use of geoid models | <ul style="list-style-type: none"> • Educational institutions – universities and polytechs • UN-GGIM Geodesy Capacity Group • FIG • Government mapping agency • Private companies | Countries with small CORs network and those who adopt global Reference frames for their nation reference frames – e.g. Fiji? |
| 3 | The above plus high knowledge of: <ul style="list-style-type: none"> • Implementing and running large CORs networks • High end GNSS processing and datum access • Geoid model computation and implementation into a vertical datums • Monitoring earth dynamics and including in datum realization • Geodetic database management | <ul style="list-style-type: none"> • Specialized courses – e.g. geoid school • UN-GGIM Geodesy Capacity Group • IAG and FIG • Government mapping agency • Private companies | Countries with a more extensive CORS and developing their own specialized national and vertical datum – e.g. New Zealand and Sweden? |
| 4 | The above plus expert knowledge of: <ul style="list-style-type: none"> • Reference frame determination and computation • High end GNSS analysis and processing • SLR including analysis and processing • VLBI including analysis and processing • Gravity collection, processing and geoid determination | <ul style="list-style-type: none"> • IAG • Specialist training courses run by NASA/JPL – e.g. on VLBI or SLR • Private companies • Specialized software training courses – e.g. Bernese | Countries engaged in Global Reference frame determination and Geodesy Science - e.g. US, Australia and Germany? |

| Level | Competency Requirements | Training provided by | |
|-------|--|--|---|
| 1 | <p>Basic understanding of:</p> <ul style="list-style-type: none">● GNSS● Reference frames, including geoid models, vertical and horizontal datums | <ul style="list-style-type: none">● Educational institutions – universities and polytechnic institutes● Government mapping agency● Private companies | <p>Countries that might have one CORs and maintain a traditional geodetic network of reference marks – e.g. small Pacific Island Nations?</p> |

| Level | Competency Requirements | Training provided by | |
|-------|--|--|---|
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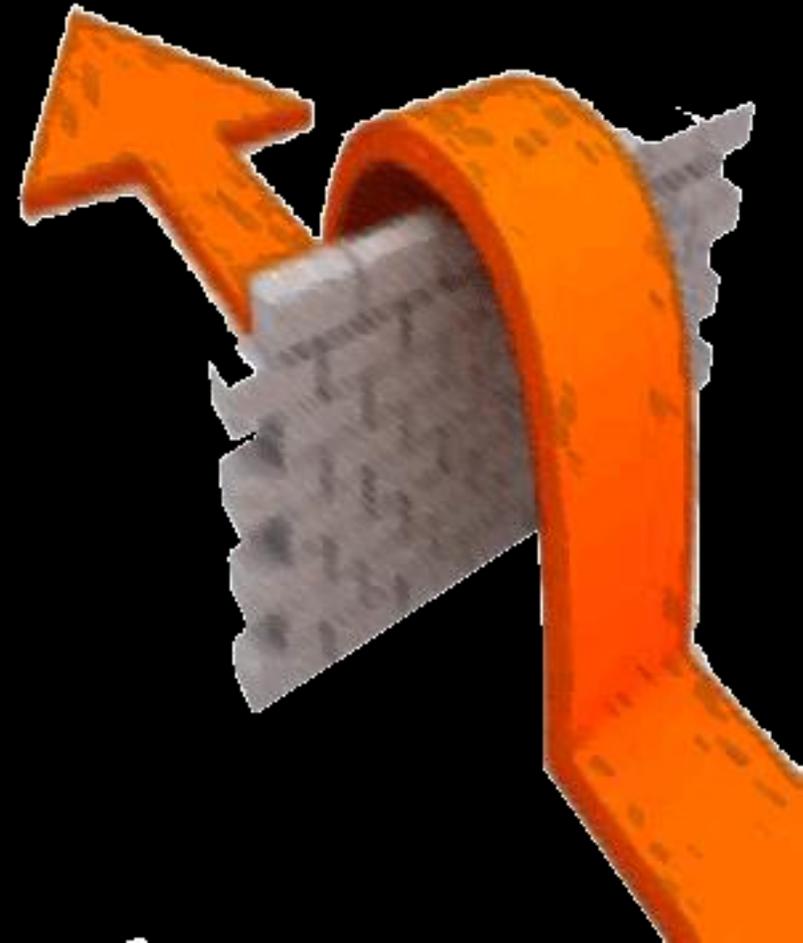
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| Level | Competency Requirements | Training provided by | |
|-------|--|---|--|
| 4 | <p>The above plus expert knowledge of:</p> <ul style="list-style-type: none"> • Reference frame determination and computation • High end GNSS analysis and processing • SLR including analysis and processing • VLBI including analysis and processing • Gravity collection, processing and geoid determination • Analysis centre – combining various geodetic techniques to determine reference frame parameters • Use of other potential geodetic techniques – e.g. DORIS and InSAR | <ul style="list-style-type: none"> • IAG • Specialist training courses run by NASA/JPL – e.g. on VLBI or SLR • Private companies • Specialized software training courses – e.g. Bernese | <p>Countries engaged in Global Reference frame determination and Geodesy Science - e.g. US, Australia and Germany?</p> |

Pilot Initiative:

Identification of Existing Capacity Building Resources and Enabling Discoverability – knowledge database

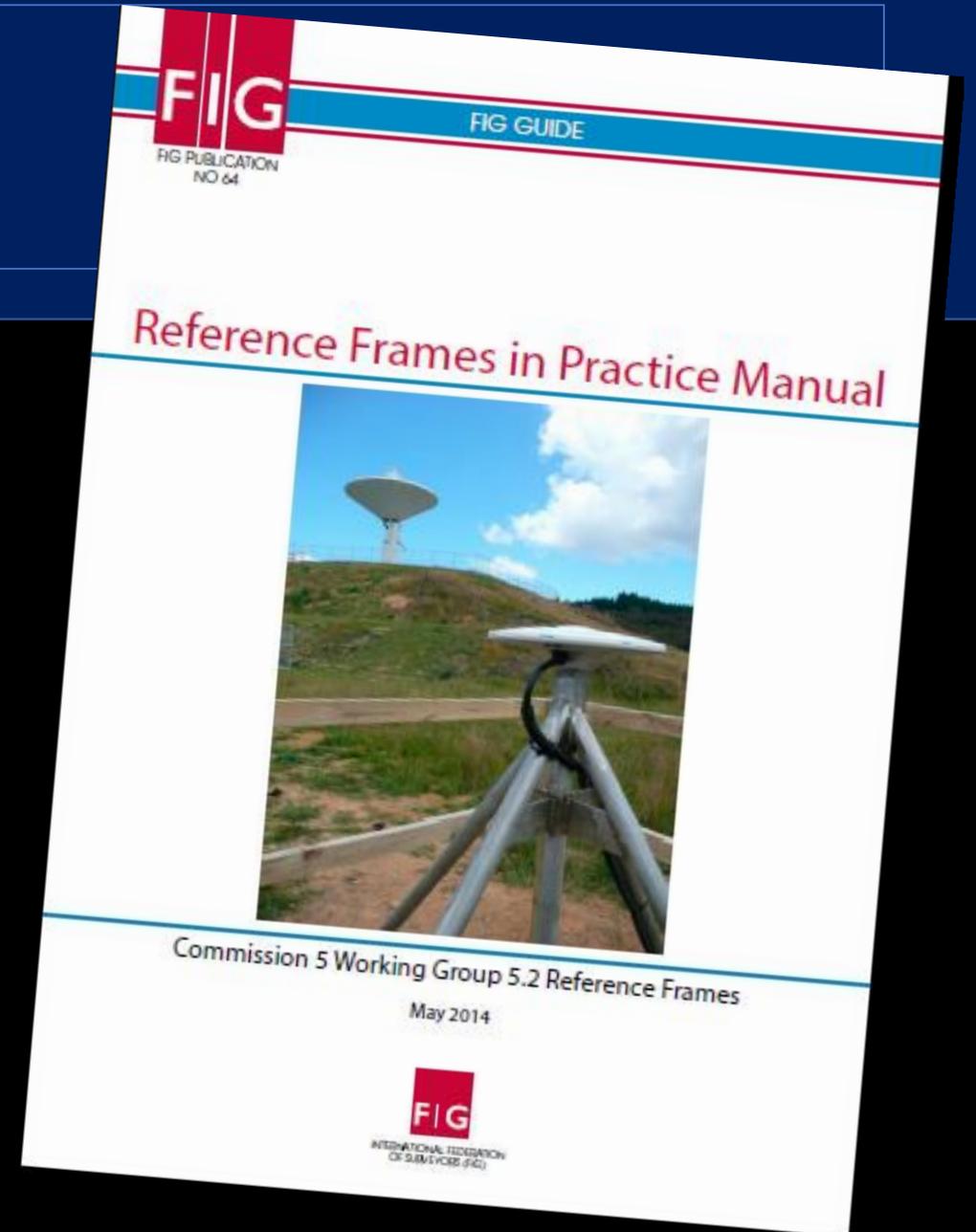
- Identify and leverage existing ETCB resources
- Develop a system of tagging for **discoverability** and categorization of existing resources:
 - Questionnaire Level 1/2/3/4
 - Standardized Keywords
 - Vetted/endorsed by community
- Establish a central point of information on UN GGIM SCoG website
 - A “referral service” linking to external resources maintained by universities, societies, NGOs, and others
 - Lower the barrier to entry by identifying and explaining first steps to geodetic capacity



Pilot Initiative: *Developing Publications*

Platform for the Reference Frame in Practice seminars:

- Publication produced by FIG, IAG, IGS and UNOOSA ICG
- Needs an update to be relevant
- Previous authors have been contacted
- New authors are welcome



Pilot Initiative:

Drafting Standardized Capacity Building and Development Frameworks



- How to empower nations to take ownership of relevant capacity building efforts/initiatives by providing a clear, easy to understand framework with standards and references?
 - Addressing different aspects of the GGRF Implementation Plan
 - Tailor to individual member state or region needs and circumstances
 - Increasing capacity capability
 - Organized facilitation of knowledge transfer
- Identify existing standards, frameworks, checklists, and other “how to” resources
- Work in conjunction with stakeholders



United Nations – Fiji

Workshop on the Applications of GNSS

Suva, Fiji – 27 June 2019

Proposed Geodetic Capacity Building Applications for the UN GGIM-World Bank Integrated Geospatial Information Framework

Allison Craddock

Director, IGS Central Bureau

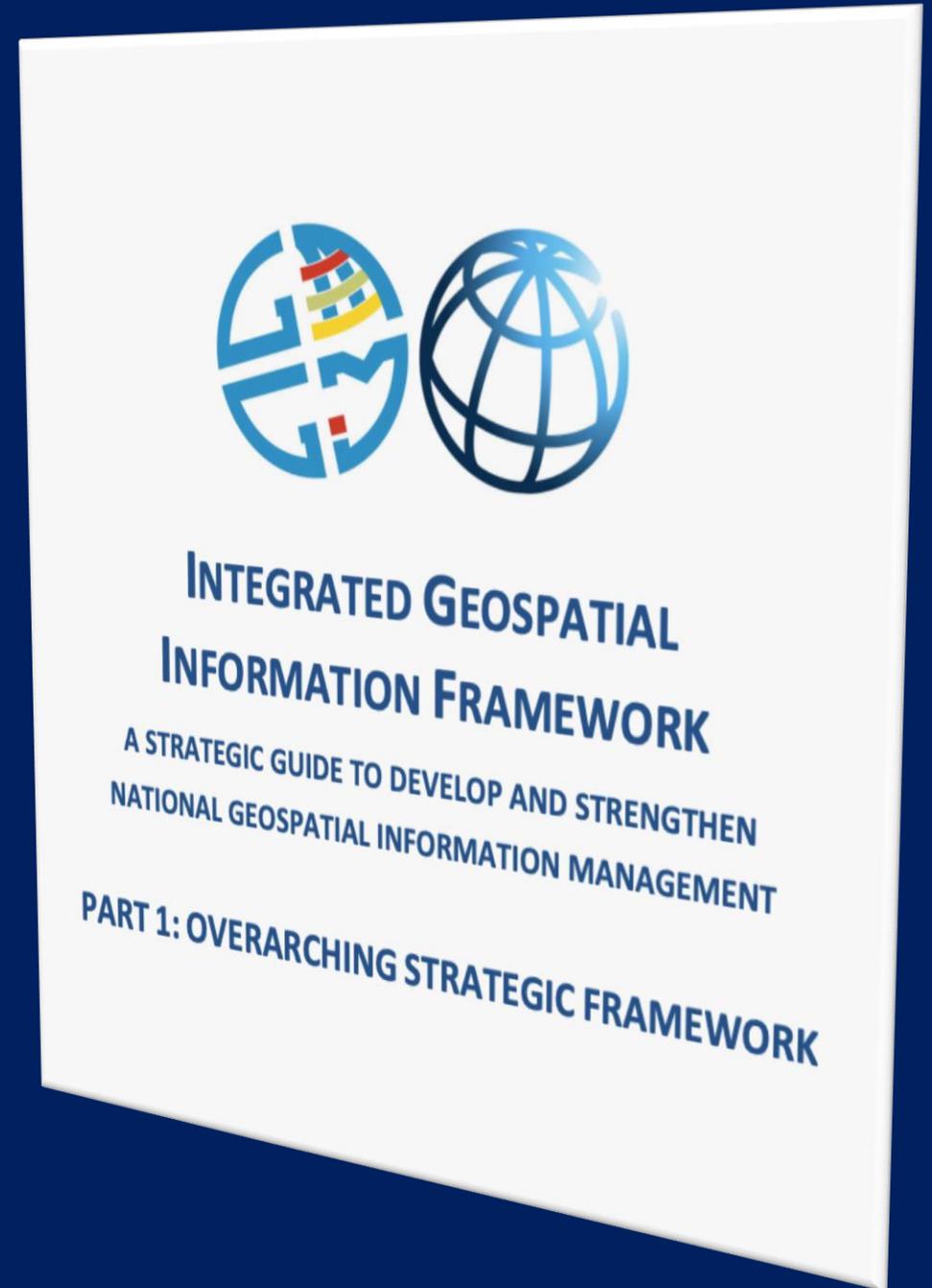
Manager of External Relations, IAG Global Geodetic
Observing System (GGOS)



Jet Propulsion Laboratory
California Institute of Technology

GGIM-World Bank Integrated Geospatial Information Framework

- UN and World Bank collaborative roadmap to help governments develop, access, and use geospatial information to make effective policies and more accurately direct aid and development resources.
- Makes concrete recommendations on establishing national geospatial information management and putting that information to use.
- Calls for partnerships with civil society, businesses, and academic institutions who have access to relevant data and technology.
- Full document on GGIM website:
 - <http://ggim.un.org/meetings/GGIM-committee/8th-Session/documents/Part%201-IGIF-Overarching-Strategic-Framework-24July2018.pdf>
 - <http://bit.ly/GGIMWBigif>



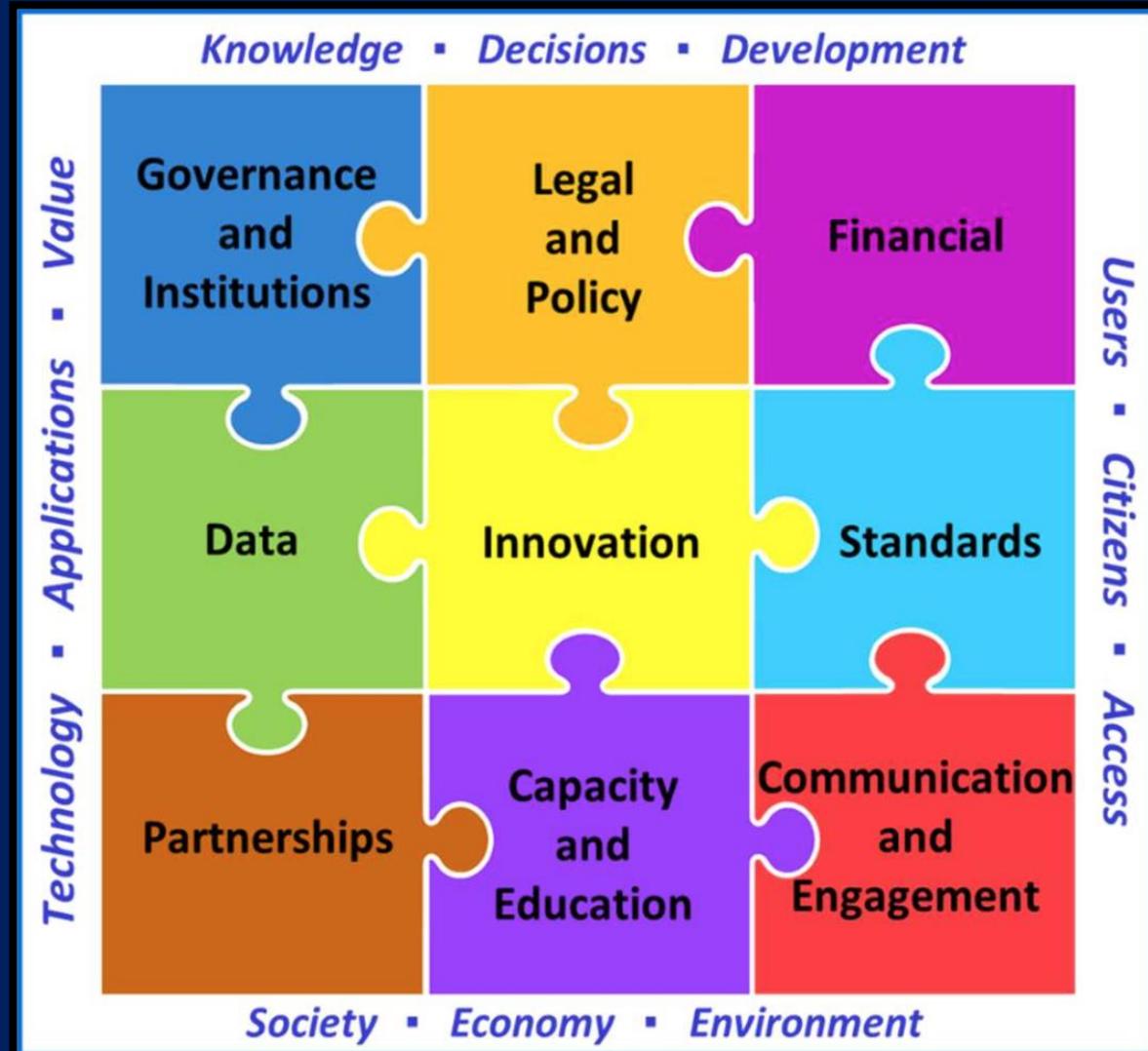
GGIM-World Bank

Integrated Geospatial Information Framework

Governance →

Technology →

People →

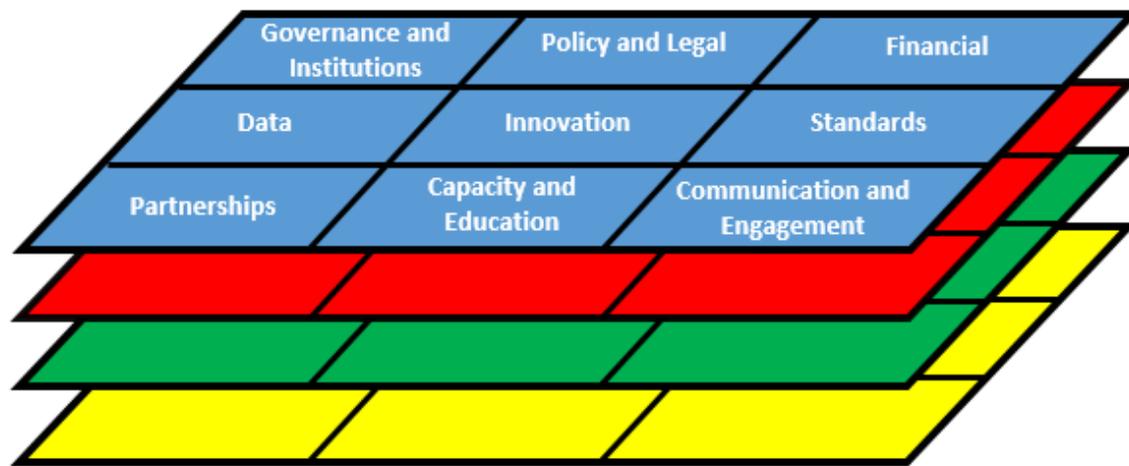


Part 1: Overarching Strategic Framework

The Why - via 7 underpinning principles, 8 goals and 9 strategic pathways

Part 2: Implementation Guide

The What – expands on each of the 9 strategic pathways, the Guide comprises reference guides, good practices and specific principles for each of the strategic pathways. The aim is to provide guidance for governments to establish ‘nationally’ integrated geospatial information frameworks



Geodesy ← *UNGGIM Roadmap*
Administrative Boundaries *UNGGIM Implementation Plan*
Land Parcel and Property
Water
...

Part 3: Country-level Action Plans

Templates and guides to operationalize the Framework

| UN GGIM IGIF Strategic Pathways | UN GGIM GGRF Roadmap Focus Areas |
|-------------------------------------|---|
| Governance and Institutions | Governance |
| Policy and Legal | Policies, Standards and Conventions |
| Financial | |
| Data | |
| Innovation | |
| Standards | Policies, Standards and Conventions |
| Partnerships | |
| Capacity and Education | Education, Training and Capacity Building |
| Communication and Engagement | Outreach and Communication |
| | Geodetic Infrastructure |

STRATEGIC PATHWAY 8

CAPACITY AND EDUCATION



- *This strategic pathway establishes **enduring capacity building programs and education systems** so that geospatial information management and entrepreneurship can be sustained in the longer term.*
- *The objective is to **raise awareness and develop and strengthen the skills, instincts, abilities, processes and resources** that organizations and communities require to utilize geospatial information for decision-making*

ETCB Perspective

In the perspective of the ETCB Working Group, effective education, training, and capacity building seeks to:

- Assess the current availability of education, training, and capacity building resources
- Identify gaps in capacity or other areas of need
- Propose short-, mid-, and long-term solutions to realize the full scientific and social benefit of the Global Geodetic Reference Frame
- Help Member States bridge the “geospatial digital divide”
- Advance the agenda of geospatial information and technology for sustainable development

ETCB Guiding Principles for Supporting IGIF

A strategic regional focus, sensitive to language and culture:

- The SCoG will conduct due diligence, with the assistance of UN-GGIM regional groups, to ensure that all coordination and development efforts are conducted in a way that is **respectful to local and regional cultures, languages, and in supportive collaboration with existing entities seeking to promote geodetic capacity building and education.**

Ensure that knowledge and skills are discoverable and openly shared:

- Identify existing educational and capacity building resources and facilitate their discoverability.

Geodetic Organizational Support, and Advocacy:

- Maintain close contact with national and international agencies and organizations, including the **International Association of Geodesy (IAG), IAG geodetic technique services (such as the International GNSS Service), and the International Federation of Surveyors (FIG)**, who may provide funding, advocacy, or other technical support for training and capacity building. Work with stakeholders to ensure cooperation and benefits for the ETCB strategy.



Proposed ETCB “Deliverables” in response to IGIF



UN World Conference on
Disaster Risk Reduction
2015 Sendai Japan

- Geodetic Capacity/Competency Assessment and Gap Analysis
- Identification of Existing Capacity Building Resources and **Enabling Discovery**
 - Knowledge Base and Training “Hub”
- Regionally Focused Capacity Building **Workshops**
- Standardized Capacity Building and Development **Frameworks**
- Cross-linkages to **Sustainable Development Goals (SDGs)**
- Cross-linkages to **Sendai Framework for Disaster Risk Reduction**

ETCB and the UN Sustainable Development Goals (SDGs)

4 QUALITY
EDUCATION



8 DECENT WORK AND
ECONOMIC GROWTH



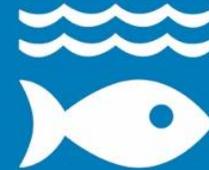
11 SUSTAINABLE CITIES
AND COMMUNITIES



13 CLIMATE
ACTION



14 LIFE
BELOW WATER



15 LIFE
ON LAND



17 PARTNERSHIPS
FOR THE GOALS



4 QUALITY EDUCATION



SDG Metrics: Targets and Indicators

TARGET 4.B

By 2020, substantially **expand globally the number of scholarships** available to developing countries, in particular least developed countries, small island developing States and African countries, for **enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes**, in developed countries and other developing countries

INDICATOR 4.B.1

Volume of **official development assistance** flows for scholarships by sector and type of study

TARGET 4.3

By 2030, ensure **equal access** for all women and men to **affordable and quality technical, vocational and tertiary education**, including university

INDICATOR 4.3.1

Participation rate of youth and adults in **formal and non-formal education and training** in the previous 12 months, by sex

TARGET 4.C

By 2030, substantially **increase the supply of qualified teachers, including through international cooperation for teacher training** in developing countries, especially least developed countries and small island developing States

INDICATOR 4.C.1

Proportion of teachers in: (a) pre-primary; (b) primary; (c) lower secondary; and (d) **upper secondary education** who have received at least the minimum organized teacher training (e.g. pedagogical training) pre-service or in-service required for teaching at the relevant level in a given country



TARGET 4.3

By 2030, ensure **equal access** for all women and men to **affordable and quality technical, vocational and tertiary education**, including university

INDICATOR 4.3.1

Participation rate of youth and adults in **formal and non-formal education and training** in the previous 12 months, by sex

How can geodetic capacity building support achieving this goal?

Apprenticeships

Regional
Workshops

University
Program
Development

Technical
Training Sessions

Vetting and
Discoverability
of Education
Resources
(Platform)

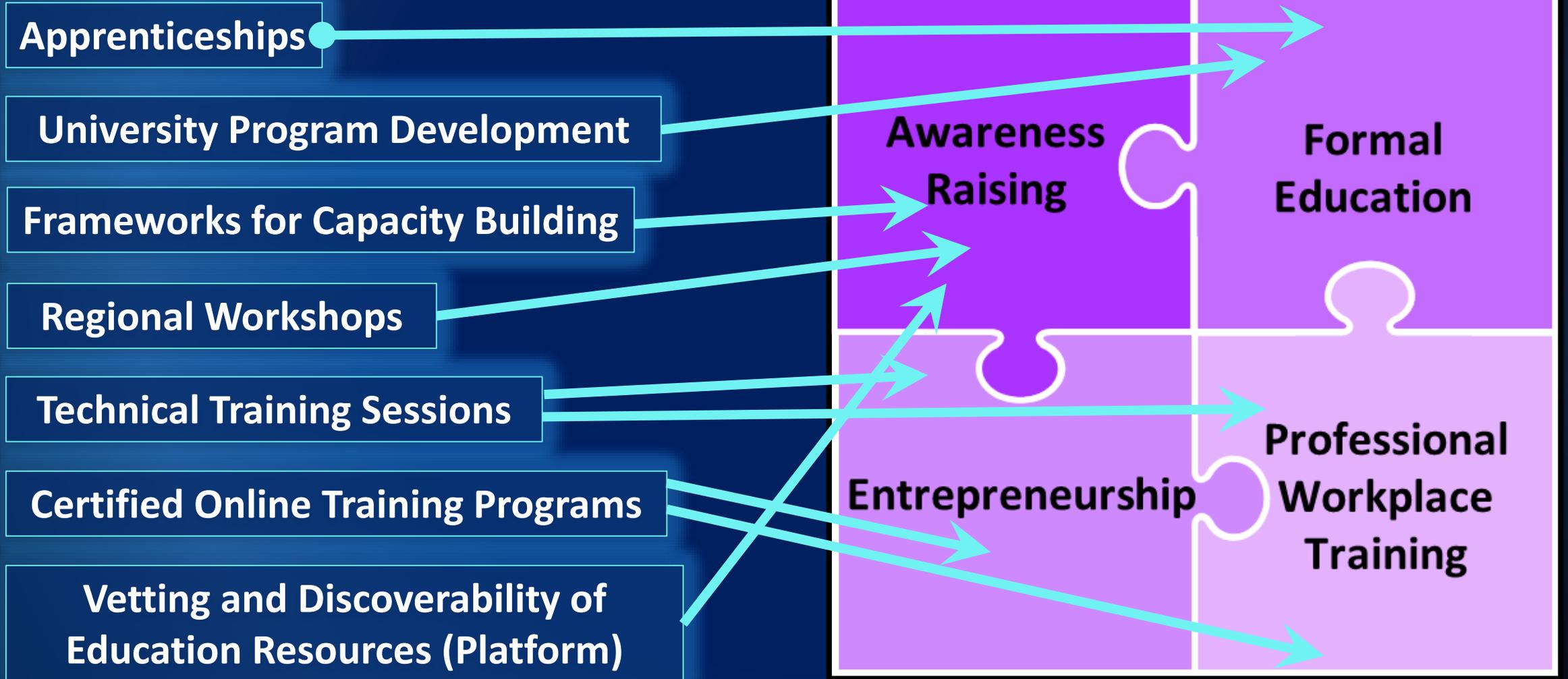
Frameworks for
Capacity Building

Certified Online
Training Programs

Immediate need: current/baseline data (e.g. participation rate)

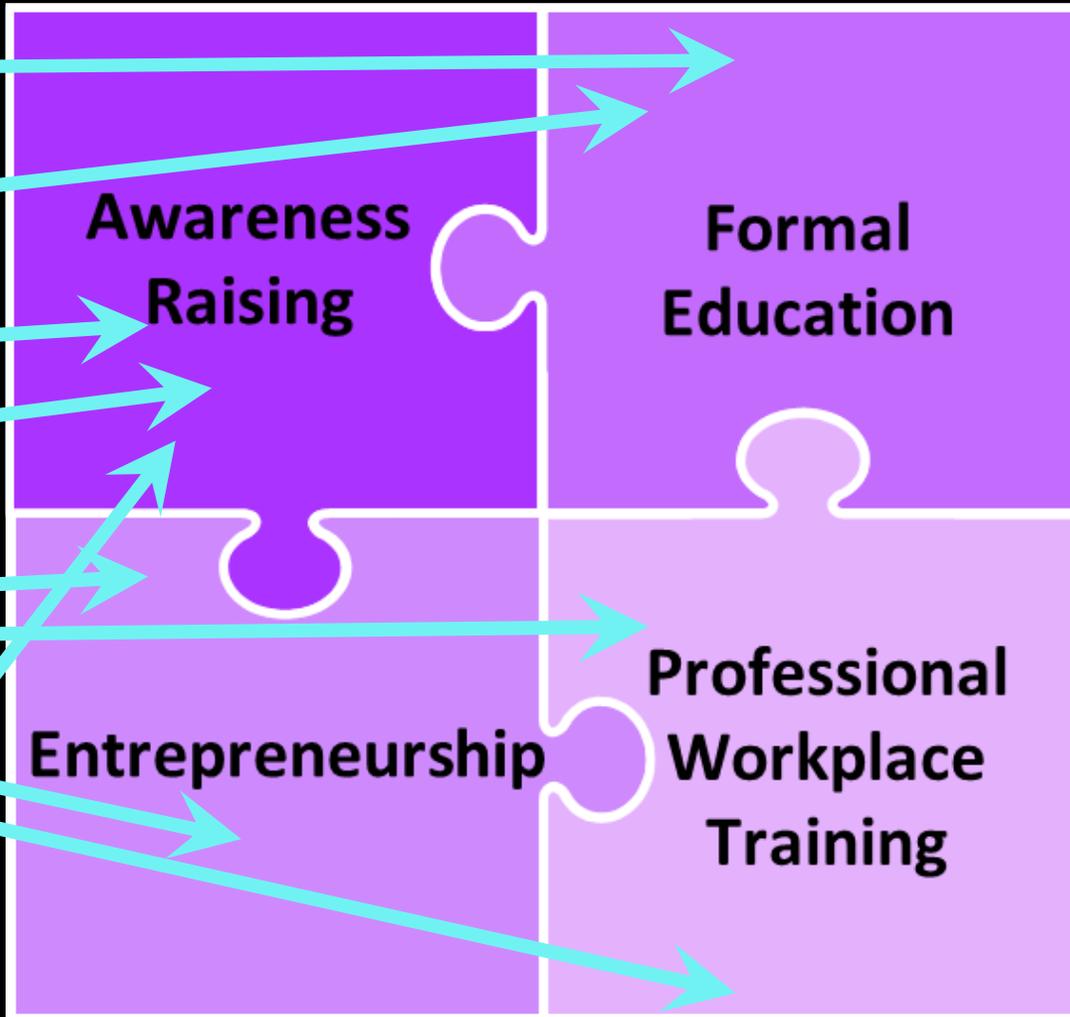


How does this relate to the IGF Capacity and Education Strategic Pathway?





How does this translate to the Sendai Framework Targets?



E: Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;

F: *Substantially enhance international cooperation to developing countries* through adequate and sustainable support to complement their national actions for implementation of the present framework by 2030;

G: Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.



How does this translate to the Sendai Framework Target Indicators?



F-4

Total official international support (ODA plus other official flows) for the transfer and exchange of disaster risk reduction-related **technology**.

F-5

Number of international, regional and bilateral programmes and initiatives for the transfer and exchange of **science, technology and innovation** in disaster risk reduction for developing countries.

F-6

Total official international support (ODA plus other official flows) for disaster risk reduction **capacity-building**.

F-7

Number of international, regional and bilateral programmes and initiatives for disaster risk reduction-related **capacity-building** in developing countries.

F-8

Number of developing countries supported by international, regional and bilateral initiatives to strengthen their disaster risk reduction-related statistical **capacity**.

F: Substantially enhance international cooperation to developing countries

through adequate and sustainable support to complement their national actions for implementation of the present framework by 2030;

For more Information and to download newsletters and other resources prepared by the Subcommittee on Geodesy:

GGIM.un.org

www.unggrf.org

 @UNGGRF

Factsheet
December 2015

UN-GGIM – Global Geodetic Reference Frame Working Group

The UN-GGIM Roadmap for the Global Geodetic Reference Frame
In February 2015 the UN General Assembly adopted the resolution "A Global Geodetic Reference Frame for Sustainable Development" - the first resolution recognizing the importance of a globally-coordinated approach to geodesy.
The GGRF Working Group is working on the development of a roadmap that will describe how governments can contribute to the sustainability and enhancement of the Global Geodetic Reference Frame.
unggrf.org

Actions forward

– From a UN mandate to a roadmap for global geodesy

"The momentum the adoption of the UN resolution has created will position the global geodetic community well for the complex task ahead, developing a roadmap for GGRF enhancement."
Gary Johnston, co-chair UN-GGIM/GGRF Working Group



PHOTO: K. SCHNEIDER/UNEP

NEW YORK: Ambassador Peter Thomson from Fiji introducing the resolution to the UN General Assembly.

After the UN General Assembly adopted the resolution "A Global Geodetic Reference Frame for Sustainable Development", the GGRF Working Group has been working on a roadmap for global geodesy.

Role of the roadmap
The UN-GGIM Roadmap for the Global Geodetic Reference Frame is intended to identify the role that governments, through UN-GGIM, can play in improving the sustainability and enhancement of global geodesy.

"The roadmap is intended to provide an understanding interface between the geodetic community, who are scientifically skilled, and administrators in the national mapping and space agencies, and their governments", says co-chair Gary Johnston.
He explains that the roadmap is not intended to be a full scale technical document describing every element of geodesy. "It is rather intended to be an actions focused document that references existing technical material, or recommends the development of more detailed plans," says Johnston.

The roadmap needs to address the operational paragraphs from the UN General Assembly resolution

- Global cooperation in providing technical assistance in geodesy for those countries in need to ensure the development, sustainability and advancement of a GGRF
- Implement open geodetic data sharing
- Improve and maintain national geodetic infrastructure
- Enhanced multilateral cooperation that addresses infrastructure gaps and duplications globally
- Improved outreach to make the GGRF more visible and understandable to society

The roadmap needs to indicate a series of recommended actions

- Infrastructure
- Policy, Standards and Conventions
- Education, Training and Capacity building
- Communication and Outreach
- Governance

 **UN-GGIM** | United Nations Committee of Experts on Global Geospatial Information Management
ggim.un.org



Jet Propulsion Laboratory
California Institute of Technology

L A N T M Ä T E R I E T



Some take-home resources

- International GNSS Service
 - Information, data and product access: [IGS.org](https://igs.org)
- GGOS Paper on GNSS-Enhance Tsunami Early Warning Systems
 - Download report: bit.ly/gtews2018
- GGIM-World Bank Integrated Geospatial Information Framework
 - bit.ly/GGIMWBigif
- UN Global Geospatial Information Management + GGRF
 - Committee of Experts: ggim.un.org
 - Subcommittee on Geodesy: ggim.un.org/UNGGIM-wg1/
 - Information about the GGRF: www.unggrf.org
- Sendai Framework for Disaster Risk Reduction
 - Global Assessment Report 2019: gar.unisdr.org
 - Interactive Story Map: arcg.is/1f9OXP
 - Sendai Framework Monitor: sendaimonitor.unisdr.org
- Sustainable Development Goals
 - Group on Earth Observations support of SDGs: eo4sdg.org

According to the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER):

“...reliable geospatial data helps policymakers, international organizations and civil society have better information for decision-making processes, in particular in directing aid and development resources.

Although governments hold a significant amount of geospatial information, it is often not current, shared or integrated with other necessary data.

High-quality, timely geospatial information is often overlooked in policymaking, yet is fundamental to achieving inclusive growth and sustainable development.”