Towards an appropriate governance framework

UN-GGIM Subcommittee on Geodesy

GEODESY - A GLOBAL SCIENCE ON A RESTLESS PLANET

Implementation of GA Resolution 69/266 in Russia

RUSSIAN GNSS GLONASS

Orbital constellation - 27 satellites

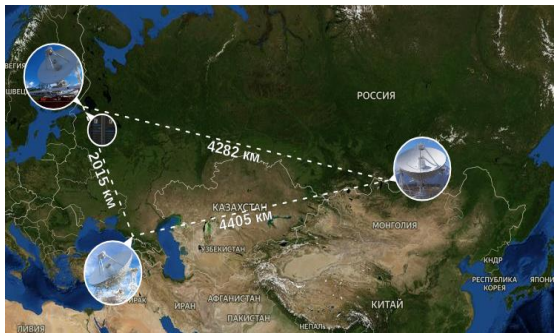
Signal availability globally : 100.0%

From the GLONASS satellites, users can directly receive coordinates in PZ-90

PZ-90.11 is aligned to ITRF2014, how it was shown on 13th meeting of International Committee on GNSS, Xi'an, China, November 2018

Russian VLBI Network "QUASAR"

The "QUASAR" VLBI Network is created by the Institute of Applied Astronomy (IAA). It consists of three observatories with RT-32, RT-13 co-located with GNSS, SLR and one DORIS.



IAA observatories participate in different IVS observation programs and IAA Analysis Center contributes to the IVS different products including reference frames and EOPs.

The RAS FX GPU Based Software Correlator

FX software correlator was developed in 2015 for processing new radio telescope VLBI data in quasi real time mode.

The FX software correlator is able to process up to 6x16 Gb/s input streams.

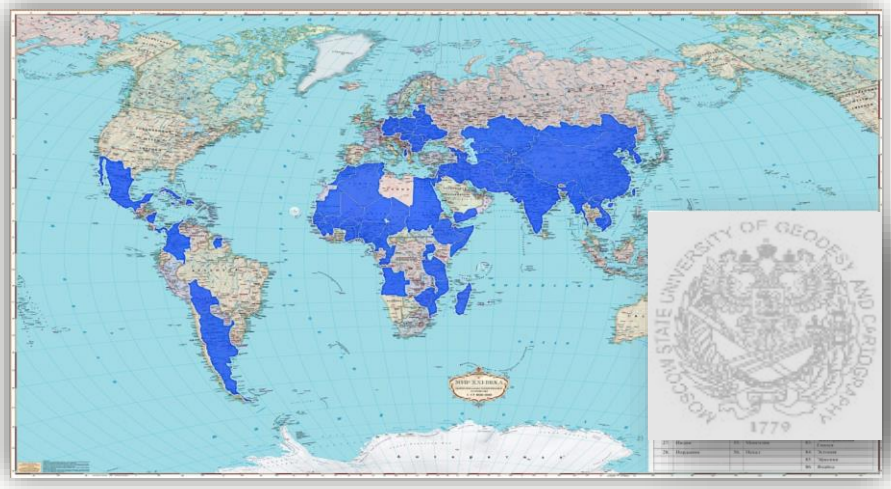
Implementation of GA Resolution 69/266 in Russia

The Interstate Council of CIS Member States on Geodesy, Cartography, Cadastre and Remote Sensing

Two basic organizations for the CIS Member States are identified:

- Core scientific and technical organization in the field of geodesy, cartography, cadastre and remote sensing –*Russian State Center of Geodesy, Cartography and SDI*
- Core organization for training and capacity building in the field of geodesy, cartography, cadastre and remote sensing – *Moscow State University of Geodesy and Cartography (MIIGAiK)*

  Foreign graduates of MIIGAiK work all over the world:



Within the Council's activities the following working groups are functioning :

- Working group on Spatial Data Infrastructure
- Working group on Reference Frames
- Working group on Geospatial Information Management
- Working group on Geographical Names

Global Geodetic Reference Frame

"*The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.*"

Mark Weiser, 1991, Chief Scientist, Xerox PARC

Towards an appropriate governance framework

The GGRF is the foundation for all geospatial information

1) Working group on Global Fundamental Geospatial Data Themes:

GGRF is included in the minimal list of fundamental global geospatial data themes -

Global Geodetic Reference Frame

2) Working Group on Geospatial Information of the IAEG-SDGs

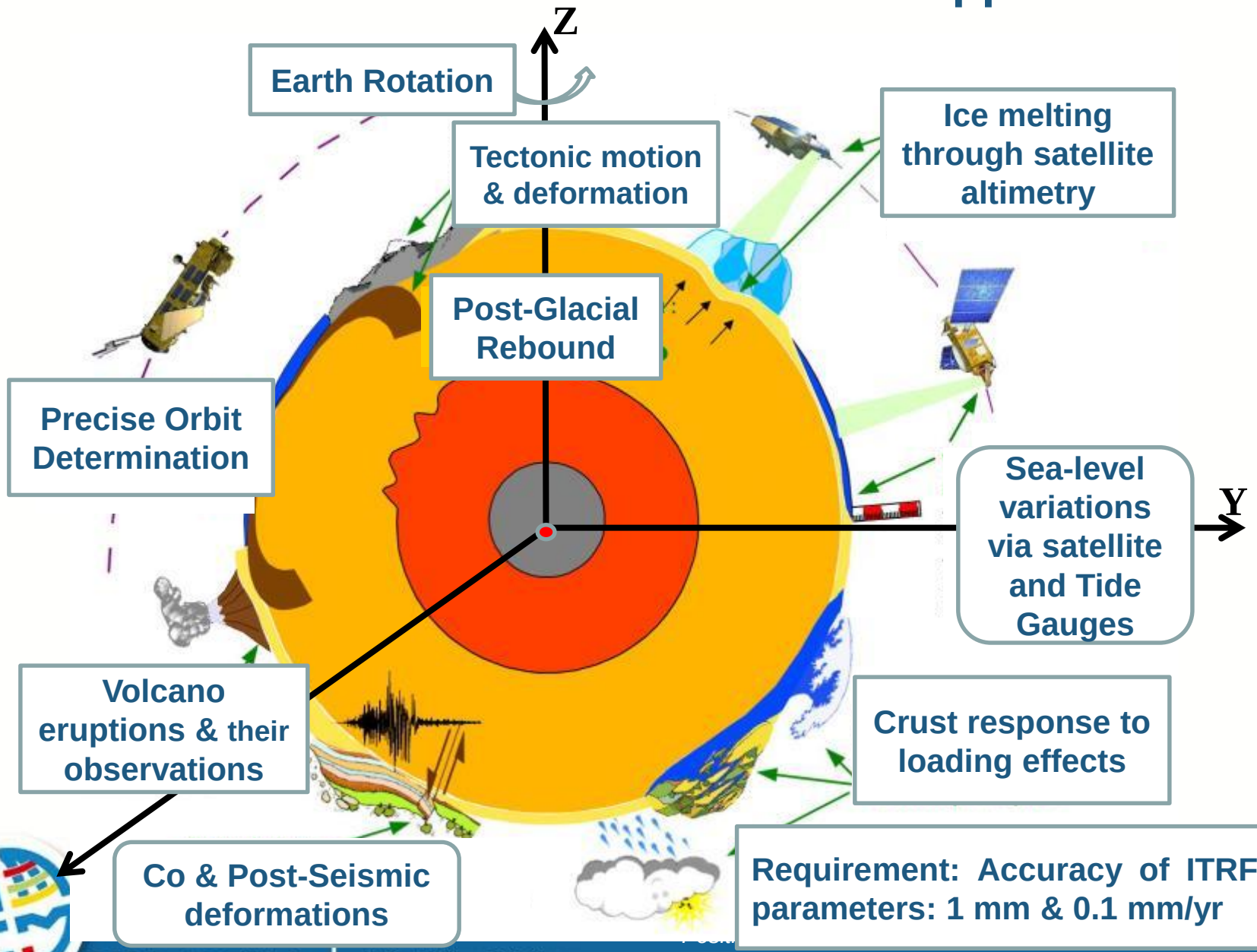
Noted the contribution of geospatial information to SDGs evaluation -

3) Expert Group for the Integration of Statistical and Geospatial Information:

Principle 1. Use of fundamental geospatial infrastructure and geocoding

'All statistical unit record data should be collected or associated with a location reference'

The reference frame & Earth science applications

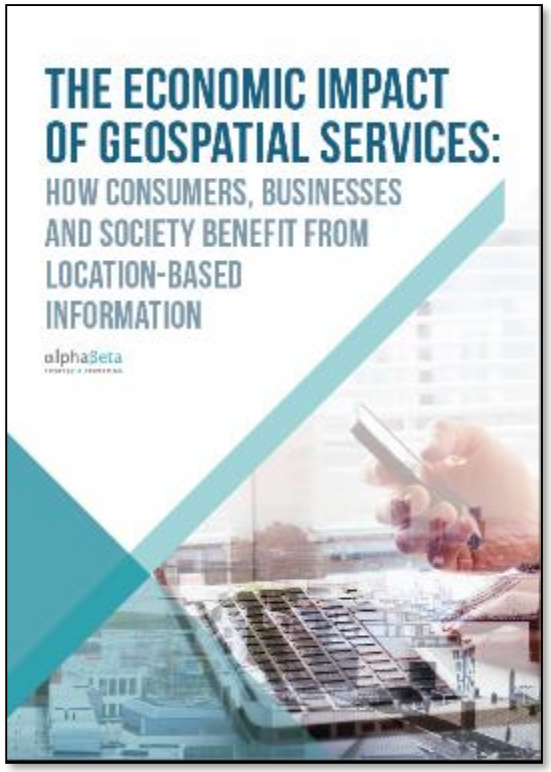


Economic Impact of Sea Level Rise

- **Rising sea levels could cost the world $14 trillion a year by 2100**

(Flood damage costs under the sea level rise with warming of 1.5 ºC and 2 ºC, *Environmental Research Letters* (2018). DOI: 10.1088/1748-9326/aacc76 , http://iopscience.iop.org/article/10.1088/1748-9326/aacc76)

Potential for Economic Growth



Geospatial services industry generated revenue of approximately

US$400 BILLION IN 2016.

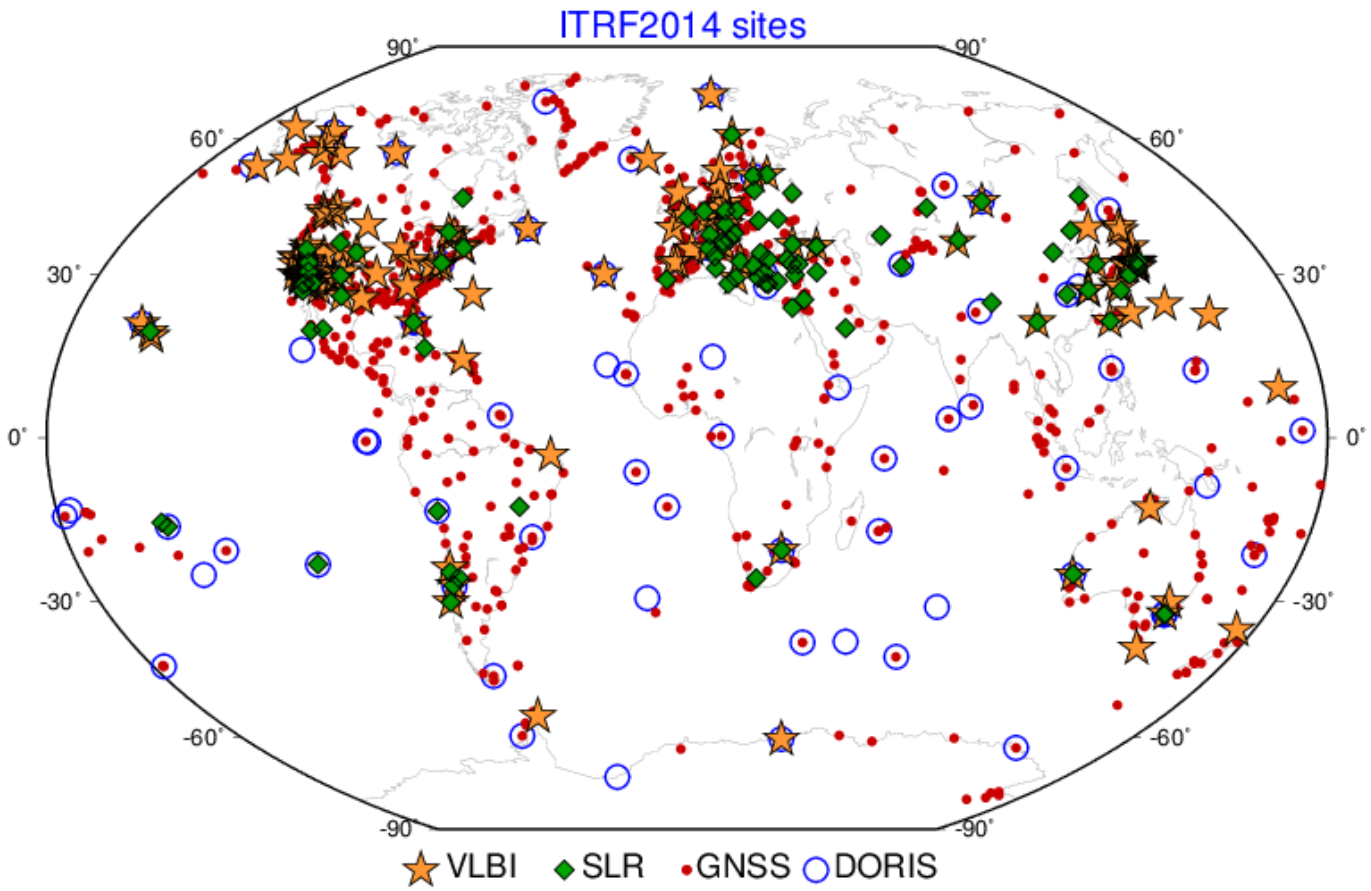
Geospatial services could have a significant productivity impact in sectors representing approximately

75% OF GLOBAL GDP.

Economic benefit to society

- Conservative estimate of economic benefits based on a 10cm positioning capability across Australia and New Zealand
- Figures based on benefit to the projects tested, rather than the entire benefit
- Does Not include very precise positioning, or general GNSS positioning, both of which also rely on the GGRF

Geodetic Infrastructure: our heritage since space geodesy era



SLR

VLBI

GNSS

DORIS

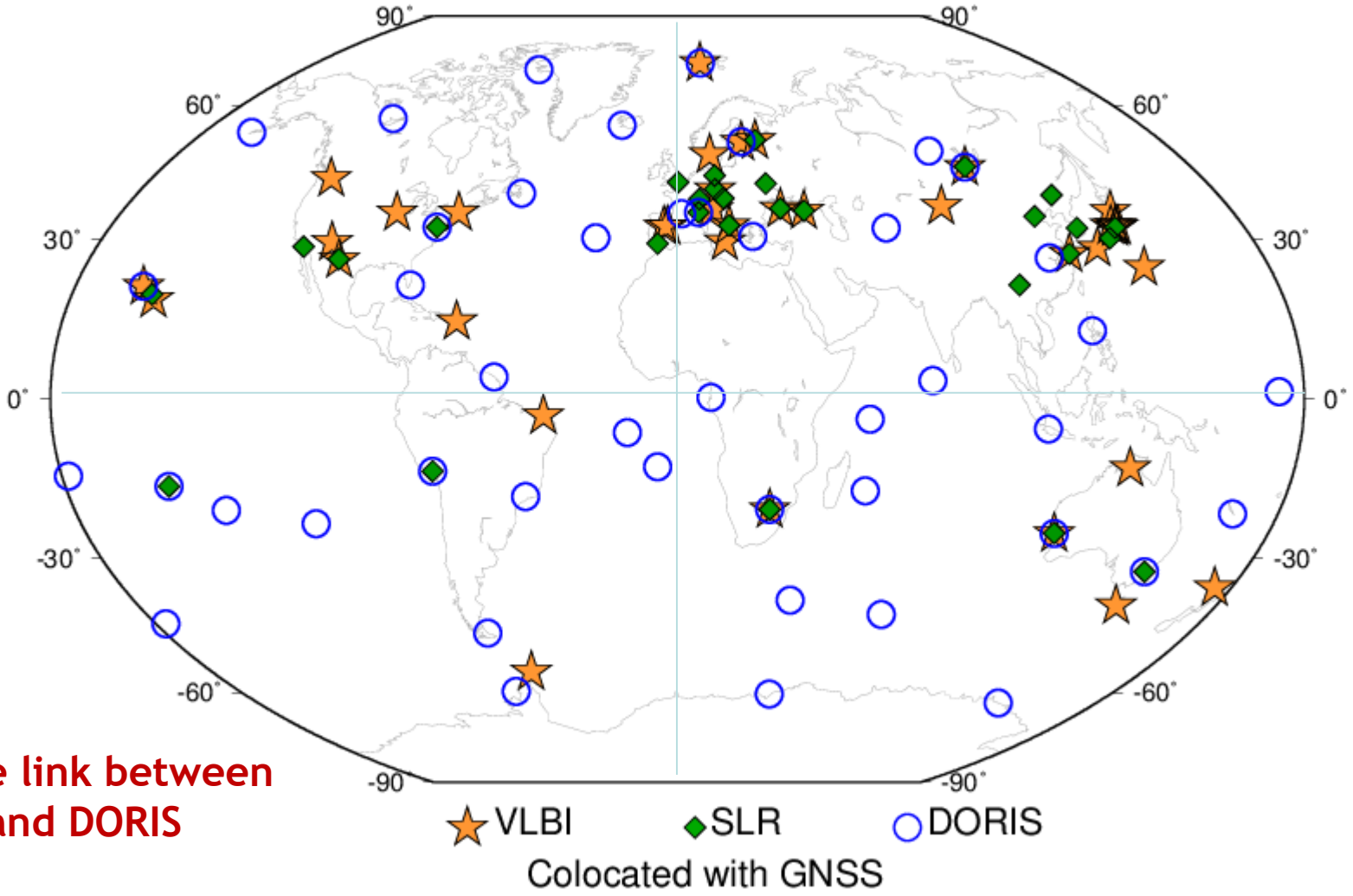
BUT: only 35% of VLBI and SLR sites are in operation today
Most of the old decommissioned sites were of poor quality

Current co-locations (multiple instruments at the same site)

SLR 30 sites

VLBI 44

DORIS 45



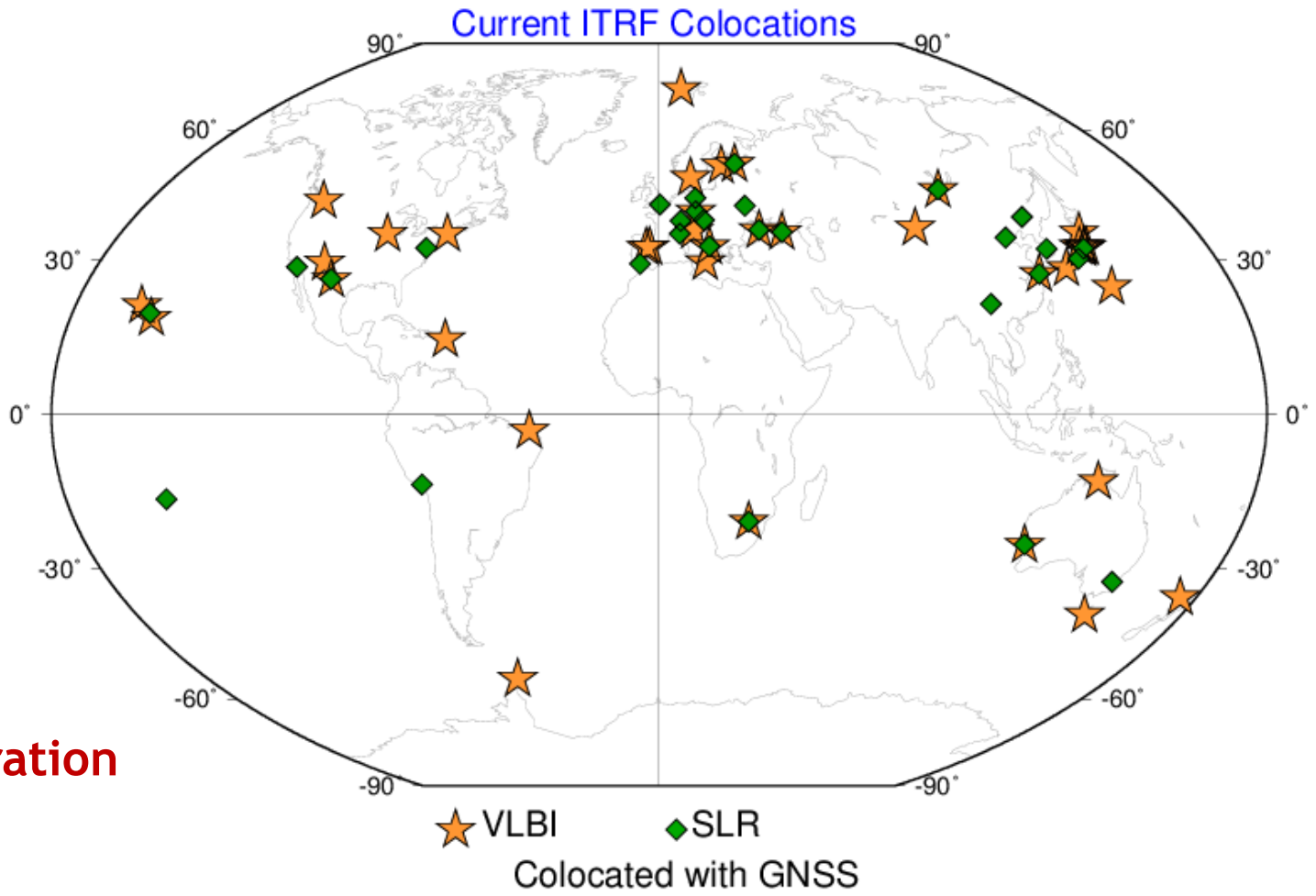
GNSS is the link between SLR, VLBI and DORIS

Risk of degradation

SLR 30 sites

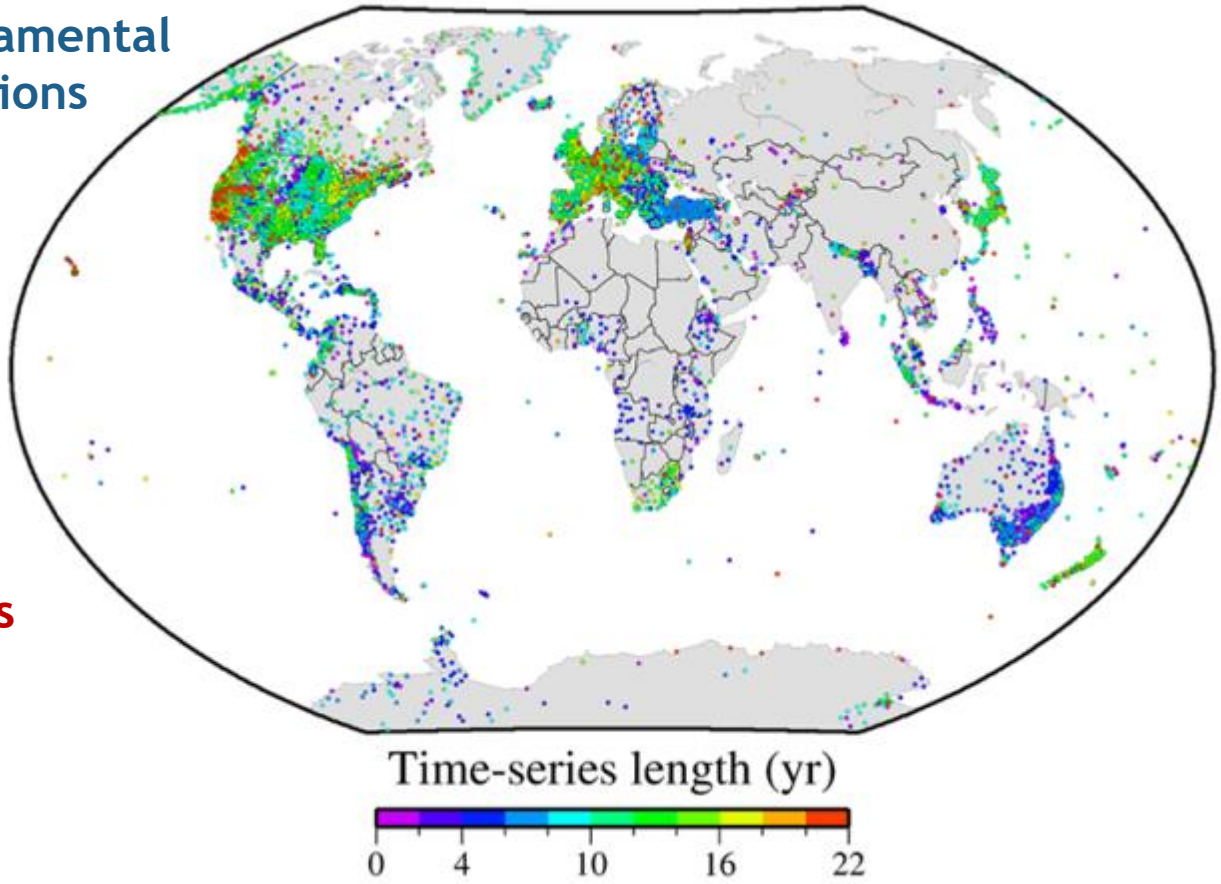
VLBI 44

- **SLR & VLBI are fundamental**
- **Poor/uneven distribution**
- **> 50 % old-generation systems**



Access to the GGRF/ITRF via GNSS

- Open Data Sharing is fundamental to enable science applications
- Gaps in Africa, East and South East Asia & South America
- Some empty areas does not mean no GNSS stations Data is not shared



Blewitt, G., W. C. Hammond, and C. Kreemer (2018), Harnessing the GPS data explosion for interdisciplinary science, Eos, 99, https://doi.org/10.1029/2018EO104623

The Norwegian geodetic earth observatory

Photo: Bjørn-Owe Holmberg

Senegal case

Photo: Adobe Stock

Tonga and ETCB (Education, Training & Capacity Building) Projects

- **Reference Frame Competency Questionnaires- A starting point.**
  - Use as framework to ensure national progress is made
- **Increase human resources in geodetic survey**
  - Recruit graduates in surveying & BSc physics and mathematics
- **Attending workshops and seminar Asia Pacific Region**
  - co-organised by ETCB, UNGGIM AP WG1, FIG CDN AP, PGSC in GGRF, GNSS & CORS
- **Follow-up in-house hands-on training**
  - Downloading, processing, adjusting & storing GNSS campaign observation by PGSC helpdesk

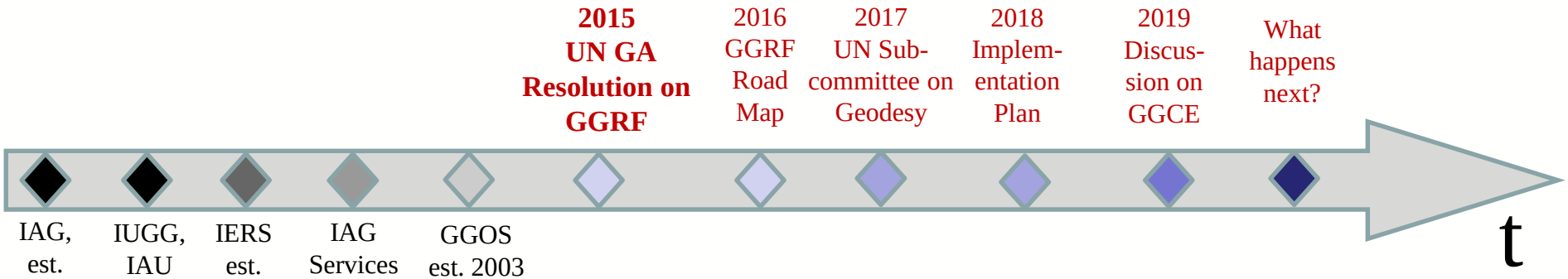
How to Close the Gaps Between SIDS and Developed Countries

Actions	
Utilising Reference Frame Competency Requirements	Use it as framework to ensure progress is made and required competencies are met.
Facilitate educational opportunities at regional level Eg Pacific Geospatial & Surveying Council for Pacific Islands	Identify universities with related program to geodesy and explore opportunities Influence scholarship donors (international & national) on scholarships in geodesy Moving together as a region-leaving no one behind
More qualified/specialised staff	Post-graduate research in specialised areas in geodesy Increase ability in soft-skills
Regional and national strategy	This will ensure geodetic systems & infrastructures are plan for and developed such as GNSS, CORS, modern datum & vertical reference frame, geoid model etc Capacity development to ensure self-reliance & sustainability
Get political will with ongoing engagement	Ensure long-term support
Empower SIDS	Create a forum or platform for SIDS to engage, share experiences & voice their needs-regional & global

How Enhanced Governance can help the Situation

- It will assist in identifying and providing technical assistance, knowledge sharing and training to enable nations
- Organised and comprehensive ETCB
  - Can map the situation in regions and nations
  - Perform advocacy and help planning
  - Will provide a platform for SIDS to collaborate and voice their needs
- ETCB
  - Ensure long-term operation and ensure benefits are realised

Towards an appropriate governance framework



Key event - adoption GA resolution on GGRF in 2015, when the UN noted the need of sustainable reference frame as an item of the global agenda.

- *Now the UN became the only intergovernmental organization considering the issues of global Geodesy*
- *UN-GGIM and the Subcommittee on Geodesy are becoming a bridge on the global level between the existing global geodetic community and Member Nations governments*

Future task:

- *realization of the Actions from the Implementation Plan for Observers, Member Nations and Subcommittee itself require resources*
- *need for further development and deepening of the Inter-Governmental cooperation*

Position Paper on enhanced governance arrangements

- It is the informed opinion of the Sub-committee on Geodesy that achieving the objectives of the UN, including the Sustainable Development Goals (SDG), will be improved with the establishment of a Global Geodetic Centre of Excellence (GGCE) to oversee and facilitate the best GGRF possible. The SCoG therefore proposes to establish an GGCE under the auspices of UN-GGIM.

Photo: Anne Jørgensen

The Global Geodetic Centre of Excellence

- The Global Geodetic Centre of Excellence (GGCE) would act as an operational hub to support the objectives of UN-GGIM and the Subcommittee on Geodesy, with three initial thematic priorities: Enhance global cooperation; Provide operational coordination; Provide technical assistance and capacity building.

GGCE three thematic priorities

1. **Enhance global cooperation**
   - Bring stakeholders together to build continuity and commitment
2. **Provide operational coordination**
   - Coordinate and guide the implementation of the GGRF road map in the Member States
3. **Provide capacity building**
   - Provide advice, communication, and management support
   - Guide Member States to better utilize GGRF infrastructure to improve national to global prosperity

Photo: Andrick Lal

GGCE modalities and governance arrangements

- The exact modalities, including the role, work program and governance of the GGCE would be determined by negotiations between the Committee of Experts Bureau, the SCoG and financial donors.

Photo: Anne Jørgensen

- The GGCE could either be hosted by one nation and have a centralized organisational structure, or have a distributed structure with a core-location in a particular Member State, and with single contributions from other Member States.

Education, Training and Capacity Building

The ETCB working group seeks to

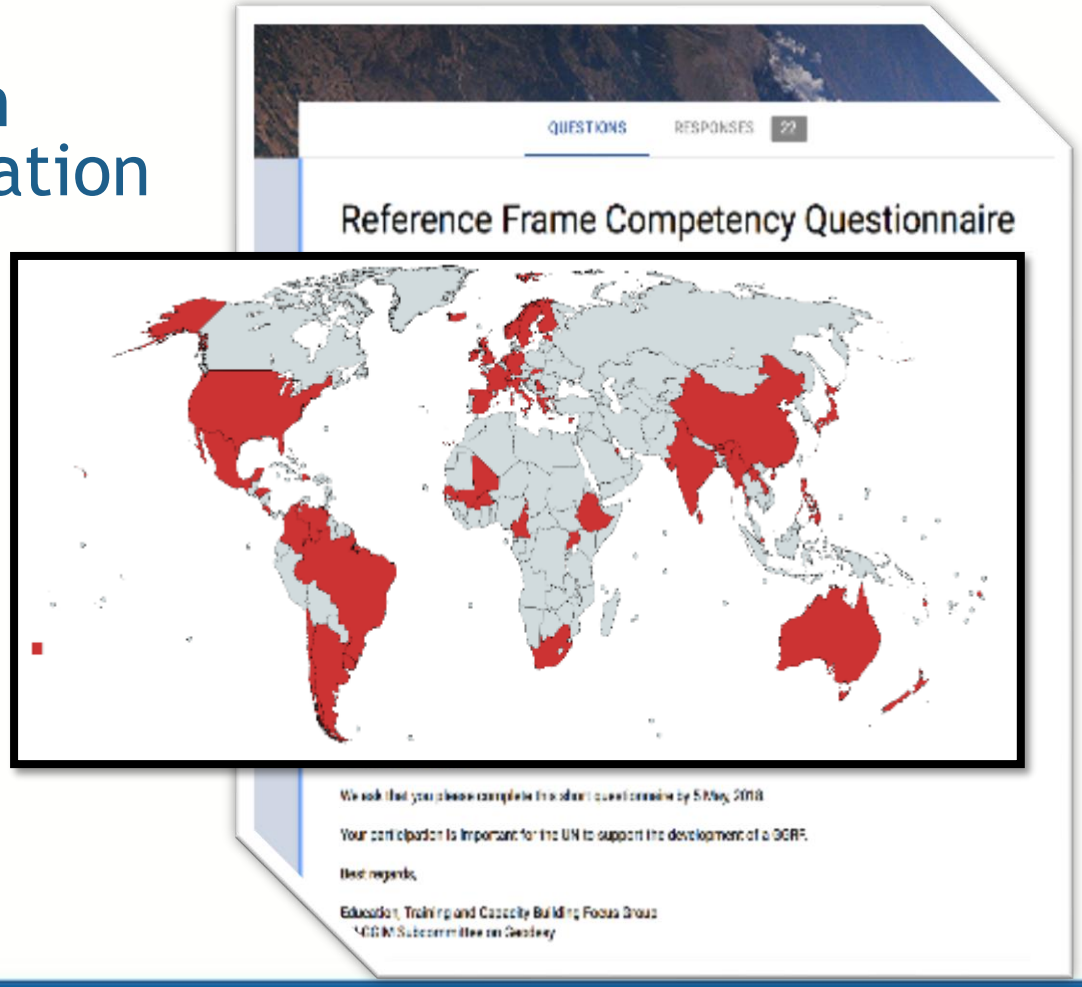
- **Assess the current availability** of education, training, and capacity building resources
- **Identify gaps** in capacity or other areas of need
- **Propose** short- and long-term **solutions** to realize the full scientific and social benefit of the Global Geodetic Reference Frame

Photo: Geoscience Australia

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:
http://bit.ly/scogsurvey



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**

Regional focused workshops including leading and contributing to special sessions as e.g.;

- FIG Working Week, April, Hanoi, Vietnam;

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

- 15th South East Asian Survey Congress, August, Darwin, Australia

- Workshop on Implementing the GGRF in Latin America, September, Buenos Aires, Argentina

Summary

- The GGRF underpins all spatial data collection, integration and application
- The sustainability and enhancement of the GGRF relies on improved governance arrangements
- A Global Geodetic Centre of excellence is an opportunity to bring the geodetic community together under the auspices of the UN resulting in improved governance
- The SCoG seeks the views and guidance of the Committee of Experts regarding the path forward


Global Framework Towards Sustainability