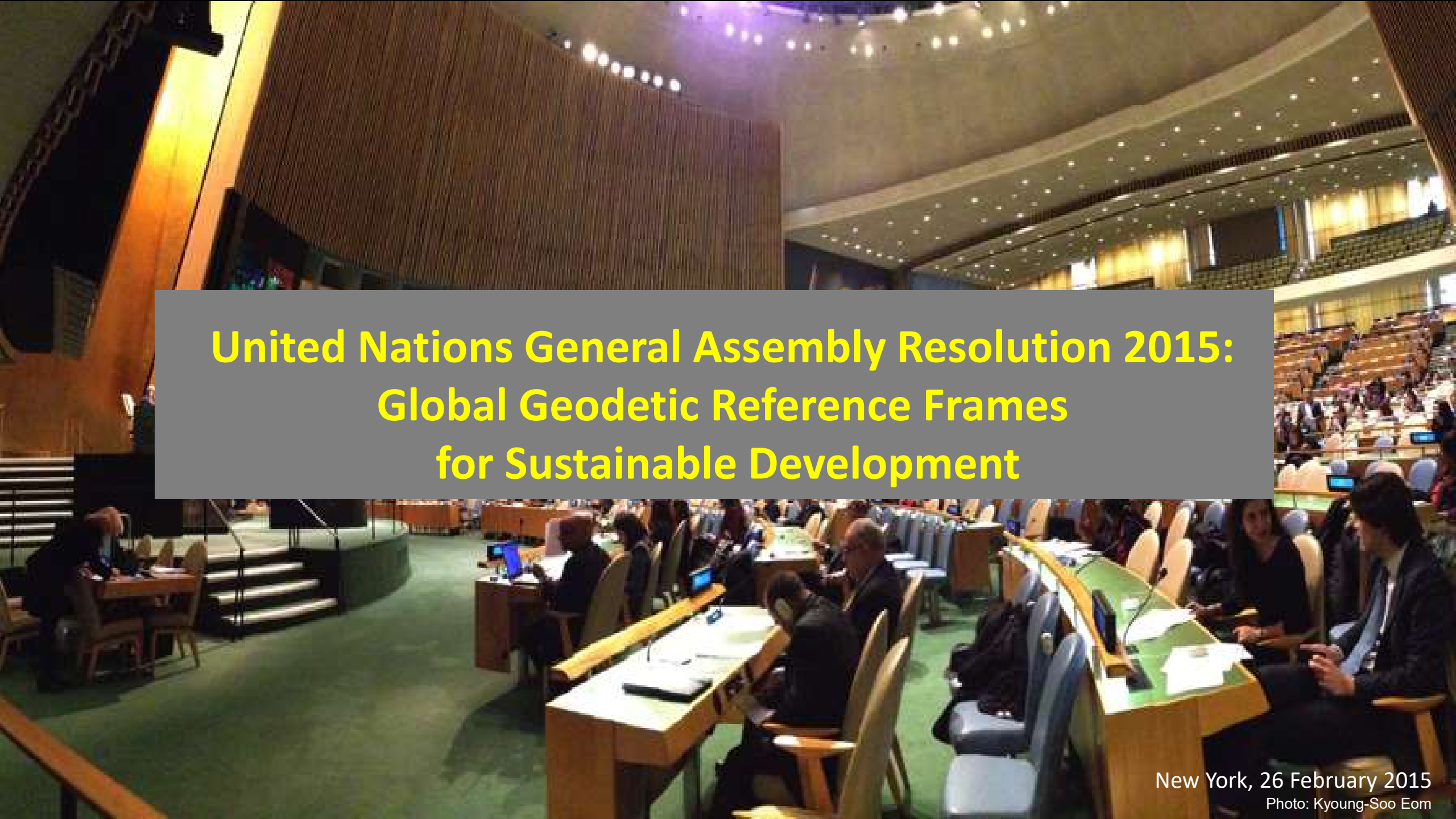
United Nations Global Geospatial Information Management Subcommittee on Geodesy Education, Training and Capacity Building Efforts in support of the GGRF Roadmap Implementation Plan

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)

April 2019



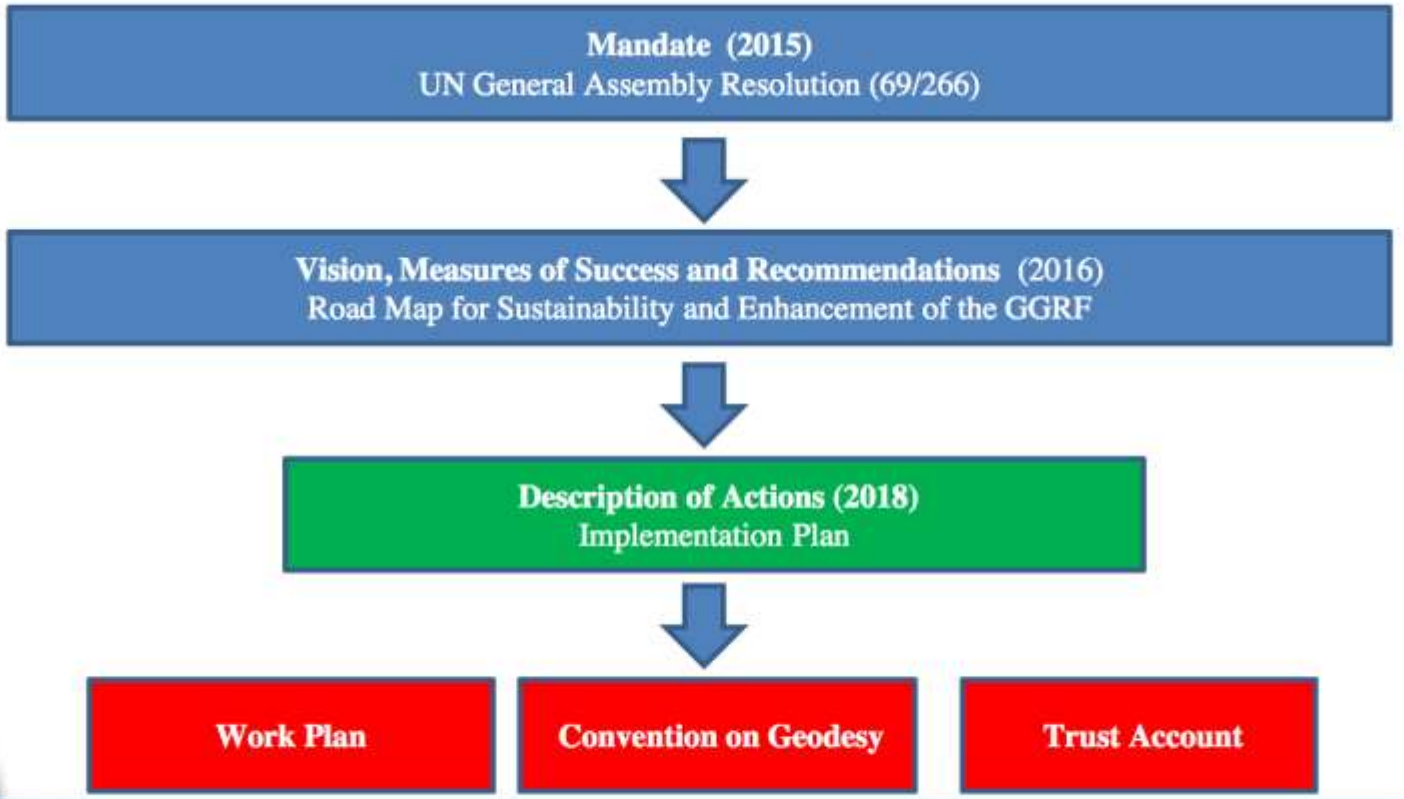
United Nations General Assembly Resolution 2015: Global Geodetic Reference Frames for Sustainable Development

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



Slide courtesy of Gary Johnston/ UN GGIM SCoG

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**


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

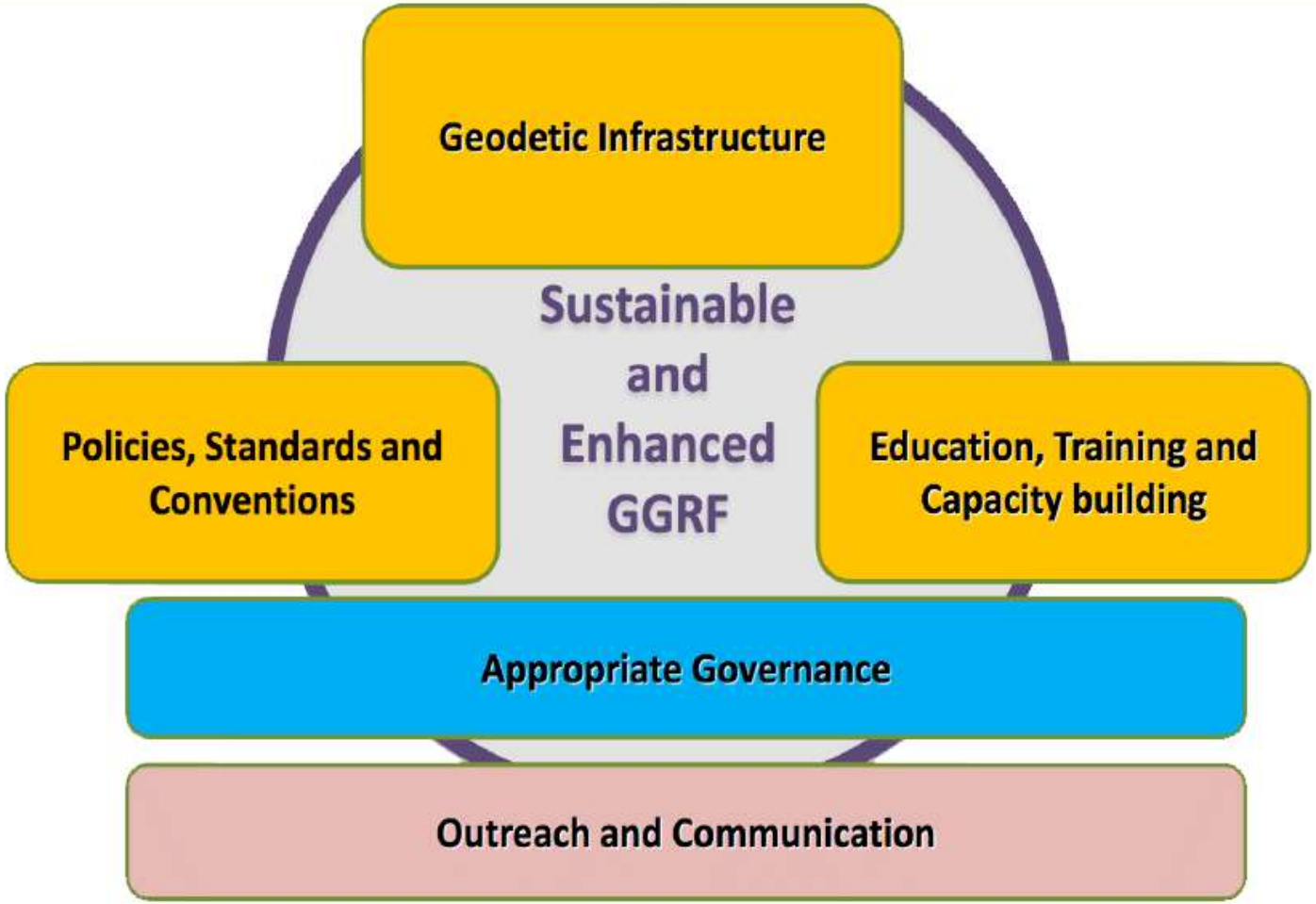
“A global reference frame is key if you want to be able to compare data from all continents; and to empower scientists from all parts of the world – to really give precise information, to make the planet a better place.”

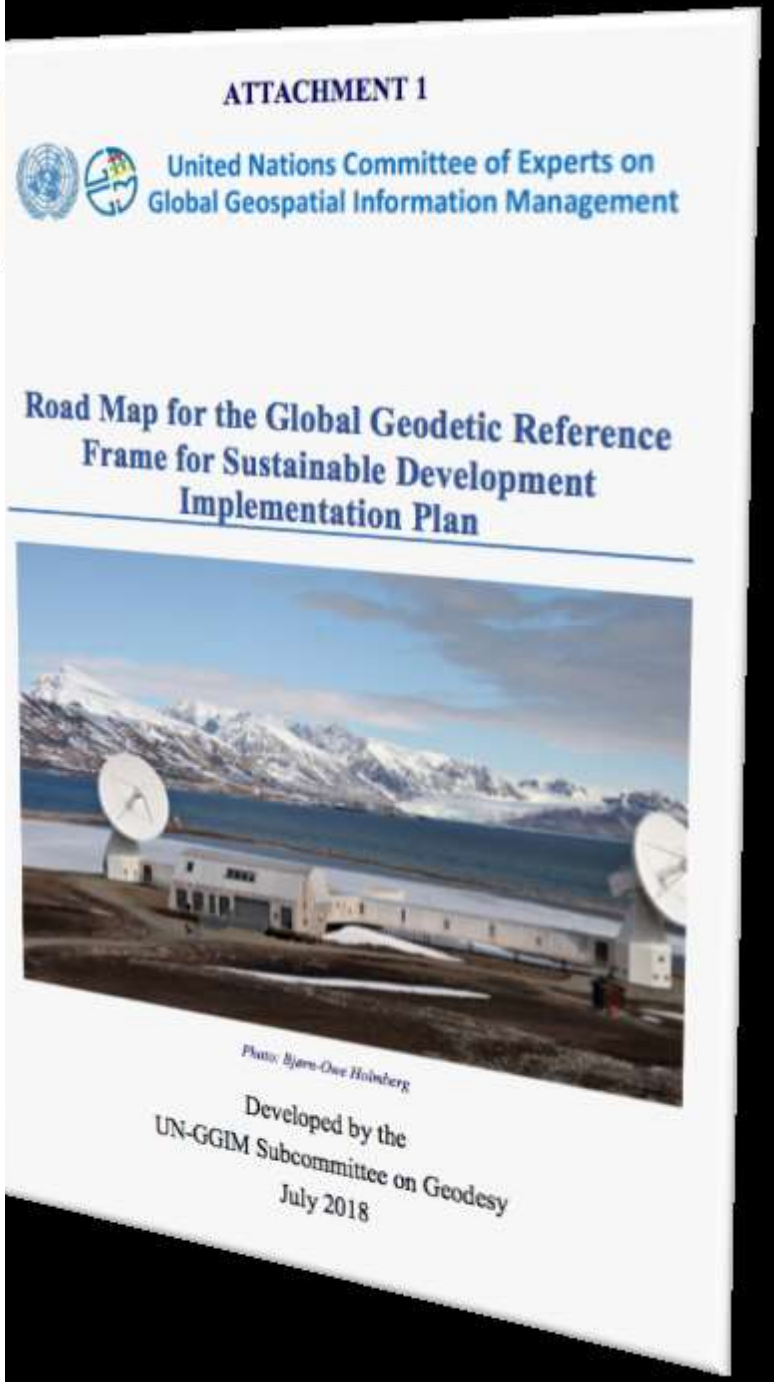
– Erik Solheim, Executive Director

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-Ove 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

ADVANCE UNEDITED VERSION

E/C.20/2016/4/Add.1

UNITED NATIONS

Economic and Social Council

8 July 2016

Committee of Experts on Global Geospatial Information Management
Sixth session
New York, 3-5 August 2016
Item 4 (f) of the provisional agenda*
Global geodetic reference frame

Global geodetic reference frame

Note by the Secretariat

Summary

The present paper contains the report of the Working Group on the Global Geodetic Reference Frame for consideration by the Committee of Experts on Global Geospatial Information Management.

At its fifth session, held in New York from 3 to 7 August 2015, the Committee of Experts adopted decision 5/102, in which it commended the considerable efforts of the Working Group on the Global Geodetic Reference Frame and expressed its appreciation to Fiji for its leadership in the preparatory process and in the final formulation and successful tabling of the resolution on the global geodetic reference frame for sustainable development to the General Assembly with the support of 52 co-sponsoring countries. Acknowledging the importance of the resolution and of the road map as critical enablers for sustainable development, the Committee of Experts encouraged Member States and the Working Group to gather inputs on the key elements of the development and sustainability of the global geodetic reference frame, including the need to address the imbalance in the distribution of geodetic infrastructure globally, in particular between the North and the South, and to commit to undertaking outreach programmes to ensure that experiences and best practices were communicated effectively, particularly to developing countries. In its report, the Working Group presents progress on the road map, which includes issues related to infrastructure, policy, standards and conventions, education, training and capacity-building, communication and outreach, and governance.

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

Level	Competency Requirements	Training provided by	
1	Basic understanding of: • GNSS • Reference frames, including geoid models, vertical and horizontal datums	• 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: • 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	• 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: • 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	• 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: • 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	• 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	
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Level	Competency Requirements	Training provided by	
4	The above plus expert knowledge of: • 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	• 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?

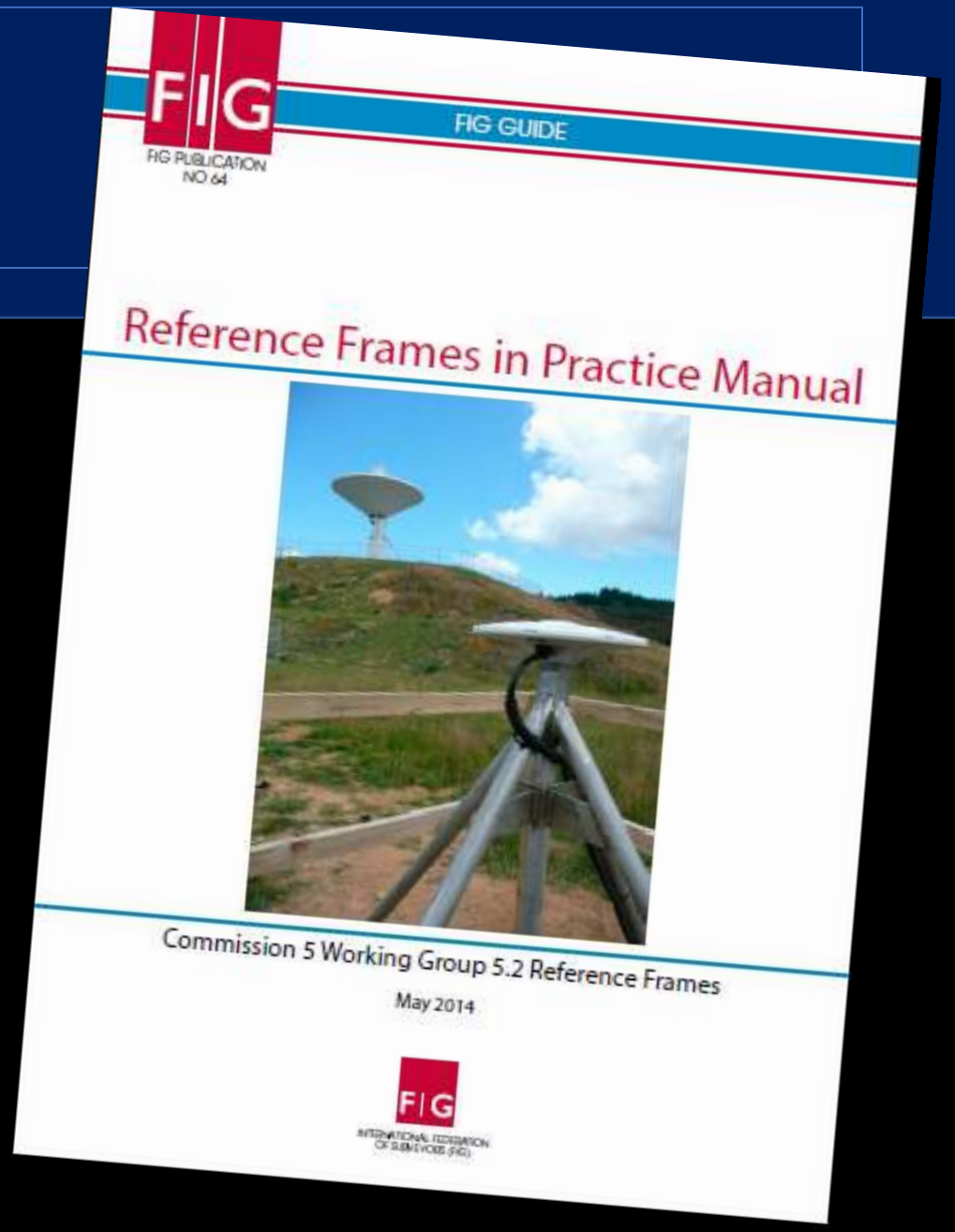
Pilot Initiative:
Identification of Existing Capacity Building Resources and Enabling Discoverability – knowledge database

- 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 produces 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

International Federation of Surveyors

Working Week - Hanoi, Vietnam

April 2019

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

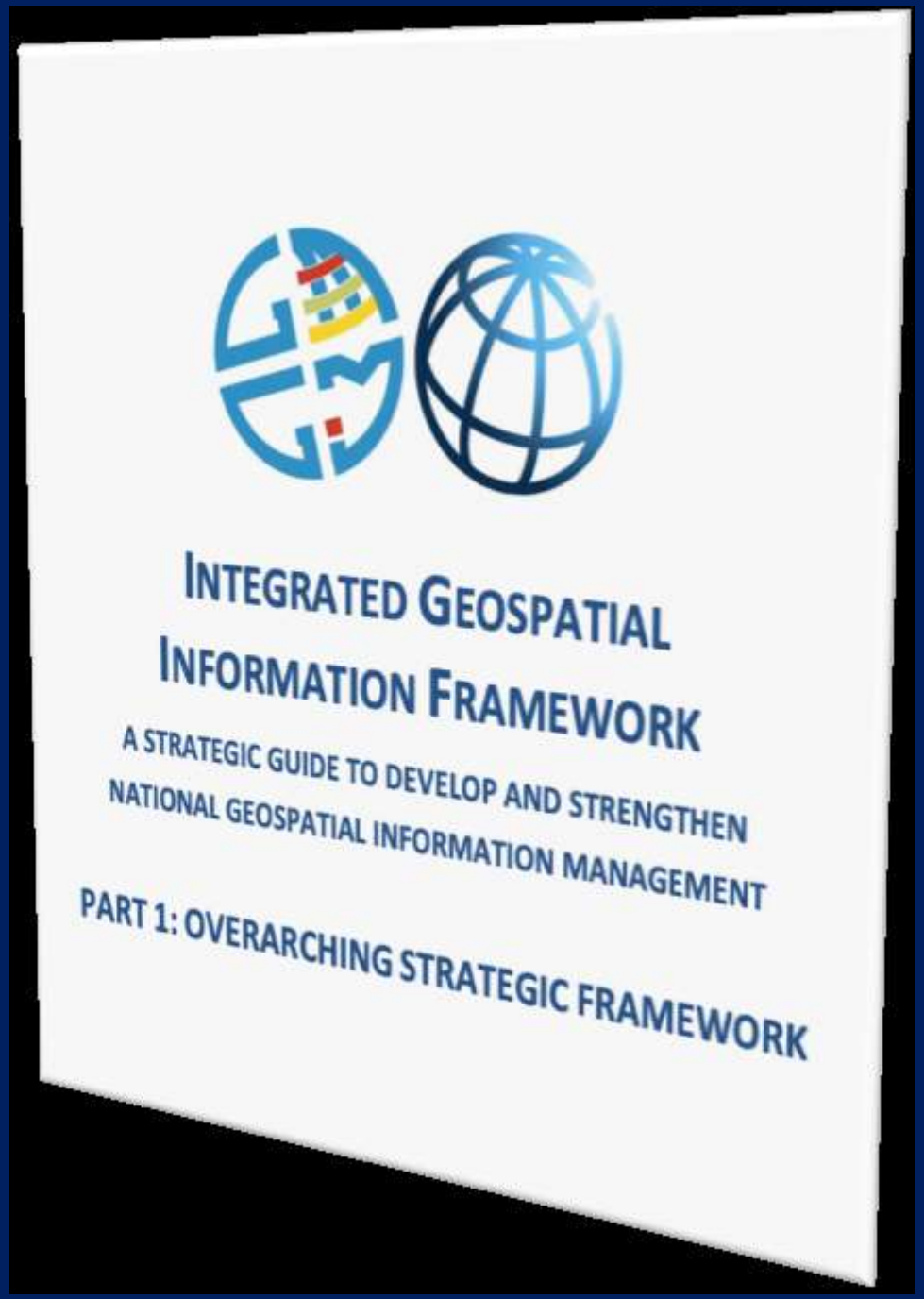
Allison Craddock

Director, IGS Central Bureau

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

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**



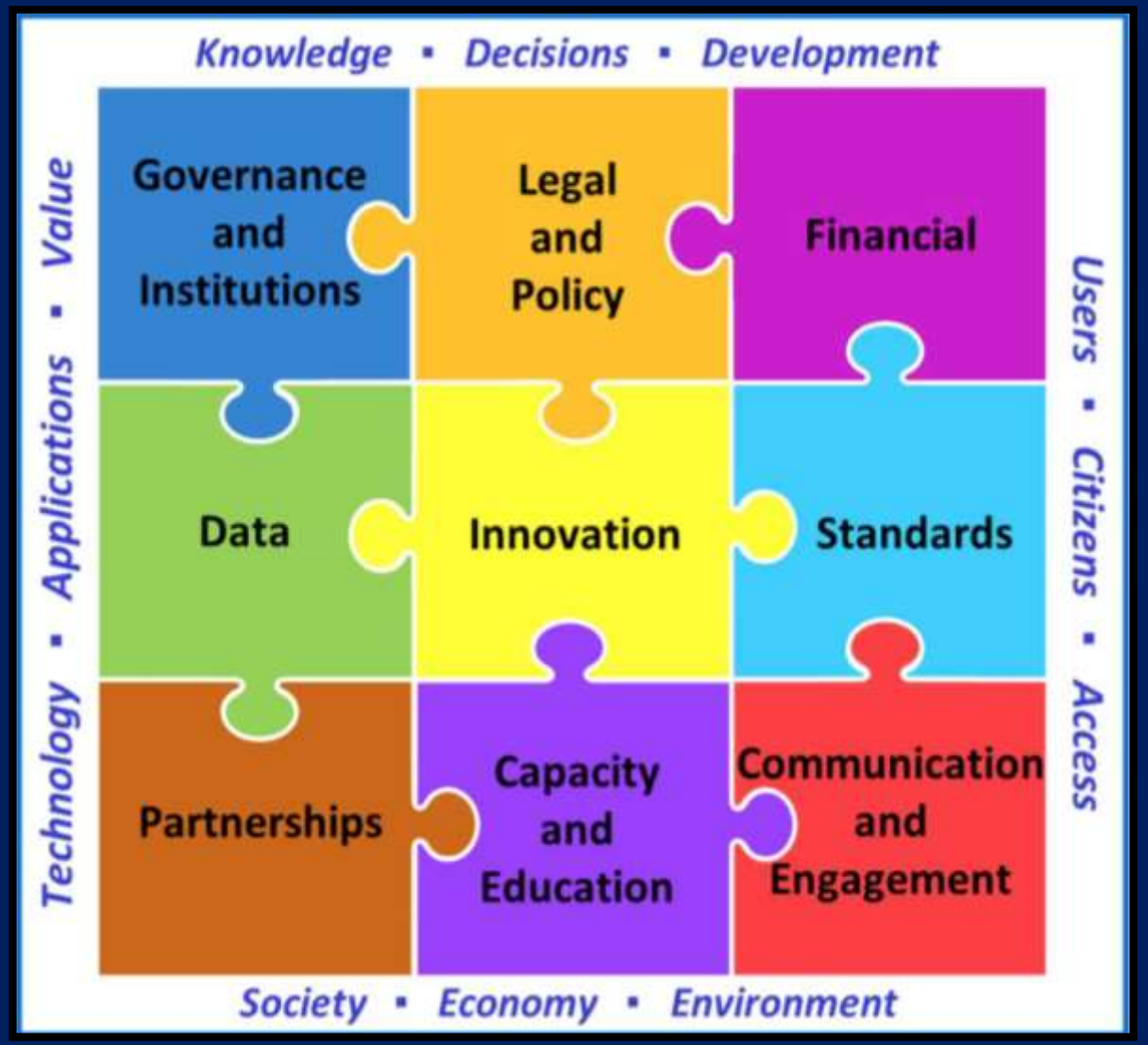
GGIM-World Bank

Integrated Geospatial Information Framework

Governance →

Technology →

People →

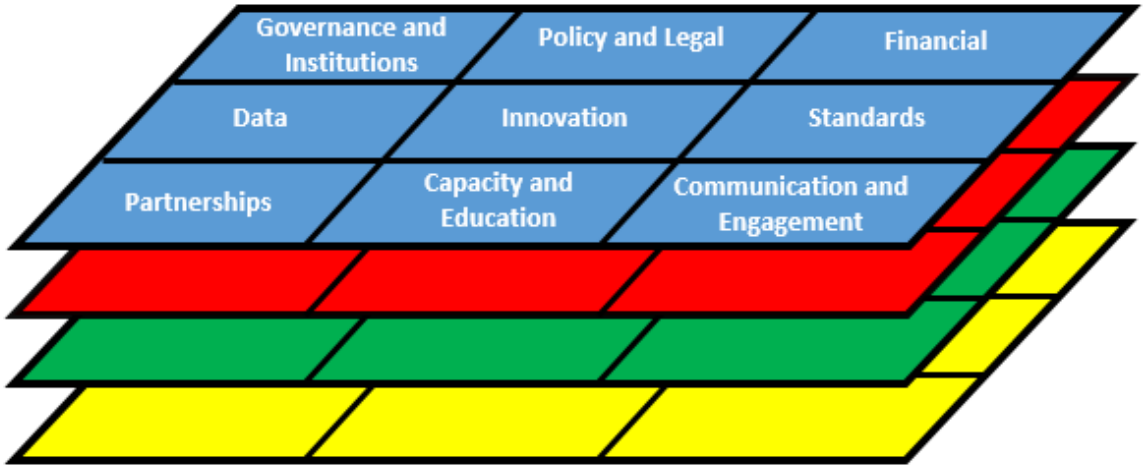


Part 1: Overarching Strategic Framework

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*
UNGGIM Implementation Plan
Administrative Boundaries
Land Parcel and Property
Water
…

Part 3: Country-level Action Plans

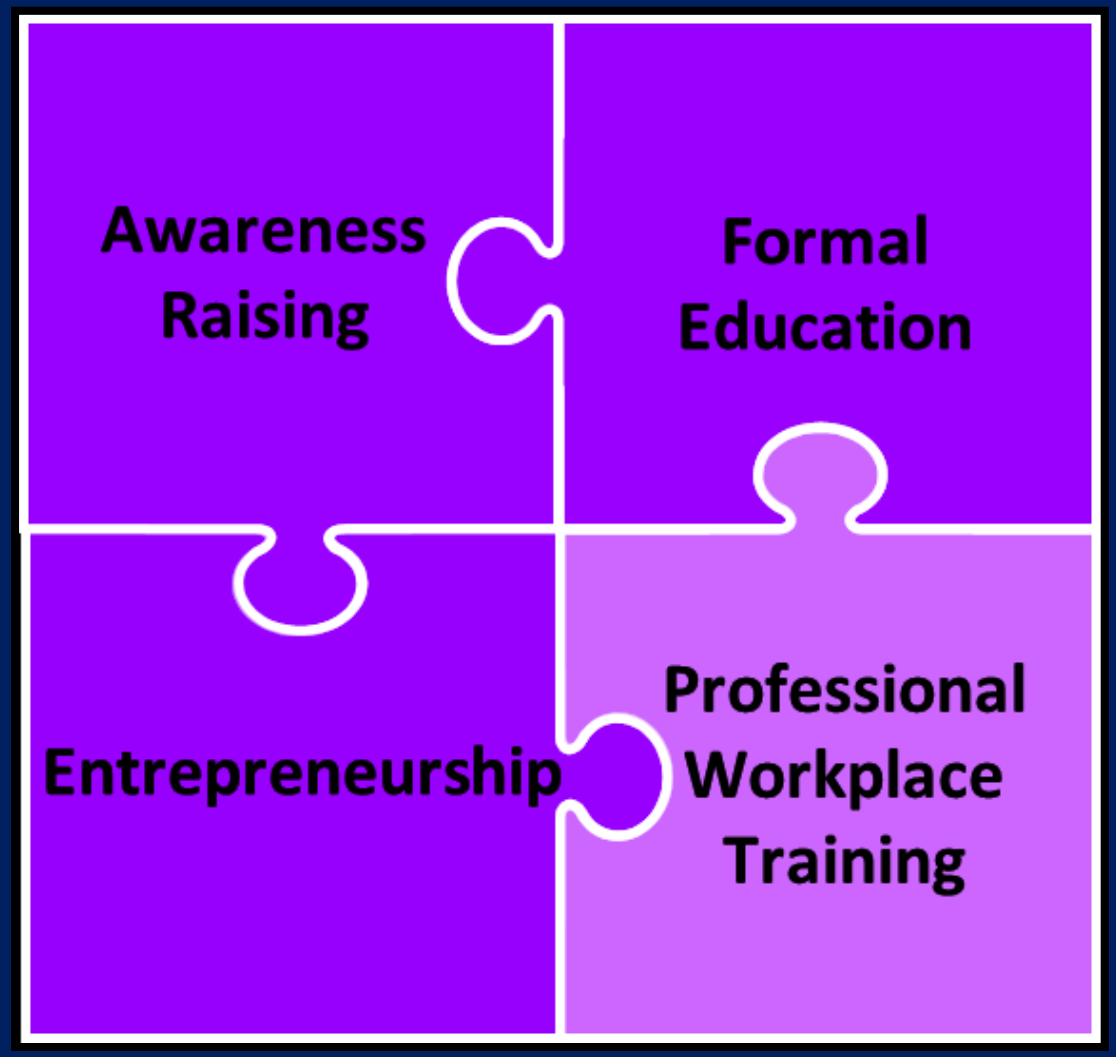
Templates and guides to operationalize the Framework

Slide Content Courtesy Nick Brown, Geoscience Australia

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

Slide Content Courtesy Nick Brown, Geoscience Australia

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**
  - Realizing the GGRF in Latin America – September 2019, Buenos Aires, Argentina
- 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)

SDG Metrics: Targets and Indicators

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.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.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

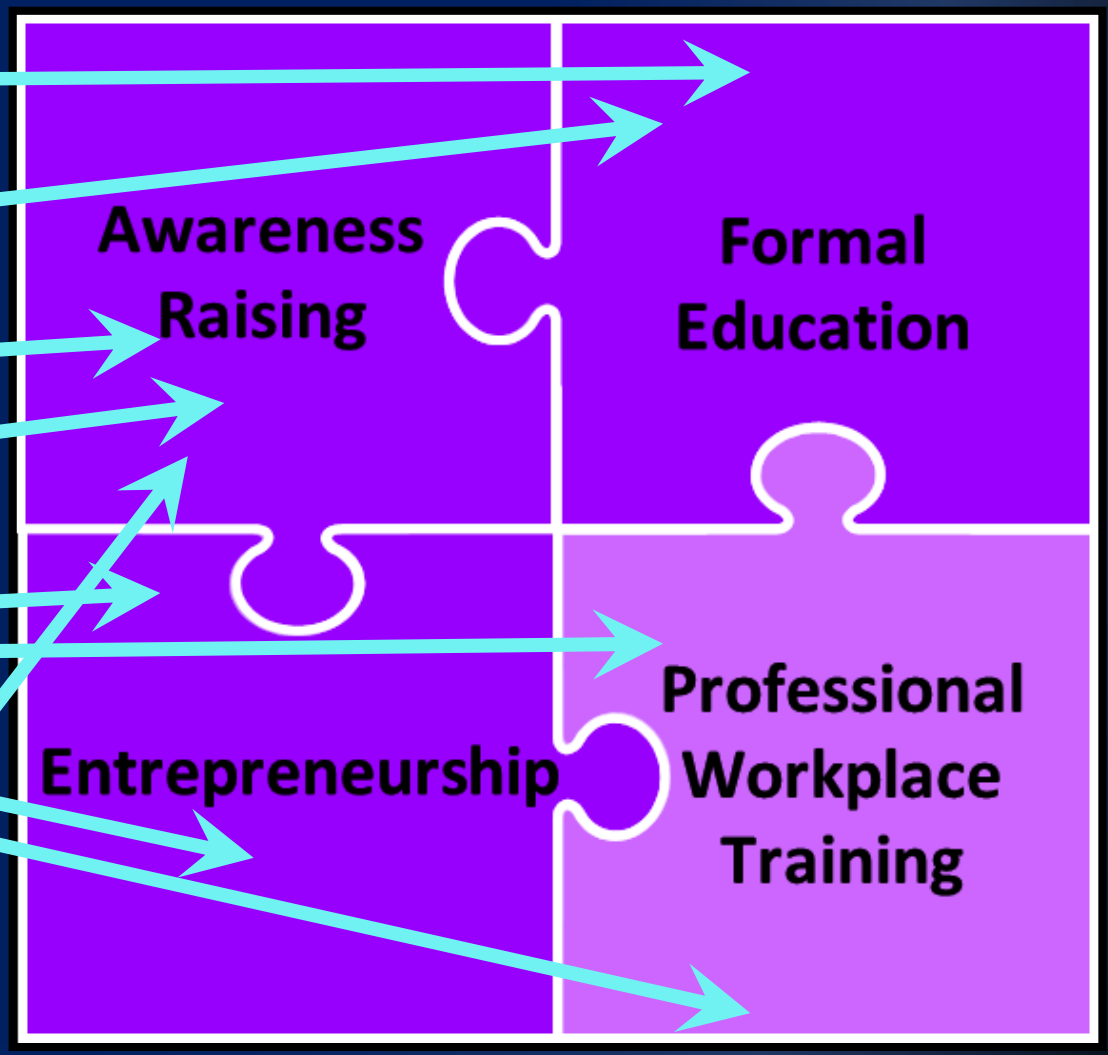
How can geodetic capacity building support achieving this goal?

- **Apprenticeships**
- **Regional Workshops**
- **Vetting and Discoverability of Education Resources (Platform)**
- **Frameworks for Capacity Building**
- **University Program Development**
- **Technical Training Sessions**
- **Certified Online Training Programs**

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

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

- Apprenticeships
- University Program Development
- Frameworks for Capacity Building
- Regional Workshops
- Technical Training Sessions
- Certified Online Training Programs
- Vetting and Discoverability of Education Resources (Platform)



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 recognising 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

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

LANTMÄTERIET

Supporting Sendai

Coordinating Earth Observations for Disaster Risk Reduction

Group on Earth Observations 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.

- According to **UNISDR**: “Regional Platforms for Disaster Risk Reduction represent core multi-stakeholder mechanisms that serve to assess progress, identify gaps and monitor the implementation of the Sendai Framework at the regional level. Regional Platforms are becoming more and more instrumental in building coherence across the disaster risk reduction, climate change and sustainable development agendas.”
- In the **GGRF Roadmap Implementation Plan**, ETCB recommended to “Develop a capacity building programme that ensures *balanced regional representation* by encouraging regional participation on the UNGGIM sub-committee on geodesy, especially from developing or historically under-represented member states; and by working with the UN-GGIM regional groups (UN GGIM americas, europe, asia-pacific, arab states, and africa) to determine training needs at regional levels.”

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."

http://www.un-spider.org/news-and-events/news/new-un-report-geospatial-data-decision-making