The International Association of Geodesy's Global Geodetic Observing System: **Supporting the Sendai Framework through International Collaborations in Geodesy**

Allison Craddock
IAG/GGOS External Relations Manager
Jet Propulsion Laboratory, California Institute of Technology

IUGG

Global Geodetic Observing System

OVERVIEW

International Association of Geodesy's Global Geodetic Observing System (IAG/GGOS) Participation and Representation in External Stakeholder Organizations

- United Nations Global Geospatial Information Management (GGIM) Subcommittee on Geodesy (SCoG)
- Group on Earth Observations (GEO)

Current IAG/GGOS External Relations Projects in support of the Sendai Framework

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

GGOS Participation and Representation in External Stakeholder Organizations

- United Nations Global Geospatial Information Management (GGIM) Subcommittee on Geodesy (SCoG)

According to 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."

United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER); based in the United Nations Office for Outer Space Affairs (UNOOSA).

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

The Inherently International Nature of Geodesy

"Geodesy is the science of accurately measuring and understanding three fundamental properties of Earth: its geometric shape, orientation in space, and gravity field, and the changes of these properties with time."

– United States National Research Council

"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**

Major work items of the UN-GGIM

- A **global geodetic reference frame**
- Adoption and implementation of standards
- Determining global fundamental data sets
- **Geospatial information supporting sustainable development**
- Identification of trends in national institutional arrangements in geospatial information management
- Integrating geospatial, statistical, and other forms of data
- Legal and policy frameworks
- Land administration and management
- **Disaster risk reduction and resiliency**
- Marine geospatial information

[Slide text courtesy UN-GGIM Americas, as presented at a side event if the UN GGIM CoE, August 2017]

United Nations Global Geospatial Information Management (GGIM) Subcommittee on Geodesy (SCoG)

United Nations

UN-GGIM
UNITED NATIONS INITIATIVE ON GLOBAL GEOSPATIAL INFORMATION MANAGEMENT

SCoG Major Activities

- To provide an intergovernmental forum, with equitable international representation, for communication and cooperation on issues relating to **the maintenance and enhancement of a Global Geospatial Reference Frame (GGRF);**
- To develop a roadmap for a **collaborative global geodetic observation network and the associated infrastructure**, with sustainable funding and investment, as well as strategic partnerships between mapping, space and other interested agencies;
- To encourage **open sharing of geodetic data and information** that contribute to regional and global reference frames;
- To advocate for guidelines and standards to **advance the interchangeability and interoperability** of geodetic systems and data;
- To **address various technical, institutional and policy issues** related to the implementation of a GGRF

United Nations

UNITED NATIONS

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

8 July 2016

Economic and Social Council

Committee of Experts on Global Geospatial Information Management
Sixth session
New York, 3-5 August 2016
Item 4 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 5 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 in 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.

UN-GGIM Subcommittee on Geodesy (SCoG)

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

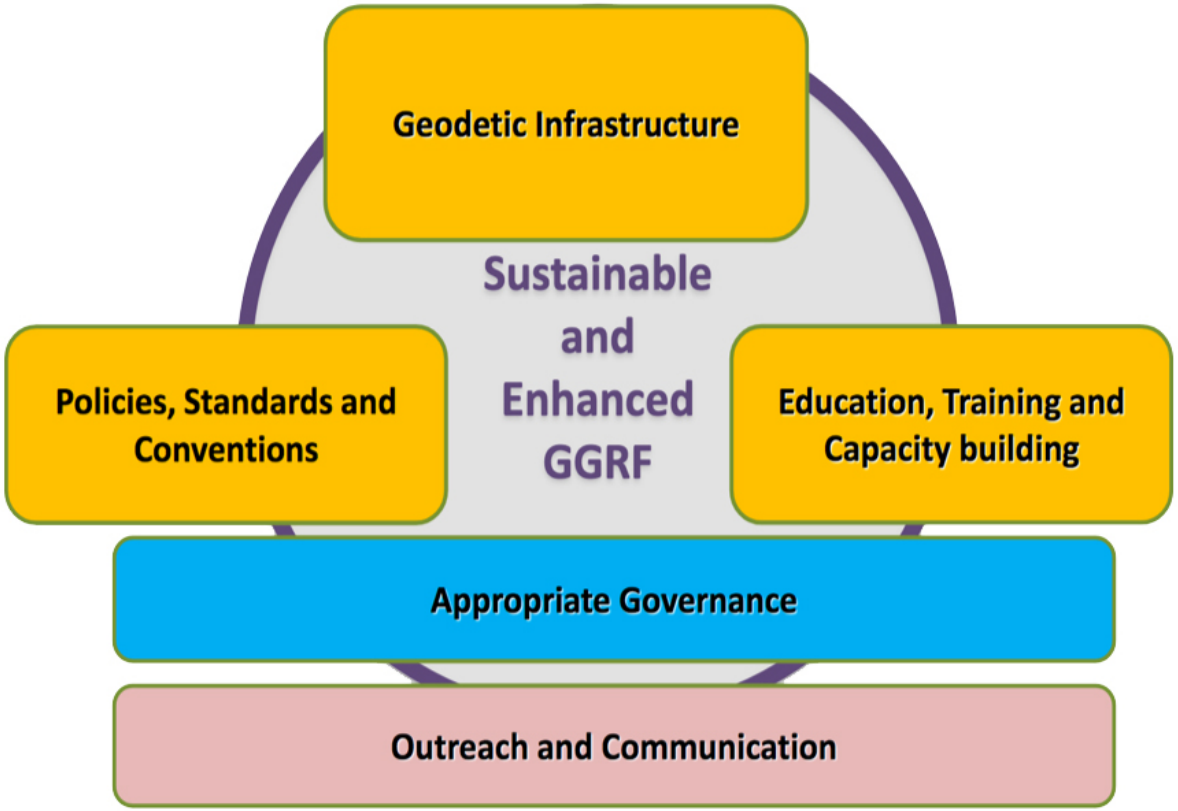
GGOS participation in SCoG focus groups, on behalf of the IAG, has ensured initial takeoff and continued momentum of progress toward a GGRF

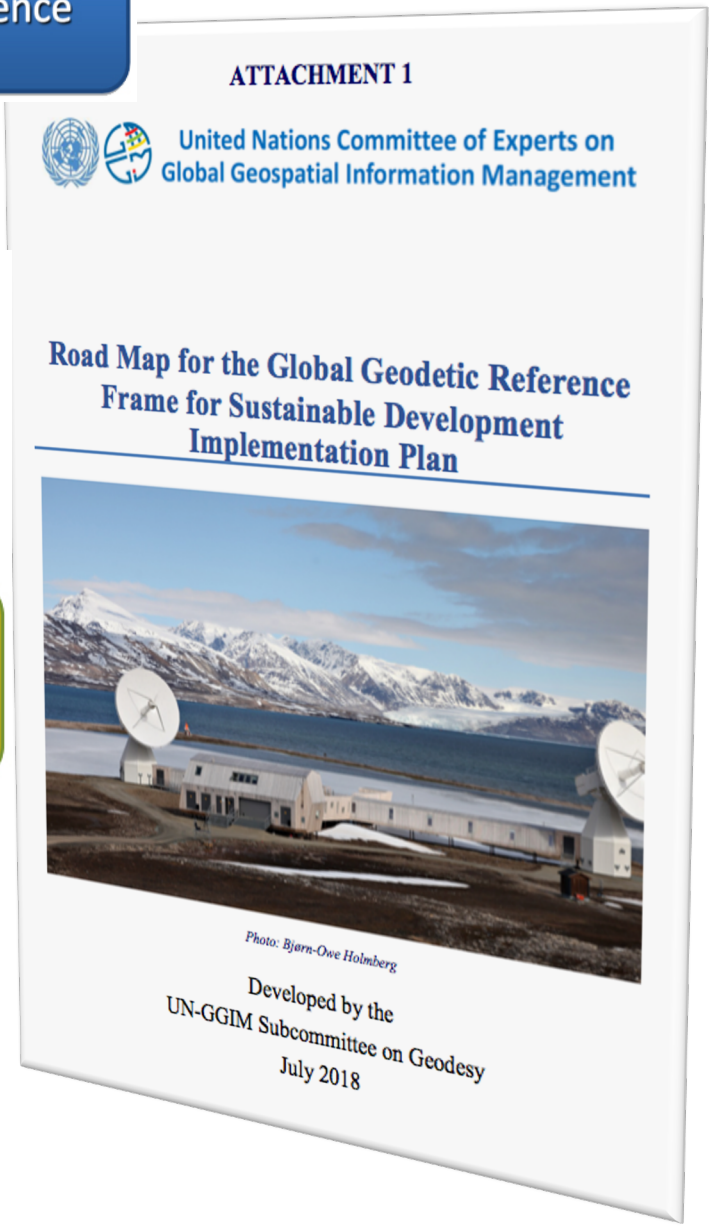
2018 Accomplishments (tabled at UN CoE GGIM 8)

- ✓ **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

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

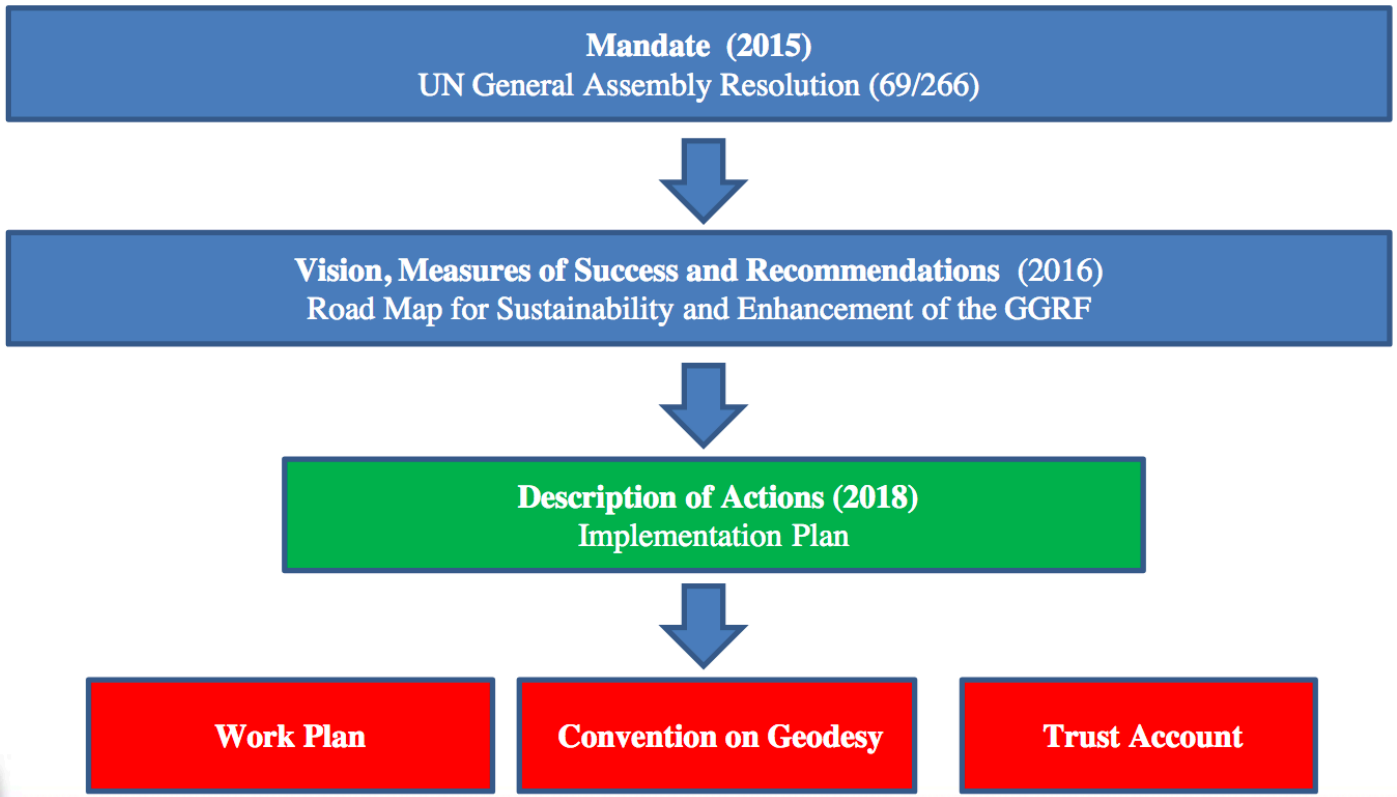
Developed by the UN-GGIM Subcommittee on Geodesy

July 2018

Slide courtesy of Gary Johnston, Geoscience Australia/ UN GGIM SCoG

Sub-Committee Progress

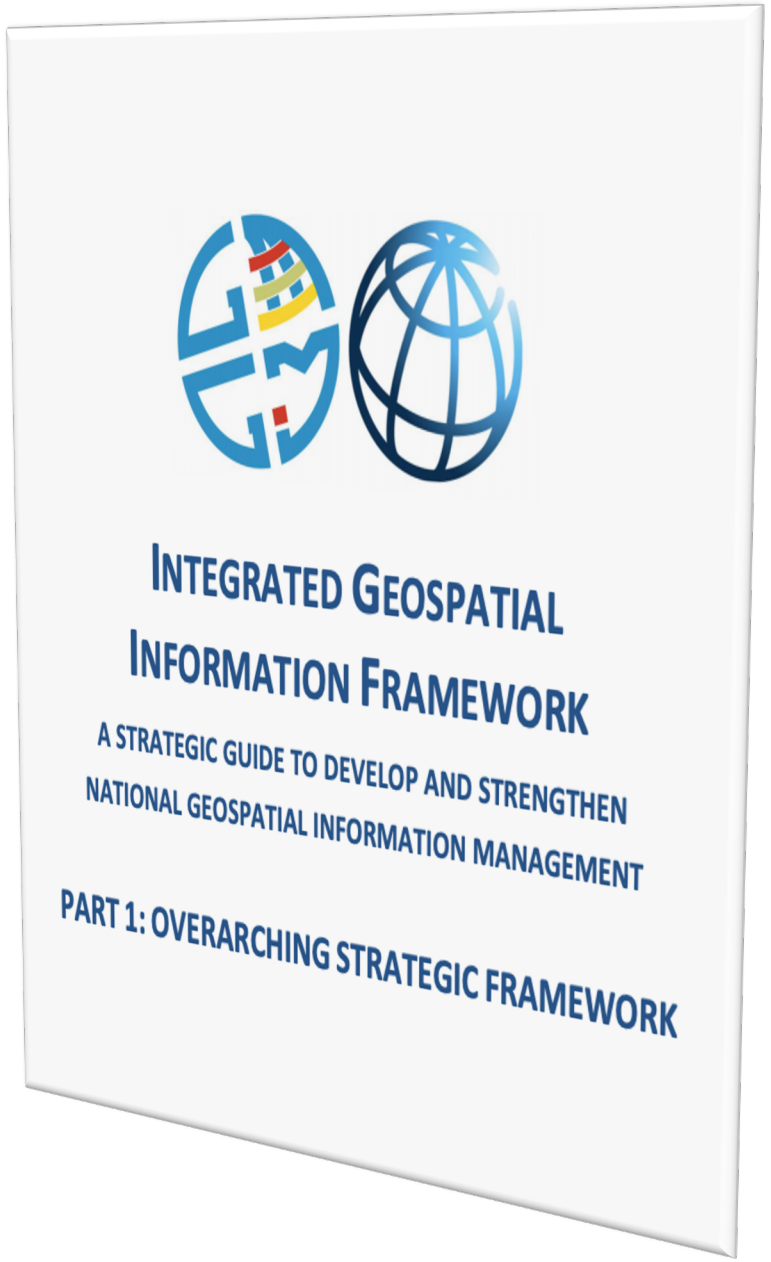
- Recognising its importance the UN General Assembly adopted resolution 69/266 in February 2015, entitled 'A Global Geodetic Reference Frame for Sustainable Development'
- At the 6th session of UN GGIM, the Road Map for the development and sustainability of the Global Geodetic Reference Frame was endorsed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



Slide courtesy of Gary Johnston (Geoscience Australia)/ UN GGIM SCoG

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

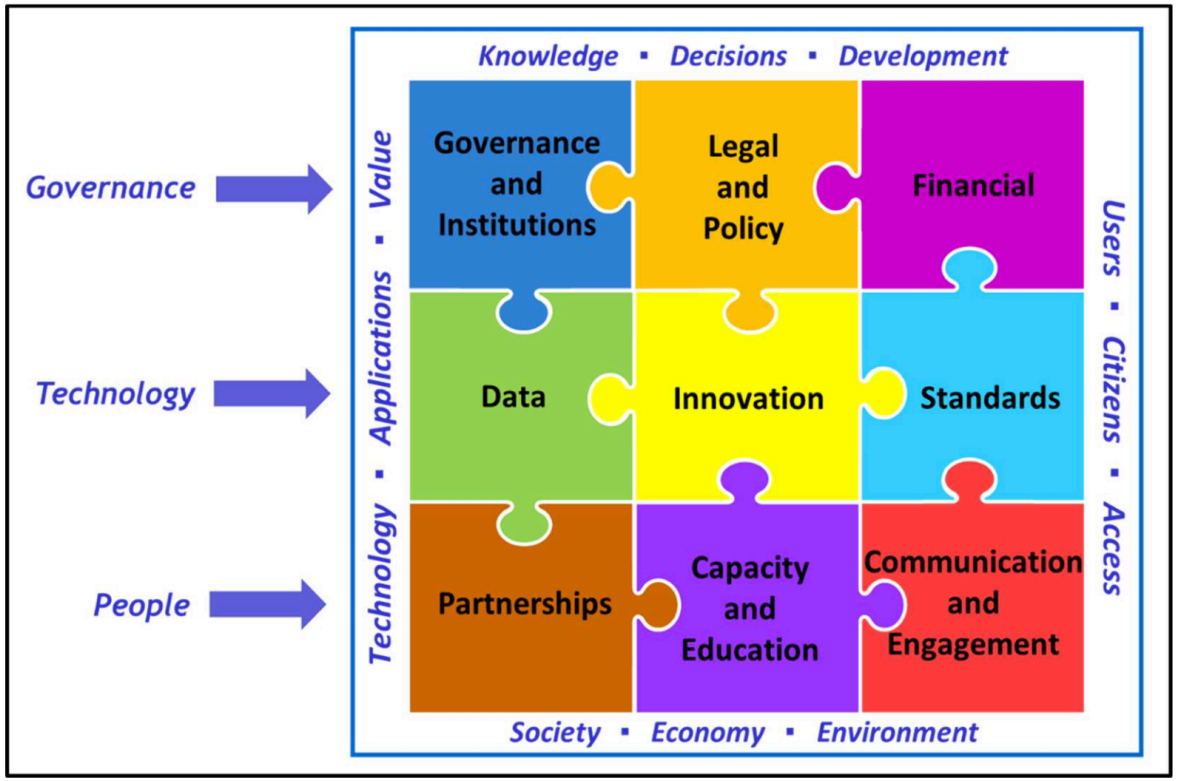


Figure 3: *The Framework is anchored by nine strategic pathways and three main areas of influence. Once implemented, the strategic pathways realize many benefits.*

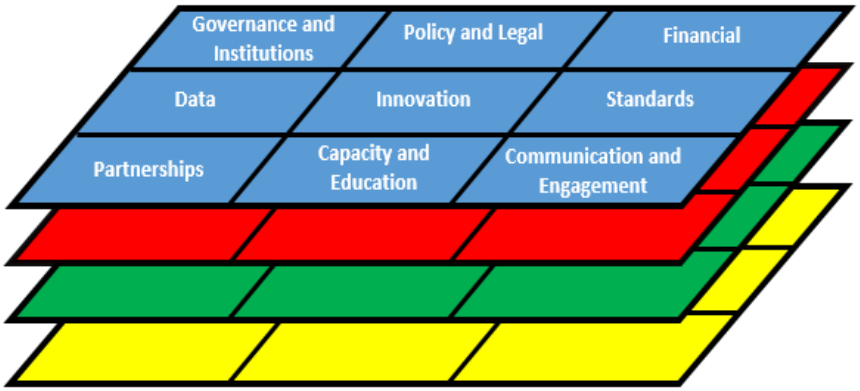
GGIM-World Bank
Integrated Geospatial Information Framework

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



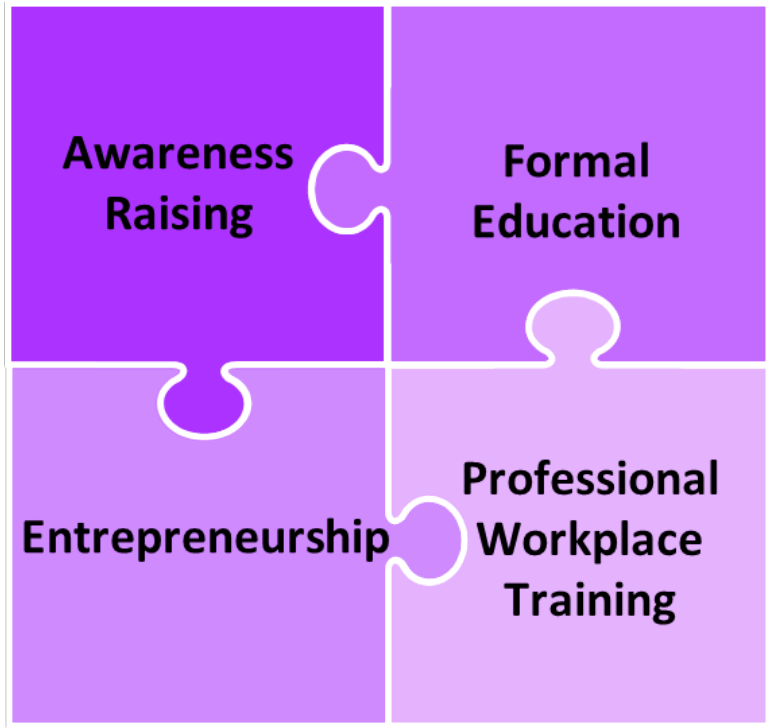
Geodesy ← *UNGGIM Roadmap*
UNGGIM Implementation Plan
Administrative Boundaries
Land Parcel and Property
Water
...

Part 3: Country-level Action Plans

Templates and guides to operationalize the Framework

Slide 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***

UN GGIM Subcommittee on Geodesy Education, Training, and Capacity Building Working Group Guiding Principles

- **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.

Pilot Capacity Building Regional Workshop:

Workshop on Implementing the GGRF in Latin America

IUGG

IAG GGOS Global Geodetic Observing System

UNITED NATIONS
Office for Outer Space Affairs

ICG International Committee on Global Navigation Satellite Systems

- Partially sponsored by IUGG
- Partnering with IAG/GGOS
- Potential for **collaboration with UN International Committee on GNSS (UNOOSA)** Working Group C for GNSS capacity building and training
- Contributions from UN GGIM SCoG
- Inviting contributions from Earth Observations stakeholder organizations, including:
  - Group on Earth Observations (GEO)
  - International GNSS Service (IGS)

Pilot Initiative:

Identification of Existing Capacity Building Resources and Enabling Discoverability

- Identify and leverage existing ETCB resources
- Develop a system of tagging for discoverability and categorization:
  - Questionnaire Level 1/2/3/4
  - Standardized Keywords
- 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:
Drafting Standardized Capacity Building and Development Frameworks

- How to empower organizations 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 ISO?

Newsletter
July / August 2018
08

UN RESOLUTION
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 UN-GGIM Subcommittee on Geodesy was inaugurated in Mexico City in November 2017. The subcommittee is now presenting the position paper defining appropriate governance arrangements for the GGRF, and has finalised the roadmap implementation plan.

unggrf.org

From a UN mandate to commitment for global geodesy

Without commitment by Member States, the Global Geodetic Reference Frame (GGRF) will be in danger of degradation over time and consequently gradually lose its required accuracy and fundamental role in societal and scientific applications. As demonstrated by the GGRF Governance Position Paper a UN GGRF convention could be the long-term solution to this problem.

PHOTO: BJØRN-OWE HOLMBERG

NY-ÅLESUND: Dr. Zuheir Altamimi, France, is responsible for the international terrestrial reference frame. He encourages nations to follow Norway's and Australia's examples.

"The UN General Assembly resolution on the GGRF for sustainable development calls for commitments by Member States to improving national geodetic infrastructure as an essential means to enhance the global geodetic reference frame. Without commitment by Member States, the GGRF will be in danger of degradation over time and consequently will gradually lose its required accuracy and fundamental role in societal and scientific applications. The current developments and investments to enhance the geodetic infrastructure in Australia, and more recently the inauguration of the new geodetic Earth observatory in Ny-Ålesund by Norway are concrete examples to follow by other nations", says Zuheir Altamimi, France.

No one country can do this alone
"For the global geodetic reference frame to be sustainable all countries need to play a role, with many of the developed countries providing assistance to the less developed countries where possible, while also continuing to upgrade their own contribution to GGRF to enhance its quality," says Gary Johnston, co-chair of the UN-GGIM Subcommittee on Geodesy, representing Australia.

While many countries have a willingness to cooperate in this way, currently no clear mechanism exists to facilitate cooperation, especially where the sharing of resources is required.

Facilitate commitment
"It is our belief that a UN convention on geodesy will create such a mechanism. Coupled with the possible creation of a UN trust account, which would provide a financial mechanism for donor contribution to this effort, we believe many of the current barriers to success will become far more manageable, therefore improving the outcome for all UN Member States, and the eventual successful and sustainable enhancement of the Global Geodetic Reference Frame", says Johnston.

"The legal framework allowable by a UN convention should provide a basis for the coordination of joint work of Member States in the field of global geodesy. It will also provide governmental support and attention to the development of the GGRF both at the national and the global level", says Alexey Trifonov, co-chair of the UN-GGIM Subcommittee on Geodesy, representing the Russian Federation.

PHOTO: ANDRICK LAL

PACIFIC ISLANDS: GPS for defining territorial sea baseline on the Gilbert Islands of Kiribati.

The Global Geodetic Reference Frame – towards sustainability

2015: **Mandate**	2016: **Plan**	2018: **Action**	Next step: **Commitment**
The UN General Assembly adopted the resolution 'A global geodetic reference frame for sustainable development'.	The UN-GGIM Committee of Experts endorsed the Road Map for the Global Geodetic Reference Frame (GGRF) and noted the need for an appropriate governance structure in order to effectively implement the Road Map.	The UN-GGIM Subcommittee on Geodesy presents the GGRF Road Map Implementation plan and the Governance Position Paper to the UN-GGIM Committee of Experts.	UN-GGIM facilitates Member State commitment to the GGRF in accordance with the UN General Assembly Resolution (A/RES/69/266) and the GGRF Road Map recommendations.

"In a formal program evaluation in 2018 the Government of Canada noted significant program integrity concerns about global and (thereby) our national geodetic reference systems, echoing concerns raised at the UN-GGIM level. Canada views the establishment of stronger governance in Geodesy as an important means to ensure integrity of the fundamental systems that support the Global Geodetic Reference Frame (GGRF) and client access to this frame."

Calvin Klatt, Canada

"In order to ensure long-term policies related to the development of the GGRF in developing countries like Argentina, the GGRF UN-convention is an essential governance mechanism that will encourage legislators and stakeholders to invest in a more homogeneously-distributed geodetic infrastructure."

Diego Piñon, Argentina

ARGENTINA: Recent relative-gravity campaign to strenghten the GGRF.
PHOTO: INSTITUTO GEOGRÁFICO NACIONAL ARGENTINA

The GGRF Governance Position Paper

Recommends to:

1. **Start an investigation regarding the establishment of a GGRF UN-convention to enable Member States to commit to the development and sustainability of the GGRF**
2. **Investigate the future need for a professional operations organisation for the GGRF**
3. **Strengthen the subcommittee on Geodesy as a governance arrangement for the GGRF by revising the subcommittee Terms of Reference.**
4. **Initiate the establishment of a UN GGRF trust fund to support and promote Member State activities**

"The establishment of a GGRF UN-convention will most likely have positive impact outside of the GGRF. Successful establishment of such a convention will clearly demonstrate the importance of UN-GGIM and the UN-GGIM decisiveness and ability to act. It will likely raise the awareness and profile of geospatial data in general."

Laila Løvhøiden, Norway, lead of the GGRF Governance Focus Group.

PHOTO: BJØRN-OWE HOLMBERG

MALAWI: Towards an accurate, sustainable and accessible global geodetic reference frame.

"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

Current External Relations Projects

- Connecting United Nations Initiatives with the GGOS Geohazards Focus Area through the GAR19 Report
- Connecting the GEO Work Program's United Nations Initiatives with GGOS

GGOS External Relations Near-Term Goals

Two Paths to Connect GGOS with the United Nations

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

UNISDR

United Nations Office for Disaster Risk Reduction

UN World Conference on Disaster Risk Reduction

2015 Sendai Japan

- 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 the GEO Work Program's United Nations Initiatives with GGOS

There is tremendous potential to increase the exposure and impact of GGOS by identifying potential contributions and connecting existing relevant work to efforts in support of both **UN SDGs** and the **Sendai Framework**.

GGOS has the potential to help by:

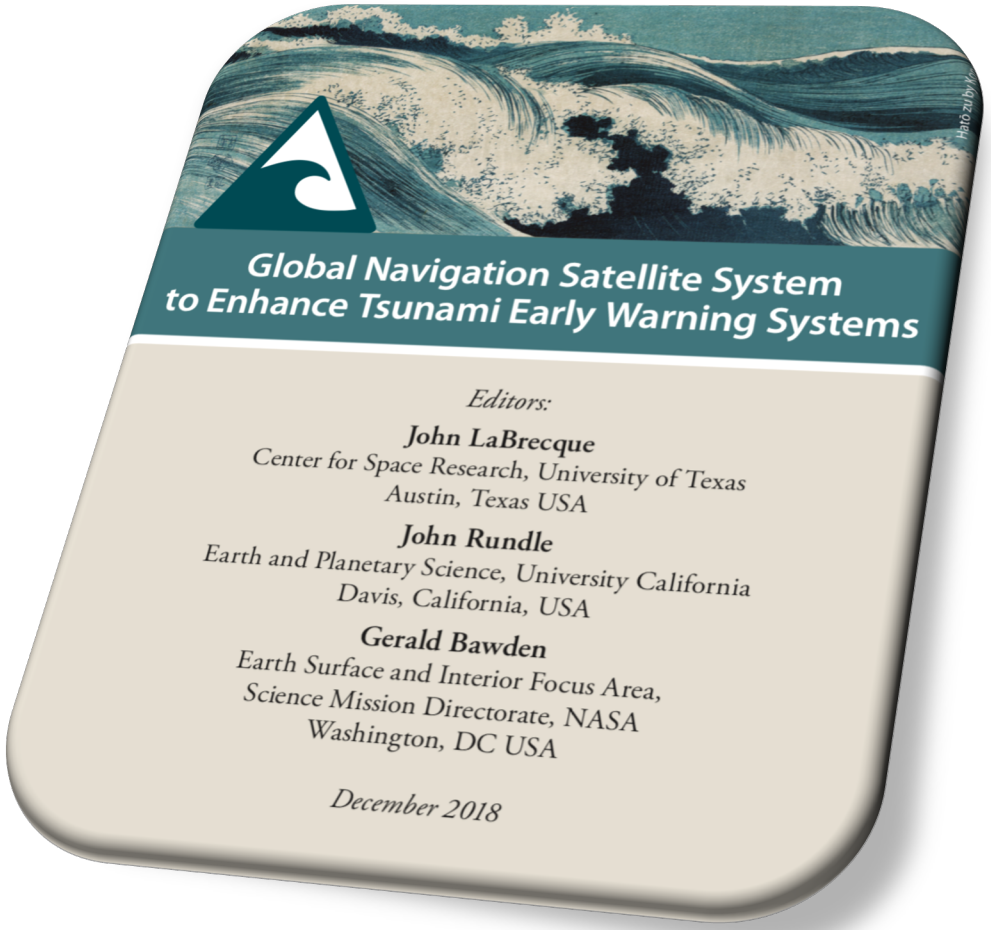
- ❑ **Facilitating linkages** to agencies and other providers of geodetic data
- ❑ Making existing geodetic data **discoverable** and easily **accessible**
- ❑ Working toward **standardization**
- ❑ **Advocating** for geodetic data and infrastructure in relation to Earth observations and the Sendai Framework via the GEO Programme Board Subgroup on Sendai

Participation at the GEO Programme Board level ensures that IAG/GGOS efforts in alignment with GEO's global priorities (supporting the UN SDGs, Sendai Framework, as well as the Paris Agreement on Climate Change) are well supported and complimentary to other related work – as well as preventing unnecessary redundancy of work.

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.

IAG/GGOS GTEWS has successfully submitted a contribution to the 2019 UN Global Assessment Report on Disaster Risk Reduction (GAR19)



GAR

Global Assessment Report on Disaster Risk Reduction

UNISDR

United Nations Office for Disaster Risk Reduction

Download report:
http://bit.ly/gtews2018

Participation and Representation in External Stakeholder Organizations

- Group on Earth Observations (GEO)

IUGG

IAG GGOS Global Geodetic Observing System

GEO GROUP ON EARTH OBSERVATIONS

Connecting the GEO Work Program United Nations Initiatives with IAG/GGOS

- GEO's global priorities include supporting the **UN SDGs** and **Sendai Framework**, as well as the Paris Agreement on Climate Change.

EARTH OBSERVATIONS FOR THE SUSTAINABLE DEVELOPMENT GOALS

Earth Observations for the Sustainable Development Goals (EO4SDG), an initiative led by **GEO** that seeks to organize and realize the potential of Earth observations and geospatial information to advance the UN 2030 agenda, and enable societal benefits (and where possible, quantification of these benefits) across SDGs.

What does GEO do?

Disaster Risk Reduction in the GEO Work Programme

GEO Engagement Priorities

- SDGs
- Climate Change
- Disaster Resilience

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

- 4 • Flagships
- 24 • Initiatives
- 10 • Foundational Tasks
- 35 • Community Activities

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

Supporting Sendai

Coordinating EO for Disasters

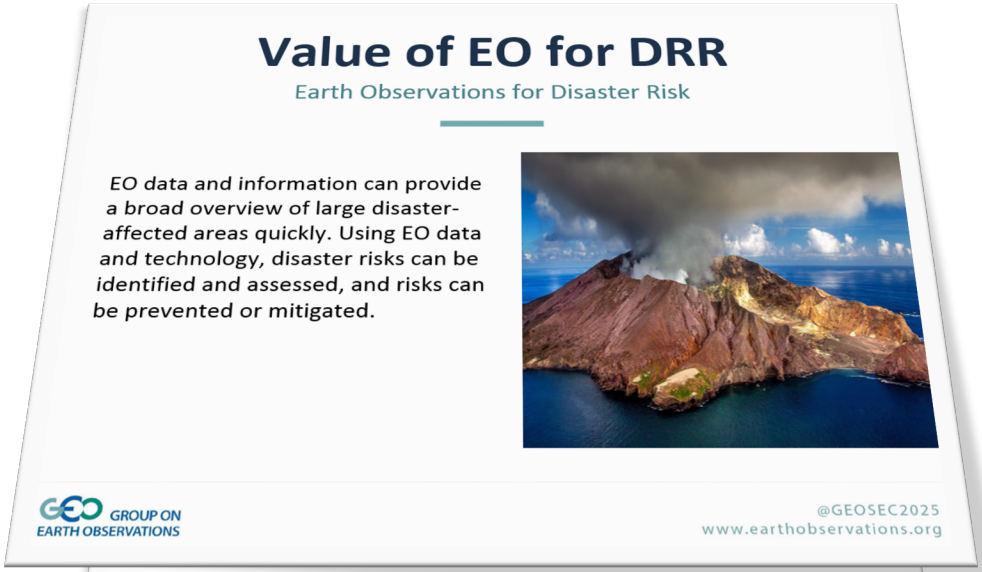
GEO supports implementation of Sendai Framework targets E,F and G through engagement with UNISDR.

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.

GROUP ON EARTH OBSERVATIONS

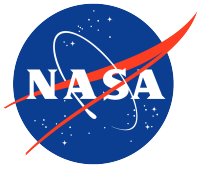


Future Work

- Continue representing geodetic community through active participation on the Programme Board and its Subgroups on Sendai and Sustainable Earth Observations
  - **Participation in Sendai Subgroup facilitates tightly-coupled overlap with GGOS Geohazards Focus Area and IUGG GeoHazards Commission, creating threefold opportunities for leverage in developing both policy and infrastructure in support of the geodetic contribution to UNISDR's Sendai Framework on Disaster Risk Reduction.**
  - GEO Communicators Network
- **Better articulate, through collaboration with the programme board, the value of geodetic Earth observations to disaster risk reduction, and how these observations can take a role in prevention, preparedness, reponse, or recovery from disaster**
- Leverage representation and participation within GEO to "ride the wave" of new Secretariat Director's vision of a GEO whose work has real purpose, outcome, and effects.

THANK YOU!

✓ Follow IAG/GGOS on Twitter @IAG_GGOS



Jet Propulsion Laboratory
California Institute of Technology

jpl.nasa.gov

UN-GGIM

Strategic Framework on Geospatial Information and Services for Disasters

Geospatial Information and services are important for Disaster Risk Reduction.

The United Nations Committee of Experts on Global Geospatial Information Management has approved an overarching strategic framework to ensure that geospatial information can be available to those who need it, at the time they need it.

Implementation Plan

- Implementation plan reports on work of the focus groups on Geodetic Infrastructure; Policies, Standards and Conventions; Education, Training and Capacity Building; and Outreach and Communication
- Reviews the Measures of Success and Recommendations which were included in the Road Map (which was endorsed at the 6th session (2016))
- Develops action for each of the recommendations detailed in the Road Map
- Provides additional background and reference material in the annexes

Highlights

- Compilation of geodetic standards
- Case Studies of data sharing policies
- Questionnaire on Reference Frame Competency as input to planning for education, Training and Capacity Building
- Plan to create of a Geospatial Communication network

Next Steps

- Develop a work plan to start real action
- Engage more strongly with Nations on their needs

Slide courtesy of Gary Johnston/ UN GGIM SCoG

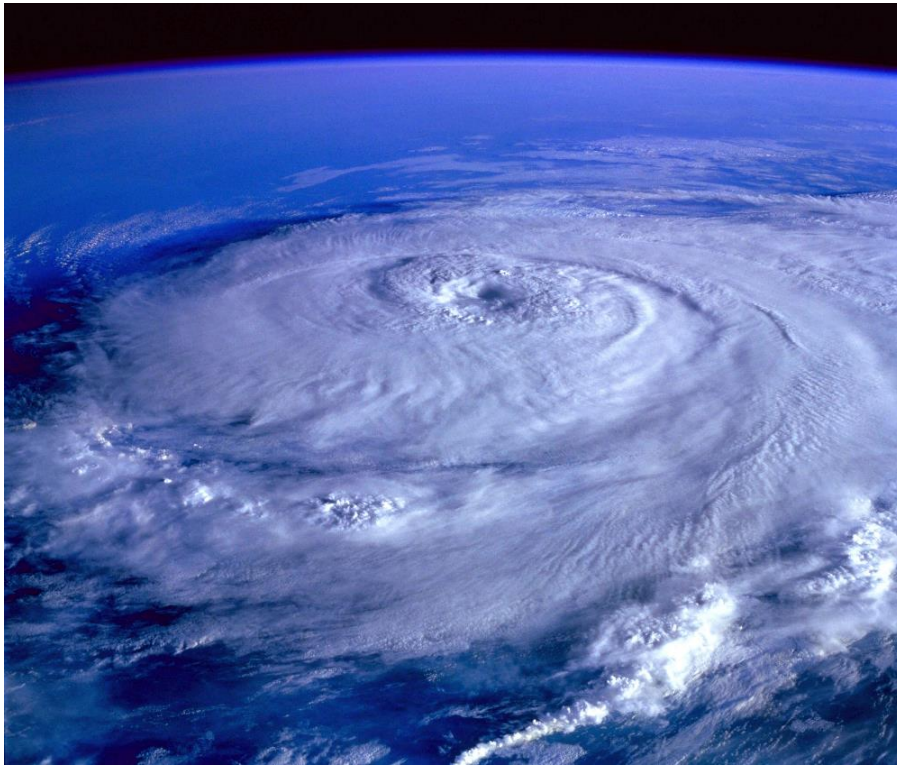
DRR & the SDGs

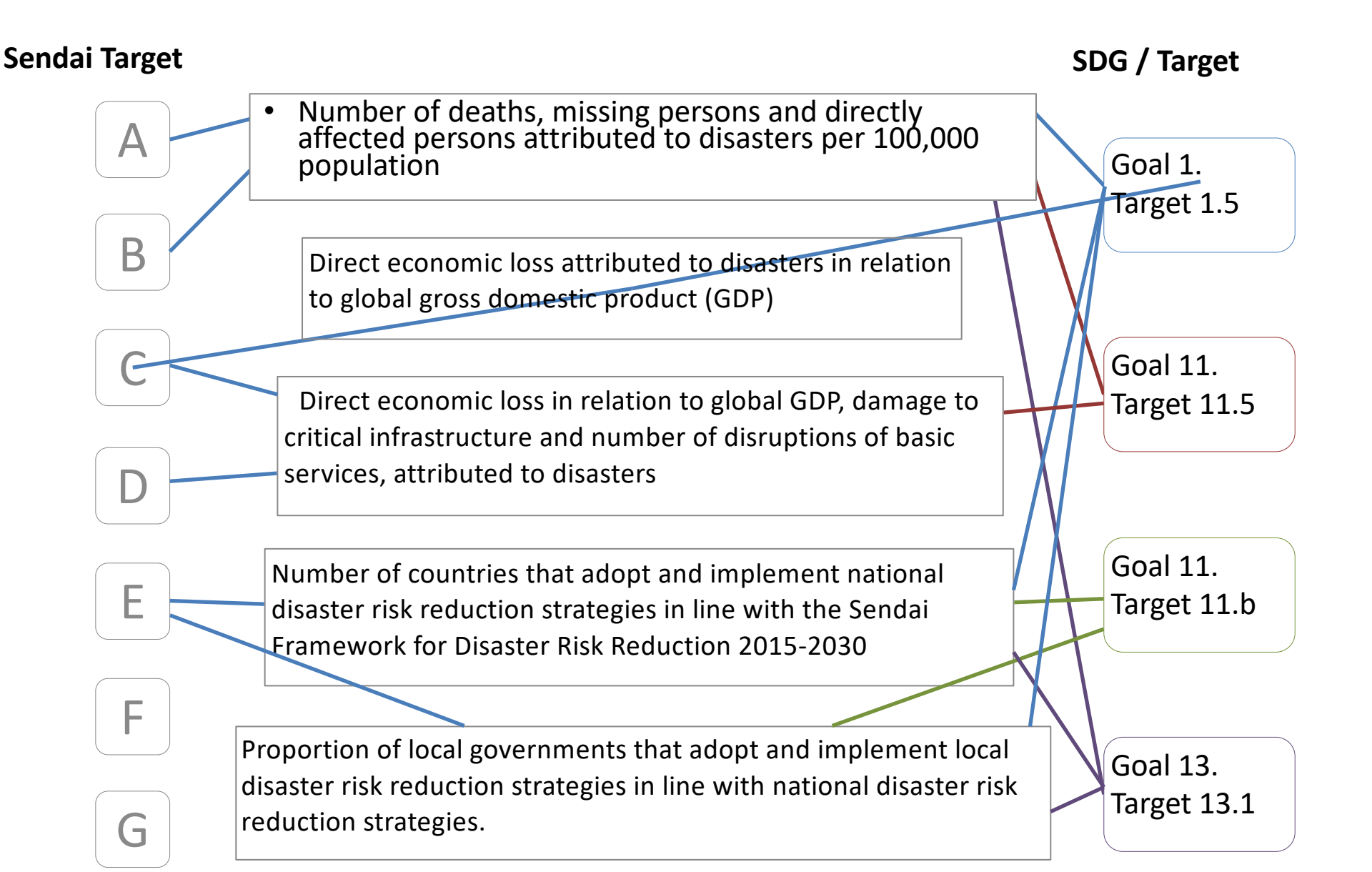
Informing DRR Indicators for SDGs 1, 11 and 13

Aligning disaster-related SDGs with the Sendai Framework for Disaster Risk Reduction.

GEO is working to support the Sendai Framework and to address disaster-related goals, targets and indicators of the 2030 Agenda:

- 3 SDGs
  - 1: End poverty in all its forms everywhere
  - 11: Make cities and human settlements inclusive, safe, resilient and sustainable.
  - 13: Take urgent action to combat climate change and its impacts
- 4 SDGs Targets
- 11 SDGs indicators





Note: the indicators above are proposed by the IAEG-SDGs to the UN Statistical Commission, 48th Session, and as such are not yet considered final.