

FINAL DRAFT FOR ENDORSEMENT

UNITED NATIONS COMMITTEE OF EXPERTS ON GLOBAL GEOSPATIAL
INFORMATION MANAGEMENT

Subcommittee on Geodesy

Version: 29 July 2021

E/C.20/2021/7/Add.3

Concept Paper on Establishing a Global Geodetic Centre of Excellence

1 Background

The Global Geodetic Reference Frame (GGRF) is the authoritative, reliable, high accuracy and global spatial referencing infrastructure. The GGRF includes the celestial and terrestrial reference frame products, the infrastructure used to create it, and the data, analysis and product generation systems. The GGRF also includes gravimetric observations, products and height systems, which underpin measurements of elevation.

The GGRF is the foundation for evidence-based policies, decisions and program delivery. The GGRF underpins the collection and management of nationally integrated geospatial information and is used to monitor our dynamic Earth. It is relied upon for social, environmental and economic initiatives, Earth science, the measuring and monitoring of progress of the 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction, the Small Island Developing States Accelerated Modalities of Action (SAMOA) Pathway, and other global, regional and national development agenda and initiatives.

Recognising the growing need for a high quality and sustainable GGRF to support good decision making to an ever-increasing location-based society, with inclusive social progress, environmental sustainability and economic development, the UN General Assembly adopted resolution 69/266¹ in February 2015, entitled ‘A Global Geodetic Reference Frame for Sustainable Development’.

At the ninth session of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM), in 2019, in adopting decision 9/104, the Committee of Experts requested that the Subcommittee on Geodesy (The Subcommittee) ‘explore a number of modalities to balance the longer-term vision, stability and operational requirements of the GGRF, including the establishment of a global geodetic centre of excellence in cooperation with UN-GGIM.’ The Subcommittee was further encouraged ‘to consult further on the practical implementation of the global geodetic centre of excellence, including modalities, function, financial arrangements and programme of work, in direct coordination with UN-GGIM and in coordination with other relevant geodetic stakeholders to avoid duplication of effort.’

It is with a spirit of global cooperation in geodesy that the Subcommittee has developed this concept paper on establishing a Global Geodetic Centre of Excellence for the sustainability of the GGRF.

¹ https://ggim.un.org/documents/A_RES_69_266_E.pdf

2. Sustaining the Global Geodetic Reference Frame

A draft Position Paper on Sustaining the GGRF accompanies this concept paper. The draft position paper provides a plan to achieve the long-term sustainability, accessibility and accuracy of the GGRF by delivering improvement in five focus areas, namely:

- Governance
- Geodetic Infrastructure
- Policies, Standards and Conventions
- Education, Training and Capacity Building
- Communication and Outreach

The Position Paper on Sustaining the GGRF describes the current state and future requirements of the GGRF and introduces a range of work packages for each of the five focus areas. It also introduces and discusses the potential and role of a Global Geodetic Centre of Excellence (the Centre) to support in the long-term sustainability and quality of the GGRF.

3. Global Geodetic Centre of Excellence

The role of the Centre is to assist in sustaining the GGRF by implementing the operational paragraphs of UN General Assembly resolution 69/266. This can be paraphrased as:

- enhance **global cooperation and coordination** across Member States and relevant geodetic stakeholders to maximise the benefit of ongoing geodetic efforts, ensure coherence, and avoid duplication of effort
- strengthen **geodetic infrastructure**
- assist Member States in making their geodetic data Findable, Accessible, Interoperable and Reusable in line with **standards, policies and conventions**
- support **education, training and capacity building**
- improve **communication and raise awareness**

By fulfilling these roles, the Centre would address many of the critical gaps in capacity and capability across the five focus areas. A detailed description of the Subcommittee's vision for the Centre's can be found in the Draft Strategic Plan (Annex A).

4. An Operating Framework

The Centre will be established and operationalized through a Memorandum of Understanding (MoU) between the United Nations and a host Member State(s), who are also donors. This MoU would be established in accordance with Host Country Agreement/s (HCA) between the United Nations and the Government/s of the host Member State/s.

The Centre will be established and operated as a United Nations Centre and will therefore be led and managed by the United Nations via well-established mechanisms. A range of operational models are available including:

- **A Federated Centre (preferred option; see Section 4.1)** – multiple Member States to co-host the Centre.
- Single host country where the only donor is the host country

Irrespective of the operational model, the funding and operational modalities of the Centre is stipulated in an MoU with the host country/s. The operational model will require, in coordination with relevant geodetic stakeholders, the establishment of a steering committee (to assist with governance of the Centre), and an advisory committee (to provide scientific and operational guidance). Furthermore, the Centre will have a framework plan, operational budget, governance, management and funding arrangements. The United Nations will establish and operate a Trust Fund for the Centre in accordance with prevailing rules, guidelines and practices of the United Nations. Contributions to the Trust Fund is provisioned under the MoU and HCA with the host and donor Member State(s).

The management and operation of the Centre will be fully funded through a multi-year voluntary contribution from the host Member State(s) through the aforementioned United Nations established Trust Fund.

A key overarching goal of the Centre is to deliver a framework plan to achieve the long-term sustainability, accessibility and accuracy of the GGRF through a programme of works (see Section 3 of the Position Paper on Sustaining the GGRF) that prioritizes and delivers improvements in the five GGRF focus areas listed in Section 2. The framework plan is subject to the provisions of the MoU/s with host country/s, and identifies the Centre priority areas together with an operational budget for the initial period.

4.1 Federated Global Geodetic Centre of Excellence

In order to achieve the overarching role and deliver improvement across all five focus areas, a Federated Centre is promoted. This concept caters for a range with multiple contributors, partners, multiple sources of funding, and multiple locations. For example, this could be:

- A single Centre which is funded by a number of Member States, or
- A network of Centres hosted by various Member States working under a coordinated governance model.

In August 2020, at the UN-GGIM Committee of Experts 10th session, Germany offered to host the first Centre. This offer was strongly supported by many Member States. It is planned to

establish the Centre in Bonn, Germany, with additional virtual secondment by Norway. The work plan and priorities of the Centre will be adapted to the available workforce, with possible future extensions. Member States and organizations may contribute to the Centre in a number of ways including, in-kind staff contributions (in person and virtual), organizing dedicated workshops for education, training and capacity building, providing geodetic instruments and expertise, or contributions for a longer period of time to coordinate and organize specific tasks and activities of the Centre. In-kind staff contributions may be formalized through MoUs or Letters of Collaboration.

Contribution to the UN Trust Fund which fund the operation and work program of the Centre are also welcome. Any funding provided can be have specific focus, for example, multiple Member States could contribute to establishment and maintenance of a geodetic observatory in Member State A or finance a levelling campaign in Member State B, or sponsor a summer school in Member State C, etc.

The main objective is to be as inclusive as possible and offer Member States a range of ways they can contribute to the Centre. The Subcommittee strongly encourages any Member State interested in contributing to the Centre, no matter how small, to discuss options with the UN-GGIM Secretariat about how to be involved.

Annex A: Global Geodetic Centre of Excellence - Strategic Plan 2021-2030 (Draft)

This draft strategic plan provides broad direction for Centre. Once a Centre has been established, the Subcommittee will work collaboratively with the Centre staff to further develop its long-term strategy based on its future funds and key partners. The plan has been divided into the five focus areas: Governance; Geodetic Infrastructure; Policies, Standards and Conventions; Education, Training and Capacity Building; and Communication and Outreach, and aims to address the operational paragraphs of General Assembly resolution 69/266², the recommendations of the GGRF Road Map Implementation Plan, and the work packages defined in the Position Paper on Sustaining the GGRF. The information below serves to show the evolution of the Subcommittee's thinking, and the translation of the operational paragraphs into actionable work packages to sustain the GGRF.

Mission

To assist Member States and geodetic organisations coordinate and collaborate to sustain, enhance, access and utilise the Global Geodetic Reference Frame.

Vision

To help develop an accurate, accessible and sustainable Global Geodetic Reference Frame to support science and society.

Strategy

The objectives of the Centre are to assist Member States fill some of the critical capability and capacity gaps across the five focus areas.

1. Governance

There are many parties involved in sustaining the GGRF including: Member States, UN-GGIM Regional Committees, the Private Sector and Academic Networks; IAG, FIG and many more (see Figure 1). Despite the important contributions made by these groups, there is a lack of global cooperation and coordination, in particular between Member States and between stakeholders. This is largely because the geodetic products were traditionally only accessed by a small specialist user group. With the advent of satellites and computers, geodesy became truly global and real-time applications are feasible; hence, geodesy and the GGRF now serve a far

² https://ggim.un.org/documents/A_RES_69_266_E.pdf

greater user base. Investment, however, in the governance, technology and people sustaining the GGRF have not kept up with demand.

The Centre will enhance global cooperation and coordination across Member States and organisations to maximise the benefit of ongoing geodetic efforts, ensure coherence, and avoid duplication of effort. The Centre aspires to be an operational hub, providing the focal point for the existing geodetic community, Member States and the user community to cooperate under a transparent and effective governance mechanism.

Objective 1.1: Develop short, medium and long-term goals to enhance global cooperation and communication across all five focus areas.

Objective 1.2: Assist Member States to identify and articulate their geodetic needs, and help them develop pathways to meet these needs in line with the Integrated Geospatial Information Framework.

Objective 1.3: In cooperation with the Subcommittee encourage and invite Member States to commit to improving and maintaining appropriate national geodetic infrastructure.

2. Geodetic Infrastructure

The GA Resolution 69/266: *Invites Member States to engage in multilateral cooperation that addresses infrastructure gaps and duplications towards the development of a more sustainable global geodetic reference frame. In addition, it urges Member States [...] to contribute to the global reference frame and regional densifications through relevant national mechanisms and intergovernmental cooperation, and in coordination with the International Association of Geodesy.*

The GA Resolution 69/266: *Invites Member States to commit to improving and maintaining appropriate national geodetic infrastructure as an essential means to enhance the global geodetic reference frame.*

The term Geodetic Infrastructure refers to the instruments, technology, data, data repositories, analysis, human resources, products and services required to observe and model the dynamic Earth.

The infrastructure has historically been installed and operated by Member States and organizations who could afford it. For this reason, it is not homogeneous which is suboptimal for the development of the GGRF. When coupled with some under-performing infrastructure, this jeopardizes the sustainability of the GGRF for all Member States. Furthermore, issues such as the sparsity of geodetic GNSS infrastructure and accurate national geoid models limits access to

precise positioning or makes them inconsistent with the GGRF. This limits the ability of people to capitalize on the benefits of precise positioning.

The physical infrastructure is complemented by soft infrastructure, that is, an internationally organized effort of people to operate geodetic data centres and analysis teams within governments and the scientific community that, on an ongoing basis, provide the products and models that enable the development of, and access to, the GGRF.

Much of the infrastructure contributions are based on best-efforts basis, with no contractual guarantee of continuity in the long-term. A role of the Centre will be to assist Member States improve the accuracy of, and access to, the GGRF to meet science and societal requirements.

Objective 2.1: Coordinate the development of a user requirements study to define what geodetic infrastructure is required to provide an accurate, sustainable and accessible GGRF.

Objective 2.2: Develop, implement and communicate a Global Geodesy Development Plan which addresses both the accuracy and access requirements of the GGRF.

Objective 2.3: Assist Member States with their plans to build and / or maintain their geodetic infrastructure, as well as to upgrade their geodetic infrastructure to next generation technologies, especially Very Long Baseline Interferometry (VLBI) and Satellite Laser Ranging (SLR).

Objective 2.4: Assist Member States with their plans to maintain and develop their analysis capability, product development and delivery services.

Objective 2.5: Assist Member States to define their physical height systems with training methodology, instrumentation and coordination of activities to develop, modernize and define physical national height reference systems and frames consistent with the International Height Reference Frame.

3. Policies, Standards and Conventions

The GA Resolution 69/266: *urges Member States to implement open sharing of geodetic data, standards and conventions to contribute to the global reference frame.*

Appropriate policies, standards and conventions are fundamental to ensuring the robustness and sustainability of the GGRF. Furthermore, geodetic data currently rates poorly on the Findability, Accessibility, Interoperability and Reusability (FAIR) scale, being inconsistent across fields of geodesy and Member States. This is inhibiting the use of the GGRF for myriad economic, environmental and societal applications.

The Centre will endeavour to assist Member States to implement, and benefit from open sharing of geodetic data, standards and conventions.

Objective 3.1: With assistance from the International Organisation for Standardisation (ISO), Open Geospatial Consortium (OGC), IAG and FIG, develop and assist with implementing a data-sharing strategy and promote making geodetic data Findable, Accessible, Interoperable and Reusable (FAIR) so it can be shared globally and used to improve decision-making.

Objective 3.2: With assistance from the International Organisation for Standardisation (ISO), Open Geospatial Consortium (OGC), IAG and FIG, work with Member States to apply standards, policies and conventions for the generation of consistent geodetic products for the GGRF.

4. Education, Training and Capacity Building

The GA Resolution 69/266: *Encourages Member States and relevant international organizations to enhance global cooperation in providing technical assistance, especially for capacity development in geodesy for developing countries, with the aim of ensuring the development, sustainability and advancement of a global geodetic reference frame.*

A lack of geodetic capability hinders a country's development and sustainability. In all GGRF activities, thought needs to be given to education, training and capacity building to ensure Member States have sovereign competency and can realize the benefits of working in the GGRF.

The Centre aims to ensure Education, Training and Capacity Building (ETCB) is included in work programs as well as having targeted and tailored ETCB-activities developed in collaboration with international geodetic organisations and other key partners.

Objective 4.1: Assist Member States to meet their long-term geodesy training and capacity development needs by assessing requirements and developing targeted and tailored capacity-building programs at regional and country, utilizing the templates and common vocabulary of the Integrated Geospatial Information Framework (IGIF).

Objective 4.2: Ensure geodetic education, training, and capacity building is an integral part of geospatial work programs undertaken in developing countries.

Objective 4.3: Assist Member States wishing to access, establish, or further develop internationally recognized academic and vocational education and training programs, certifications, and geodetic higher education.

5. Communication and Outreach

The GA Resolution 69/266: *Invites Member States to develop outreach programmes that make the global geodetic reference frame more visible and understandable to society.*

Geodesy often suffers from being a science which is difficult to describe. If decision makers and donors do not understand the value of an investment in the GGRF, then they are unlikely to prioritize GGRF investments above other initiatives. There is a strong need to raise the general awareness around the value proposition of geodesy and the Global Geodetic Reference Frame (GGRF).

The Centre will provide a hub for communication and outreach activities; assisting countries in developing and tailoring their messaging to have maximum influence on decision makers, policy makers and the public. The Centre will use communication and outreach to attract and inform in the best interests of Member States.

Initially, the most critical communication challenge for the Centre is its new existence. Substantial strategic communications work is necessary to build its reputation and fortify its position as a world leading centre of excellence in the field of geodesy. Communication and outreach will be used to both raise the general awareness of its existence and role, and to attract collaborates and GGRF projects.

Objective 5.1: Raise awareness around the Centre and advocate its role to assist in sustaining the GGRF, in particular to decision makers, development partners and potential donors.

Objective 5.2: Initiate, facilitate, develop and coordinate relevant outreach programs connected to specific signal projects underpinning and promoting GGRF development and sustainability.

Objective 5.3: Provide a hub for GGRF key partner communications activities to benefit the sustainability and quality of the GGRF, and roles and accomplishments become more widely and easily understood.