

Appropriate Governance Arrangements for Sustaining the Global Geodetic Reference Frame:

A Position Paper of the UN-GGIM Subcommittee on Geodesy Working Group on Governance



Photo: Bjørn-Owe Holmberg



Executive summary

The Global Geodetic Reference Frame (GGRF) is in acute danger of degradation, due to aging infrastructure, insufficient coordination and financing, and diminishing human capacity.

The GGRF is the foundation for virtually every aspect in collecting and managing of spatial information and global monitoring of the Earth. It is imperative to ensure its sustainability and enhancement.

Consequently, the Subcommittee on Geodesy's working group on governance proposes to establish a Global Geodetic Centre of Excellence (GGCE) under the auspices of UN-GGIM with the mission to actively contribute to the UN General Assembly resolution "A Global Geodetic Reference Frame for Sustainable Development" (A/RES/69/266). It is the informed opinion of the working group that achieving the Sustainable Development Goals (SDGs) will be more likely with the establishment of a GGCE to oversee and facilitate the best GGRF possible.

The GGCE would act as an operational hub to support the objectives of UN-GGIM and the Subcommittee on Geodesy (SCoG), with three initial thematic priorities: Enhance global cooperation; Provide operational coordination; Provide technical assistance and capacity building. It could also provide the focal point for the existing geodetic community, UN Member states (through UN-GGIM) and the user community to cooperate under a transparent and effective governance mechanism.

In the SCoG report to the Eighth Session, the SCoG recommended that UN-GGIM investigate: 1) to establish a GGRF UN-convention to strengthen the field of geodesy, 2) to create an operational coordination entity, and 3) a trust account to allow for the management of donor funds in support of the operational costs.



The need to strengthen the short- to medium-term GGRF governance arrangements increases daily. However, the development of a convention is a very long-term and resource-intensive task. In addition, a convention would not guarantee financial support for an operational coordination entity. Therefore, given the immediate challenges, the GGRF is facing, and to avoid it being degraded further, the working group believes that a suitable mechanism needs to be found in the short- to medium-term.

Consultations with the UN-GGIM secretariat identified that the establishment of a centre of excellence, in cooperation with a willing donor, would provide the mechanism required to deliver those elements of governance not already provided by the SCoG. The exact modalities, including the role, work program and governance of the GGCE will be determined by negotiations between the Committee of Experts Bureau, the SCoG and financial donors. The SCoG recognises the need to work closely with the International Association of Geodesy (IAG), and the International Federation of Surveyors (FIG), to avoid duplication of existing GGRF structures when defining the modalities and governance arrangements for the GGCE.

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Geodesy is sustaining our people and planet

Referencing all geospatial information

Through geodesy we measure the Earth's shape, rotation and gravitational field, and the way these change. We live on a dynamic planet. Its seemingly solid surface is always on the move. Because the Earth is in constant motion, an accurate point of reference – a position – is needed for making measurements of almost everything. Geodesy provides this reference system for the whole planet – the Global Geodetic Reference Frame (GGRF). All geospatial information must be referenced to the GGRF, allowing us to truly relate measurements and positions taken anywhere on the Earth with similar measurements taken at a different time or location. The social, economic and environmental benefits of implementing the GGRF are significant; so is its role in underpinning sustainable development and building a better world.

Critical to satellite positioning

The GGRF supports all satellite positioning technology, and is underpinned by critical and unique globally distributed ground infrastructure including observatories and satellite tracking stations. The physical infrastructure of the GGRF is complemented by a “best-effort” based internationally organized cooperation of data processing centers and analysis teams within governments and the scientific community that, on an ongoing basis and often in real-time, provide products, corrections and models that enable the establishment of, or access to, the GGRF.

Basis for all positioning applications

Location-based positioning applications are increasingly critical for civil engineering and construction, industrial automation, transport, agriculture, mining, and recreation. Because it enables the ‘position’ in precise coordinates, the GGRF is the foundation for the successful and correct use of such applications. In addition, satellite navigation systems provide fundamental services for the operation of electricity grids, telecommunication networks, the financial markets, disaster response and emergency management, environmental studies and scientific research. The GGRF also provides the platform from which Earth Sciences (such as Global Change studies) can be undertaken, monitoring changes in the planet on which we live and rely. The importance and need of the GGRF is growing as new geospatial applications in location-based services, intelligent transport, precision agriculture and industrial automation emerge globally.



Photo: Bjørn-Owe Holmberg

In danger of degradation

However, the GGRF is vulnerable and in danger of degradation in terms of its required accuracy and accessibility by the users. An accurate, stable and reliable GGRF requires effective maintenance of the infrastructure, but also the upgrade on instruments to new technology and the development of existing infrastructure and new sites in locations not currently served by the existing networks. Collectively this needs ongoing investment from all nations. The “best-effort” endeavour to provide both high quality and high integrity data processing is suffering from a lack of redundancy and insufficient budgets to ensure consistency, and to allow for the application of new technological developments. Unfortunately, the rapidly increasing competition with other important societal needs is challenging the GGRF sustainability, increasing the risk of degradation.

Challenges

Too little redundancy

The development and sustainability of the GGRF is dependent on the contributions from many nations and often several agencies within these nations. These contributions are presently based on “best-effort” collaboration, with no contractual guarantee of continuity in the long-term. Importantly, some of these contributions are performed by only one or two agencies globally, leaving very little redundancy in key parts of the GGRF value chain. If for one reason or the other, these agencies cease their GGRF contributions and activities, it not only degrades the GGRF but also jeopardises the activities of industry, science and society that are dependent on the availability of the GGRF. For instance, the continuous determination of the Earth Orientation Parameters and

the Universal Time (EOPs) is critical for the operation of navigation satellites and many other scientific and societal applications. Changes in the political situation and budgetary cuts may severely restrict the production of the EOPs, the reason being that there is minimal redundancy in parts of the Very Long Baseline Interferometry (VLBI) data processing, which is critical to the continuous determination of the EOPs. Unfortunately, this not only accounts for the VLBI, but also for other geodetic techniques. There is an urgent need for more sustainability and redundancy relating to the GGRF.

In need of global coordination

Several countries have invested in state-of-the-art GGRF infrastructure in recent years, but this is not sufficient to secure a sustainable GGRF globally because it is only part of the value chain. More than ten Member States have invested large sums in new data-intensive GGRF-technology, but the “best-effort” cooperation on processing and storing the data does not have the capacity and capability to utilise the data gathered. Because of this, it is likely that it will take several years before this new technology can completely replace the old, leaving the new technological equipment underutilized. At the same time, the aging equipment is underperforming or at end-of-life and highly vulnerable to potentially severe operational failures. To address this situation, coordinated efforts must be initiated to enhance operational capacity, capability and research on all components of the value chain. The challenge has been that no one entity or one nation exists to see the entire picture to plan and coordinate the work and ensure systematic and consistent development globally. This has resulted in a significant imbalance between national investments in physical infrastructure, and the “best-effort” cooperative activity related to the data processing.



Photo: Andrick Lal

Low benefits realisation from education training and capacity building projects

The Education Training and Capacity Building (ETCB) effort performed by Member States, institutions and organisations in the area of GGRF are, and have been, substantial and undertaken with considerable expertise, and with the best of intentions. However, questionnaires completed by Member States indicate that in most countries additional capacity building is imperative to the uptake of the GGRF. For instance, ETCB activities that assist developing countries to establish and utilize geodetic infrastructure, like for instance GNSS, serve several important purposes, both for the developing country and for the GGRF. Unfortunately, the situation has often been that when the assisting nation steps back leaving the operation of the equipment to the developing nation, the utilisation of the GGRF infrastructure is halted or at least is sub-optimal. This is due to lack of sustained geodetic knowledge or capacity, or other GGRF related resources in the developing nation. It might also be due to other circumstances. For a nation to utilize the GNSS infrastructure, it is a prerequisite to have reliable Internet connection and power supply. This demonstrates that a holistic approach is necessary to ensure that geodetic ETCB-projects are successful, requiring ongoing effective global coordination, while recognising the regional nuances of capacity building.

The SCoG has limited working capacity

The SCoG has recognised that to achieve our objectives, dedicated human resources need to be assigned to key tasks like coordination, outreach and communication. The second plenary SCoG meeting in Deqing, in November 2018, established the SGoG Bureau. This has improved the working capacity of the SCoG, but not to the extent that the SCoG has sufficient working capacity to advocate and coordinate the implementation of the GGRF road map in the Member States.

The working capacity of the Bureau is limited as all members are directors or in managerial positions nationally and have to prioritise the obligations their regular job brings upon them, often doing work for the SCoG out of regular working hours. This is also the situation for the members of the five working groups of the SCoG.

The Global Geodetic Centre of Excellence (GGCE) will be globally recognised, and have three initial thematic priorities: Enhance global cooperation; Provide operational coordination; Provide technical assistance and capacity building.

Enhance global cooperation

- Work to ensure that organisations, which collect, manage and are significant users of geodetic information have a significant role to play in strengthening geodetic information and infrastructure management;
- Encourage GGRF-related project sponsors to share experiences on a global level.

Provide Operational coordination

- Be the secretarial office for the SCoG and the GGCE governing bodies;
- Guide, coordinate and manage the realisation of the GGRF road map;
- Promote and facilitate the development of clear policies and procedures that commit Member States to open sharing of geodetic data;
- Map, analyse and address operational weaknesses in the GGRF value chains with a view to maintain and improve the GGRF;
- Provide counselling, coordination, advocacy and management support to projects and activities that mend GGRF value chain weaknesses or ensures redundancy;
- Initiate, facilitate, develop and coordinate relevant communication, outreach and engagement programs underpinning and promoting GGRF maintenance and improvement.

Provide technical assistance and capacity building

- Identify and provide technical assistance, knowledge sharing and training to enable nations to
 - Build capacity and establish appropriate geodetic infrastructure (especially GNSS), and
 - Better utilize GGRF infrastructure to improve national to global prosperity;
- Provide advice, communication, and management support to enable nations to realise GGRF development projects and activities that are key to fulfilling the SDGs;
- Be depository and foster communities of practice for exploring and sharing information and transferring capacities and specialized knowledge through training and materials.

Solution

It is the informed opinion of the working group that achieving the Sustainable Development Goals (SDG) will be more likely with the establishment of a GGCE to oversee and facilitate the best GGRF possible. The working group therefore proposes to establish a Global Geodetic Centre of Excellence (GGCE) under the auspices of UN-GGIM.

Global Geodetic Centre of Excellence

It is proposed that the GGCE goal would be to maintain and improve the global geodetic reference frame (GGRF) by strengthening the technical capacity of national geospatial agencies, allowing them to sustain, enhance, access and utilize the GGRF to substantively improve national and global prosperity and produce reliable and enduring SDG information. The establishment of the Centre would actively contribute to realising the ambitions of the UN General Assembly resolution "A Global Geodetic Reference Frame for Sustainable Development" (A/RES/69/266), with the aim of ensuring the development, sustainability and advancement of the GGRF, as well as its densification and access by all Member States.

The GGCE would act as a GGRF operational hub that would strengthen capacity to implement the General Assembly resolution, support the objectives of UN-GGIM and the SCoG, provide technical assistance and capacity building, and facilitate and encourage open geodetic data sharing. It will enhance the capacity of the SCoG to effectively and efficiently manage global cooperation in the area of geodesy, and provide advocacy and outreach.



The Gilbert Islands of Kiribati. Photo: Andrick Lal

GGCE modalities and governance arrangements

Governance arrangement mission

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.

Financial arrangements

The creation of the GGCE is subject to suitable funding being provided by one or more Member State donor (s). The GGCE could either be hosted by one nation and have a centralized organisational structure, or have a distributed organisational structure with a core-location in a particular Member State, and with single contributions from other Member States.

Under the auspices of UN-GGIM

To ensure visibility and transparency, the GGCE would report its technical activities through the annual report of the SCoG to the UN-GGIM plenary session, so that Member States and other stakeholders are aware of what efforts are taking place, and can contribute to the discussion and directions the GGCE may be taking. The operational reporting (financial, and accountability of operations) line for the GGCE will be through the UN-GGIM Bureau to the Statistics Division. Additional oversight would be provided by the governance mechanism put in place for GGCE by the UN-GGIM Bureau, SCoG and financial donors.

Collaboration with geospatial organisations

The SCoG recognises the need to work closely with the International Association of Geodesy (IAG), and the International Federation of Surveyors (FIG), to avoid duplication of existing GGRF governing structures when defining the modalities and governance arrangements for the GGCE.

Possible options for additional oversight of the GGCE include the creation of a Global Geodetic Governing Council, with appropriate UN and donor representation, which would provide strategic oversight and governance at the highest level and would ensure that an appropriate level of dialogue occurs between institutions. Additionally, the creation of an International Advisory Committee that is more technically and operationally oriented may be of value. It could have a structure that ensures that organisations, which collect, manage, and are significant users of geodetic information have a significant role to play in strengthening the management of geodetic information and infrastructure.



United Nations, New York. Photo: Anne Jørgensen

Continue the work

This position paper is intended to advance the discussion on appropriate governance mechanism for Global Geodesy. It is not intended to provide the final arrangements and modalities for the GGCE as these will need to be determined in consultation with prospective financial donors and the broader geodetic community. Due to the complexity of this issue, and the large number of contributors to the production and dissemination of the GGRF, the working group intends to continue its broad consultations on the best options for the creation of the GGCE. The working group therefore seeks endorsement from the Committee of Experts to continue to work on this task towards the Tenth Session.

Major accomplishments

The UN General Assembly resolution on the GGRF

At its third session in July 2013, already aware of the growing demand for positioning services that are more precise and the economic importance of the development and sustainability of the GGRF, the United Nations Committee of Experts on Global Geospatial Information Management (UN GGIM) agreed that actions should be taken to facilitate the submission of a resolution to be tabled at the sixty-ninth session of the General Assembly in order to seek support and commitment at the highest level to strengthen the GGRF. On 26th February 2015, the United Nations General Assembly adopted a resolution (A/RES/69/266) entitled "A global geodetic reference frame for sustainable development". The resolution recognized the importance of international cooperation, as no one country can do this alone, to realize the GGRF and services to underpin GNSS technology and provide the framework for all geospatial activity, as a key enabler of spatial data interoperability, disaster mitigation and sustainable development. The resolution further invited Member States to commit to improving and maintaining appropriate national geodetic infrastructure as an essential means to enhance the GGRF, and to engage in multilateral cooperation that addresses infrastructure gaps and duplications towards the development of a more sustainable GGRF.

The development of the GGRF road map

The General Assembly noted with appreciation the development of a global geodetic road map that addresses key elements relating to the development and sustainability of the GGRF. The following year the Working Group on the GGRF developed the road map for the GGRF, which was adopted by UN-GGIM at its sixth session in August 2016. In an informational manner, the GGRF road map revealed to UN GGIM the vulnerability of the GGRF. In 2016, UN-GGIM noted the need for an appropriate governance structure for the GGRF in order to effectively implement the road map. In addition, UN-GGIM requested the newly formed SCoG on Geodesy (SCoG) to "develop a position paper to define the appropriate governance arrangements for the global geodetic reference frame, while balancing the sustainability, investment and data-sharing needs"

The position paper on governance

A first draft iteration of the position paper on 'Appropriate Governance Arrangements for Sustaining the GGRF' was subsequently prepared and provided as a background document to the report of the SCoG at the Eighth Session of UN-GGIM in August 2018. In response to productive discussions and interventions by delegations, in making decision 8/103, UN-GGIM suggested that the SCoG undertake broad consultation on the position paper during the intersessional period, and provide an update to the Committee of Experts at its Ninth Session in 2019.

Options considered

Discussions on a coordinating unit resumed

At the 2nd plenary SCoG meeting in Deqing, in November 2018, several challenges around GGRF infrastructure were on the agenda. To follow up on these discussions, the working group, dived deeper into the matter, found that the situation was even more severe, and called for immediate action. The working group had during the last two and a half years, investigated and discussed several governance mechanisms with the potential to strengthen the governance framework of the GGRF; an intergovernmental organisation (IGO); a UN-convention; a coordinating unit; a trust fund. Because of this, the working group knew that even though an IGO or a convention are powerful tools that ensures commitment in the long-term, the establishment would take too long, given the urgency of the situation. The GGRF had to be strengthened in the short- to medium-term. This left the working group with the two options: 1) a coordinating unit, and 2) a trust fund, and the thought on combining these two governance mechanisms into one governance arrangement started to grow.

Feedback from the consultations

To get advice on the appropriateness of the governance arrangements recommended in the first draft of the position paper, the working group turned to the feedback from the position paper consultations. At the UN-GGIM Eighth Session there was no consensus among the Member States regarding the establishment of a convention, however, there were supporting interventions for the need to investigate the establishment of a coordinating entity and a trust fund. Further, the UN-GGIM Americas after the Eighth Session wrote to the SCoG saying they agreed on the need to establish a coordinating entity that can coordinate the implementation of the GGRF road map in the Member States.

Integrated Geospatial Information Framework

While doing more research, the working group learned about the Integrated Geospatial Information Framework (IGIF). When studying the draft of the IGIF Governance and Institutions Guide, the working group found additional arguments for establishing an independent coordinating body representing global needs. Further, the IGIF emphasized that it is highly recommended that a geospatial governing body have a structure that recognises that organisations which collect, manage and are significant users of geospatial information, have a significant role to play.

The GGCE is conceived

The first United Nations World Geospatial Information Congress was convened in Deqing, China, from 19-21 November 2018. In issuing the Moganshan Declaration at the conclusion of the Congress, participants supported the establishment of Global Centers of Excellence on Geospa-



Several challenges were discussed at the second plenary Subcommittee on Geodesy meeting in Deqing. Photo: Anne Jørgensen

tial Knowledge, including in Deqing, to promote and build global geospatial capacity and capability, develop collaborative knowledge and innovation hubs for harnessing contemporary methods, technologies and analytics in geospatial information, facilitate access to regional and global information and data sources including earth observations, and to improve and strengthen national geospatial information management to assist developing countries to implement the SDGs. In March 2019, the working group became aware of the intent to establish a Global Geospatial Knowledge and Innovation Centre in China. Inspired by this, the working group identified the possible option of establishing a Global Geodetic Centre of Excellence (GGCE), under the auspices of UN-GGIM. The GGCE would act as a GGRF operational hub supporting the objectives of UN-GGIM and the SCoG, with three initial thematic priorities: 1) enhanced global cooperation, 2) GGRF coordination, and 3) to provide technical assistance and capacity building. At the unofficial SCoG meeting in Vienna April 10th 2019, the working group presented the idea of establishing a GGCE that would augment current governance arrangements provided by the SCoG, in order to achieve the decisions as stated in the General Assembly resolution, "A Global Geodetic Reference Frame for Sustainable Development". The SCoG was supportive of this and requested the working group to pursue the idea further.

Consultations

At the UN-GGIM Eighth Session, several Member States expressed in their interventions that they supported the approach to investigate the need for a professional operations entity. More than ten Member States supported the establishment of a convention. However, others were concerned that this was not an appropriate governance arrangement for the GGRF.

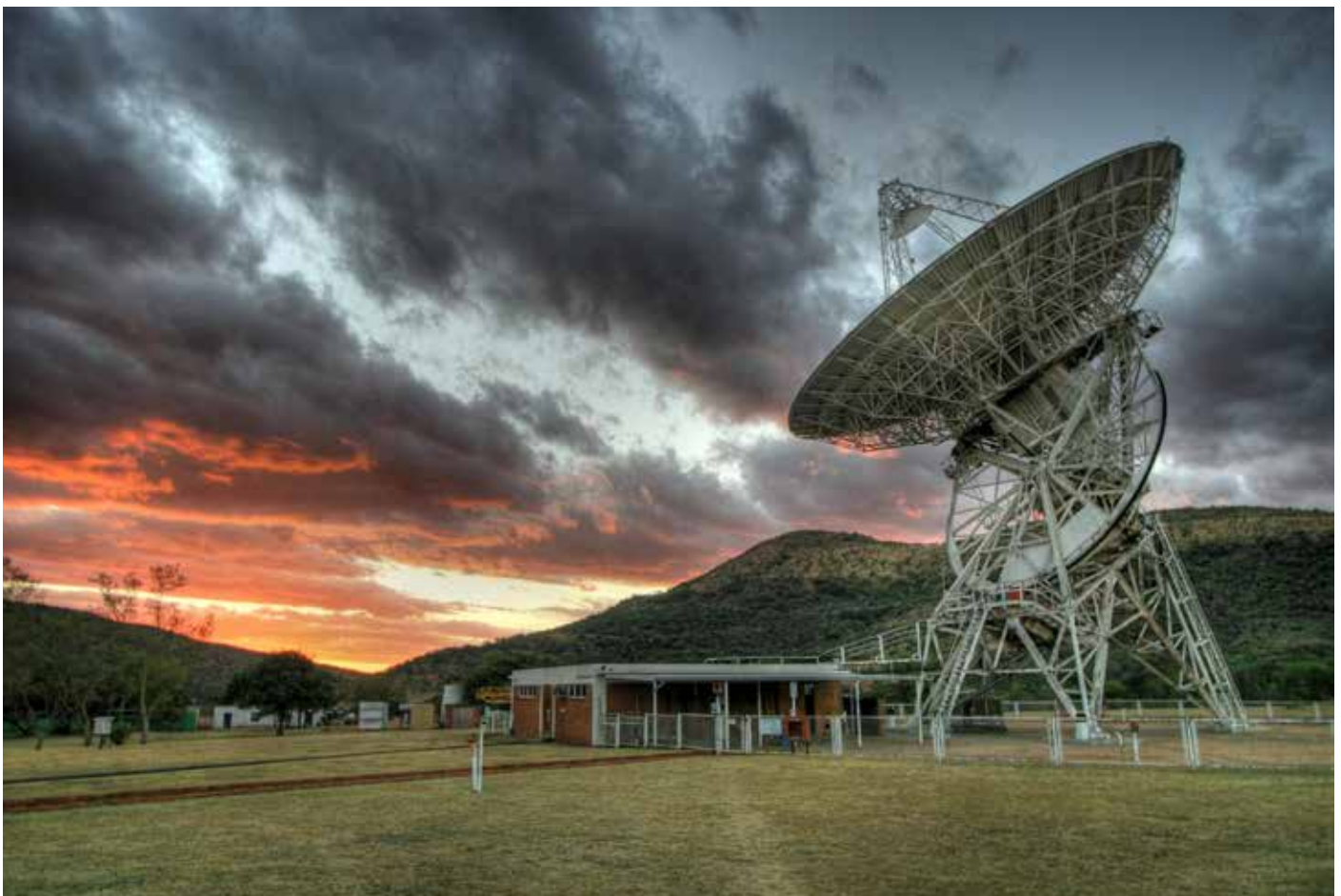
After the UN-GGIM Eighth Session UN-GGIM Americas reached out to the SCoG and provided their comments to the position paper on governance. The comments were thorough and constructive and created good discussions in the SCoG. In February, the SCoG attended the annual meeting of UN-GGIM Arab States and presented the conclusions of the position paper. Later the position paper was sent to the regional chairs of UN-GGIM Europe and Africa. The feedback from these last consultations were that this method of performing consultations was not optimal. Because of this, and as part of the consultation process, a Forum on this position paper will be arranged August 6th, as a side event to the Ninth Session.

Conclusion

A draft of this position paper was sent to the 42 SCoG members, NASA, IAG and FIG for consultation 11 June 2019. Based on the feedback from this consultation, the SCoG working group on governance recommends to:

Create a Global Geodetic Centre of Excellence (GGCE) under the auspices of UN-GGIM, subject to the identification of a financial donor (s), with the mission to actively contribute

to realising the ambitions of the UN General Assembly resolution “A Global Geodetic Reference Frame for Sustainable Development” (A/RES/69/266), and to subsequently work with the UN-GGIM Bureau and the financial donor to determine the modalities of the GGCE.



Hartebeesthoek observatory, South Africa. Photo: Thomas Abbott