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Global geodetic reference frame

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Note by the Secretariat

Summary

The present paper contains the report prepared by the Subcommittee on Geodesy on the global geodetic reference frame for consideration by the Committee of Experts on Global Geospatial Information Management.

At its eleventh session, held virtually on 23, 24 and 27 August 2021, the Committee of Experts adopted decision 11/104, in which it welcomed the progress made during the intersessional period, including the Subcommittee's considerable efforts to address the many complex issues related to the global geodetic reference frame. The Committee noted with appreciation the Subcommittee's focus on broad global consultation and the subsequent finalization with Member States and relevant geodetic stakeholders of the position paper on sustaining the global geodetic reference frame and the concept paper on establishing a global geodetic centre of excellence. The Committee adopted the two papers as key guidance documents to ensure the sustainability and enhancement of the global geodetic reference frame.

The Committee of Experts also welcomed the discussion on the proposed work package items described in the position paper to address the critical issues facing the global geodetic reference frame. The Committee further welcomed the progress made by the Government of Germany and the United Nations to host and establish a global geodetic centre of excellence at the United Nations campus in Bonn, Germany, and encouraged the future global geodetic centre of excellence to collaborate and coordinate closely with the Subcommittee to foster greater planning and international coordination in pursuit of strengthening partnerships and opportunities enabled by geodesy. Last, the Committee noted the Subcommittee's desire to review its working modalities, including its terms of reference and structure.

In this report, the Subcommittee provides information on its activities, including its efforts to continue to implement General Assembly resolution 69/266 on a global geodetic reference frame for sustainable development. It also reports on its consideration of and progress made in reviewing its working modalities, terms of reference and structure so as to align them with the future working arrangements outlined in the position paper on sustaining the global geodetic reference frame and the concept paper on establishing a global geodetic centre of excellence, adopted by the Committee of Experts. The aim is to ensure an efficient and relevant Subcommittee with active participation from developing countries in the Subcommittee and its working groups.

* E/C.20/2022/1

The report also contains information on the progress and achievements made by the working groups of the Subcommittee during the intersessional period. Planned activities and related considerations will also be reported. The Subcommittee also provides a summary of initial discussions and considerations regarding the proposed work package items described in the position paper to address the critical issues facing the global geodetic reference frame. In this regard, the Subcommittee is expected to review its modalities on its working groups.

In furtherance of the progress made by the Government of Germany and the United Nations to establish a global geodetic centre of excellence at the United Nations campus in Bonn, the Subcommittee affirms the necessity of working collectively with relevant geodetic stakeholders to foster greater planning and international coordination in pursuit of strengthening partnerships and opportunities enabled by geodesy, as well as to collaborate and coordinate closely, including with the centre of excellence, in order to implement General Assembly resolution 69/266.

I. Introduction

1. Positioning, navigation and geospatial data are part of everyday life. In addition to the traditional survey, mapping and navigation fields, location-based positioning applications are increasingly critical for civil engineering, industrial automation, agriculture, construction, mining, recreation, financial transactions, intelligent transport systems, disaster response and emergency management, environmental studies and scientific research.

2. The Global Geodetic Reference Frame (GGRF) enables accurate and robust alignment of geospatial datasets – a key requirement for sustainable development in fields such as land use planning and administration, construction and hazard assessment. The GGRF is also an essential foundation for national height systems, which enable sustainable water management and monitoring of climate change and its impacts, such as sea-level rise, droughts, glacial retreat and ice-sheet melting. The coordinates used in these applications are ideally referred to a mathematically well-defined geodetic reference frame.

3. The GGRF is an authoritative, reliable, highly accurate, and global, spatial referencing infrastructure, and 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.

4. The GGRF is fundamental to supporting the collection, integration and utilization of all other geospatial data. 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.

5. As the foundation for accurate and reliable geospatial data collection and integration for decision making, the GGRF has a significant impact on many activities within the programme of work of the Committee of Experts. The GGRF is one of 14 Global Fundamental Geospatial Data Themes and underpins the quality and usefulness of the other 13. The GGRF is not a data theme per se, but instead is a prerequisite for the accurate collection, integration and use of all other geospatial data. Analysis of the global indicator framework for the sustainable development goals (SDGs) with a 'geographic-location' lens showed that the geospatial information has a direct or significant contribution to the production of SDGs indicators.

6. Recognizing the growing demand for an accurate and stable GGRF and the importance of international cooperation, the General Assembly of the United Nations adopted resolution 69/266 in February 2015, entitled 'A Global Geodetic Reference Frame for Sustainable Development'. The resolution reflects that the GGRF is the foundation required for the collection, integration, and utilisation of all geospatial information. Furthermore, it supports precise positioning from Global Navigation Satellite Systems (GNSS), which is becoming an important tool for informed decision making, supporting the three pillars of sustainable development – the society, economy and environment.

7. At its sixth session in 2016, the Committee of Experts adopted decision 6/102, which noted the need for an appropriate governance structure to effectively implement the road map for the GGRF. At its seventh session in 2017, the Committee adopted decision 7/103, in which it endorsed the formal establishment and composition of the Subcommittee on Geodesy (the Subcommittee) with proposed terms of reference, and also expressed support for the development of appropriate governance arrangements for the GGRF. At its eighth

session in 2018, the Committee of Experts noted the Subcommittee's initial work towards improving the sustainability and enhancing the quality of the GGRF.

8. At the ninth session of the Committee of Experts in 2019, the Subcommittee provided a background document on the governance arrangements required to help sustain the GGRF[1]. In adopting decision 9/104, the Committee requested that 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 the Committee. The Committee requested the Subcommittee to continue to ensure broad consultation on the progression and modalities of the position paper on governance, to establish global cooperation and to acquire a better understanding of how the practical and operational requirements of the GGRF could be implemented. The Committee of Experts also encouraged the Subcommittee to consult further on the practical implementation of a proposed global geodetic centre of excellence, including modalities, function, financial arrangements and programme of work, in direct coordination with the Committee and in coordination with other relevant geodetic stakeholders to avoid duplication of effort.

9. At the tenth session of the Committee of Experts in 2020, the Subcommittee provided two strategic papers as background documents to its report; a draft Position Paper on Sustaining the Global Geospatial Reference Frame2 and a draft Concept Paper on Establishing a Global Geodetic Centre of Excellence3. The draft Position Paper provides a strategy and action plan to help achieve the long-term sustainability, accessibility and quality of the GGRF by delivering improvement in five focus areas: Governance; Geodetic Infrastructure; Policies, Standards and Conventions; Education, Training and Capacity Building; and Communication and Outreach. The draft Concept Paper includes a strategic plan providing a broad direction for the centre that addresses many of the critical gaps in capacity and capability across the five focus areas described in the draft Position Paper.

10. In adopting decision 10/104 at its tenth session, the Committee of Experts commended the efforts of the Subcommittee for the preparation of the draft Position Paper and draft Concept Paper. Further, the Committee of Experts welcomed and supported the offer from the Federal Republic of Germany to establish and host a global geodetic centre of excellence at the United Nations campus in Bonn, Germany, as the first centre of an envisioned federated approach to enhance global cooperation and coordination across Member States and relevant geodetic stakeholders.

11. At the eleventh session of the Committee of Experts in 2021, the Subcommittee informed the Committee of the broad consultation process on the draft Position Paper and draft Concept Paper and provided the final draft Position Paper on Sustaining the Global Geodetic Reference Frame and the final draft Concept Paper on Establishing a Global Geodetic Centre of Excellence as background documents to its report for consideration and adoption by the Committee. In making decision 11/104, the Committee of Experts adopted the two papers as key guidance documents to ensure the sustainability and enhancement of the GGRF.

12. At its eleventh session, the Committee of Experts further welcomed the progress made by the Government of Germany and the United Nations to host and establish a Global Geodetic Centre of Excellence (GGCE) at the United Nations campus in Bonn and encouraged the future Centre of Excellence to collaborate and coordinate closely with the Subcommittee to foster greater planning and international coordination in pursuit of strengthening partnerships and opportunities enabled by geodesy.

1 GGRF_Position_Paper2019_24July_web.pdf (un.org)
2 DRAFT-Position-Paper-on-Sustaining-the-GGRF-20200806.pdf (un.org)
3 DRAFT-Concept-Paper-on-GGCE-20200806.pdf (un.org)

13. This present report provides information and updates the Committee of Experts on the Subcommittee's activities, efforts and progress during this intersessional period, and of its planned next steps. In addition, the report gives a status on the establishment of the Centre of Excellence in Bonn. The Committee of Experts is invited to take note of the report and to express its views on the activities and next steps of the Subcommittee and the way forward. Points for discussion and decision are provided in paragraph 42.

II. Subcommittee activities during the intersessional period

14. This section provides a summary of the work conducted by the Subcommittee's five working groups: Governance; Geodetic Infrastructure; Policies Standards and Conventions; Education Training and Capacity Building, and Communication and Outreach during the intersessional period. In this context, it is important to note that the Subcommittee has not convened a formal (in-person) plenary meeting since November 2018 and welcomes the opportunity to meet in person, informally, on the margins of this twelfth session of the Committee of Experts. Additionally, the Bureau of the Subcommittee has begun discussions on the revision of its structure, terms of reference and working modalities. These key modalities will be addressed at the Subcommittee's next plenary meeting following the twelfth session of the Committee of Experts, with the aim of determining and maintaining an appropriate and effective operation for the fulfilment of the Subcommittee's objectives.

15. **Governance.** The intersessional period has been a period of limited activity for the working group on Governance, as the working group have been awaiting the establishment of the GGCE. The working group has had two meetings, primarily discussing the future of the working group and the role it may play to assist the GGCE in establishing its governance structure.

16. The working group plans to facilitate discussions with the GGCE, the Subcommittee and relevant geodetic stakeholders (IAG and its Services, FIG, etc.) on the governance structure of global geodesy with the ambition to help the GGCE explore how the organisations will interact to avoid overlap and build well-functioning governance mechanisms. In addition to this, the working group members have participated in several activities promoting the sustainability of the GGRF in their respective UN-GGIM regions.

17. **Geodetic Infrastructure.** The Geodetic Infrastructure working group has also been awaiting the establishment and operation of the GGCE. Working group members have started to review and act on the responses received from the IAG and its Services to the geodetic infrastructure questionnaire in order to start developing a Global Geodesy Development Plan (GGDP). To that end, the working group envisages to set up a sub-working group to focus on the GGDP, and more specifically to list priorities and actions to be discussed with the GGCE once it becomes operational. This includes exploring mechanisms to attract investments in the geodetic infrastructure from Member States and other possible donors. Members of the sub-working group should include experts from the Subcommittee, IAG and its Services, and the GGCE.

18. Geodetic Infrastructure working group members who were involved in a number of scientific events organized by IAG continued to raise the awareness and the importance of the activities of the Committee of Experts, and in particular the work of the Subcommittee, emphasising that this initiative to maintaining and improving the GGRF is a unique opportunity to sustain IAG, science, reference geodetic products and services, via sustaining the geodetic infrastructure that is the basis of all what is carried out within and for geodetic science.

19. **Policies, Standards and Conventions.** The working group on Policies, Standards and Conventions has the objective to encourage Member States to continue to make their data

Findable, Accessible, Interoperable and Reusable (FAIR). Over the intersessional period, working group members have been actively involved with international standards related activities that aim to make data access easier, more useful, more accurate and more efficient for users. This includes work within organizations such as: the Bureau of Products and Standards of the IAG's Global Geodetic Observing System (GGOS) and the International Organization for Standardization (ISO) Technical Committee 211 and the Open Geospatial Consortium (OGC).

20. Notable activities from working group members include:

(a) Further development of the ISO Geodetic Registry (ISOGR) with the goal of facilitating the implementation of the GGRF and the interoperability of national geodetic data and products. The ISOGR is an online database of reference frames and transformations which is used to uniquely identify reference systems and transformations. The ISOGR is the only authoritative source for reference frames and transformations where data is entered and/or validated by the agencies that define and maintain the frames and transformations. During the past year, 45 new coordinate reference systems and associated transformations have been added to the ISOGR, including the latest ITRF2020 and WGS 84 (G2139) reference frames. Another 27 are currently in the process of being added. The ISOGR has also been expanded to include projected coordinate systems with all UTM projections recently added and several national systems in the process of being validated. Work has also continued on migrating the existing ISOGR to a new, more modern platform using the latest versions of ISO standards to enable more reliable and efficient operation in a cloud environment. ISO, OGC and the International Association of Oil and Gas Producers (IOGP), owners of the EPSG registry, have continued working on the preparation of a guide to geodetic registries that clarifies the roles of the different registries currently available. ISO and IOGP have also been collaborating on ways for more efficiently linking the content of both the ISOGR and EPSG registers. The ISOGR can be found at https://geodetic.isotc211.org.

(b) Members of the working group are involved in leading a global initiative to identify and meet user requirements for FAIR geodetic data. This initiative is paying particular attention to ensuring the new and emerging user-base of positioning information (e.g., location-based services and intelligent transport services) have FAIR geodetic data. Through a process of user consultation and engagement the working group is developing industry specific metadata profiles (e.g., construction, agriculture etc.) to help data providers include all relevant metadata and enable users to better the lineage of data and the range of applications it could be applied to.

(c) Under the auspices of the OGC Coordinate Reference System Domain Working Group in conjunction with the IAG working group 1.3.1 on time-dependent transformations between reference frames in deforming regions, a Deformation Model Functional Model specification has been finalised. The intention of this specification is to allow deformation model producers, such as national geodetic agencies, to publish models, and consumers to use them, with confidence that the model is being correctly interpreted and used. The specification defines a general parameterization of deformation models. The total deformation is decomposed into a set of elements, each of which is defined by a spatial function and a time function. The spatial function defines the displacement that applies at a given location, and the time function defines a scalar function that applies for the element at a given time. The displacement due to the element is the spatial function displacement multiplied by the time function scale factor. The total displacement at the location and time is the sum of the displacements from all of the elements. The specification defines a set of parameters and metadata that

define the deformation model, and how they are used to apply that model in coordinate transformations. It does not prescribe how they should be encoded into a digital file, but the work has been conducted in conjunction with a parallel project to define a gridded geodetic data eXchange Format (GGXF). The draft specification is available through GitHub.[4] The specification is currently passing through the formal OGC adoption process and is expected to be published in about September 2022.

(d) The work of another OGC Coordinate Reference System Domain Working Group to define a common, standardized format for grids of different types of geodetic data, the GGXF, has progressed. The content of the format has been finalised and its mapping into a binary encoding is nearing completion. A single, standard, grid file format offers the advantages: i) Grid producers do not have to create file formats themselves, provide their own software to read and interpolate their gridded data or concern themselves with lack of take-up of their data due to its proprietary distribution format; ii) Survey and geographic information software vendors need to read only one grid file format, eliminating the need to repeatedly write programs to import different grids; and iii) End users can use a new grid file as soon as it becomes available, without having to wait for their application vendor to produce a software upgrade. The format is intended to be able to carry any gridded geodetic data, in particular grids supporting geoid models, coordinate transformations, velocities and deformation. GGXF has been designed to cope with multiple levels of data resolution, engender computational efficiency, be straightforward for grid producers to populate and easy and efficient for application developers to use. The draft specification together with proof-of-concept implementation is available from GitHub.[5]

(e) Based on discussions in international forums, the working group has found that data sharing is inconsistent or absent across regions. The barriers to data sharing include: legislative limitations, institutional and conflicting commercial concerns, lack of financial and technical resources, lack of regional collaboration and initiatives (often due to geographic isolation or cultural behaviour), sparseness of geodetic infrastructure and lack of data, and security concerns. The working group will continue to encourage Member States to more openly share their geodetic data by contributing to existing international data portals or provide access to their own portal, use international metadata standards and metadata catalogues for their own portals, and continue to assist in data sharing workshops.

(f) Working Group members have been involved in establishing best practices for the consistent implementation of Digital Object Identifiers (DOIs) across all IAG Services and in the broader geodetic community. This includes participation in discussions on DOI-related topics during regular video conferences (e.g., granularity, hierarchical DOIs, DOIs for products, FAIR principle etc.).

(g) Members of the PSC working group have noted the increasing reliance on space-based positioning standards (e.g., WGS84) to be interoperable with terrestrial based positioning standards (e.g., ITRS) and encourage all Member States to ensure standards are aligned to ensure applications will not be negatively affected. This particularly relates to the International Civil Aviation Organization (ICAO) but may also include the International Hydrographic Organization (IHO). Specifically, ISO TC20/SC14/WG1 recently approved a new standard (ISO 24246:2022)[6] that stipulated how GNSS Continuously Operating Reference

4 https://github.com/opengeospatial/CRS-Deformation-Models/blob/master/products/specification/abstract-specification-deformation-model-functional-model.pdf

5 https://github.com/opengeospatial/CRS-Gridded-Geodetic-data-eXchange-Format

6 https://www.iso.org/standard/78181.html?browse=tc

Stations (CORS) were to receive data and indicated a preference for satellite-based reference systems (e.g., WGS84). Furthermore, European level working groups have developed regional standards for Intelligent Transport Systems (EN 16803-1:2020)[7] that adopt similar space-based reference systems. This diverges from most applications reliant on terrestrial-based reference systems that account for earth surface movement. There is a need to homogenize efforts in developing standards to ensure interoperability of geospatial data across all domains.

21. At its eleventh session, the Committee of Experts noted that the integration of the terrestrial, maritime and cadastral domains remained a priority for Member States and encouraged further consideration to ensure that institutions collaborate to consider and develop interoperable arrangements, standards and infrastructures for the integration of all types of geospatial information leveraging the Integrated Geospatial Information Framework (IGIF). Efforts have begun to collaborate with the Working Group on Marine Geospatial Information to focus on transitioning from maritime to terrestrial domains. This will ensure the interoperability of data between these domains and require appropriate policies, standards and conventions to support the GGRF in both domains and implement the IGIF. The Working Group on Marine Geospatial Information have likewise addressed this issue in their report to this twelfth session (E/C.20/2022/15/Add.1).

22. **Education, Training and Capacity Building.** Analysis of the 2018 worldwide geodetic educational needs assessment determined that strong institutional support from national geodetic organizations and international professional organizations, such as the International Association of Geodesy (IAG) and International Federation of Surveyors (FIG), as well as appropriate means for resourcing the needs, will be required to realize the GGRF. The results of the assessment were documented and published by the FIG as an Article of the Month in January 2021.[8]

23. The working group has continued to actively engage with international technical bodies and representatives of small island developing states to support the modernisation of geodetic infrastructure and systems through capacity and skills development workshops. Essential to these engagements is the integration of geodetic capacity development within the broader scope of national geospatial information management to contribute to the SDGs and Sendai Framework for Disaster Risk Reduction (Sendai Framework) within the implementation guidance of the IGIF.

24. Building upon the valuable information collected in the 2018 assessment, the working group prepared and launched a follow-on survey in 2020 on Geodetic Reference Frame Competency. The Working Group worked with regional partners to promote survey participation in regions that were under-represented in the 2018 needs assessment. The results from this follow-on survey will allow the Subcommittee to better understand and raise awareness on gaps and future investment needs in geodetic education, training, and capacity development to sustain national, regional, and global geodetic reference frames for sustainable development. Results from the 2018 and 2021 assessments will also inform appropriate and strategic development of education, training, and capacity development work packages as outlined in the 2021 Position Paper on Sustaining the Global Geodetic Reference Frame and E/C.20/2021/7/Add.1.

25. The results from this survey will be further analysed over this next year to determine updated and refined regional and national needs. This information will be coordinated with the GGCE to provide context for the needs of Member States in different regions around the

[7] https://genorma.com/en/project/show/cen:proj:66697
[8] https://fig.net/resources/monthly_articles/2021/Keenan_etal_January_2021.asp

world and to aid in planning to address capacity development specifically but also any education and training needs.

26. Since the eleventh session, the working group has contributed widely, and often remotely via video conference, to numerous geodetic workshops, seminars, plenaries, and conferences, especially in the Asia-Pacific and Americas regions, all of which have significantly improved the geodetic stakeholder community's awareness and perception of the Committee of Experts and the Subcommittee in these regions. During FIG Working Week 2021, FIG's Capacity Development Network (CDN), Commission 2 (Professional Education) and Commission 5 (Positioning and Measurement) hosted a joint session titled 'Coordination of Global to Regional Geodetic Efforts through the United Nations'. This session focused on education, training and capacity building related issues for Member States and facilitated dialog for both developed and developing countries. The intent was to bring awareness of global programs supporting the working group's efforts, to endorse completion of the global competency survey, and to receive direct feedback on education, training and capacity building needs. Additional topics related to the SDG's and other efforts of the Committee of Experts were presented in other sessions. Additional outreach and communication of education, training and capacity building needs occurred during the 2021 SIRGAS annual meeting as well as UN-GGIM Regional Committee meetings.

27. The working group continues to emphasize the need for regionally focused strategies, as the nature and variety of challenges differ regionally and may include linguistic, technological, economic, and cultural impediments. Additional findings from the educational needs assessment indicated that access to highly skilled personnel varies widely among Member States, thus requiring the need to ensure that knowledge and competence are shared in FAIR formats. A key to optimizing the efficiency of the group's objectives is to identify and make existing educational and capacity development resources easily discoverable, while identifying gaps in capacity and proposing short and long- term solutions to bridge these deficiencies. The working group plans to collaborate with FIG, the IAG and its technical services, as well with stakeholder international organizations such as the UN Inter-Governmental Committee on Global Navigation Satellite Systems (ICG), the Committee on Earth Observation Satellites (CEOS), and the Group on Earth Observations (GEO) to identify focal point for enabling information discovery and distribution around the world.

28. The working group noted with interest the broad potential of the IGIF, especially the communications and capacity development benefits provided in its Strategic Pathways. The working group has proposed three guiding principles to support the IGIF: i) a strategic regional focus, utilizing the IGIF to bridge gaps and sensitivities in language and culture; ii) ensure that knowledge and skills are discoverable and openly shared by aligning resources to a common vocabulary and comprehensive organizational templates; and iii) utilizing the IGIF to facilitate collaboration with geodetic support and advocacy organizations.

29. The working group plans to organize its future work in a strategic implementation plan to align with the goals in the Position Paper on Sustaining the GGRF, and supporting subsequent plans developed by the Subcommittee to help achieve sufficient geodetic capacity to ensure the long-term sustainability and quality of the GGRF. This education, training and capacity building strategic implementation plan will advocate, utilize the implementation guidance and support the recommended actions, templates, and vocabulary of the IGIF whenever possible, and support the work packages contained in the Position Paper as well as that of the GGCE. The working group notes the value of diverse perspectives in its work and encourages members of the Subcommittee to contribute to its work.

30. **Communications and Outreach.** During the intersessional period, the Communication and Outreach working group has provided planning and strategic communication support for the Subcommittee's side events: The Subcommittee's side event 'GGCE: Pulling Together – European Contribution to the Global Geodetic Centre of

Excellence' at UN-GGIM: Europe's 8th plenary meeting in October 2021, and the side event on the margins of this twelfth session of the Committee of Experts.

31. Working group members have also been engaged in other regional and stakeholder meetings as part of the broader communications and outreach effort for the Subcommittee, such as UN-GGIM: Asia Pacific, the Pacific Geospatial and Surveying Council (PGSC), FIG and the Geodetic Reference System for the Americas (SIRGAS).

32. The working group has met virtually during the intersessional period and has started an initial discussion to review its working modalities. The working group has discussed how communication resources can involve and support the Subcommittee with customized and targeted communication when implementing the position paper's work packages.

33. The working group has also continued to provide communication services to the Subcommittee through social media; @unggrf at Twitter and the subcommittee's LinkedIn profile as well as the landing page of unggrf.org.

34. The upgrade of unggrf.org to the new platform at Squarespace is performing well, and the website is the Subcommittee's landing page for social media and news articles, and it complements the Subcommittee's web page on the UN-GGIM website.

III. Coordination of efforts

35. In the intersessional period the Subcommittee have discussed and consulted on the proposed governance and operational modalities of the Subcommittee and the GGCE. The Subcommittee have also been considering how to develop stronger working relationships between the Subcommittee, the GGCE, IAG, FIG, ISO and other relevant organisations. The intent of this discussion is to improve collaboration and coordination and reduce duplication of effort as we strive to sustain the GGRF.

IV. The United Nations Global Geodetic Centre of Excellence in Bonn

36. In August 2020, at the tenth session of the Committee of Experts, an offer by Germany to host the GGCE was acknowledged and supported by many Member States. It is planned to establish the GGCE at the UN Campus in Bonn, Germany, with an additional virtual secondment provided by Norway. The work plan and priorities of the GGCE will be adapted to the available workforce, with possible future extensions. Member States and organisations may contribute to the GGCE in a number of ways including, in-kind staff contributions (in person and virtual), organizing dedicated workshops for education, training and capacity development, providing geodetic instruments and expertise, or contributions for a longer period of time to coordinate and organize specific tasks and activities of the GGCE. It is envisaged that in-kind staff contributions may be formalized through MoUs or Letters of Collaboration.

37. Acknowledging that the GGRF depends on the participation all Member States, and the need to take action to strengthen international cooperation, the overarching goal of the GGCE is to deliver a work program to achieve the long-term sustainability and quality of the GGRF. Therefore, contributions to the UN Trust Fund which fund the operation and work program of the GGCE are welcome. Any funding provided can have a specific focus, for example, multiple Member States could contribute to the 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 Subcommittee strongly

encourages any Member State interested in contributing to the GGCE, no matter how small, to discuss options with the UN-GGIM Secretariat about how to be involved.

38. The legal framework and agreement between the Government of Germany and the United Nations have recently been concluded, so that the GGCE may be established in 2022.

V. Next Steps

39. The Subcommittee will continue to develop stronger working relationships with the IAG, FIG, ISO and other relevant organisations. Once the GGCE is established, the Subcommittee plans to engage in broad consultations to discuss the governance model which will enable organisations to best work together to sustain the GGRF. Once the GGCE is established, the Subcommittee will also offer its assistance to the GGCE to give advice and assistance in designing and establishing its International Advisory Committee.

40. Further, the Subcommittee is ready and willing to support the GGCE in its establishment, provide expert guidance through the GGCE International Advisory Committee, and work to ensure the GGCE has the best start-up conditions possible. This includes helping to establish strategic liaisons with relevant Member States, IAG, FIG and relevant geodetic stakeholders and provide updates on the GGRF history and status, and other relevant background information. The Subcommittee will also offer its assistance to the GGCE and help develop its work program and identify priorities which will be taken from the Position Paper on Sustaining the GGRF.

41. To advance its work, the Subcommittee will continue with its online meetings in the upcoming period. However, the Subcommittee has noted the value of in-person exchanges and interactions amongst its members and relevant stakeholders, and wish to consider, when global conditions permit, organizing its next formal (in-person) plenary meeting before the thirteenth session of the Committee of Experts. The Subcommittee welcomes offers to support and host this plenary meeting, noting its last in-person plenary meeting was in November 2018. In this regard, the Subcommittee has noted the value and relevance of convening this plenary meeting at the GGCE in Bonn, Germany once established.

VI. Points for discussion

42. The Committee of Experts is invited to:

(a) Take note of the present report and the work and progress of the Subcommittee, including its considerable efforts to grow the critical understanding, awareness and importance of the GGRF as a vital global infrastructure;

(b) Provide guidance on how to attract more contributions to support the establishment and operations of the Global Geodetic Centre of Excellence and encourage Member States and relevant geodetic stakeholders to contribute to the Centre;

(c) Provide guidance on the planned activities of the Subcommittee: i) on how to proceed with developing stronger working relationships between the Subcommittee, the GGCE, IAG, FIG, ISO and other organisations, and ii) on how to design an efficient and competent International Advisory Committee for the GGCE;

(d) Take note of the desirability of convening the next in-person plenary meeting of the Subcommittee on Geodesy, during the upcoming intersessional period, in Bonn, Germany.