

1st Joint Development Plan for Global Geodesy



Version 1.0



**United
Nations**



**United Nations
Global Geodetic
Centre of Excellence**

1st Joint Development Plan for Global Geodesy

United Nations Global Geodetic Centre of Excellence (2025)

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LIST OF CONTRIBUTORS

MEMBER STATES

Africa

Burkina Faso, Cameroun, Côte d'Ivoire, Egypt, Ethiopia, Ghana, Madagascar, Morocco, Nigeria, South Africa, Uganda.

Americas

Antigua and Barbuda, Argentina, Bahamas, Barbados, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, Grenada, Guatemala, Guyana, Honduras, Jamaica, Mexico, Panama, Peru, Trinidad and Tobago, United States of America, Uruguay, Venezuela.

Arab States

Algeria, Bahrain, Comoros, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Somalia, State of Palestine, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates and Yemen.

Asia Pacific

Armenia, Australia, Bhutan, Brunei, China, Fiji, India, Indonesia, Iran (Islamic Republic of), Japan, Kazakhstan, Kingdom of Tonga, Malaysia, Mongolia, New Zealand, Philippines, Republic of Korea, Russian Federation, Singapore, Sri Lanka, Thailand, Timor-Leste, Tuvalu.

Europe

Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Germany, Estonia, Finland, France, Georgia, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of Kosovo, Republic of North Macedonia, Serbia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom.

PARTNERS

Esri, European Space Agency (ESA), FrontierSI, International Association of Geodesy (IAG), International Federation of Surveyors (FIG), International Hydrographic Organization (IHO), International Organization for Standardization Technical Committee 211 (ISO/TC 211), National Aeronautics and Space Administration (NASA), Geodetic Reference System for the Americas (SIRGAS), The Pacific Community, Topcon, Trimble, United Nations Economic Commission for Africa (UNECA), United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), United Nations Global Geospatial Information Management Subcommittee on Geodesy, United Nations Office of Outer Space Affairs International Committee on Global Navigation Satellite Systems (UNOOSA ICG).

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1.0

INTRODUCTION

Background

Modern society is dependent on satellites, and satellites are dependent on the global geodesy supply chain.

In many countries, satellite information is essential for economic growth, the operation of critical infrastructure, and is a cornerstone of national defence forces.

Operation of critical infrastructure

Although best known as a positioning and navigation system, accurate on-board atomic clocks make Global Navigation Satellite System (GNSS) satellites excellent timekeepers. As a global, 24/7 operational, free (to the user) resource, GNSS (predominantly the Global Positioning System (GPS)) has become the world's primary system for the distribution of accurate (sub-microsecond) time. However, this heavy reliance on GNSS timing raises concerns about potential weaknesses in the global geodesy supply chain.

The U.S. Department of Homeland Security found that 15 out of 18 critical infrastructure and key resources sectors rely on the GPS including telecommunications, emergency services and financial exchanges.¹

Without GNSS timing, the operation of mobile phone networks would be impossible, stock exchanges would have reduced protection for investors and, the daily operation of power grids would be more difficult and labour intensive.

Economic benefits

National economies are increasingly reliant on revenue generated from satellite services. Over the next decade, global GNSS downstream market revenue is expected to grow at a mean annual growth rate of 9.2%, reaching a total of €492 billion by 2031. Over 82% of the revenue will be

generated in mass market user segments (e.g. mobile devices, tourism, health and automotive) along with the industry sectors of agriculture, urban development, and infrastructure.

In the same period, Earth Observation (EO) market revenues are set to double from roughly €2.8 billion to over €5.5 billion. Major contributors to this are expected to come from climate services, urban development and agriculture.

The satellite communications market size is estimated at US\$193 billion in 2024, and is expected to reach US\$297 billion by 2029, growing at rate of approximately 9% between 2024-2029. This is largely driven by increasing demand for high-speed internet, communication services, and data transfer across different industries.

Development agenda

A reliable global geodesy supply chain is fundamental to supporting the collection, integration, and utilization of all other geospatial data, which is necessary to measure, monitor, and evaluate 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 agendas and initiatives.

Place in space

Thanks to the science of geodesy (and highly qualified geodesists), it is possible to observe and monitor the *place in space* of both the Earth and satellites. This includes monitoring the Earth's position, shape, size, orientation, and

¹ Dana Goward, NSC director: GPS 'Still a Single Point of Failure', (*GPS World*, 4 Jan. 2022) <https://www.gpsworld.com/nsc-director-gps-still-a-single-point-of-failure/> accessed 28 May 2024.

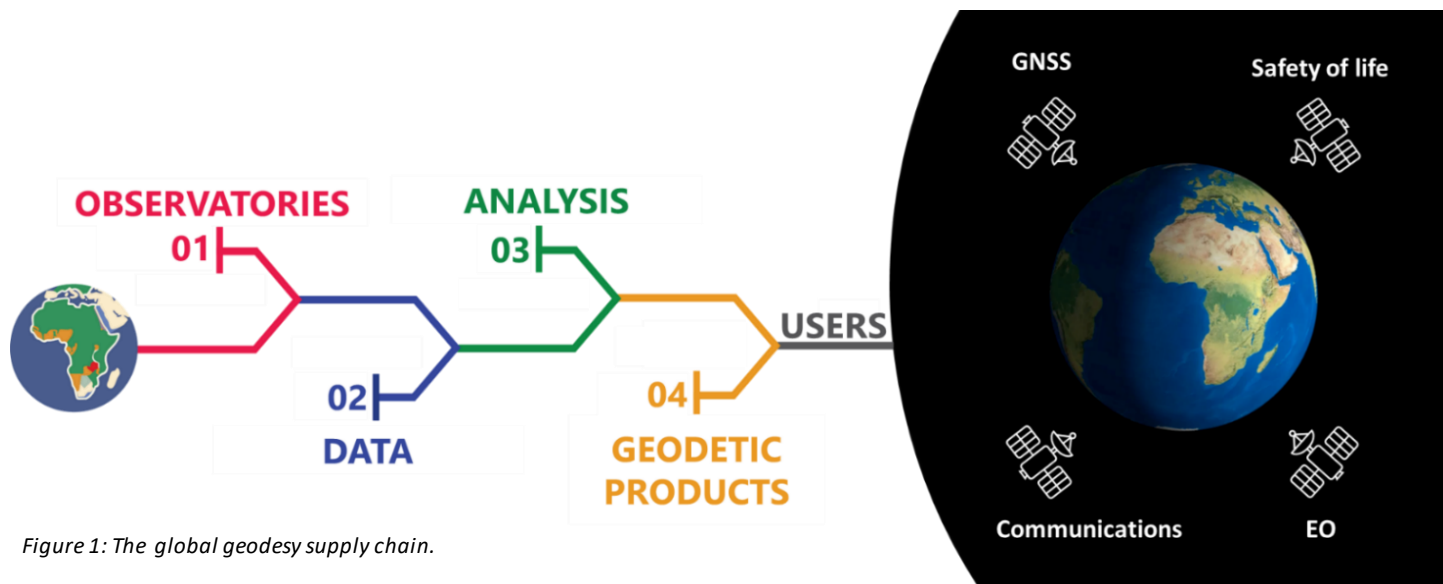


Figure 1: The global geodesy supply chain.

gravity field, and how these parameters change over time. In the case of satellites, it refers to monitoring their position as they orbit the Earth and observing the changes between their predicted orbit and actual orbit due to things like changes in the Earth's gravity field or solar radiation pressure.

The Earth and satellite *place in space* information are types of geodetic products.

Other important geodetic products include a global coordinate reference frame and a global gravity reference frame, which provide points of reference for measurements (like a zero point on a ruler). It is only by combining all these geodetic products together that people can accurately and reliably use satellite data.

Global geodesy supply chain

Geodetic products are the outputs of the global geodesy supply chain (Figure 1: The global geodesy supply chain.) which includes:

- ground station observatories owned and operated by mapping agencies, space agencies, universities and research groups, who constantly observe the movement of the Earth and satellites;
- data centres operated by specialists who quality check, store, and archive the data from observatories and make it available to the global geodesy analysis community; and,
- analysis, combination and correlation centres and analysts who translate the raw data into geodetic products.

It is a *global* geodesy supply chain because no single country can fulfill all the requirements of accurately and reliably observing and analyzing the Earth and satellites. To measure the continuous changes, with the timeliness and level of precision required to produce the geodetic products satellites and users demand, ground observatories and highly qualified people within governments and universities all around the world are needed.

Global Geodesy Needs Assessment

The UN-GGCE undertook a thorough *Global Geodesy Needs Assessment*² to guide the formulation of everything from the goals to the activities of this report. The UN-GGCE reviewed and summarized expert views and perspectives from in-person consultation meetings and nine "listening" sessions where the team members listened to the needs of over 550 representatives from 110 Member States and partner organizations around the world.

Furthermore, the Global Geodesy Needs Assessment drew on responses and recommendations from other reports and surveys including the UN-GGIM Subcommittee on Geodesy: Global Surveys on Geodetic Reference Frame Competency Surveys (2021 and 2018), UN-GGIM Subcommittee on Geodesy Position Paper on Sustaining the Global Geodetic Reference Frame (2021) and UN-GGIM Subcommittee on Geodesy: Geodetic Infrastructure Working Group Questionnaire (2020).

² UN-GGCE, 2024, Global Geodesy Needs Assessment, https://ggim.un.org/UNGGCE/documents/20240509-Global_Geodesy_Needs_Assessment.pdf accessed 28 May 2024.

2.0

1st JOINT DEVELOPMENT PLAN FOR GLOBAL GEODESY

Purpose

The purpose of the *1st Joint Development Plan for Global Geodesy (Joint Development Plan)* is to translate the geodetic needs of Member States and partners into strategic objectives and activities, which, when achieved, will strengthen the global geodesy supply chain.

Guiding Principles

This *Joint Development Plan* embraces guiding principles from the United Nations and other non-government organizations for capacity development, standards and best practices for asset management, best practices for operating supply chains in federated systems, and best practices for program design, management and evaluation. These principles are outlined in further detail below.

Asset and quality management

The proposed activities of the *Joint Development Plan* reflect that the global geodesy supply chain is an ensemble of 'assets' which have significant value and must be managed to ensure they perform at the level required to deliver on Member State requirements. For example, the timing information provided by GNSS satellites is required in some Member States to operate critical national infrastructure³ such as power supplies, finance, telecommunications and emergency services. Some Member States have, therefore, called for elements of the global geodesy supply chain that provide geodetic products essential for the operation of GNSS to also be recognized as critical national infrastructure.²

In recognition of the importance of the supply chain, it is recommended that groups leading activities to strengthen the supply chain refer to the Asset Management (series 15000) and Quality Management (series 9000) standards published by the International Organization for Standardization (ISO) for guidance. These standards provide recommendations for best practices in the operation of infrastructure and quality management of data services. Such standards are used by asset and quality managers worldwide in sectors such as transport and meteorology.

Operating federated supply chains

The global geodesy supply chain is a federated supply chain. Assets and services of the supply chain are owned and operated by governments, academic and scientific institutions within Member States with admirable coordination effort provided by the International Association of Geodesy (IAG).

The *Joint Development Plan* provides suggested activities across three phases to strengthen the governance of a federated supply chain in a manner commensurate with the risk associated with our growing reliance on it.

Implementation of UN-GGIM Subcommittee on Geodesy strategies

The United Nations Global Geospatial Information Management Subcommittee on Geodesy (SCoG) is comprised of geodetic expert representatives from Member States and partner organizations such as the International Association of Geodesy (IAG).

The role of the SCoG is to develop strategies, implementation plans, policies, and guidelines to help

³ Critical national infrastructure refers to infrastructure or services governments provide such as power supplies, finance, telecommunications and emergency services. Any disruption to these would have serious consequences on national security or the economic and / or social welfare of a country.

achieve the long-term sustainability, accessibility and quality of the global geodesy supply chain.

The SCoG however does not have dedicated resources or a formal Secretariat. It is therefore important that the SCoG and UN-GGCE work closely together to ensure the strategies developed by the SCoG can be translated into action by the UN-GGCE.

Collaboration with the International Association of Geodesy

The International Association of Geodesy is a scientific association which promotes scientific cooperation and research in geodesy on a global scale and contributes to it through its various research bodies. Members of IAG often work for Member State governments or universities.

Throughout the UN-GGCE Listening World Tour, there was resounding feedback from Member States and partner organizations who expressed their gratitude to IAG for their work providing coordination of member activities to measure and monitor the Earth, and satellites, and develop critical products which are used every day by people for positioning, navigation and timing services.

Participants in the Listening World Tour also expressed their concern for the over-reliance the world has on the IAG to perform both the scientific research and operational support and the risks this poses to satellite services and national economies.

The *Joint Development Plan* provides suggested activities to: 1) heighten the awareness of the global dependence on IAG, and 2) enhance support for the IAG in the form of capacity development, resourcing and formalised commitments.

Theory of Change

The theory of change was used by the UN-GGCE team to create the *Joint Development Plan*. A theory of change is a method that explains how a given intervention, or set of activities, are expected to lead to a specific change, drawing on a causal analysis based on available evidence.

A theory of change was preferred for many reasons. Firstly, it is well suited for complex problems with many factors and layers which are deeply embedded. It assists with the identification of root causes of the challenges and how they

influence or depend on each other. Furthermore, it helps to prioritise when and where specific effort or interventions are needed.

Secondly, a theory of change provides a framework for monitoring, evaluation and learning both within and between programming cycles. By articulating the causes of a development challenge, making assumptions explicit on how the proposed strategy is expected to yield results, and testing these assumptions against evidence—including what has worked well, or not, in the past—the theory of change helps ensure a sound logic for achieving change.⁴

Thirdly, the theory of change is increasingly being utilized as a means for developing and managing partnerships and partnership strategies. This is particularly important for the broad, and growing number of geodesy stakeholders to ensure clear articulation of the purpose of the *Joint Development Plan* and clear communication to beneficiaries, stakeholders, donors, governments and other partners.

Further information regarding the UN-GGCE's theory of change and logical framework development can be found as Annex's to this *Joint Development Plan*.

United Nations resolutions, directives, guidelines and procedures

The *Joint Development Plan* also reflects United Nations resolutions, directives, guidelines, and procedures for guidance ensuring alignment with:

- UN General Assembly resolution 69/266 entitled 'A global geodetic reference frame for sustainable development'.
- UN-GGIM Subcommittee on Geodesy 'Position Paper on Sustaining the GGRF' (E-C.20-2021-7-Add-2).
- The 2030 Agenda for Sustainable Development
- The Paris Agreement (on Climate Change).
- Sendai Framework for Disaster Risk Reduction.
- Habitat III: The New Urban Agenda.
- Small Island Developing States Accelerated Modalities of Action Pathway (SAMOA Pathway).
- Regional agendas such as the INSPIRE Directive (European Union) and Agenda 2063: the future we want for Africa.

⁴ UNSDG, Theory of change, <https://unsdg.un.org/sites/default/files/UNDG-UNDAF-Companion-Pieces-7-Theory-of-Change.pdf> accessed 25 September 2024.

- UN Integrated Geospatial Information Framework (UN-IGIF) and the Diagnostic Tools used to develop Country Action Plans.
- UN Guidelines on Infrastructure management and development, including UN Guidelines on Infrastructure Asset Management and UNEP International Good Practice Principles for Sustainable Infrastructure.
- Member State development priorities and strategies, where applicable.
- Best practice program design, monitoring, and evaluation.

It is important to consider this information as potential donors or funding agencies aim to:

- Maximise impact by ensuring alignment with regional and global initiatives. This requires the identification of long-, medium- and short-term objectives, impacts, and outcomes.
- Minimize duplication of effort.
- Ensure transparency through monitoring and evaluation processes.

Strengthening the global geodesy supply chain in a phased approach

The *Joint Development Plan* outlines how to strengthen the supply chain in three phases; with each subsequent phase building on the activities of the previous phase.

Phase 1: Avoid further degradation of the global geodesy supply chain

In Phase 1, Member States and partners are urged to take action to ensure:

- the accuracy of geodetic products essential for Member States operational requirements⁵ does not degrade from current levels to ensure support for the current positioning, navigation, and timing requirements of Member States; and
- current geodesy capacity and capability are at least retained, if not improved, especially in developing countries.

The need for immediate action on the activities in Phase 1 is in response to weaknesses in the global geodesy supply chain, which were identified in the Global Geodesy Needs Assessment² and UN-GGCE Hidden Risk report⁶.

It is proposed that Member States and partners achieve this by:

- improving the evidence of the importance of geodesy to people's daily lives;
- growing awareness of the weaknesses in the global geodesy supply chain across government agencies and industries that are reliant on it; and,
- improving national governance arrangements and developing a country-level work plan to manage the strategic, operational, and technical risks associated with the global geodesy supply chain.

Phase 2: A robust global geodesy supply chain

In Phase 2 Member States and partners are advised to build on the foundations in Phase 1 and enhance the reliability and integrity of geodetic products (while maintaining the

accuracy achieved in Phase 1) essential for Member States operational requirements.

The transition from Phase 1 to Phase 2 will be delivered through enhanced coordination, capacity, ground observatory network, data centres, and analysis capability.

A robust geodesy supply chain will have a governance model where Member States manage the federated supply chain in a manner commensurate with the risk and consciously contribute to the production of geodetic products, in particular the International Terrestrial Reference Frame (ITRF) and the global geoid as a reference for height determination. Enhanced coordination will ensure clear responsibility of specific roles, avoid duplication of effort and optimise resources.

Phase 2 will enable stronger foundations for Member State development agendas and industry requirements due to improved data integrity, observatory network uptime, and reliability of geodetic products in developing countries and remote regions. Furthermore, the activities in Phase 2 will improve the efficiency and resilience of critical national infrastructure systems such as power supplies, finance, telecommunications and emergency services.

Phase 3: A next-generation global geodesy supply chain

The transition from Phase 2 to Phase 3 will require research and development and strong collaboration between Member States and partners. Phase 3 will build on the outcomes delivered in Phase 2 and provide improved *accuracy* of geodetic products required to address scientific and societal challenges.

A next-generation global geodesy supply chain would enable millimetre-level monitoring of sea-level changes over decades, which is critical in understanding the causes and effects of climate change. Furthermore, it would meet the emerging needs for satellite operations, autonomous transportation, space exploration, astronomy, and interplanetary travel.

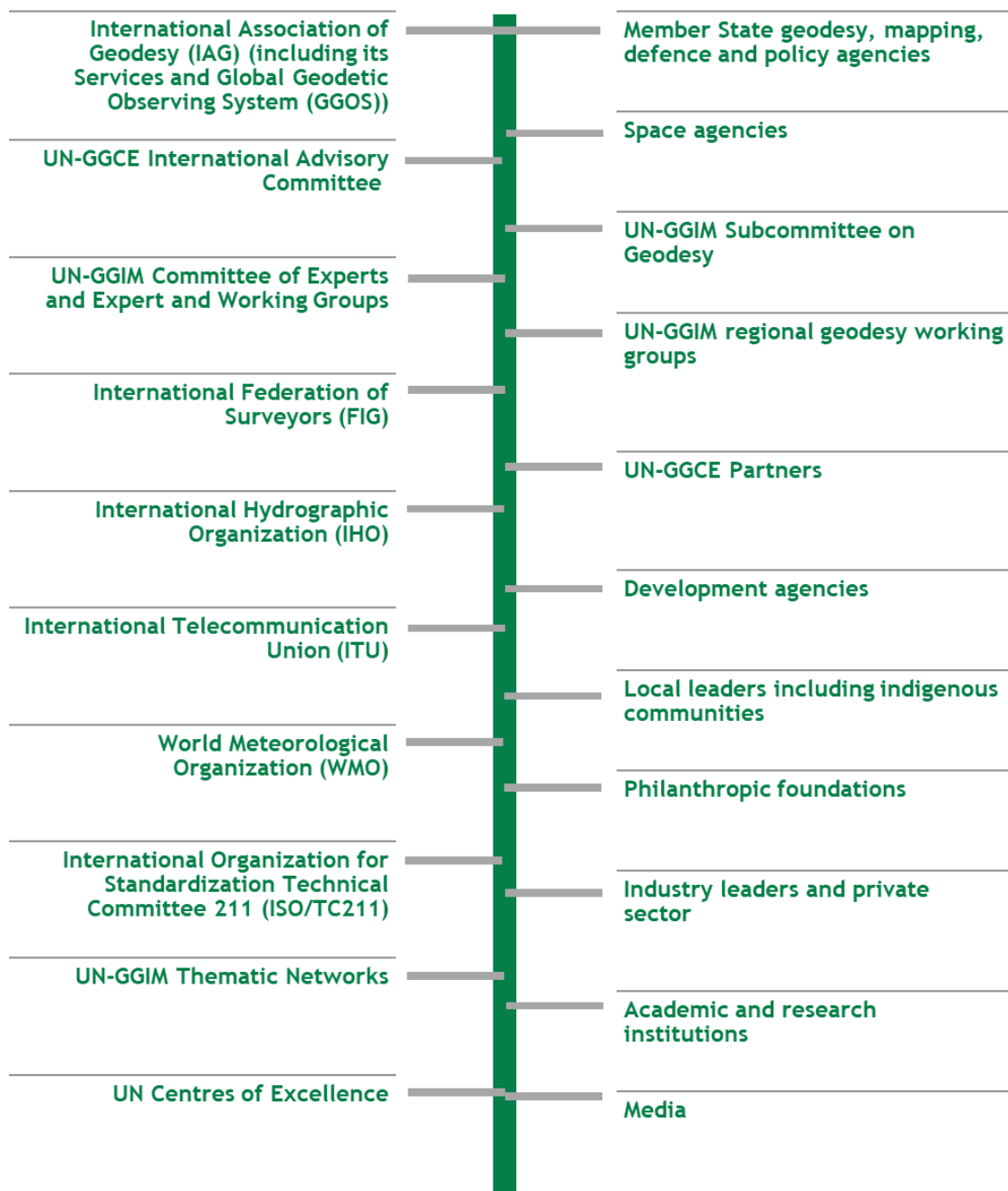
⁵ e.g. GNSS satellite operations (including timing applications); Defence operations; Earth Observation operations.

⁶ UN-GGCE, 2024, Hidden Risk, https://ggim.un.org/UNGGCE/documents/20240620-Hidden_Risk_Report.pdf accessed 28 May 2024.

PARTNERSHIPS FOR ACTION



The activities of the *Joint Development Plan* are beyond the scope of any single agency to tackle alone. The goals and impacts will only be realised if Member States, the UN-GGCE and partners take responsibility to lead, collaborate and deliver on the activities outlined below. The partners involved include but are not limited to those shown below.



GOALS AND IMPACTS

3 GOALS

MANY IMPACTS

The *Joint Development Plan* has three overarching Goals which provide a framework to strengthen the global geodesy supply chain through the provision of strong evidence and outreach to fund ground observatories, data centres, analysis centres, and grow capacity.

In combination, the Goals capture the whole-of-system approach required to create a society that values and prioritizes policy investments in geodesy as being essential to everyday life.

The three goals are:

Goal 1: Geodesy is recognized as being essential to the operation of critical infrastructure and economic development.

Which will provide impacts such as:

- continuity of service to telecommunications, banking, navigation, and other critical infrastructure services;
- defensible revenue raising from land tax;
- land as a reliable asset for loans; and,
- efficient and resilient operation of critical infrastructure.

Goal 2: The global geodesy supply chain is robust and sustainable to support efficient and effective decision-making.

Which will provide impacts such as:

- improved mitigation of risks from hazards such as earthquakes, volcanoes and landslides to communities and infrastructure;
- high integrity intelligent transport systems for collision avoidance;
- more efficient route planning for road, marine, air, and interplanetary travel; and,
- accurately monitored and quantifiable changes in water-level through time.

Goal 3: Geodesy is applied to accelerate the achievement of the UN Sustainable Development Goals.

Which will provide impacts such as:

- continuous, accurate, and reliable monitoring of environmental change through time;
- assisting with the sustainable management of natural resources; and,
- assisting to make cities and human settlements inclusive, safe, resilient, and sustainable.

OBJECTIVES, OUTCOMES AND ACTIVITIES

13 OBJECTIVES

109 ACTIVITIES

The three Goals will be realized through the following **Strategic Objectives** and **Outcomes** delivered by the proposed **Activities** of the Member States, UN-GGCE and partners.

Phase 1: Avoid further degradation of the global geodesy supply chain

Objective 1.1 – Member States are engaged in geodesy governance

Outcomes

- 1.1.1 Member States have improved governance arrangements within their country including a workplan to manage strategic, operational, and technical geodetic risks.
- 1.1.2 Governments, science organizations, industry, and universities understand their roles in the global geodesy supply chain, as well as how they relate to other elements of the chain.
- 1.1.3 Member States understand their dependency on, and contribution to, the global geodesy supply chain, as well as the impact of loss due to failure or degradation of the global geodesy supply chain.
- 1.1.4 Risks associated with weaknesses in the global geodesy supply chain are beginning to be mitigated.

Proposed Activities of Member States

1. Establish, or strengthen an existing, country level geodesy working group which includes representatives from government (science, policy, defence), industry and academia.
2. Lead the development and implementation of a country level strategy and action plan to:

3. Assess risks to their country's economy and environment, and social impacts associated with weaknesses in the global geodesy supply chain.
- Increase awareness of the global geodesy supply chain within government, industry and the broader public.
- Address risks that, if realised, would have significant economic, social, and environmental consequences.

Proposed Activities of UN-GGCE

3. Implement a Multilateral Memorandum of Understanding on strengthening the global geodesy supply chain which can be signed by government agencies, industry bodies or science organizations.
4. Establish a website for Member States to voluntarily report on the Activities assigned to them in the Joint Development Plan, monitor their progress and provide summary statistics of Member State activities.
5. On request, assist Member State representatives to establish or strengthen country level working groups, strategies and action plans.

Proposed Activities of partners

6. Engage with Member State representatives and assist them to establish or strengthen country level working groups, strategies and action plans.

Timeline and Committed Parties: Objective 1.1

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
3	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	-	-	-
4	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	-	-	-
5	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE
6	<ul style="list-style-type: none"> SCoG IAG Esri 	<ul style="list-style-type: none"> SCoG IAG UN-GGIM regional committees Esri RMIT University 	<ul style="list-style-type: none"> SCoG IAG UN-GGIM regional committees Esri RMIT University 	<ul style="list-style-type: none"> SCoG IAG UN-GGIM regional committees Esri RMIT University 	<ul style="list-style-type: none"> SCoG IAG UN-GGIM regional committees Esri RMIT University

How to read the Timeline Tables

The timeline tables contain the proposed activities of the UN-GGCE and partners along with the proposed time frame when the activity will be undertaken.

The proposed Activities of partners contain the names of a partner (or partners) that has (have) committed to lead or assist with the proposed activity and when they plan to undertake the work. The UN-GGCE will be in contact with partners to measure their progress and share their outcomes and deliverables.

Activities with a red background reflect that not enough partners are responsible for, or have dedicated themselves to, performing these activities which puts the Objective and future Phases of the Joint Development Plan at risk of not being realized.

Reporting on Member States Activities

The proposed activities of Member States are not shown in the tables in the Joint Development Plan as the activities the Member States choose to do and the timeframe they choose is country specific. The UN-GGCE team has developed an online tool for Member States to record and track progress on their activities. For a link to the online reporting tool for your country, please contact the UN-GGCE on un-ggce@un.org.

Objective 1.2 – Maintain current accuracy and reliability of geodetic products

Outcomes

- 1.2.1 The accuracy and reliability of geodetic products is maintained at current levels.
- 1.2.2 Member States have committed to the ongoing operation of:
 - existing ground observatory stations; and,
 - data, analysis, combination, correlation and geodetic product development centres.
- 1.2.3 The Global Geodesy Supply Chain meets Member State Position, Navigation and Timing operational requirements for critical national infrastructure and key resource sectors.
- 1.2.4 Where possible, Member States make geodetic data Findable, Accessible, Interoperable and Reusable (FAIR).
- 1.2.5 Where possible, Member States make geodetic information available in the ISO Geodetic Register and European Petroleum Survey Group (EPSG) register.

Proposed Activities of Member States

- 7. Formalize long term agreements for the operation and maintenance of:
 - existing ground observatory stations; and,
 - data, analysis, combination, correlation and geodetic product development centres

including consideration of land lease agreements, infrastructure maintenance, cybersecurity and staffing.

- 8. Where possible, make geodetic products available under Findable, Accessible Interoperable and Reusable (FAIR) principles⁷.
- 9. Where possible, provide redundant GNSS equipment to regional hubs for other Member States to use.

Proposed Activities of UN-GGCE

- 10. Develop guidelines to assist Member States in making geodetic products available in the ISO Geodetic Register and in line with FAIR principles.

Proposed Activities of partners

- 11. Establish regional hubs to host, and share, geodetic equipment and products, and provide technical support. [with support from UN-GGCE and partners]
- 12. Where possible, provide redundant GNSS equipment to regional hubs for other Member States to use.⁸
- 13. Where possible, make geodetic products available under FAIR principles.

Timeline and Committed Parties: Objective 1.2

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
10		<ul style="list-style-type: none"> • UN-GGCE 	<ul style="list-style-type: none"> • UN-GGCE 	<ul style="list-style-type: none"> • UN-GGCE 	<ul style="list-style-type: none"> • UN-GGCE
11	<ul style="list-style-type: none"> • IAG • The Pacific Community (Asia-Pacific) • Africa? • Arab States? • Americas? • Europe? 	<ul style="list-style-type: none"> • IAG • The Pacific Community (Asia-Pacific) • Africa? • Arab States? • Americas? • Europe? 	<ul style="list-style-type: none"> • IAG • The Pacific Community (Asia-Pacific) • Africa? • Arab States? • Americas? • Europe? 	<ul style="list-style-type: none"> • IAG • The Pacific Community (Asia-Pacific) • Africa? • Arab States? • Americas? • Europe? 	<ul style="list-style-type: none"> • IAG • The Pacific Community (Asia-Pacific) • Africa? • Arab States? • Americas? • Europe?
12	<ul style="list-style-type: none"> • Geoscience Australia (Asia-Pacific) 	<ul style="list-style-type: none"> • Geoscience Australia (Asia-Pacific) 	<ul style="list-style-type: none"> • Geoscience Australia (Asia-Pacific) 	<ul style="list-style-type: none"> • Geoscience Australia (Asia-Pacific) 	<ul style="list-style-type: none"> • Geoscience Australia (Asia-Pacific)
13	<ul style="list-style-type: none"> • IAG 	<ul style="list-style-type: none"> • IAG 	<ul style="list-style-type: none"> • IAG 	<ul style="list-style-type: none"> • IAG 	<ul style="list-style-type: none"> • IAG

⁷ FAIR principles, <https://www.nature.com/articles/sdata201618>, date accessed 26 September 2024.

⁸ Geoscience Australia have an exchange of letters with The Pacific Community (SPC) to gift them geodetic equipment which is no longer required by the Australian Government. SPC make this equipment available for use by Pacific Island Member States.

Objective 1.3 – Decision-makers are convinced of importance of geodesy

Outcomes

- 1.3.1 Evidence and communication products are available to Member States and partners which describe the importance of the global geodesy supply chain.
- 1.3.2 Member States are successful in accessing resources to avoid further degradation of the global geodesy supply chain.

Proposed Activities of Member States

- 14. Develop business cases (with consideration of current government priorities) to access resources to avoid further degradation of the global geodesy supply chain. [with support from UN-GGCE]
- 15. Submit business cases to government with support from members of the country geodesy working group, other government departments, and industry groups.

Proposed Activities of UN-GGCE

- 16. Develop a Hidden Risk report and policy brief that describes how weaknesses in the global geodesy supply chain pose risk to economic development and the operation of critical national infrastructure.
- 17. Develop policy briefs that describe the importance of geodesy for topics such as monitoring climate change (two per year).
- 18. Develop State of Geodesy reports which highlight the current state of the elements of the global geodesy supply chain including weaknesses and risks.

Proposed Activities of partners

- 19. Develop examples or use cases that demonstrate how critical the global geodesy supply chain is to their business. [with support from UN-GGCE]
- 20. Perform a more detailed assessment of why there is a lack of FAIR GNSS data and metadata in Africa and the Arab States (as reported in the Global Geodesy Needs Assessment) and outline necessary actions to address these issues.

Timeline and Committed Parties: Objective 1.3

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
16	<ul style="list-style-type: none"> • UN-GGCE 				
17	<ul style="list-style-type: none"> • UN-GGCE 	<ul style="list-style-type: none"> • UN-GGCE 	<ul style="list-style-type: none"> • UN-GGCE 	<ul style="list-style-type: none"> • UN-GGCE 	<ul style="list-style-type: none"> • UN-GGCE
18	<ul style="list-style-type: none"> • UN-GGCE 				<ul style="list-style-type: none"> • UN-GGCE
19		<ul style="list-style-type: none"> • GNSS providers • Earth Observation providers • Sat. Comm providers • IAG 	<ul style="list-style-type: none"> • GNSS providers • Earth Observation providers • Sat. Comm providers • IAG 	<ul style="list-style-type: none"> • GNSS providers • Earth Observation providers • Sat. Comm providers • IAG 	<ul style="list-style-type: none"> • GNSS providers • Earth Observation providers • Sat. Comm providers • IAG
20		<ul style="list-style-type: none"> • SCoG • FIG 	<ul style="list-style-type: none"> • SCoG • FIG 	<ul style="list-style-type: none"> • SCoG • FIG 	

Objective 1.4 – Develop and retain a talented and diverse workforce in areas it is urgently needed

Outcomes

- 1.4.1 The capacity development⁹ requirements of Member States are known.
- 1.4.2 Capacity development programs are designed and delivered to a diverse group of participants to meet Member State needs.
- 1.4.3 Capacity development material is made freely available online.
- 1.4.4 Member States are receiving assistance to improve geodesy capacity.
- 1.4.5 partners are assisting in the delivery of geodetic capacity development.
- 1.4.6 New generations of geodetic researchers are being trained who will develop new methodologies and technologies.

Proposed Activities of Member States

21. Develop and strengthen formal geodesy training programs in country or in partnership with other countries.
22. Prioritise training new staff members with geodesy skills to transfer knowledge from existing staff.
23. Prioritise hiring of geodesists into science and defence organizations.
24. Work with the university and industry sectors to develop or strengthen formal geodesy training programs.
25. Provide scholarships or grants for geodesy research and development in universities.

Proposed Activities of UN-GGCE

26. Develop and deliver rationalizations or justification specifically aimed at universities to encourage investment in delivering geodesy programs.
27. Develop and deliver a communications package which describes the benefits of a career in geodesy.
28. Identify Member State capacity development needs in Global Geodesy Needs Assessment and prioritize the needs by region and Member State.

29. Design and deliver capacity development training program for each region with time allocated to addressing specific Member State geodetic needs, ensuring consideration of participants technical skills and diversity.
30. Make material from capacity development workshops, and other geodetic education material available online and in multiple languages (where possible).
31. Provide online list of scholarship opportunities in the field of geodesy.

Proposed Activities of partners

32. Provide resources for the UN-GGCE led regional capacity development training.
33. Provide geodesy capacity development workshops in conjunction with science and industry meetings or conferences.
34. Provide scholarships or grants for geodesy research and development in universities.

⁹ Capacity development is defined by the United Nations Development Group (UNDG) as the process whereby people, organizations and society as a whole unleash, strengthen, create, adapt and maintain the ability to manage their affairs over time. In the context of this report, capacity development refers to training of professionals to operate the current global geodesy supply chain and future generations of geodesists who will research and develop new methodologies and technologies.

Timeline and Committed Parties: Objective 1.4

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
26				<ul style="list-style-type: none"> UN-GGCE 	
27			<ul style="list-style-type: none"> UN-GGCE 		
28	<ul style="list-style-type: none"> UN-GGCE 				
29	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 		
30	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE
31		<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE
32	<ul style="list-style-type: none"> BIG (Indonesia) Geoscience Australia Land Information New Zealand Singapore Land Authority OGC and ISO/TC211 International Hydrographic Organization UN-GGIM Asia Pacific UN-GGIM Working Group on Marine Geospatial Information UN-GGIM Expert Group on Land Administration and Management SCoG NMRIA (Philippines) NGS (USA) TU Delft (NL) FIG IAG 	<ul style="list-style-type: none"> UN-GGIM regional committees SCoG IAG BKG IGN-France NGI (Belgium) Esri FIG 	<ul style="list-style-type: none"> UN-GGIM regional committees SCoG RMIT University IAG SIRGAS GEOSA (KSA) UN ECLAC Esri FIG 	<ul style="list-style-type: none"> UN-GGIM regional committees SCoG IAG Esri FIG 	<ul style="list-style-type: none"> UN-GGIM regional committees SCoG IAG Esri FIG
33	<ul style="list-style-type: none"> UN-GGIM regional committees FIG IAG SIRGAS 	<ul style="list-style-type: none"> UN-GGIM regional committees UN-GGIM regional committees FIG IAG SIRGAS 	<ul style="list-style-type: none"> UN-GGIM regional committees UN-GGIM regional committees FIG IAG SIRGAS 	<ul style="list-style-type: none"> UN-GGIM regional committees UN-GGIM regional committees FIG IAG SIRGAS 	<ul style="list-style-type: none"> UN-GGIM regional committees UN-GGIM regional committees FIG IAG SIRGAS
34					

Objective 1.5 – The value of geodesy is understood by other science organizations, industry sectors and society

Outcomes

- 1.5.1 All groups involved in the implementation of the Joint Development Plan understand each other’s role and messaging about the plan is clear.
- 1.5.2 Clear and concise communication material is available and being used to demonstrate the value of geodesy.
- 1.5.3 Science organizations and industry sectors dependant on geodesy, and the public, understand the importance of geodesy.
- 1.5.4 Science organizations and industry sectors dependant on geodesy plays a stronger geodesy advocacy role.

Proposed Activities of Member States

- 35. Develop and communicate national and regional stories which demonstrate the value of geodesy to government (e.g. operation of critical infrastructure, environmental monitoring, natural hazard mitigation). [with support from UN-GGCE]

Proposed Activities of UN-GGCE

- 36. Develop and deliver a public awareness campaign about the importance of geodesy and the applications it enables. [with support from partners]
- 37. Engage with science organizations and industry bodies which are dependent on geodesy and encourage greater acknowledgement for geodesy in their publications, conferences and meetings.

Proposed Activities of partners

- 38. Provide guidance on how to better integrate geodesy in the cadastral, maritime and terrestrial domains. [with support from UN-GGCE]
- 39. Develop stories which demonstrate the value of geodesy in industries such as agriculture, health services, urban planning, land administration and mining. [with support from UN-GGCE]

Timeline and Committed Parties: Objective 1.5

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
36		<ul style="list-style-type: none"> • UN-GGCE 	<ul style="list-style-type: none"> • UN-GGCE 		
37		<ul style="list-style-type: none"> • UN-GGCE 	<ul style="list-style-type: none"> • UN-GGCE 	<ul style="list-style-type: none"> • UN-GGCE 	
38		<ul style="list-style-type: none"> • UN-GGIM Working Group on Marine Geospatial Information • UN-GGIM Expert Group on Land Administration and Management 	<ul style="list-style-type: none"> • UN-GGIM Working Group on Marine Geospatial Information • UN-GGIM Expert Group on Land Administration and Management 	<ul style="list-style-type: none"> • UN-GGIM Working Group on Marine Geospatial Information • UN-GGIM Expert Group on Land Administration and Management 	<ul style="list-style-type: none"> • UN-GGIM Working Group on Marine Geospatial Information • UN-GGIM Expert Group on Land Administration and Management
39	<ul style="list-style-type: none"> • Esri 	<ul style="list-style-type: none"> • Esri 	<ul style="list-style-type: none"> • IAG • Esri 	<ul style="list-style-type: none"> • IAG • Esri 	<ul style="list-style-type: none"> • IAG • Esri

Phase 2: A robust global geodesy supply chain

Objective 2.1 – Geodetic products meet Member State accuracy, reliability and integrity standards to deliver on operational requirements

Outcomes

- 2.1.1 A jointly designed robust global geodesy supply chain including ground observing stations, technology, analysis, capacity, software, spectrum and cybersecurity requirements.
- 2.1.2 A jointly developed implementation plan for a robust global geodesy supply chain.
- 2.1.3 Development and sustainment of a robust global geodesy supply chain.
- 2.1.4 The reliability, accuracy and integrity of geodetic products meet civilian, defence and industry operational requirements.

Proposed Activities of Member States

40. Provide the UN-GGCE with your country's operational requirements from the global geodesy supply chain for critical national infrastructure and key resource sectors.
41. Contribute (financially or in-kind) to the geodetic research required to design a robust global geodesy supply chain.
42. Financially contribute to the implementation and sustainment of a robust global geodesy supply chain.
43. Increase awareness in the greater UN-community of the weaknesses of the supply chain and the need for improved governance
44. Investigate possible governance options with the aim to identify ways to improve commitment and strengthen the governance mechanisms of the global geodesy supply chain

Proposed Activities of UN-GGCE

45. Design a draft robust global geodesy supply chain which includes:
 - ground observatory stations; and,
 - data, analysis, combination, correlation and geodetic product development centres,

including consideration of software, spectrum and cybersecurity requirements. [with support from Member States and Partners]

46. Gather expert views and perspectives on the draft robust global geodesy supply chain.
47. Host expert meetings, as required, to bring together government (science, policy and defence) and industry for discussions on developing a robust supply chain.
48. Finalise a design, supported with evidence, of a robust supply chain.
49. Develop an implementation plan in consultation with Member States and partners of a robust global geodesy supply chain.
50. Gather expert views and perspectives on the robust implementation plan.

Proposed Activities of partners

51. Provide the UN-GGCE with your operational requirements from the global geodesy supply chain for your industry.
52. Contribute (financially or in-kind) to the geodetic research and development required to achieve a robust global geodesy supply chain.

Timeline and Committed Parties: Objective 2.1

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
45	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 		
46	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	
47		<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	
48			<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE 	
49				<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE
50				<ul style="list-style-type: none"> UN-GGCE 	<ul style="list-style-type: none"> UN-GGCE
51	<ul style="list-style-type: none"> UN-GGIM regional committees FIG IAG SIRGAS GNSS providers EO providers Sat. Comm providers 	<ul style="list-style-type: none"> UN-GGIM regional committees FIG IAG SIRGAS GNSS providers EO providers Sat. Comm providers 	<ul style="list-style-type: none"> UN-GGIM regional committees FIG IAG SIRGAS GNSS providers EO providers Sat. Comm providers 	<ul style="list-style-type: none"> UN-GGIM regional committees FIG IAG SIRGAS GNSS providers EO providers Sat. Comm providers 	<ul style="list-style-type: none"> UN-GGIM regional committees FIG IAG SIRGAS GNSS providers EO providers Sat. Comm providers
52	<ul style="list-style-type: none"> UN-GGIM regional committees IAG SIRGAS 	<ul style="list-style-type: none"> UN-GGIM regional committees IAG SIRGAS 	<ul style="list-style-type: none"> UN-GGIM regional committees IAG SIRGAS 	<ul style="list-style-type: none"> UN-GGIM regional committees IAG SIRGAS 	<ul style="list-style-type: none"> UN-GGIM regional committees IAG SIRGAS

Objective 2.2 – Global geodesy supply chain governance is commensurate with risk

Outcomes

- 2.2.1 Member States have regional and global geodesy governance frameworks, strategic plans, operational plans and dedicated resources to:
- ensure the operation of a robust global geodesy supply chain;
 - create and share geodetic products; and,
 - manage strategic, operational and technical risks.

Proposed Activities of Member States

53. Have bilateral and multilateral discussions on the options for stronger global geodesy supply chain governance framework presented by the UN-GGIM Subcommittee on Geodesy. [based on options presented in #55]
54. Implement a standing item on UN-GGIM regional committee agendas on regional and global geodesy supply chain governance.

Proposed Activities of UN-GGCE

55. Coordinate meetings and information sharing amongst Member States to assist them in reaching a consensus on the design and implementation of a global geodesy supply chain governance framework.
56. Assist in the establishment a global geodesy supply chain governance framework based on the needs of Member States.

Proposed Activities of partners

57. Investigate and document options (including bilateral agreements and the establishment of an intergovernmental organization) to strengthen the governance of the global geodesy supply chain and present options to Member State representatives.
58. Reach a consensus on the design and implementation of a global geodesy supply chain governance framework. [based on options presented in #55]

Timeline and Committed Parties: Objective 2.2

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
55		• UN-GGCE	• UN-GGCE		
56		• UN-GGCE	• UN-GGCE	• UN-GGCE	• UN-GGCE
57	• UN-GGIM Subcommittee on Geodesy	• UN-GGIM Subcommittee on Geodesy	• UN-GGIM Subcommittee on Geodesy	• UN-GGIM Subcommittee on Geodesy	• UN-GGIM Subcommittee on Geodesy
58	• UN-GGIM Subcommittee on Geodesy	• UN-GGIM Subcommittee on Geodesy	• UN-GGIM Subcommittee on Geodesy	• UN-GGIM Subcommittee on Geodesy	• UN-GGIM Subcommittee on Geodesy

Objective 2.3 – Decision-makers are convinced of the importance of a robust supply chain

Outcomes

- 2.3.1. Stronger evidence is available on the importance of making the global geodesy supply chain more robust.
- 2.3.2. Member States provide resources to make the global geodesy supply chain more robust.
- 2.3.3. Member States designate, and resource, elements of the global geodesy supply chain as critical national infrastructure (or something similar).

Proposed Activities of Member States

- 59. Develop country specific evidence (e.g. policy brief, business cases, stories) to assist in getting additional resources for a robust global geodesy supply chain. [with support from the UN-GGCE]
- 60. Use evidence to influence decision makers to transition to a robust global geodesy supply chain.
- 61. Where possible, designate, and resource, elements of the global geodesy supply chain as critical national infrastructure (or something similar).
- 62. Where possible, share evidence, and stories of success and failure (with respect to getting resources), with UN-GGCE to share with other Member States and partners.

Proposed Activities of UN-GGCE

- 63. Develop a report for decision makers explaining why a robust global geodesy supply chain is needed including a cost benefit analysis.

Proposed Activities of partners

- 64. Define the Essential Geodetic Variables (EGV) and describe the importance of them to policy makers.
- 65. Advocate for additional resourcing to be provided to Member States for the global geodesy supply chain.

Timeline and Committed Parties: Objective 2.3

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
63		• UN-GGCE	• UN-GGCE	• UN-GGCE	• UN-GGCE
64	• IAG	• IAG	• IAG		
65		• IAG	• IAG	• IAG	• IAG

Objective 2.4 – Implement open data sharing and protect radio frequency spectrum

Outcomes

- 2.4.1 More geodetic data is Findable, Accessible, Interoperable and Reuseable (FAIR).
- 2.4.2 The portion of the radio frequency spectrum required for geodesy is safeguarded.

- 73. Where possible, make geodetic data and products open and FAIR.
- 74. Where possible, assist in the development of open standards.
- 75. Where possible, provide geodetic data and products available in open standards.
- 76. Represent the needs of geodetic community at the International Telecommunications Union to protect the radio frequency spectrum required for geodesy.

Proposed Activities of Member States

- 66. Where possible, make geodetic data and products open and FAIR.
- 67. Ensure metadata records comply with international standards.
- 68. Document and share case studies of data sharing, the benefits that have arisen, and strategies for overcoming barriers.
- 69. Represent the needs of geodetic community at the International Telecommunications Union to protect the radio frequency spectrum required for geodesy.

Proposed Activities of UN-GGCE

- 70. Develop a data sharing policy template for Member States to use in preparing their national data sharing policies.
- 71. Promote open data policies to make geodetic data available to the public, researchers, and other industries.
- 72. Develop a policy brief with members of the International Telecommunications Union on the need to protect the radio frequency spectrum required for geodesy.

Proposed Activities of partners

Timeline and Committed Parties: Objective 2.4

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
70			• UN-GGCE	• UN-GGCE	
71	• UN-GGCE	• UN-GGCE	• UN-GGCE	• UN-GGCE	• UN-GGCE
72	• UN-GGCE	• UN-GGCE			
73	• IAG	• IAG	• IAG	• IAG	• IAG
74	• IAG • Esri	• IAG • Esri	• IAG • Esri	• IAG • Esri	• IAG • Esri
75	• IAG • Esri	• IAG • Esri	• IAG • Esri	• IAG • Esri	• IAG • Esri
76					

Objective 2.5 – Member States have a modern Geospatial Reference System

Outcomes

- 2.5.1 Member States have, or are transitioning to, a modern Geospatial Reference System (GRS)¹⁰.
- 2.5.2 Member States transitioning to a modern GRS have implementation plans describing how a modern GRS will be realized (including resourcing, technical and stakeholder engagement requirements).
- 2.5.3 Member States have financial support from their country needed to implement a modern GRS.
- 2.5.4 Where possible, Member States make their GRS information available in the ISO Geodetic Register and EPSG register.

Proposed Activities of Member States

- 77. Review the current GRS in collaboration with the Member State geodesy working group and determine if any elements need to be modernised to meet the needs of the country.
- 78. For Member States transitioning to a modern GRS, develop a country level roadmap, in collaboration with the Member State geodesy working group. [with support from the UN-GGCE]
- 79. For Member States transitioning to a modern GRS, develop a country level implementation plan in collaboration with the Member State geodesy working group describing how it will be realized (including resourcing, technical and stakeholder engagement requirements). [with support from the UN-GGCE]
- 80. For Member States transitioning to a modern GRS, develop a business case to seek resourcing needed to

fund the development, implementation and communication of a modern GRS.

- 81. Make GRS information available in the ISO Geodetic Register and EPSG register. [with support from the UN-GGCE]

Proposed Activities of UN-GGCE

- 82. Provide online webinar series on what a modern GRS is and how to develop it.
- 83. Provide capacity development workshops to assist countries develop a modern GRS.
- 84. Provide a template document which describes the steps countries can go through to implement a modern GRS.

Proposed Activities of partners

- 85. Assist Member States to include GRS information in the ISO Geodetic Register and EPSG register.

Timeline and Committed Parties: Objective 2.5

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
82	• UN-GGCE				
83		• UN-GGCE	• UN-GGCE	• UN-GGCE	• UN-GGCE
84		• UN-GGCE			
85					

¹⁰ A Geospatial Reference System includes geometric datums (e.g. geocentric datums) and physical datums (e.g. height datums), models (e.g. geoid models), transformation parameters and standards. A modern GRS has a geometric datum aligned to ITRF and physical datum which has a well-defined connection to a global gravity model.

Objective 2.6 – Member States are developing and maintaining regional reference frames

Outcomes

- 2.6.1 Member States are engaged in regional collaboration to develop and maintain regional reference frames.
- 2.6.2 Member States regional organizations are receiving the support needed to develop or maintain regional reference frames.
- 2.6.3 Changes in the Earth are monitored in more detail and with greater accuracy.

Proposed Activities of Member States

- 86. Create and sustain regional working groups to govern the establishment and maintenance of regional reference frames responsible for providing:
 - A clear description of why a regional reference frame is important.
 - A regional Central Bureau, which is resourced, to coordinate efforts.
 - Data processing and analysis capability.
 - Sharing and communication of geodetic data and results.

Proposed Activities of UN-GGCE

- 87. Prepare and share information describing the benefits of a regional reference frame.

Proposed Activities of partners

- 88. Provide a forum for discussion and collaboration on regional reference frames.

Timeline and Committed Parties: Objective 2.6

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
87		• UN-GGCE			
88	• IAG	• IAG	• IAG	• IAG	• IAG

Phase 3: A next-generation global geodesy supply chain

Objective 3.1 – Decision-makers are convinced of the importance of a next-generation supply chain

Outcomes

- 3.1.2 Evidence supporting the transformation to a next-generation global geodesy supply chain is easily understood by decision makers.
- 3.1.3 Approved business cases for transforming to a next generation global geodesy supply chain.
- 3.1.4 Increased investment by decision makers to transform the global geodesy supply chain.

Proposed Activities of Member States

- 89. Develop evidence (e.g. policy brief, business cases, stories) to assist in getting resources they are responsible for in a next-generation global geodesy supply chain.
- 90. Use evidence to influence decision makers to transition to a next-generation global geodesy supply chain.
- 91. Where possible, share evidence, and stories of success and failure (with respect to getting resources), with UN-GGCE to share with other Member States and partners.

Proposed Activities of UN-GGCE

- 92. Translate Member States description of the requirements of a next-generation supply chain into a language decision makers can understand and are likely to support.

- 93. Commission reports demonstrating the potential of next generation technology.
- 94. Research, develop and exploit next-generation technology opportunities for geodesy.
- 95. Design a next-generation global geodesy supply chain.

Proposed Activities of partners

- 96. Provide UN-GGCE with a clear description, and evidence for a next-generation geodesy supply chain.

Timeline and Committed Parties: Objective 3.1

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
92				• UN-GGCE	• UN-GGCE
93				• UN-GGCE	• UN-GGCE
94				• UN-GGCE	• UN-GGCE
95				• UN-GGCE	• UN-GGCE
96				• IAG	• IAG

Objective 3.2 – Availability of higher accuracy and stability geodetic products

Outcomes

- 3.2.1 A design, supported with evidence, of a next generation global geodesy supply chain including ground observing stations, technology, analysis and capacity requirements.
- 3.2.2 An International Terrestrial Reference Frame realization with 1 mm accuracy and +/- 0.1 mm/yr stability.
- 3.2.3 An International Height Reference Frame realization.
- 3.2.4 An implementation plan which describes how the design of a next generation global geodesy supply chain will be implemented and resourced.
- 3.2.5 Geodetic products accurate and reliable enough to meet high accuracy applications such as sea level rise observation and interplanetary navigation.
- 3.2.6 Globally, there is an adequate formal education program supporting geodetic research and development.

Proposed Activities of Member States

- 97. Provide information to UN-GGCE regarding what are the operational requirements constituting a next-generation global geodesy supply chain.
- 98. In conjunction with the university sector, undertake the geodetic research and development required to sustain and enhance the global geodesy supply chain.
- 99. Provide ongoing and sustainable financial support to the university sector for geodesy training and development programs.
- 100. Where appropriate, support space missions relevant to geodesy such as the ESA Genesis mission or the NASA/ESA joint missions on satellite gravimetry.

Proposed Activities of UN-GGCE

- 101. Undertake study of the requirements of a next-generation global geodesy supply chain, including identifying gaps between the current state and a next-generation global geodesy supply chain.
- 102. Develop a design, supported with evidence, of a next-generation global geodesy supply chain including ground observing stations, technology, analysis and capacity requirements.
- 103. Where appropriate, support space missions relevant to geodesy such as the ESA Genesis mission or the NASA/ESA joint missions on satellite gravimetry.
- 104. Consult with Member States on the creation of an implementation plan which describes how the design

of a next-generation global geodesy supply chain will be implemented and resourced.

Proposed Activities of partners

- 105. Provide information to UN-GGCE regarding what are the operational requirements constituting a next-generation global geodesy supply chain.
- 106. Undertake the geodetic research and development required to achieve a next-generation global geodesy supply chain or fund partners to do this work.
- 107. Provide ongoing and sustainable financial support to the university sector for geodesy training and development programs.
- 108. In conjunction with the government sector, undertake the geodetic research and development required to sustain and enhance the global geodesy supply chain.
- 109. Where appropriate, support space missions relevant to geodesy such as the ESA Genesis mission or the NASA/ESA joint missions on satellite gravimetry.

Timeline and Committed Parties: Objective 3.2

	Q4 2024	2025 (Q1-Q2)	2025 (Q3-Q4)	2026	Beyond 2026
101				• UN-GGCE	• UN-GGCE
102				• UN-GGCE	• UN-GGCE
103				• UN-GGCE	• UN-GGCE
104				• UN-GGCE	• UN-GGCE
105		• IAG	• IAG	• IAG	• IAG
106		• IAG	• IAG	• IAG	• IAG
107		• IAG	• IAG	• IAG	• IAG
108		• IAG	• IAG	• IAG	• IAG
109		• IAG	• IAG	• IAG	• IAG

GOVERNANCE OF THE JOINT DEVELOPMENT PLAN

Operating Plan Governance

The governance of the *Joint Development Plan* will be undertaken by the following people and committees.

Senior Responsible Owner (SRO): Head of Office, UN-GGCE

The SRO is accountable for providing the conditions which maximize the success of the implementation of the *Joint Development Plan*. This includes delivering on roles within the responsibility of the UN-GGCE and supporting Member States and partners leading other activities. The SRO also ensures that the Sponsoring Group members have a clear understanding of their roles.

Strategic Advisory Body: UN-GGCE Steering Committee

The Steering Committee members are responsible for providing strategic advice and guidance to ensure the UN-GGCE activities are aligned with UN policies and processes (including financial matters).

Independent Advisory Body: UN-GGCE International Advisory Committee

The International Advisory Committee members are independent advisors who are responsible for providing advice and guidance to assist the UN-GGCE delivering a strengthened global geodesy supply chain.

Program Manager: Geospatial Information Officer, UN-GGCE

Oversights delivery of the changes to the global geodesy supply chain. Responsible for the day-to-day management of the *Joint Development Plan*, including the coordination of

projects and their interdependencies, risk and budget management, and reporting.

Business Change Manager: Project Officer, UN-GGCE

Responsible for realizing measurable benefits by embedding the changes from the *Joint Development Plan* into the regular operations of the global geodesy supply chain.

Program Office and Secretariat: Administrative Assistant, UN-GGCE

The Program Office and Secretariat is accountable for coordinating people and groups involved in the global geodesy supply chain.

Other Advisory Bodies

- UN Committee of Experts on Global Geospatial Information Management and its Regional Committees for matters of alignment with Member State priorities.
- UN-GGIM Subcommittee on Geodesy, Geospatial Societies, Academic and Industry partners, for technical matters.
- Donors and Development partners for further financial matters not covered by the UN-GGCE Steering Committee.
- Other high interest/high influence stakeholders as appropriate.

Reporting Arrangements

Strategic Reporting

Strategic reporting, including financial statements, will be provided annually to the Steering Committee. Summaries of the reports will be provided to the International Advisory Committee and other Advisory Groups.

The reporting will be limited to reporting on progress against Strategic Objectives and Outcomes, with a rating and high-level description as follows:

- Strategic Objective
- Short- or medium-term Output
- Rating (as a traffic light)
- Description of any achievements or issues requiring attention of these bodies
- Risks

Operational Reporting

Member States or partners who take responsibility for delivering any projects or activities of the *Joint Development Plan*, will report on progress to the UN-GGCE.

Operational reporting will include a summary including information such as:

- Progress against the indicators for the output
- Key deliverables
- Stories of success or lessons learnt
- Updated timelines
- Budget
- Change in Scope
- Risks
- Any regional or Member State perspectives
- Any other requirements of donors or funders

Operational reports will be delivered every six months.

3.0

STATE OF GEODESY 2024

Introduction

The *State of Geodesy 2024* provides an overview of the current status of the global geodesy supply chain. Based on expert views and contributions from representatives of Member State governments and partners captured in the Global Geodesy Needs Assessment Report (2024)¹¹, this summary is vital to keep those responsible for the global geodesy supply chain informed of progress against global indicators, notable weaknesses, and associated risks.

Criteria for assessing

The *State of Geodesy 2024* provides a rating for each of the Strategic Objectives described in the *Joint Development Plan* (see Section 2.0). Each Strategic Objective has been allocated an aggregate rating based on the delivery of the Outcomes against each Strategic Objective.

For example, *Strategic Objective 1.1 - Member States engaged in geodesy governance*, has four Outcomes. The status of *Strategic Objective 1.1* is an aggregate rating of these four Outcomes.

A status of each Strategic Objective can be assessed as being **Good**, **Marginal**, **Inadequate** or **Non-Existent**. Where insufficient data exists, the indicator status is set to **Not Assessed**.

Good: all being met or on track to be met.

Marginal: Outcomes of the Strategic Objective are sometimes being met or on track to be met.

Inadequate: Outcomes of the Strategic Objective are not meeting user needs.

Non-existent: Outputs do not exist yet. Outcomes are not being met.

Not assessed: Status has not been assessed, due to lack of data.

- The trend status (↑ improvement, → steady, ↓ degradation) reflects the anecdotal perspectives of recent change from experts involved in the Global Geodesy Needs Assessment.
- The confidence value reflects the confidence in the data provided for this indicator (✓✓ = **high**, ✓ = **reasonable**, ✗ = **limited**)

Key challenges

¹¹ Global Geodesy Needs Assessment

This *State of Geodesy 2024* highlights a number of challenges including:

- **Insufficient evidence** of the importance of resourcing the global geodesy supply chain in ways that decision makers can understand (e.g. societal, environmental and economic benefits realization).
- **Insufficient resources** (dedicated funds and people) to transition to a robust global geodesy supply chain to meet operational requirements for key resource sectors and critical infrastructure.
- **Inadequate governance mechanisms** exist that, whilst being suitable in the pre-digital era, are no longer appropriate in a digitally connected, federated supply chain involving entities managing assets across different levels of government and across public, private, and academic sectors.
- **Decreasing capacity** training opportunities being offered by academic institutions to train geodesy specialists.
- **Lack of awareness** of the reliance that industry; other fields of science; and, the public, have on geodesy.

For a more detailed analysis of the challenges please refer to the following reports published by the UN-GGCE:

Hidden Risk: How weaknesses in the global geodesy supply chain could have catastrophic impacts on critical infrastructure and national economies,
<https://ggim.un.org/UNGGCE/#documents/> accessed 13 June 2024.

Global Geodesy Needs Assessment,
<https://ggim.un.org/UNGGCE/#documents/> accessed 13 June 2024.

Summary of findings

	2024 Status	2024 Trend	2024 Confidence
Phase 1: Avoid further degradation of the global geodesy supply chain			
1.1 Member States engaged in geodesy governance	Red	→	✓
1.2 Maintain current accuracy and reliability of geodetic products	Yellow	↓	✓
1.3 Decision-makers are convinced of importance of geodesy	Red	→	✓✓
1.4 Develop and retain a talented and diverse workforce in areas it is urgently needed	Red	↓	✓✓
1.5 The value of geodesy is understood by other science organizations, industry sectors and society	Red	→	✓✓
Phase 2: A robust global geodesy supply chain			
2.1 Geodetic products meet Member State accuracy, reliability and integrity standards to deliver on operational requirements	Red	→	✓
2.2 Global geodesy supply chain governance is commensurate with risk	Red	→	✓✓
2.3 Decision-makers are convinced of the importance of a robust supply chain	Red	→	✓✓
2.4 Implement open data sharing and protect radio frequency spectrum	Yellow	→	✓
2.5 Member States have a modern Geospatial Reference System	Red	→	✓
2.6 Member States are developing and maintaining regional reference frames	Yellow	→	✓✓
Phase 3: A next-generation global geodesy supply chain			
3.1 Decision-makers are convinced of importance of a next generation supply chain	Red	→	✓✓
3.2 Availability of higher accuracy and stability geodetic products	Red	→	✓✓

Stronger. Together.

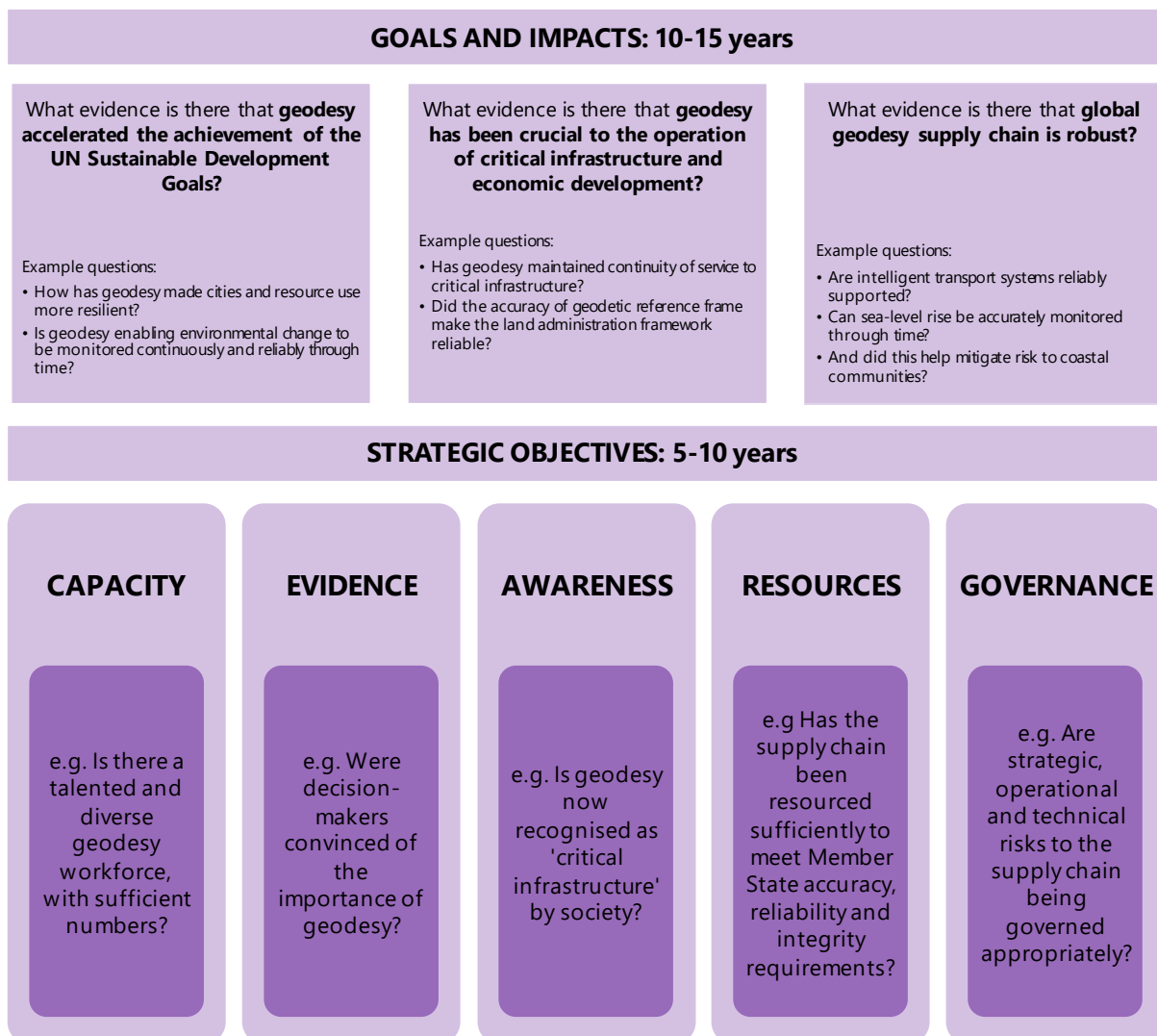
Improvement against each Strategic Objective requires action from Member States, the UN-GGCE and partners. As matters of priority, Member States, the UN-GGCE and partners are:

- *Urged* to stabilize the global geodesy supply chain to avoid degradation or failure of essential geodetic products which support current Position, Navigation and Timing operational requirements.
- *Urged* to define the user requirements of a robust global geodesy supply chain, including data quality and network resilience.
- *Urged* to commission economic studies and reports, which capture the costs and benefits of the global geodesy supply chain to critical infrastructure, earth observation, land administration, telecommunications and general PNT services.
- *Urged* to explore opportunities for knowledge transfer and staff exchanges, as an interim measure to build capacity and capability in developing Member States
- *Encouraged* to create a country level geodesy community of interest to meet, discuss governance, risks and identify potential opportunities for funding within the Member State.
- *Encouraged* to develop communication products, geared towards raising awareness of the importance of geodesy to society.
- *Encouraged* to develop communication products, geared towards raising geodesy as a career pathway for young professionals.
- *Invited* to explore the use cases and emerging technology required to deliver a next-generation global geodesy supply chain.
- *Invited* to consider the benefits of making geodetic data openly accessible.

4.0

EVALUATION

Program evaluation will build upon monitoring the status of Strategic Objectives in the *State of Geodesy* reports. Below is a broad outline of how evaluation will be undertaken. The approach will evaluate the following:



NB: Program monitoring and evaluation will be done by an independent party, hired by the UN-GGCE, specializing in program management monitoring and evaluation.