



United Nations Global Geodetic Centre of Excellence

Highlights Report 2024-2026

Bonn, Germany · Published 2026

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Who We Are

The UN-GGCE was established in 2023 under the auspices of the United Nations as a practical response to growing international recognition of the importance—and vulnerability—of geodesy. The Centre works closely with Member States, international organizations, scientific bodies and the broader geospatial community to strengthen the global geodesy supply chain, in accordance with United Nations General Assembly resolution 69/266.

The Centre's vision is a future in which all countries have strong support for geodesy, enabling them to work together to accelerate progress towards the Sustainable Development Goals and generate social, environmental and economic benefits.

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**United Nations
Global Geodetic
Centre of Excellence**

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Acronyms and Abbreviations

BKG	Federal Agency for Cartography and Geodesy (Germany)
CDW	Capacity Development Workshop
CORS	Continuously Operating Reference Station
DORIS	Doppler Orbitography and Radiopositioning Integrated by Satellite
EGNOS	European Geostationary Navigation Overlay Service
EOP	Earth Orientation Parameters
FIG	International Federation of Surveyors
GGOS	Global Geodetic Observing System (of the IAG)
GGSC	Global Geodesy Supply Chain
GNSS	Global Navigation Satellite System
IAC	International Advisory Committee (UN-GGCE)
IAG	International Association of Geodesy
ICG	International Committee on GNSS
ITRF	International Terrestrial Reference Frame
JDP	Joint Development Plan for Global Geodesy
MMOU	Multilateral Memorandum of Understanding
PNT	Positioning, Navigation and Timing
SCoG	Subcommittee on Geodesy (UN-GGIM)
SIRGAS	Geodetic Reference System for the Americas
SLR	Satellite Laser Ranging
UN-GGCE	United Nations Global Geodetic Centre of Excellence
UN-GGIM	United Nations Committee of Experts on Global Geospatial Information Management
VGOS	VLBI Global Observing System
VLBI	Very Long Baseline Interferometry
WRC	World Radiocommunication Conference

Message from the Head of the Centre

When the United Nations Global Geodetic Centre of Excellence (UN-GGCE) opened its doors in Bonn in October 2023, we made a clear commitment: to listen. Over the six months that followed, the Centre hosted nine online and in-person consultations, engaging more than 550 individuals from 110 countries. What we heard was consistent, sobering and clarifying.

Geodesy—the science that ensures satellite signals are accurate, timestamps are precise, and positioning systems are trustworthy—is in trouble. There are five reasons. The infrastructure is fragile. The workforce is ageing. Governance is insufficient. Awareness, even among the policymakers whose critical systems depend on geodesy, is close to zero. And resources—the fifth reason—are scarce because the other four make it almost impossible to secure them.

This report is an account of what the Centre—together with Member States and partners—has done about that since its work began.

What we have built together

We translated the problems we heard about into actions that the Centre, countries and partners could take to strengthen the global geodesy supply chain. The First Joint Development Plan for Global Geodesy, developed with geodesy experts worldwide in 2024 and endorsed in 2025, gave the community a shared blueprint across three phases—first, halt the degradation; then, make the supply chain robust; and finally, build the next generation.

We built an evidence base. The *Hidden Risk* report, revealing critical weaknesses in geodetic infrastructure and capacity; the first-ever State of Geodesy report,

with its maturity assessment of 58 capabilities across the global geodesy supply chain; and the Invisible Infrastructure report, with views from the private sector explaining their dependence on the global geodesy supply chain. We also produced policy briefs on hidden risk, climate science, frequency protection and digital infrastructure. For the first time, decision-makers asking, “why should I care about geodesy?” can be handed something other than a textbook.

We built capacity. Four regional capacity development workshops on four continents brought 216 professionals from 100 countries together — sharing the same curriculum, the same standards, the same vocabulary. We translated material into French, Spanish and Portuguese. An alumni network now keeps the conversation going long after the workshops have ended.

We built coordination. The Multilateral Memorandum of Understanding on Strengthening the Global Geodesy Supply Chain became operational in March 2025 with 36 founding participants; by mid-2026, it had 57 participants. National working groups have been established or strengthened in Singapore, the United Kingdom, New Zealand, South Africa, Belgium, the United States and elsewhere. The European Commission has also created a Task Force on Geodesy for Galileo and EGNOS to better assess the risks that weaknesses in the supply chain may pose to the operation of Galileo and EGNOS.

The outcomes of this taskforce, and next steps, are now being discussed within the EU space programme.

We built awareness. In October 2024, the world's GNSS providers – GPS, Galileo, GLONASS and BeiDou among them – issued an unprecedented joint statement via the International Committee on GNSS, acknowledging that weaknesses in the supply chain put their satellite services at risk. That statement was informed by evidence presented by the UN-GGCE.

What it adds up to

Geodesy is still fragile. The *State of Geodesy 2026* maturity assessment places the global geodesy supply chain at 2.3 out of 5 – operational, but not yet robust. Worryingly, the governance and strategy capability scores average 1.8 and financial management capabilities score 1.0, the lowest level of the maturity scale. We have a long way to go.

But we are now visible. Geodesy now has a recognised home within the United Nations system, a plan, a growing coalition of the willing, an evidence base, and a generation of geodetic professionals who know each other across borders. That is the foundation.

My thanks to the German Government and the Federal Agency for Cartography and Geodesy (BKG) for hosting us, to every secondee who has lent their expertise, to every Member State and partner who is working collaboratively with us, and to the team in Bonn who turn ideas into action and deliver week after week.

Stronger. Together.

Nicholas Brown

Head of Office, UN-GGCE



Photo courtesy of Ryan Keenan (2024)

Introduction

Geodesy is the science of measuring Earth's shape, orientation, gravity field and how they change over time. The information geodesists measure – everyday – enable accurate positioning and timing, earth observation and satellite communications as well as stable reference frames. Geodesy is as essential to modern society as electricity or the internet; and like both of those, geodesy is largely invisible until it stops working.

The global geodesy supply chain: a critical vulnerability

The global geodesy supply chain (GGSC) is the end-to-end system that assists in the delivery of satellite services underpinning the modern global economy. This vital system relies on three interconnected pillars:

- A global network of **ground observatories** and satellites monitoring the Earth using highly specialised instruments.
- Dedicated **data centres** that collect, quality-check and distribute geodetic datasets.
- Product delivery through specialised **analysis centres** that translate raw data into foundational geodetic products on which every satellite service depends.

The geopolitical and governance challenge

Geodesy is inherently international; no single country can accurately monitor changes in the Earth's shape, orientation and gravity field alone. It demands a balanced geographic distribution of infrastructure and people across every continent.

For more than a century, this critical global coordination has relied entirely on the voluntary, in-kind contributions of the International Association of Geodesy (IAG) and its technical Services. While this represents a remarkable scientific achievement, it has created a fragile foundation—without formal international governance or a sustainable funding architecture.

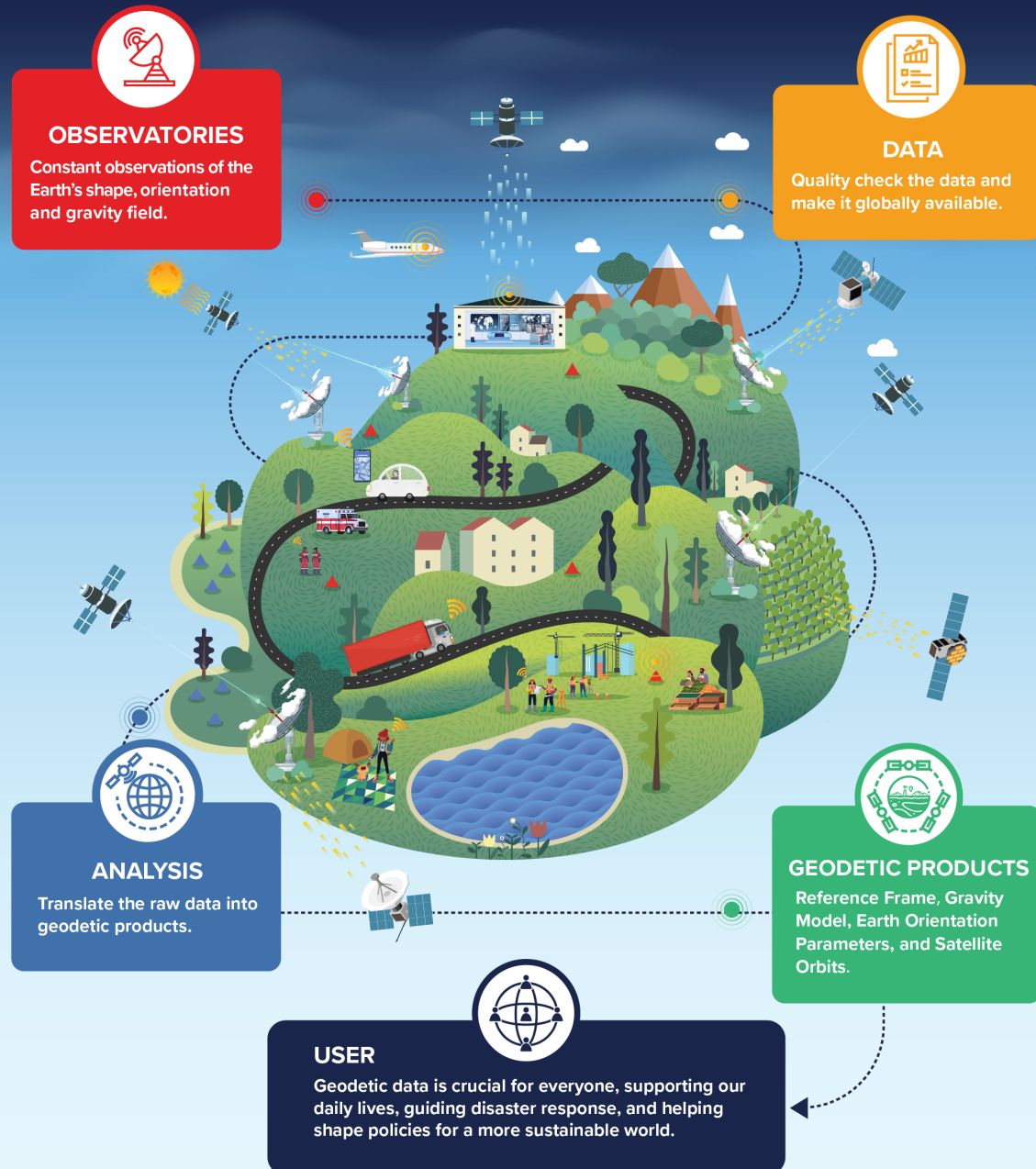
From scientific fragility to strategic risk

In February 2015, the UN General Assembly adopted resolution 69/266, *A Global Geodetic Reference Frame for Sustainable Development*, establishing the strongest international mandate for geodesy.

In the decade that followed, society's dependence on geodesy has grown significantly while the underlying infrastructure has not. At the 18th meeting of the International Committee on GNSS (ICG-18), the world's satellite navigation providers issued a joint statement acknowledging a stark reality: weaknesses in the global geodesy supply chain pose risks to continuous satellite services. "ICG members openly acknowledged the risks that had been highlighted by the UN-GGCE and recognised that strengthening the global geodesy supply

GLOBAL GEODESY SUPPLY CHAIN (GGSC)

The global geodesy supply chain is the complete system that produces and delivers accurate geodetic data – from ground-based observatories – through to the final products used in mapping, disaster management, and sustainable development.



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<https://un.org/globalgeospatial/en/centre-of-excellence/geodesy>
<https://www.linkedin.com/company/unggce/>

Stronger. Together.

chain should be prioritised in order to ensure that GNSS services were made more robust.”¹

This unprecedented statement was long overdue. Ageing observatories, declining university programmes, fragmented governance, and chronic underfunding are not new problems in this sector. What is new is our absolute reliance on geodetic services—across telecommunications, finance, energy, Earth observation, aviation, defence, climate monitoring and emergency response—and the cascading consequences of failure. In this regard, a vulnerable global geodesy supply chain is no longer just a scientific concern; it is a critical point of failure for modern society.

A Warning from the World’s Navigation Satellite Providers

**ICG members openly
acknowledged the risks that had
been highlighted by the UN-GGCE
and recognised that “strengthening
the global geodesy supply chain
should be prioritised in order to
ensure that GNSS services were
made more robust.”**

- ICG-18 Joint Statement,
Wellington, New Zealand,
October 2024

Securing the supply chain

The UN-GGCE was established under the auspices of the United Nations and is hosted in Bonn by the Government of Germany. Its mandate is to support the implementation of resolution 69/266 by working with Member States and the international geodesy community to strengthen the supply chain. It does this across four objectives: coordination and collaboration; evidence and awareness; support to the UN-GGIM Subcommittee on Geodesy to enhance governance and investment; and capacity development.

This Highlights Report covers the period from the start of full operations in early 2024 through the first half of 2026—the first two and a half years in which the Centre has been delivering. It is a record of what has been built, what has been learned and where the work goes next.

¹ Joint Statement adopted at the Eighteenth meeting of the International Committee on Global Navigation Satellite Systems, paragraph 23 (Wellington, 11 October 2024). Available at https://www.unoosa.org/documents/pdf/icg/2024/ICG-18/ICG-18_Joint_Statement.pdf.

Highlights at a glance

57

PARTICIPANTS

of the Multilateral MoU
on Strengthening
the GGSC

216

PROFESSIONALS

trained through UN-GGCE
Capacity Development
Workshops

100

COUNTRIES

represented across the
four in-person Capacity
Development Workshops

12

EDITIONS

of the UN-GGCE
Newsletter published

150+

SCIENTIFIC EXPERTS

who have collaborated with
the UN-GGCE

32

PARTNERS OF THE UN-GGCE

who are advancing the science
of geodesy and strengthening
the global geodesy supply chain

Major deliverables

- **First Joint Development Plan for Global Geodesy** – a three-phase plan endorsed by Member States and partners to sustain the supply chain.
- **Multilateral MoU on Strengthening the Global Geodesy Supply Chain** – operational since 10 March 2025; currently 57 participants from Member State agencies, organizations, the private sector and academia.
- **State of Geodesy 2026** – first comprehensive maturity assessment of the GGSC, evaluating 58 capabilities across six domains.
- **Hidden Risk report and contribution to Invisible Infrastructure (2026)** – flagship awareness pieces aimed at decision-makers.
- **Policy Briefs** on geodesy and climate science, frequency protection and digital infrastructure.
- **Four regional capacity development workshops** (Europe, Africa, Asia-Pacific, Americas) plus joint workshops with International Association of Geodesy (IAG), the International Federation of Surveyors (FIG) and other partners.
- **Country-level Roadmap to Modernise a Geospatial Reference System** – practical guidance used in every regional workshop.
- **Joint Statement from GNSS providers at ICG-18 and ICG-19** – informed by UN-GGCE evidence on GGSC fragility.

Coordination and collaboration

Geodesy is a global, interconnected supply chain. Strengthening it begins with ensuring the people who run the supply chain can find each other, talk to each other and act together.

A growing coalition: the Multilateral MoU

The Multilateral Memorandum of Understanding on Strengthening the GGSC became operative on 10 March 2025 with 36 founding participants. By mid-2026 it had grown to 57 participants, covering Member State agencies, international organizations, the private sector and academic institutions from every inhabited continent.

The MoU encourages participants to engage in two phases of cooperation: first, avoiding further degradation of the GGSC; second, making it robust. It carries no financial obligations, but it creates the diplomatic and operational platform on which workplans, joint activities and voluntary contributions are being developed. Importantly, it has given scientists an opportunity to engage directly with senior leaders in their governments and organizations, elevating geodesy into boardroom discussions where strategic decisions are



UN Bonn: Europe Capacity Development Workshop on Transitioning to a Modern Geospatial Reference System, February 2025.



Ny-Ålesund, Svalbard: Johnny Welle, Director General, Kartverket and Nick Brown, Head of Office, UN-GGCE, at the Norwegian Mapping Authority's geodetic Earth observatory. Photo: Bjørn-Owe Holmberg / Kartverket

CURRENT MMOU PARTICIPANTS (57 AS OF MAY 2026)

Geoscience Australia, Royal Observatory of Belgium, NGI Belgium, U. Santiago de Chile, CSGPC China, National Land Survey Finland, IGN France, EOST France, CNFGG France, BKG Germany, DGFI-TUM Germany, TUM Germany, Aristotle U. Thessaloniki, IIT (BHU) India, Survey of India, Politecnico Milano, INAF Italy, GASI Saudi Arabia, LGIA Latvia, INEGI Mexico, GALAGC Mongolia, NCG Netherlands, GNS Science NZ, LINZ New Zealand, NAMRIA Philippines, U. Philippines, Geodesy Committee Kazakhstan, NGII Republic of Korea, Cadastre N. Macedonia, SLA Singapore, IGN Spain, Chalmers U. Technology, DGC Timor-Leste, IGM Uruguay, Kartverket Norway, Danish Agency for Climate Data, State Service Ukraine, AGCC Moldova, Surveying Authority Slovenia, NLA Jamaica, IGAC Colombia, CGN Nigeria, Esri, ESA, FrontierSI, IAG, NKG, PGSC, Positioning Insights, SIRGAS, Trimble, Hexagon Geosystems, RCMRD, EPOS ERIC, GEO, SNIT-IDE Chile, UN-GGCE.



Ion Cretu, Deputy Director General, AGCC and Nicholas Brown, Head of Office, UN-GGCE confirms AGCC's participation in the MMoU. Photo: AGCC.

made. It has also forged connections between governments and organizations that have since progressed to developing binding agreements, demonstrating its value as a stepping stone from informal cooperation to formal commitment.

Key mandates from joint meetings in Bonn

In March 2025 and again in March 2026, the UN-GGIM Subcommittee on Geodesy, the UN-GGCE International Advisory Committee and the UN-GGCE Steering Committee met jointly at the UN Campus in Bonn. These meetings facilitated discussions between Member States from all UN-GGIM regions — Africa, the Americas, Arab States, Asia-Pacific and Europe — alongside updates from space agencies and partners including the International Association of Geodesy (IAG), NASA, ESA, the International Federation of Surveyors (FIG), among others.

In 2025, the representatives at the 5th Plenary of the UN-GGIM Subcommittee on Geodesy and the Third UN-GGCE International Advisory Committee (IAC)

meeting endorsed the First Joint Development Plan for Global Geodesy as a shared three-phase blueprint for strengthening the GGSC. Participants also considered how the Subcommittee, supported by the UN-GGCE, could most effectively raise the state of the geodesy supply chain, and the case for making it more sustainable, with the wider United Nations community.

The Sixth Plenary of the UN-GGIM Subcommittee on Geodesy and 4th UN-GGCE IAC meeting (9–12 March 2026) was structured around the major findings of the State of Geodesy 2026 report. Members considered the international governance of geodesy and the design of a robust GGSC; reviewed progress on national-level PNT and geodesy committees and working groups; and confirmed the UN-GGCE strategic partnerships and communication plan. The meeting also aligned the UN-GGCE work programme with the broader UN-GGIM agenda.

National working groups: a quiet revolution

Two years ago, fewer than a handful of countries had a national working group, committee or office that considered coordination of geodesy or positioning, navigation and timing (PNT) across government. Recently, a marked increase in the number [ADD: of] such coordination bodies has been noted, including:

- The **United Kingdom** established the National Positioning, Navigation and Timing Office within the Department for Science, Innovation and Technology, with responsibility for PNT policy, coordination and delivery across critical national infrastructure.
- **Singapore, New Zealand, South Africa, Belgium, Germany, France, Canada and the United States** have each established or strengthened national coordination bodies for geodesy or PNT during the reporting period.
- Other countries are following—through their UN-GGIM regional committees and bilaterally with the UN-GGCE.

The European geodesy supply chain

The UN-GGCE has interacted with European institutions to put the global geodesy supply chain on the policy agenda. On their side, the European Commission

consequently created a task force on Geodesy for Galileo and EGNOS to better assess the risks that weaknesses in the supply chain may pose to the operation of Galileo and EGNOS. The outcomes of this task force, and next steps, are now being discussed within the EU space programme.

Engaging the GNSS providers

At the 18th meeting of the International Committee on GNSS (ICG-18) in Wellington, October 2024, GNSS providers — including the operators of GPS, Galileo, GLONASS and BeiDou — issued a joint statement acknowledging that weaknesses in the global geodesy supply chain pose risks to continuous satellite services. The Centre presented evidence on the fragility of the supply chain and the systemic risk this represents to satellite operations.

The UN-GGCE representative “highlighted weaknesses in the global geodesy supply chain, in particular issues relating to the reliability of geodetic products such as Earth orientation parameters and future realizations of the International Terrestrial Reference Frame, which were essential to the operation of GNSS satellites. ICG members openly acknowledged the risks that had been highlighted by the Centre and recognized that strengthening the global geodesy supply chain should be prioritized in order to ensure that GNSS services were made more robust.”

— ICG-18 Joint Statement, October 2024

One year later, at ICG-19 (October 2025), ICG adopted a dedicated “Statement on the Critical Role of the Global Geodesy Supply Chain for GNSS”, coordinated by the International GNSS Service (IGS) with support from many ICG members, the UN-GGCE and external contributors. The statement affirms the critical reliance of GNSS on the global geodesy supply chain, identifies its relevance for the millions of users relying on GNSS for downstream applications, and gives ICG an agreed basis from which to consider opportunities for coordinated action to address critical vulnerabilities.² Together, ICG-18 and ICG-19 mark the first time the world’s ICG members have spoken with one voice on this issue.

Frequency protection: safeguarding the airwaves for satellite services

Radio frequency spectrum is the invisible medium through which many satellite and geodetic signals travel. If satellites or changes in the Earth’s shape, orientation and gravity field cannot be observed, satellite services will degrade or fail.

A critical vulnerability exists for Very Long Baseline Interferometry (VLBI)—a critical technique used to obtain fundamental information on the orientation of the planet on which all artificial satellites continuously rely. VLBI systems are increasingly threatened by a rising tide of artificial radio emissions from expanding commercial wireless networks and other applications.

In May 2025, the UN-GGCE published *Policy Brief No. 003, Safeguarding VLBI Radio-Frequencies*, outlining strategic guidance for governments to protect these vital frequency bands.

The brief calls on Member States to: raise awareness with national spectrum management authorities; advocate for the extension of Radio Astronomy Service bands to include those used by VLBI; support a future World Radiocommunication Conference (WRC) agenda item on VLBI; register VLBI sites as Earth Stations within the ITU Radiocommunication Sector so they can be afforded formal protection; and establish national protection or coordination areas around important geodetic observatories.

² ICG-19 Working Group D Recommendation A, “Statement on the Critical Role of the Global Geodesy Supply Chain (GGSC) for GNSS” (October 2025). Available at https://www.unoosa.org/documents/pdf/icg/2025/ICG-19/ICG-19_WG-D_Recommendation_A_.pdf.

The road to WRC-27 and beyond

To ensure the geodesy supply chain retains its vital bandwidth, the UN-GGCE supports the UN-GGIM Subcommittee on *Geodesy Frequency Protection Working Group*, which convened in March 2026 to align country-level strategies.

The UN-GGCE is assisting with international outreach between geodetic experts and government spectrum managers worldwide. This coordinated effort is preparing the groundwork for formal discussions at the World Radiocommunication Conference in 2027 (WRC-27) and laying the foundations for a possible VLBI-related agenda item at WRC-31, with the goal of ensuring that the invisible foundation of global navigation is not unwittingly drowned out by neighbouring frequencies.

Other coordination work

- **Joining Land and Sea initiative** with Singapore Land Authority – in development; draft for country feedback by end-2026.
- **UN Science Summit–Africa Rising (New York, 2024)** – UN-GGCE co-organizer and presenter.
- **Internet Governance Forum (Norway, 2025)** – UN-GGCE keynote to a forum attended by nearly 9,000 participants. This was the first time geodesy had been put before the global internet governance community as critical digital infrastructure, opening a new audience of policymakers, regulators and platform operators to the case that the supply chain underlying timing, positioning and Earth observation is itself an internet-scale dependency.

Evidence and awareness

Decision-makers do not act on what they cannot see. The Centre's evidence and awareness work exists to make geodesy visible to the people whose budgets, policies and laws depend on it—whether they are aware of it or not.

State of Geodesy 2026

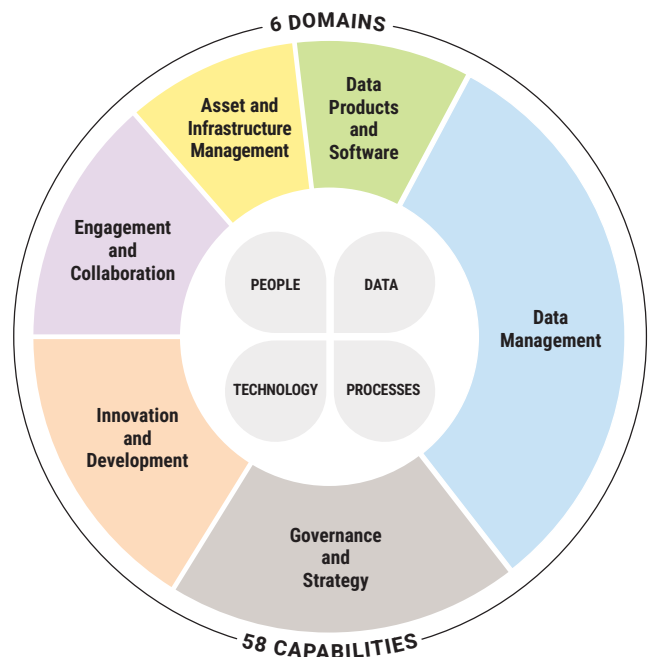
Published in May 2026, the State of Geodesy report presents the first comprehensive maturity assessment ever undertaken of the global geodesy supply chain. The assessment evaluates 58 capabilities, drawing on the 2024 Global Geodesy Needs Assessment (500+ stakeholders across 110 countries) and consultation with more than 130 leaders from the IAG, the UN-GGIM Subcommittee on Geodesy, and the UN-GGCE International Advisory Committee.

A Level 2.3/5 supply chain can produce accurate geodetic products—but not reliably. It is operational. It is not yet robust.

— State of Geodesy 2026

The headline finding is that the GGSC scores 2.3 out of 5 on the maturity scale. It is operational and can produce accurate geodetic products, but not reliably; its performance remains fragile and overly dependent on in-kind contributions rather than formal arrangements. Governance and Strategy is the lowest-scoring domain (1.8).

The pattern is the story, and the clearest pattern is that governance is a cross-cutting constraint across the GGSC. Mandate development, strategic planning, financial management and risk management all score at the lowest level on the maturity scale. The GGSC continues to produce high-quality geodetic products despite these structural gaps, largely thanks to an overreliance on the International Association of Geodesy. More than a decade after UN General Assembly resolution 69/266, no international body holds the combined visibility,



authority and accountability needed to coordinate the supply chain end-to-end, develop investment strategies across it, or assess and mitigate risks at supply chain level. The downstream effects appear across the other domains: ageing observatories without coordinated continuity planning, declining university programmes without coordinated workforce strategy, single points of failure in data archiving, and minimal systematic engagement with policymakers.

In response, the UN-GGCE is assisting the UN-GGIM Subcommittee on Geodesy to work with Member States and partners to discuss possible governance arrangements that could strengthen the supply chain — leveraging the evidence the assessment provides to bolster the strong technical coordination the IAG and its Services already deliver within their scope.

Reports and policy briefs

- **Hidden Risk (2024)**—how weaknesses in the global geodesy supply chain could have catastrophic impacts on critical infrastructure and national economies. Published as the headline awareness piece for decision-makers.
- **Invisible Infrastructure (2026)**—co-published with Geospatial World, this longer-form piece reaches a wider geospatial and infrastructure audience.
- **Policy brief: Geodesy is critical to climate science (2025)**—how geodetic reference frames underpin climate monitoring from millimetre-scale sea level rise to centimetre-scale subsidence.
- **Policy brief: Safeguarding VLBI Radio-Frequencies (2025)**—the radio frequency spectrum bands geodesy depends on, and what is at stake if they cannot use them.
- **Policy brief: Geodesy as digital infrastructure (2026)**—framing geodesy as a foundational digital utility in the policy conversations now happening at national and EU level.
- **Internet Governance Forum (Norway, 2025)**—keynote at a forum attended by nearly 9,000 participants— a measure of how far the conversation about geodesy as digital infrastructure has progressed.
- **Junior Academy of Sciences of Ukraine (2025)**—contributing to outreach and student involvement in the field of geodesy.
- **BeGeo 2026 (Belgium, 2026)**—keynote to an audience of more than 900 people.
- **Geospatial World Forum (Netherlands, 2026)**—keynote reaching participants from more than 100 countries; also a Global Geodesy Supply Chain Summit to discuss the impacts of weaknesses in the GGSC with the private sector.
- **Geospatial stakeholder and partner events**—regular UN-GGCE presence and contribution.

The Newsletter

The UN-GGCE Newsletter has published 12 editions to date, covering policy developments, technical milestones, workshop write-ups and partner news. It is the Centre's main ongoing channel to the geodesy community and an increasingly used reference for the wider geospatial press.

Outreach at international fora

In a single calendar year, UN-GGCE representatives delivered keynote addresses or speaking roles at the major international geospatial and infrastructure events:

- **UN Science Summit, Africa Rising (United States, 2024)**—UN-GGCE co-organizer and presenter.
- **International Federation of Surveyors (Ghana, 2024)**—keynote presentation on the importance of the GGSC and assistance in delivering the Reference Frame in Practice workshop
- **International Committee on GNSS (New Zealand, 2024)**—presentation on the weaknesses of the GGSC and a discussion panel on actions Member States can take to enhance resilience.

Case study: Senegal — Geodesy for land management

Ask a Senegalese farmer what they want from their government, and “a modernized geodetic reference frame” is unlikely to come up. Secure title to the land they farm almost certainly will.

That is the starting point for one of the most quietly impressive geodesy stories.

Senegal is in the middle of an ambitious national effort: a country-wide cadastre, supported by the World Bank’s \$80 million Land Cadastre and Tenure Security Project (PROCASEF), with a target of registering some 530,000 occupancy titles and bringing secure land rights to around 1.4 million people. A significant share of those titles is designated for women. The effort is delivering. As of March 2026, more than 742,000 parcels had been surveyed across the project’s 138 communes — ahead of the original target — with cadastral identifiers and deliberation under way on a large share of them.

A national cadastre needs a national reference frame. It is not feasible to register a million parcels of land on using inconsistent coordinates, and not possible to defend a title in court on a position that drifts.

So PROCASEF made geodesy one of its four pillars from the start, and the National Land-Use Planning Agency (ANAT), together with the French IGN FI, Leica Geosystems consortium, and additional support from the Japanese International Cooperation Agency (JICA), went to work.

In two years, they have brought Senegal’s national reference frame into consistency with the latest international standard, established a national SEN-CORS network of 23 continuously operating GNSS stations — 16 under PROCASEF, with further densification support through cooperation with JICA and the German Agency for International Cooperation (GIZ). This effort has re-observed the 158 benchmarks of the rehabilitated national network, and built an open-source national positioning service, SEN-POS, that gives surveyors centimetre-accurate coordinates without a multi-day field campaign. Alongside the reference frame, the project delivered high-resolution imagery (5 cm in urban areas, 30 cm in rural areas) and trained a new generation of land professionals: 410 young technicians, including 145 land agents, with several hundred administrative and



Field training of surveyors in GNSS data collection under the PROCASEF project, Senegal (ANAT/DTGC).



Handover of 65 administrative land deeds with NICAD plans to beneficiaries of the village of Thicky, commune of Diass, on 10 December 2025, under the PROCASEF project. Photo: PROCASEF / Mairie de Diass

technical officers also brought up to speed. The CORS network coverage of the 138 communes in the project's scope is now a tracked indicator on the World Bank's results framework — geodesy as a measured contribution to a development outcome.

What stands out is not the technical achievement, considerable as it is. It is the sequencing.

ANAT did not start with geodesy and look for a problem. It started with a national priority — secure land tenure for Senegalese citizens — and built the geodesy that priority required, in partnership with the people who would use it, namely

- Surveyors.
- Cadastral agents.
- The land professionals trained under PROCASEF.
- The municipal land bureaus that will issue the titles.
- The World Bank task team that needed positioning infrastructure to underwrite its results indicators.
- JICA, who brought complementary capacity.

Several different communities of practice came together to create one shared piece of national infrastructure underneath them.

That is what a national link in the global geodesy supply chain looks like when it is working — not as an end in itself, but as the quiet, accurate substrate beneath something a citizen cares about. A title to the field. A line on a map that holds in court.

The approach has proven durable enough to be extended. On the strength of the first phase's results, the World Bank and the Government of Senegal have approved a second phase: an additional \$40 million that will carry the work forward from 2026 to 2029 and bring 60 further communes into the cadastre. The geodetic infrastructure built in the first phase is what makes that extension possible — the reference frame and the SEN-CORS network are already in place to serve it.

The model it sets — geodesy designed around the development outcomes a country is already pursuing, delivered with the partners who will use it — is one many other Member States can learn from.

Partners: Republic of Senegal · ANAT · PROCASEF Project Implementation Unit · World Bank · IGN FI · Leica Geosystems · JICA

Learn more: geodesie.sn

Capacity development

The State of Geodesy 2026 scored workforce development at 1.7 out of 5. The UN-GGCE Capacity Development programme is a concrete response to that finding — and the most concrete way Member States see the UN-GGCE in action. In 2025, the UN-GGCE implemented four regional workshops, each one week long and delivered in person, on four continents: Europe, Africa, Asia-Pacific and the Americas. Together they brought 216 professionals from 100 countries. An impact assessment based on 112 respondents from across all four regions shows that the programme delivered significant, measurable outcomes for Member States.

Headline findings of the impact assessment

- **94% of respondents from participating Member States** reported that the workshop influenced their transition toward a modern Geospatial Reference System (GRS). Of those, 23% said the workshop had been a catalyst for the formal adoption of a new national policy, road map or official strategy, and a further **45%** had used workshop outcomes to trigger internal policy reviews or revisions to existing geodetic plans.
- **73% of respondents** reported little to no prior awareness of weaknesses in the global geodesy supply chain or the hidden risks of system collapse before attending — reinforcing the importance of continued evidence-based communication and advocacy alongside the technical content.

- **56% of respondents** are now actively leveraging UN-GGCE evidence and strategic tools to advocate for geodetic sustainability within their own governments — the bridge between training and investment.

The same impact assessment survey results also highlighted what training alone cannot fix: **63% of respondents** identified financial resources as the primary barrier to enhancing national geodesy, and **53%** noted that low national prioritisation impedes progress. The political and financial roots of the implementation gap cannot be addressed through training alone — they require policy-level intervention, sustained advocacy, and changes in how geodesy is prioritised and funded at the national level.

The four regional workshops

- **Europe**—UN Campus, Bonn, 10–14 February 2025. 45 participants from 22 countries. Hosted with UN-GGIM: Europe.
- **Africa**—UN Campus, Nairobi, 19–23 May 2025. 61 participants from 29 countries. Hosted with UN-GGIM: Africa. Materials translated into French.
- **Asia-Pacific**—UN Campus, Bangkok, 30 June–4 July 2025. 53 participants from 22 countries. Hosted with UN-GGIM: Asia-Pacific.
- **Americas**—UN Campus, Santiago, 3–7 November 2025. 57 participants from 27 countries. Hosted with UN-GGIM: Americas with support from SIRGAS. Materials translated into Spanish.



UN Office at Nairobi (UNON): UN-GGCE Africa Capacity Development Workshop on Transitioning to a Modern Geospatial Reference System, May 2025.



ECLAC (CEPAL), Santiago, Chile: UN-GGCE Americas Capacity Development Workshop on Transitioning to a Modern Geospatial Reference System, November 2025.

What the workshops did

Each workshop ran across five days and covered the same core curriculum, adapted regionally. Participants left with a working understanding of

- the **Why** (the value of geodesy and the case for investment),
- the **How** (modern geodetic reference systems – datums, geoid modelling, transformation parameters, national adjustments),
- the **What** (initiatives, partners, standards),
- the **Who** (governance structures and stakeholder engagement) and
- the **Where** (building communications plans and business cases that work in their country).

The *Country-level Roadmap to Modernize a Geospatial Reference System* – developed by the UN-GGCE and used in every workshop – gave participants a step-by-step framework they take home and apply. It has become the de facto guidance document for countries undertaking GRS modernization.

The alumni network

After each workshop, participants are invited into a Global Alumni Network maintained through Microsoft Teams and regional WhatsApp channels. The network keeps the conversation alive between workshop participants, enables cross-regional problem-solving and is becoming a powerful tool for international geodesy capacity. All workshop materials – recordings, presentations, multilingual translations – are publicly available.

Partner workshops

UN-GGCE capacity development extends well beyond the four flagship regional workshops, in collaboration with partners:

- **International Association of Geodesy (IAG)** – joint training and contributions to IAG events; the closest and most sustained partnership in our capacity work.
- **International Federation of Surveyors (FIG)** – joint sessions at the FIG Congress and Working Weeks 2024, 2025 and 2026.
- Targeted joint workshops with EGU, GEO, and others.

216

PARTICIPANTS

across four
regional workshops

100

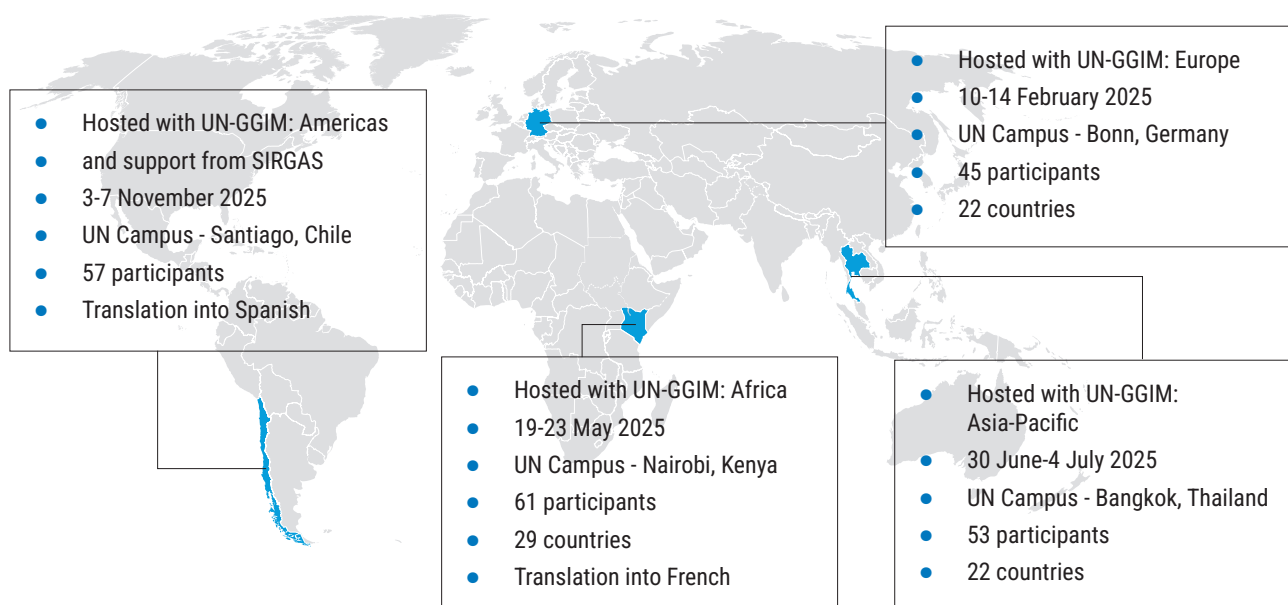
COUNTRIES

reached

4

CONTINENTS

– Europe, Africa,
Asia-Pacific, Americas



Cross-cutting threads

Women in geodesy

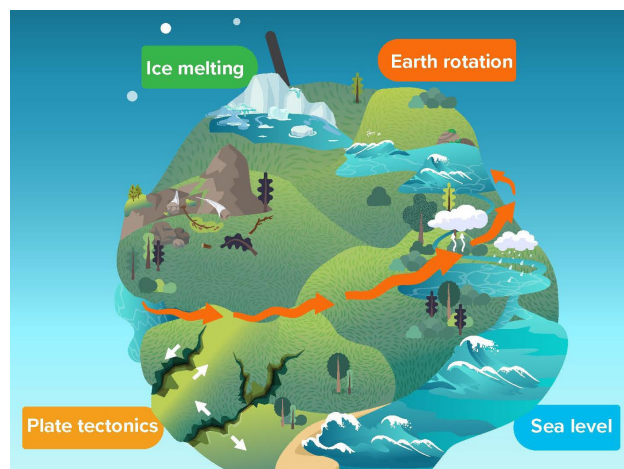
Women currently hold three of the four positions in the UN-GGCE and one of the two co-chair positions of its International Advisory Committee. Visible female leadership is important to ensure women are included in what has been a historically male-dominated discipline.

That commitment is also evident in the Capacity Development Workshops, where female participation has been a deliberate priority. Across the four regional workshops, women were strongly represented, making up 54 of the 216 participants—significant given the historical gender imbalance in geodesy – with many in national leadership roles for geodesy or PNT.

Early-career professionals and youth

Geodesy's workforce challenge is acute and well documented: declining university programmes, an ageing specialist community, knowledge concentrated in a small number of individuals approaching retirement. The Centre's response has been threefold – pulling young professionals into capacity development workshops as participants, supporting initiatives such as the Group on Earth Observations Mountains Youth Ideation as a technical advisor, and producing communications material that frames geodesy as a viable and exciting career.

The Impact Assessment of the four regional Capacity Development Workshops shows this is starting to take shape. **20% of workshop participants were Early Career Professionals under the age of 35**, and approximately **50 participants – close to a quarter of the 216 trained – under the age of 40**, equipping the next generation



UN-GGCE Infographic: Measuring Earth's constant changes through geodesy: monitoring surface motion, sea-level change, ice melting, and environmental shifts.

with the advanced geodetic skills and business-case strategies they will need to lead national supply chains as the current cohort approaches retirement.

Climate, disaster risk and the SDGs

Geodesy is the measurement infrastructure for the climate response. Millimetre-scale sea level rise, centimetre-scale coastal subsidence, ground deformation preceding volcanic eruptions, the verification of international environmental agreements – all rest on the same reference frames and observation networks. The UN-GGCE Policy Brief on geodesy and climate science makes this case explicitly. The Centre's work supports SDGs 9 (Industry, Innovation and Infrastructure), 11 (Sustainable Cities and Communities), 13 (Climate Action), 14 (Life Below Water) and 15 (Life on Land), and contributes to the Sendai Framework for Disaster Risk Reduction.



ESCAP, Bangkok Asia-Pacific Capacity Development Workshop on Transitioning to a Modern Geospatial Reference System, June–July 2025

Looking ahead

Governance

With the State of Geodesy 2026 baseline now in hand, the UN-GGIM Subcommittee on Geodesy and the UN-GGCE will work with Member States and partners to raise awareness of the governance, mandate and financing gaps the assessment identified, and to begin a conversation about what international governance arrangements for geodesy could look like. The Subcommittee and the Centre look forward to consulting with a broad and inclusive audience — across Member State governments, partner organizations, scientific bodies and the wider geospatial and infrastructure community — so that the path forward is shaped by, and works for, the full range of countries and institutions that depend on the global geodesy supply chain.

A robust supply chain

Phase 2 of the Joint Development Plan moves from “avoid further degradation” to “make it robust”. The UN-GGCE is working with IAG and its Services, the UN-GGIM Subcommittee on Geodesy and a wider network of partners to design what a robust global geodesy supply chain should look like—defining the requirements for ground observing stations, technology, analysis capacity, software, frequency spectrum protection and cybersecurity against which future investment can be planned. A zero draft of this design will be published in the next reporting period and developed iteratively with the community that will be asked to operate and resource it.

Growing capacity

The UN-GGCE Capacity Development Programme is being developed as a blended learning programme designed to strengthen the geodetic capacity and capability of Member States. It responds directly to UN General Assembly Resolution 69/266 on a Global Geodetic Reference Frame for Sustainable Development, and complements the UN Integrated Geospatial Information Framework (IGIF). It also strengthens national capacity to integrate marine geodetic infrastructure with terrestrial reference frames, in alignment with the work of the International Hydrographic Organization (IHO) and the UN Decade of Ocean Science.

The three tracks in the programme are professional and pre-professional capacity development courses delivered through e-learning and in-person workshops. The programme creates pathways into formal academic programmes at partner universities but does not itself confer academic credit.

The programme will be loosely aligned with all nine IGIF Strategic Pathways and built with a focus on assisting developing countries, Small Island Developing States and least developed countries.

Frequency protection and WRC-27

Preparing country representatives for formal discussions on geodesy and spectrum at the World Radiocommunication Conference in 2027 is now a coordinated international effort. Material support, common talking points and a shared evidence base are being developed with the Frequency Protection Working Group.

Joining Land and Sea

The Joining Land and Sea initiative will produce a draft for country feedback by the end of 2026. The purpose of the document is to provide technical guidance on aligning and/or integrating land and sea data. Specifically, it focuses on establishing vertical Coordinate Reference Systems (CRSs) for Land-Sea integration, enabling the referencing of data to common geodetic height reference surfaces or datums. It addresses a key technical need identified in the UN-GGIM compilation report on *Integration of Terrestrial, Maritime, Built and Cadastral Domains*, which analyses the broader aspects of domain integration across Member States — covering governance frameworks, institutional arrangements, capacity-building needs and strategic approaches.

People, governance and acknowledgments

Governance

The UN-GGCE operates under the auspices of the United Nations. It is hosted by the Government of Germany at the UN Campus in Bonn and is part of the United Nations Statistics Division within the Department of Economic and Social Affairs. The Centre is supported by an International Advisory Committee (IAC) and a Steering Committee and works closely with the UN-GGIM Subcommittee on Geodesy.

Steering Committee

The UN-GGCE Steering Committee provides strategic oversight and guidance for the implementation of the Centre's work programme. The Committee comprises seven members representing the United Nations Department of Economic and Social Affairs (UN DESA), the Government of Germany, and the UN-GGCE, ensuring alignment between global priorities and operational delivery.

Host country representation is provided through the Federal Agency for Cartography and Geodesy (BKG) and the Federal Ministry of the Interior and Community (BMI), demonstrating Germany's sustained commitment to the Centre.

The Committee includes senior policy and technical representatives and is supported by observer participation to strengthen coordination and international engagement. The Head of Office of the UN-GGCE serves ex officio, ensuring direct linkage between governance and implementation.

International Advisory Committee

The International Advisory Committee of the UN-GGCE provides strategic and technical guidance to the Centre, bringing together expertise from across the global geodesy community.

The Committee comprises 19 members from 16 countries, representing all regions of the world. Members include leaders from national geodetic agencies, international organizations, academia and the scientific community.

Several members also contribute to the work of the UN-GGIM Subcommittee on Geodesy, ensuring strong alignment between global governance, technical coordination and implementation.

The Committee operates under a co-Chair structure, reflecting the collaborative and international nature of global geodesy governance.



UN Bonn, UN-GGCE Team, March, 2026.



UN Bonn, UN Team, March 2025.

The team in Bonn and virtual secondees

The Centre's core team is composed of three internationally recruited personnel, one locally recruited staff member, and one on-site seconded from the German government (BKG). In addition, the core team is supported by virtual secondees from Norway, France, Singapore, Japan, Spain and the Technical University of Munich. Their expertise — across communications, technical analysis, GNSS, DORIS, geodetic standards and more — is the engine of the Centre's delivery.

Acknowledgments

Host and principal funder

The UN-GGCE is hosted in Bonn by the Government of Germany. Its principal in-country partner is the Federal Agency for Cartography and Geodesy (BKG), whose long-standing commitment to international geodesy made the Centre possible. The Centre's funding has been extended to 2030.

Secondment partners and contributing organizations

The Centre is grateful to every organisation that has seconded staff, contributed expertise, hosted workshops, signed the Multilateral MoU or otherwise supported the work of the past two years. Particular thanks to the International Association of Geodesy (IAG) and its Services; the UN-GGIM Subcommittee on Geodesy and the UN-GGIM regional committees; the International Federation of Surveyors (FIG); SIRGAS; ECLAC; and all 57 participants of the Multilateral MoU.



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