Post-2025 GEO Work Programme (Version 2.1)

This document is submitted to the Plenary for decision.

GROUP ON EARTH OBSERVATIONS

Post-2025 GEO WORK PROGRAMME

SUMMARY DOCUMENT

VERSION 2.1 – May 2025

Preface

This document represents a new chapter for the Group on Earth Observations (GEO) as we embark on the journey outlined in the Post-2025 Strategy. It builds upon two decades of global collaboration and shared ambition, marking the ninth iteration of the GEO Work Programme (previously known as GEO Work Plan) since its inception in 2005.

The process of developing this Work Programme has been both collaborative and dynamic, involving extensive consultation with GEO Members, Participating Organizations, and stakeholders. Guided by the GEO Programme Board, this document reflects the collective insight and commitment of the GEO community, who have shaped its direction with a shared vision for a sustainable and inclusive future.

This Work Programme embodies the principles of GEO's renewed strategy, which introduces the concept of "Earth Intelligence." More than a technical framework, Earth Intelligence represents our shared commitment to transforming Earth observation data into actionable insights, co-created with users to support informed decision-making at all levels. It is this vision that will guide us in delivering real-world impact, fostering innovation, and aligning our efforts for greater global collaboration.

The activities of the new Work Programme are selected to address the evolving challenges and priorities of our time. They are based on user-centric approaches, operationalization of services, open knowledge sharing, and strengthening of partnerships across sectors. Recognizing that success thrives on adaptability, these activities are living endeavors, to be updated and refined in response to new opportunities, challenges, and lessons learned.

This summary outlines how GEO will work to achieve its mission beyond 2025. These activities are designed to align with GEO's broader goals of delivering Earth Intelligence for all, empowering users with targeted and actionable insights, and accelerating progress toward a sustainable and equitable world.

We invite your feedback and contributions to advance these activities and ensure their success. Contact information for each activity is provided within the document, and the GEO Secretariat is available for any general comments or clarifications. Together, we can turn this vision into reality, creating a legacy of global collaboration and innovation for a better future.

For questions or contributions, please contact the GEO Secretariat at geo-wp@geosec.org.

Table of Contents

Table of Changes

Key changes introduced in Version 2 with respect to Version 1.

Where	What
Flagships	• GEO BON made substantial edits to the main text and updated the list of partners. • GEOGLAM updated the list of partners. • GEOGLOWS was moved from Water and Land Sustainability Focus Area to Weather, Hazard, and Disaster Resilience Focus Area. • GEO-LDN updated the list of partners. • GOS4M made minor edits to the main text and updated the list of donors, partners, and points of contact.
Initiatives	• EO4DRM updated the list of points of contact. • GEO-PDRS updated the order of points of contact. • GEO-TREES updated the list of partners. • GEOCRI made substantial edits to the main text and updated the list of donors. • HUMAN-PLANET made minor edits to the main text and updated the order of points of contact. • NIGHT-LIGHT updated the list of partners and points of contact. • THE ATLAS made minor edits to the main text and updated the list of donors.
Pilots	• EO4KARST updated the order of points of contact. • GEOARC updated the list of donors, partners, and points of contact. • GHRS made substantial edits to the main text and updated the list of donors. • WILDFIRE-HIA revised its full and short titles from “Wildfire Observation, Forecasting, Prediction, Projection, and Health Impact Assessment” to “GEO Wildfire-Health Nexus (GEO WHN),” was moved from Weather, Hazard, and Disaster Resilience Focus Area to One Health Focus Area, made substantial edits to the main text, and updated the list of donors, partners, and points of contact.
Conveners	• GEO-BLUE-PLANET made substantial edits to the main text. • GEOMIN updated the order of points of contact. • GEONICE made minor edits to the main text. • HEALTH-CoP made minor edits to the main text and updated the list of points of contact. • SPACE-SECURITY made minor edits to the main text and updated the order of points of contact.
Enabling Mechanisms	• “Policy Coordination” is renamed as “Application Driver.” • AI4EO made minor edits to the main text and updated the list of points of contact. • DE AFRICA revised its short title from “DE-AFRICA” to “DE AFRICA,” made minor edits to the main text, and updated the list of partners and points of contact. • DE PACIFIC revised its short title from “DE-PACIFIC” to “DE PACIFIC” and updated the list of partners. • EO4SDG made minor edits to the main text. • GEO-CONNECTIONS made minor edits to the main text. • GEO-CRADLE revised its full name, made minor edits to the main text, and updated the order of points of contact. • GEO-DECOP made minor edits to the main text. • GEO-YOUTH made minor edits to the main text.
Table of Acronyms	• Added and removed acronyms.

Status of Existing and New Activities

Table A – Recommended Categorization of Existing Activities

GEO Work Programme Activity	Current Category	Recommended Category
GEO Biodiversity Observation Network (GEO BON)	Flagship	Flagship
GEO Global Agricultural Monitoring (GEOGLAM)	Flagship	Flagship
GEO Land Degradation Neutrality (GEO-LDN)	Flagship	Flagship
Global Forest Observations Initiative (GFOI)	Flagship	Mature Flagship
Global Observation System for Mercury (GOS4M)	Flagship	Flagship
AquaWatch (AQUAWATCH)	Initiative	Convener
Data Integration and Analysis System (DIAS)	Initiative	Enabling Mechanism
Digital Earth Africa (DE AFRICA)	Initiative	Enabling Mechanism
Earth Observations for Disaster Risk Management (EO4DRM)	Initiative	Initiative
Earth Observations for Ecosystem Accounting (EO4EA)	Initiative	*Did not submit a plan*
Earth Observations for Health (HEALTH-CoP)	Initiative	Convener
Earth Observations for the Sustainable Development Goals (EO4SDG)	Initiative	Enabling Mechanism
GEO Blue Planet (GEO-BLUE-PLANET)	Initiative	Convener
GEO Capacity Building in the Balkans, Black Sea, Middle East, Africa, and Pacific Asia Regions (GEO-CRADLE)	Initiative	Enabling Mechanism
GEO Global Water Sustainability (GEOGLOWS)	Initiative	Flagship
GEO Human Planet (HUMAN-PLANET)	Initiative	Initiative
GEO Vision for Energy (GEO-VENER)	Initiative	*Resubmitted as GEONICE*
GEO Wetlands (GEO-WETLANDS)	Initiative	Pilot
Geohazard Supersites and Natural Laboratories (GSNL)	Initiative	Flagship
Global Drought Information System (GDIS)	Initiative	*Pending*
Global Network for Observations and Information in Mountain Environments (GEO-MOUNTAINS)	Initiative	Initiative
Global Observation System for Persistent Organic Pollutants (GOS4POPs)	Initiative	*To be merged*
Global Urban Observation and Information (GUOI)	Initiative	*Will resubmit*
Global Wildfire Information System (GWIS)	Initiative	Flagship
Antarctic Ice Sheet Monitoring (AIS-MONITORING)	Pilot Initiative	*Did not submit a plan*
ArcticGEOSS (ARCTIC-GEOSS)	Pilot Initiative	Convener
Digital Earth Pacific (DE PACIFIC)	Pilot Initiative	Enabling Mechanism
Earth Observations for Global Typical Karst (EO4KARST)	Pilot Initiative	Pilot
Earth Observations for Multi-Scale Monitoring of Mining Impacts (EO4MIN)	Pilot Initiative	Convener
Earth Observations for the Water-Energy-Food Nexus (EO4WEF)	Pilot Initiative	Pilot
Forest Biomass Reference System from Tree-by-Tree Inventory Data (GEO-TREES)	Pilot Initiative	Initiative
GEO Citizen Science (GEO-CITSCI)	Pilot Initiative	*Did not submit a plan*
GEO Cold Regions Initiative (GEOCRI)	Pilot Initiative	Initiative
GEO Essential Variables (GEO-EV)	Pilot Initiative	*Did not submit a plan*

GEO Work Programme Activity	Current Category	Recommended Category
Geodesy for the Sendai Framework (GEODESY4SENDAI)	Pilot Initiative	*Merged into the Disaster Risk Reduction and Adaptation Working Group (DRRA-WG)*
Global Ecosystems and Environment Observation Analysis Research Cooperation (GEOARC)	Pilot Initiative	Pilot
Global Geochemical Observation Network and Digital Chemical Earth (CHEMICAL-EARTH)	Pilot Initiative	*Will resubmit*
Global Products of Common Essential Variables from Multiple Satellite Data (GEO-EV-PRODUCTS)	Pilot Initiative	*Did not submit a plan*
Global Vegetation Pest and Disease Dynamic Remote Sensing Monitoring and Forecasting (GEO-PDRS)	Pilot Initiative	Initiative
In-Situ Observations and Applications for Ecosystem Status of China and Central Asia (IN-SITU-ESC)	Pilot Initiative	*Did not submit a plan*
Night-Time Light Remote Sensing for Sustainable Development Goals (NIGHT-LIGHT)	Pilot Initiative	Initiative
Open Earth Alliance (OEA)	Pilot Initiative	*Did not submit a plan*
Space and Security (SPACE-SECURITY)	Pilot Initiative	Convener
Urban Heritage Climate Observatory (UHCO)	Pilot Initiative	Convener
African Group on Earth Observations (AfriGEO)	Regional GEO	*Moved out of the GWP*
Americas Group on Earth Observations (AmeriGEO)	Regional GEO	*Moved out of the GWP*
Asia-Oceania Group on Earth Observations (AOGEO)	Regional GEO	*Moved out of the GWP*
European Group on Earth Observations (EuroGEO)	Regional GEO	*Moved out of the GWP*

Table B – Recommended Categorization of New Activities

GEO Work Programme Activity	Proposed Category	Recommended Category
Blockchain-Enabled Earth Observation for Sustainable Resource Management in Nigeria	Initiative	*Rejected*
Global Ecosystems Atlas (THE ATLAS)	Initiative	Initiative
A Decision-Making System for Slope Risk Deduction (SLOPE-RISK-GPT)	Pilot	Pilot
Dynamic Monitoring and Vulnerability Assessment of Vegetation in Typical Arid Oasis Urban (CDMVAVE)	Pilot	*To be merged*
GEO Wildfire Integrated Nexus for Planetary Health (GEO WHN)	Pilot	Pilot
Global Climate Risk Monitoring and Adaptive Intelligence Platform (CRMIP)	Pilot	*Rejected*
Global Heat Resilience Service (GHRS)	Pilot	Pilot
In Situ Observations and Modelling for Weather, Water, Environment and Climate Services in Africa (TEMBO)	Pilot	Pilot
Land Cover & Land Intelligence Action Group (EO4EcoIntel)	Pilot	*Rejected*
Artificial Intelligence for Earth Observations (AI4EO)	Convener	Enabling Mechanism
Atlas for the Endangered East African Montane Forest Ecoregion (EAMF ATLAS)	Convener	*To be merged*
Global UAV Observation Network (GEO-UAV)	Convener	Enabling Mechanism
Capacity Development Working Group (CD-WG)	Convener	*Rejected*

GEO Work Programme Activity	Proposed Category	Recommended Category
Climate Change Working Group (CC-WG)	Convener	Enabling Mechanism *(Merged into DRRA-WG)*
Data and Knowledge Working Group (DK-WG)	Convener	Enabling Mechanism
Data Gaps at the Nexus between Biodiversity, Geodiversity, and Ecosystems (ENVIRONMENT DATA GAPS)	Convener	*Rejected*
Digital Earth Approaches for GEO (GEO-DECOP)	Convener	Enabling Mechanism
Disaster Risk Reduction Working Group (DRR-WG)	Convener	*Merged into DRRA-WG*
Enhancing Capacity for Climate Risk Assessment and Catalyzing Partnerships to Inform Decisions in Latin America and the Caribbean (LACI)	Convener	*Merged into DRRA-WG*
Equality, Diversity, and Inclusion (GEO-EDI)	Convener	*Paused*
Europe-Africa EO Data Sharing for EW/Climate/DRR (EO-NREN)	Convener	Enabling Mechanism
GEO Connected Community: Advancing Communication Infrastructure and Services (GEO-CONNECTIONS)	Convener	Enabling Mechanism
GEO Indigenous Alliance (GEO-IA)	Convener	Enabling Mechanism
GEO Youth Community of Practice (GEO-YOUTH)	Convener	Enabling Mechanism
Linking and Connecting Women in Earth Observation and Earth Intelligence (GEO-WOMEN)	Convener	Enabling Mechanism
Monitor Air Quality and GHG Levels through Satellite Imagery	Convener	*To be merged*
Nexus on Climate, Energy and Urbanization (GEONICE)	Convener	Enabling Mechanism
Resilient Cities and Human Settlements Working Group (RCHS-WG)	Convener	Enabling Mechanism
Response and Restoration of Wetland Environments (GEO-REWET)	Convener	*To be merged into GEO-WETLANDS*
Sustaining Arctic Observing Networks (SAON)	Convener	*Rejected*
Understanding the Impacts and Value of Earth Observations (GEOVALUE)	Convener	Enabling Mechanism

Introduction to Post-2025 GEO Work Programme

The GEO Work Programme (GWP) is the primary instrument used by GEO to facilitate collaboration among its Members, Participating Organizations, Associates, and other partners through a series of joint activities aimed at realizing GEO's Mission and Vision.

In response to the call by the GEO Post-2025 Strategy for transformative programmes that focus on co-producing Earth intelligence solutions to address complex global challenges, the Post-2025 GWP aims to evolve GEO from primarily facilitating Earth observation data access to actively developing user-driven, integrated products and services that inform decisions and empower society. The strategy emphasizes the need for efficiency, effectiveness, impact, and additionality in GEO's programmes, requiring a growth-oriented mindset from the community to integrate new technologies, increase global access to Earth intelligence, and enhance youth participation.

Key Changes

To achieve this transformation, the following key changes have been introduced in the Post-2025 GWP.

Focus Areas

Focus Areas provide a prioritization framework to support the GEO community in performing gap analyses, identifying key objectives, and fostering interdisciplinary collaboration. The Post-2025 GWP outlines six thematic and two cross-cutting Focus Areas, as illustrated in Figure 1.

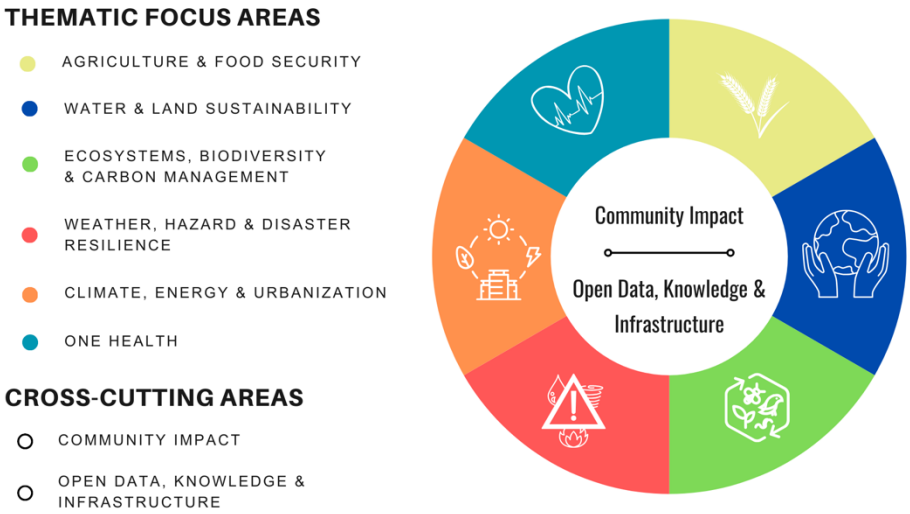

Figure 1: Focus Areas of Post-2025 GEO Work Programme

Evolving Structure

The Post-2025 GWP consists of three main categories (See Figure 2): Conveners, Research to Operations (R2O) Pipeline Activities and Enabling Mechanisms. Compared to the 2023–2025 GWP, the Post-2025 GWP integrates Pilot, Initiative, and Flagship categories into the R2O pipeline, focusing on the sustained delivery of operational, sustained products and services to support decision-making and enhance socioeconomic and environmental impact.

Evergreen Programme Cycle

Instead of having a fixed start and end date for all activities, each activity develops at its own pace, subject to the maximum duration of time it can stay in the same category. As activities meet the specified criteria, they become eligible for evaluation by the Programme Board to advance to a category reflective of a higher operational level.

Monitoring and Evaluation

A monitoring and evaluation framework will be established to track progress. Activities will be required to report on their progress against planned outputs, which will be elaborated in work plans that will be developed after the approval of activities by the GEO Plenary in May 2025. To ensure effectiveness and efficiency, activities must demonstrate advancement and successful delivery.

Structure

The Post-2025 GWP consists of three main categories: Conveners, R2O Pipeline Activities, and Enabling Mechanisms. The structure is illustrated in Figure 2 and each of these categories is described below.

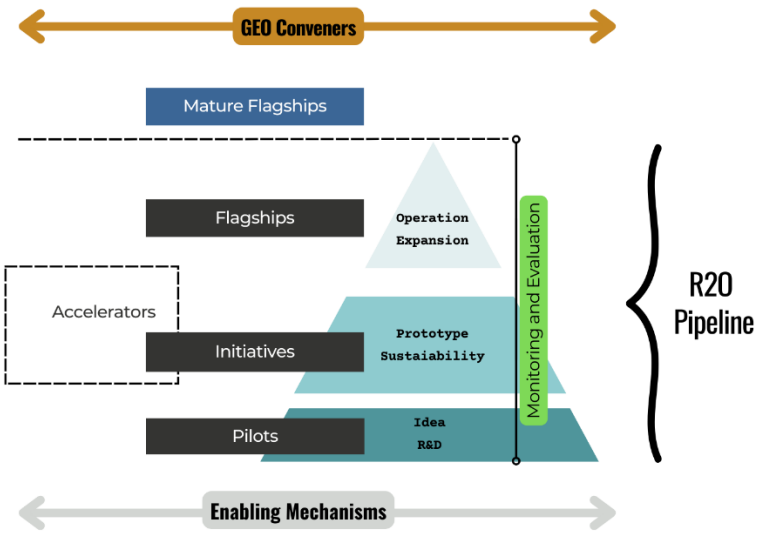

Figure 2: Structure of Post-2025 GEO Work Programme

Conveners

As a newly introduced category, Conveners serve as communities of practice or communities of interest, bringing together partners and stakeholders to exchange knowledge, share best practices, and foster connections and collaborations within and across Focus Areas. They typically don't aim at developing or transitioning specific tools and applications into operational products and services but may well curate concepts for new R2O activities.

Pilots

Formerly known as Pilot Initiatives, Pilots are activities within the Post-2025 GWP at the initial or early stages of concept development, serving as proofs of concept for proposed products, tools,

or services utilizing Earth observation data. These activities are designed to address identified needs of a defined user base and stakeholders, laying the groundwork for further development.

Initiatives

Initiatives are activities , which advance from the Pilot stage, focusing on developing products, tools, or services based on Earth observation data and relevant technologies. These activities have been validated in relevant environments and are creating system prototypes in a near-operational mode. Within their specific domains, Initiatives facilitate the transition of innovative results and prototypes from the research community into Earth observation-based products and services, catering to a diverse range of users. They also foster stakeholder communities that collaborate to build capacity and maximize the value of these products and services.

Flagships

Flagships represent the final stage of the R2O pipeline, encompassing activities with fully developed, qualified systems that have been tested and operated under real-world conditions with users, and "flight proven." They continue to progress toward long-term sustainability and full establishment, working closely with users and stakeholders.

Mature Flagships

When a Flagship achieves full operational capacity and sustained services, demonstrating high maturity and independence, and is ready to advance beyond the R2O process, it remains part of the GWP as a Mature Flagship. It retains the GEO brand, leverages further opportunities for advancement and synergy, and serves as a model of best practices to follow.

Accelerators

Accelerators reflect a particular pathway for an activity within the R2O pipeline, aimed at fast-tracking high-priority projects or addressing critical external needs. They act as catalysts for rapid development, fostering the integration of Earth observation data applications and building partnerships both within and beyond the GWP.

The Accelerator category is built on GEO's expertise in developing and implementing incubators. Applications for Accelerators will open following the GEO Global Forum 2025, subject to resource availability. Accelerators will become part of the GWP and would be subject to monitoring and evaluation criteria stipulated by the GEO Programme Board.

Enabling Mechanisms

Enabling Mechanisms are activities that either provide foundational support across all R2O Pipeline activities, enhancing their growth along the pipeline and capacity to deliver operational products and services, or serve the entire GEO community or regional aspects of it. These mechanisms encompass essential resources, infrastructure, and coordination efforts, including access to open data and knowledge, integration of advanced technologies, alignment with global policy frameworks, and increased impact through collaboration with underrepresented communities.

Process of post-2025 GWP Development

The development of the Post-2025 GWP is led by the GEO Programme Board, with the support of the GEO Secretariat.

To ensure a smooth transition from the current GWP, a two-phase approach has been applied. Phase I, running from September 2024 to May 2025, focuses on positioning the current and new activities within the new GWP structure, with clear objectives and expected results outlined. Phase II, from June to December 2025, will require accepted activities to submit detailed work plans with measurable indicators, and will focus on implementation.

Phase I was initiated with a call for proposals to GEO Members, Participating Organizations, GEO Associates, and the broad community of stakeholders with which GEO interacts. Proposals received were evaluated by Review Teams comprising of Programme Board members. An iterative process of review and revision for the proposals is ongoing, up to the time of preparation of the version for GEO Plenary approval. Coordination and merging of proposals are facilitated by the Programme Board and the GEO Secretariat to deliver a focused and manageable GWP.

A total of three versions of the GWP Summary Document will be prepared for Phase I:

- Version 1 will be distributed to Principals of GEO Members and Participating Organizations, as well as the broader GEO community, for consultation in March 2025.
- Version 2 will be distributed to GEO Principals as part of the package of documents for approval at the GEO Global Forum and will also be made available via the GEO website.
- Version 3 will take input from GEO Principals during the GEO Global Forum and will be posted on the GEO website following the Forum, reflecting any adjustments or additions made at the Plenary meeting.

Strengthening Implementation of Post-2025 GWP

Fostering collaboration and enhancing synergies across GEO are crucial for the effective implementation of the Post-2025 GWP. The following approaches (among others) will be explored:

- Strengthening bottom-up information sharing to create a collaborative marketplace. For instance, a capacity development workshop in Africa organized by Activity A could be leveraged by other GWP activities.
- Coordinating with Regional and National GEOs and leveraging Regional GEO symposia and workshops to align users, solution providers, and other partners within the Earth observation ecosystem and with GWP activities, while co-designing solutions.
- Securing financial and technical resources to foster innovation and ensuring the full deployment and operationalization of Earth Intelligence solutions tailored to user needs.

Agriculture and Food Security

Flagships

GEO Global Agricultural Monitoring (GEOGLAM)

Focus Area(s):

- **Agriculture and Food Security**

Challenge

Millions of livelihoods, particularly in smallholder crop and livestock systems in low-income countries, are increasingly vulnerable to climate change and socioeconomic pressures, including demographic growth and conflict. These regions are experiencing declining agricultural productivity and worsening food insecurity, exacerbated by the rising frequency and severity of extreme weather events. Agriculture's sensitivity to climate variability leaves food-insecure communities especially exposed, underscoring the urgent need for effective monitoring and early warning systems. GEOGLAM plays a crucial role by delivering timely, precise data to support adaptive responses, leveraging local climate information and new technologies to help mitigate food security crises and build resilience.

Solution

GEOGLAM provides systematic, timely monitoring of agricultural conditions worldwide, focusing on areas at risk of food insecurity. Using Earth observation (EO), AI-driven analytics, in situ, and socioeconomic data, GEOGLAM delivers precise, actionable insights on crop conditions and production outlooks. This comprehensive, consensus-based, co-designed approach strengthens early warning systems, enabling governments and organizations to make informed, proactive decisions to reduce vulnerability to food crises. With continuous monitoring and improved forecasting, GEOGLAM's Global Crop Monitor builds resilience and preparedness, helping mitigate agricultural risks before they escalate into crises, ultimately supporting food security and sustainable agricultural systems.

Intended Socioeconomic and Environmental Impact

The GEOGLAM initiative empowers national governments, humanitarian organizations, and other stakeholders to take proactive measures against poor agricultural production and food insecurity risks. By delivering timely, accurate data, it enables rapid responses to avert crises, thereby reducing the risk to loss of life, economic instability, and food insecurity. Governments can better prepare for production shortfalls, focusing preventive actions on vulnerable populations to strengthen food security before disasters occur. Co-development of GEOGLAM's monitoring systems ensures local ownership, enhancing their resilience and long-term sustainability. These systems are highly adaptable and provide cost-effective alternatives to reactive measures by enabling and improving preparedness and delivery of disaster emergency interventions, ultimately supporting long-term agricultural and economic stability.

Objectives for 2025–2030

From 2025 to 2030, GEOGLAM will strengthen global agricultural monitoring with a focus on food-insecure regions, especially in the Global South. GEOGLAM will extend the number of national crop monitoring systems, co-developing each with local partners to ensure alignment with national and regional needs. These efforts will provide previously underserved regions with access to vital agricultural insights to support food security and resilience to climate impacts, aligning closely with GEO's Post-2025 Strategy.

GEOGLAM will expand its digital toolkit, including mobile data collection apps to improve in situ data collection and storage, satellite-based monitoring platforms, and automated analytics systems to strengthen data accuracy and accessibility.

In parallel, it will refine Essential Agricultural Variables (EAVs) and build technical capacity through workshops and initiatives. GEOGLAM will revitalize rangeland monitoring and introduce rapid-response services to its portfolio, enabling faster reaction times in emergency situations.

In addition, GEOGLAM plans to leverage existing synergies, for instance by integrating certain services with other GEO initiatives, as well as explore new synergies, fostering a more cohesive response to food security and climate challenges.

By expanding its network of partners, GEOGLAM aims to deepen its engagement with local governments, humanitarian organizations, and agricultural stakeholders. The goal is to empower these users with actionable intelligence that supports proactive decision-making and builds resilience against production shocks. To further ensure sustainability, GEOGLAM will work collaboratively to train local teams and embed knowledge, creating systems that can operate autonomously over time.

Ultimately, GEOGLAM seeks to improve both socioeconomic and environmental outcomes. With timely interventions, it will help avert food crises, reduce economic losses, and promote sustainable resource use. By building a foundation for long-term agri-food system resilience, GEOGLAM will not only mitigate immediate risks but also contribute to the stability and sustainability of agricultural practices in some of the world's most vulnerable regions.

How We Work

The GEOGLAM initiative operates through a collaborative governance structure involving core partners, the Executive Committee (ExCom), the Co-Chairs, and the GEOGLAM Secretariat. The core partners execute the mandate, contributing through various projects, while the Executive Committee provides operational guidance with strategic oversight from the Co-Chairs. The Secretariat, led by the Program Director, coordinates program operations, reporting, and outreach. Thematic Coordination Teams (TCTs) and Regional Network Coordinators (RNCs) align activities across regions and themes. This structure integrates strategic, operational, and policy inputs, ensuring GEOGLAM's effectiveness in global agricultural monitoring and food security.

Donors

Department for Environment, Food & Rural Affairs (Defra), United Kingdom

Partners

GEO Members	
Australia	Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Belgium	Flemish Institute for Technological Research (VITO)
China	Aerospace Information Research, Chinese Academy of Sciences (AIR-CAS)
Japan	Japan Aerospace Exploration Agency (JAXA)
United Kingdom	University College London (UCL)
United States	National Aeronautics and Space Administration (NASA)
GEO Participating Organizations	
Committee on Earth Observation Satellites (CEOS)	
European Space Agency (ESA)	
Food and Agriculture Organization of the United Nations (FAO)	
International Institute for Applied Systems Analysis (IIASA)	
International Institute for Geo-Information Science and Earth Observation (ITC)	
Regional Centre for Mapping of Resources for Development (RCMRD)	
United Nations Convention to Combat Desertification (UNCCD)	
World Bank	
World Food Programme (WFP)	

Point(s) of Contact

Esther Makabe emakabe@geosec.org
Sven Gilliams sgilliams@geosec.org

Initiatives

Global Vegetation Pest and Disease Dynamic Remote Sensing Monitoring and Forecasting (GEO-PDRS)

Focus Area(s):

- **Agriculture and Food Security**
- **Ecosystems, Biodiversity, and Carbon Management**
- **Weather, Hazard, and Disaster Resilience**

Challenge

Global climate change intensifies biological crises, with vegetation pests and diseases posing severe threats. These outbreaks reduce biodiversity, disrupt ecosystems, and compromise agricultural productivity and regional stability. Current approaches lack precision and timeliness, hindering effective responses. A global, high-resolution monitoring and forecasting framework is urgently needed to mitigate impacts, reduce pesticide dependence, and protect biodiversity. Such efforts align with UN Sustainable Development Goals 2 and 13, support the Sendai Framework, and enhance international collaboration, ensuring food security and fostering resilient ecosystems.

Solution

To meet these critical challenges, a globally scalable technological framework for vegetation pests and diseases monitoring and forecasting is paramount. This framework necessitates a multi-scale approach, integrating sophisticated spectral analysis, AI-driven algorithms, and dynamic monitoring and forecasting tools to ensure rapid and precise detection and early warning of outbreaks. Essential iterative feedback mechanisms enable continuous data refinement, while the sharing and application of critical data, alongside the publication of functional modules, and specialized software, enhances utility and accessibility. Collectively, these components advance comprehensive habitat surveillance and proactive disaster forecasting, providing vital insights and decision-support capabilities to stakeholders across multiple levels.

Intended Socioeconomic and Environmental Impact

This solution enables coordinated, multi-institutional monitoring and forecasting of vegetation pests and diseases at continental and regional scales, strengthening disaster mitigation, regional stability, and food security through improved yields, reduced hunger, and reduced loss of life. Early warning capabilities support precise, cost-effective control strategies, mitigating economic losses, raising household incomes, and delivering significant financial savings. Accurate monitoring and warnings guide integrated physical, chemical, and ecological control methods, reducing pesticide dependence, protecting ecosystems, and conserving biodiversity.

Objectives for 2025–2030

Building on the foundational achievements of previous GEO projects, in 2025–2030, the project will focus on developing efficient technologies for dynamic monitoring, risk analysis, invasion forecasting, and damage assessment of major epidemic and migratory vegetation pests and

diseases. By integrating innovative models with advanced technologies, such as artificial intelligence, the project aims to enhance vegetation pest and disease monitoring and forecasting capacities, particularly in developing regions. Through the development and optimization of pest and disease information service infrastructure, the project seeks to provide comprehensive support for effective pest and disease management, contributing to sustainable development and global food security.

The project plans to produce three types of products tailored to diverse user needs. First, metadata is designed for integration with sectoral data systems to enable further analysis and applications. Second, user-oriented tools—such as maps, mobile applications (apps), and low-cost devices—are developed, specifically targeting end-users, particularly farmers in developing regions. Third, APIs and software are provided for integration with internationally recognized platforms, supporting localized applications in key regions and enhancing global scalability.

By leveraging these products and technological innovations, the project seeks to deliver comprehensive solutions that proactively address biological threats. Specifically, it aims to achieve over 85% precision in habitat monitoring and forecasting, providing early warnings at least 10 days before anticipated incursions. These outcomes will significantly enhance disaster preparedness, reduce pest impacts, and promote sustainable pest and disease management practices globally.

How We Work

The project will establish a collaborative framework integrating the core team, governance bodies, and an international network. The core team will define strategic directions, while governance bodies will oversee management and quality assurance. Leveraging its international partnerships, the project will conduct joint data acquisition, establish joint laboratories, co-develop pest and disease monitoring products, apply for international projects, and deploy global platforms. Regular scientific exchanges and joint training sessions will be organized to foster multidisciplinary integration and innovation. This framework ensures high-quality execution and effective application of outcomes.

Donors

China	Chinese Academy of Sciences (CAS)
	Ministry of Science and Technology (MOST)
Centre for Agriculture and Bioscience International (CABI)	
Food and Agriculture Organization of the United Nations (FAO)	

Partners

GEO Members	
Bangladesh	University of Chittagong
China	Bureau of International Cooperation, Chinese Academy of Sciences (CAS)
	National Agro-tech Extension and Service Center (NATESC)
	National Forestry and Grassland Administration (NFGA)

India	Indian Agricultural Research Institute (IARI)
Italy	Institute of Methodologies for Environmental Analysis, National Research Council (CNR-IMAA)
	Sapienza University of Rome
Pakistan	PMAS-Arid Agriculture University Rawalpindi (PMAS-AAUR)
United Kingdom	Manchester Metropolitan University (MMU)
GEO Participating Organizations	
Centre for Agriculture and Bioscience International (CABI)	
Food and Agriculture Organization of the United Nations (FAO)	
Global Biodiversity Information Facility (GBIF)	

Point(s) of Contact

Wenjiang Huang huangwj@aircas.ac.cn
Yingying Dong dongyy@aircas.ac.cn
Biyao Zhang zhangby@aircas.ac.cn
Linyi Liu liulyo1@aircas.ac.cn

Pilots

Earth Observations for the Water-Energy-Food Nexus (EO4WEF)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Water and Land Sustainability**

Challenge

Water, energy, and food security are pervasive needs affecting every nation and citizen. Ensuring each person has access to these resources requires effective governance and management. Earth observations and information systems have important roles to play in ensuring that governance and management decisions related to the Water-Energy-Food Nexus are based on the best available Earth intelligence.

Solution

The solution is to develop the technologies, data services, and Earth system models to enable a broad range of users, from legislators to resource managers to individual industries and producers, to use Earth observations for decision-making. This requires that effective data services, models, and technologies be developed, tested, and tuned to the needs of each region. This pilot looks at specific data applications, technologies, and Earth system model applications. In particular, the three products/services featured here address water-energy-food systems through the advancement of new technologies and Earth system models in the energy, agriculture, and water sectors.

Intended Socioeconomic and Environmental Impact

The intent of this pilot is to explore how Earth observations can benefit different aspects of Water-Energy-Food Nexus implementation, particularly where they provide insights into environmental issues, such as the Sustainable Development Goals, resilience under climate change, and efficient resource management. The value of this project is achieved by developing applications of Earth observations for specific water-energy-food issues, assessing Water-Energy-Food Nexus impacts on the environment and society through Earth system models and Earth observations, developing both Earth observations and water-energy-food technologies, and creating Information Platforms to provide needed information to the user community and promote resource use efficiencies.

Objectives for 2025–2030

- To expand and improve the use of Earth observations in decision-making by expanding the influence of the Water-Energy-Food Framework for improving resource planning, management, and coordinated resource use and protection where the water, energy, and food sectors overlap.
- To facilitate the use of Earth observations in the planning and management of Water-Energy-Food systems by supplying data in a timely manner to improve efficiencies and

productivity across the sectors and to develop the basis for joint planning of responses to environmental threats. This would include the effective monitoring of the interactions between the sectors and coordinated efforts to better predict responses to minimize the effects of environmental threats.

- To use satellite observations, remotely sensed, and in situ data to develop, test, and validate innovations (such as agrivoltaic systems) and develop methodologies and information services based on Earth observations to facilitate the adoption and use of approaches for improved resource production and use efficiency.
- To use the convening power of a GEO Pilot to promote the use of the capabilities of the Water-Energy-Food's R2O products and GEO's fundamental capabilities to ensure every opportunity for the Water-Energy-Food community at large to make maximum use of the Pilot's services and prototypes.

How We Work

This Work Plan describes three products included in the R2O activity, while a fourth product, Snowsat from Sweden, has made substantial advances in the recent past and will be featured when there is room for a fourth product/service. R2O projects are funded as research projects, and the lead investigator reports to the GEO EO4WEF Coordinator on those aspects that support the water-energy-food goals and the GEO work plan.

While the individual projects are managed by the project leads (generally university scientists) who have obtained funding for the projects, the GEO-related aspects of the project are managed by the three leads plus the overall Pilot coordinator. The overall coordinator takes responsibility for interactions with GEO and serves as the contact point for the interaction between the Pilot and GEO.

The Pilot's convener activities have general support through grants and university funds, and assistance may be given for a conference by some friendly agency. Publications usually come from individual research budgets. Overall coordination for EO4WEF is provided on a volunteer basis. Scientists report on progress at the COP meetings or submit written input when GEO calls for updates.

Donors

China	National Natural Science Foundation
Sweden	Mälardalen University
United States	National Science Foundation

Partners

GEO Members	
China	Henan Province Foreign Scientist Studio for Synergistic Management of Water, Food, Energy, and Carbon
	National Natural Science Foundation
Sweden	Formas (Swedish Research Council for Sustainable Development)
	Mälardalen University

	National League of Sweden
	Swedish Energy Agency
United States	National Aeronautics and Space Administration (NASA)
GEO Participating Organizations	
United Nations Environment Programme (UNEP)	

Point(s) of Contact

Charles Vorosmarty cvorosmarty@gmail.com
Junguo Liu junguo.liu@gmail.com
Pietro Campana pietro.campana@mdu.se
Richard Lawford rlawford@gmail.com

Climate, Energy, and Urbanization

Initiatives

GEO Cold Regions Initiative (GEOCRI)

Focus Area(s):

- **Climate, Energy, and Urbanization**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**

Challenge

Climate change is rapidly transforming the world's cold regions, exacerbating the vulnerability of ecosystems and altering the societal operations and governance within affected communities. Global warming has reshaped the Cryosphere and its surrounding and downstream areas, affecting key Societal Benefits Areas (SBAs) such as water availability in downstream regions, transportation through Northern Sea Routes (NSR) and harsh regions, infrastructure stability in permafrost areas, water- and Cryosphere-induced disasters, and lowland agriculture due to ecosystem changes. Additionally, insufficient observations and agile monitoring of the Cryospheric elements, lack of adequate data and tools, and limited or neglected information services required by local populations present major challenges to sustainable development in these regions. Timely and effective Cryospheric and environmental monitoring, along with comprehensive value-added data for decision-making, is urgently needed to address these issues.

Solution

Digital sciences and technologies, including Earth system science, environmental sciences, Earth observations (EO), Artificial Intelligence (AI), Big Data, and Data Governance with policies, provide comprehensive solutions for operations and sustainable development, delivering valued information services for cold regions. These Earth Intelligence and emerging innovations provide trusted, transparent, and undifferentiated approaches to data and knowledge, fostering groundbreaking scientific discoveries and reinvigorating the confidence of various stakeholders in societal activities at the policy level, such as the COP, global SDG policies, and national policies. By leveraging these EO and data technologies, it becomes affordable for the world to enhance monitoring capabilities, improve data accuracy, and optimize decision-making processes. Integrated Data Solutions will offer a pathway for transforming sustainable monitoring in cold regions from digitization to Earth-intelligent systems.

Intended Socioeconomic and Environmental Impact

This initiative aims to enhance operations and accelerate sustainable development in cold regions by improving the Cryosphere observations, monitoring and predicting, and disaster response and mitigation. It will reduce the risks of induced disasters, such as flooding and infrastructure instability. The integration of Earth Observations, data and AI, and data-driven decision-making provides the Deeping information for, e.g., transportation planning and advisory, ensuring the stability of transport networks, protecting vital ecosystems, mitigating disasters, and projecting future cryosphere changes. Enhanced disaster early warning systems and response solutions, and

optimized operations in cold regions, together with the development of robust AI techniques able to identify hidden patterns in multisystem and multimodal big datasets, will lead to the detailed characterization of cascading effects of climate change-induced transformation in the cold regions (e.g., impact of landslides and snow avalanches on road, electricity, and water networks), resulting in reduced economic losses, energy savings, lower pollution, decreased carbon emissions, and improved resilience to climate change, which contributes to the achievement of the UN Sustainable Development Goals (SDGs).

Objectives for 2025–2030

From 2025 to 2030, the GEOCRI initiative aims to significantly enhance the understanding, management, and operations of cold regions through the integration of high-quality Earth observation data, advanced AI-driven analytics, and improved high-quality information services. The initiative will focus on several key objectives:

- **Expansion of Data Streams and Data Products**: GEOCRI will continue to expand and improve the continuous data and product streams on Essential Cold Regions Variables (ECRVs), providing real-time, high-resolution products that cover critical aspects such as water availability in cold mountain areas, the safety of transportation on land and sea routes, cryosphere-included disaster mitigation, and sustainable development in cold regions' operations. This will include new data products, such as high-resolution snow cover products; river, lake, and sea ice monitoring data; soil thaw and refreezing; water expansion and loss; and vegetation and carbon dynamics. These data will support resource management, flood prediction, and climate change impact assessment in cold regions.
- **AI-Driven Computing and Processing**: GEOCRI will integrate AI algorithms for data flow processing, predictive modeling, and decision support models. AI will be used to enhance spatiotemporal coverage by filling data gaps in seamless spatial and temporal scale, and provide more accurate predictions, particularly in remote areas where data continuity has historically been challenging. Existing products will be upgraded with higher spatial and temporal resolutions to provide more accurate, reliable, and timely information.
- **Improved Information Services**: The platform will offer enhanced data and information services, with more accessible online tools for visualizing and analyzing snow, ice, and other essential relevant data products. These services will support decision-making for stakeholders in government, research, and industry, particularly in cold region activities operations, for example, water management, disaster mitigation and awareness, infrastructure weakness assessment, transportation (shipping and land road feasibility), climate risk assessment and adaptation, and UN SDGs.
- **User Expansion and Engagement**: By the end of 2030, GEOCRI plans to significantly expand its user base and foster greater collaboration among international bodies, such as global agreements, organizations, and bodies; policy bodies, such as the agreement of fishery in the Polar regions; and international science programs, such as the UN Science Decades for SDGs and Cryosphere Decades led by UNESCO; private companies, such as COSCO; and international standard information buyers.

How We Work

GEOCRI unites cold regions activities through current science efforts, industry involvement, and engagement with stakeholder communities, including users, public awareness, and policymakers. It operates under a distributed cooperation model, co-led by a team of lead experts from different countries and international organizations. The governance of GEOCRI also includes a Science Committee that comprises policymakers, users, and scientific experts. As the standard data product system for Cold Regions, an interoperable data portal, specific working groups, and a Secretariat will be formally set up to support operations and coordination. GEOCRI emphasizes communication and collaboration among organizations, utilizing online and in-person meetings, seminars, and workshops, such as the HiMAC Workshop, to discuss observational progress, EO data products, and services, and advance environmental change science discoveries under the global warming threat. The initiative has forged strong national and regional partnerships, integrating research efforts from across the globe.

The co-lead group will be expanded in the GEOCRI work program. The Science Committee and the Secretariat will be set up once the Initiative receives endorsement.

Donors

China	Aerospace Information Research Institute, Chinese Academy of Science (AIR-CAS)
	China Aero Geophysical Survey and Remote Sensing Center for Natural Resources (AGRS)
	Institute of Tibetan Plateau Research, Chinese Academy of Sciences (ITP-CAS)
	National Marine Environmental Forecasting Center (NMEFC)
	National Space Science Center, Chinese Academy of Sciences (NSSC-CAS)
	Northwest Institute of Eco-Environment and Resources, Chinese Academy of Science (NIEER-CAS)
	Polar Research Institute of China
	Sun Yat-Sen University
	Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences (XIEG-CAS)
Finland	Institute for Atmospheric and Earth System Research (INAR), University of Helsinki
Germany	German Aerospace Center (DLR)
High Mountain and Cold Region Working Group (HiMAC WG), Digital Belt and Road Program (DBAR)	
International Research Center of Big Data for Sustainable Development Goals (CBAS)	
Japan	National Institute of Polar Research (NIPR)
Netherlands	Delft University of Technology
Norway	The Arctic University of Norway (UiT)

Partners

GEO Participating Organizations
International Research Center of Big Data for Sustainable Development Goals (CBAS)
International Society for Digital Earth (ISDE)
Non-affiliated
Digital Belt and Road Program (DBAR)
Pan-Eurasian Experiment (PEEX)

Point(s) of Contact

Massimo Menenti m.menenti@tudelft.nl
Yubao Qiu qiuyb@aircas.ac.cn

GEO Human Planet (HUMAN-PLANET)

Focus Area(s):

- **Climate, Energy, and Urbanization**
- **One Health**
- **Weather, Hazard, and Disaster Resilience**

Challenge

Understanding the characteristics of human settlements—where people live and work, their population size, demographics, and physical environment—is essential for addressing climate action, disaster risk reduction, the Sustainable Development Goals (SDGs), and enhancing urban resilience. Crucially, vast amounts of open geospatial data must be transformed into actionable intelligence to guide policymaking through value-added insights. The focus must shift from merely mapping human settlements to fully characterizing them, capturing their social, economic, and environmental dimensions to enable more effective and sustainable interventions for cities and communities.

Solution

GEO Human Planet is a global effort dedicated to understanding human presence and the complex relationships of human activities on planet Earth. By leveraging advanced Earth observation (EO) data, geospatial data and statistics, the initiative provides crucial information, knowledge, and intelligence for policy support to a variety of stakeholders and GEO endeavors in several multi-sectoral thematic areas across the three Planetary Crises domains.

As international organizations begin to focus on the post-2030 development agenda, EO is emerging as a critical source of information. Our partnership is at the forefront of utilizing EO data to inform and guide future policies and actions.

Intended Socioeconomic and Environmental Impact

GEO Human Planet intends to close data gaps in the field of human settlement knowledge. The GEO Human Planet data contributes to addressing SDGs and international frameworks, reducing loss of lives and livelihoods with improved risk knowledge and more disaggregated geospatial data on socioeconomic phenomena. In parallel, information and knowledge generated in the initiative are transferred to policymakers at various levels through the Atlas of the Human Planet series for evidence-based decision-making, closing the loop between information and intelligence. As part of the impact, a stronger integration of GEO Human Planet into the GEO website and GEO Knowledge Hub will improve the visibility of the products.

Objectives for 2025–2030

The GEO Human Planet sets the objectives to reinforce the partnership and network among its stakeholders of global EO and geospatial data producers and users, co-create data and knowledge, and contribute to the 2030 Development Agenda and its evolution.

Through the Human Planet, various stakeholders collaborate for the production and exploitation of new open information systems and databases on global human settlements:

- Operational production and exploitation of the Copernicus Emergency Management Service Exposure Mapping Component.
- New products on vulnerability and night-time lights in global human settlements.
- Translation of evidence from Human Planet data into compelling policy support via the Atlas of the Human Planet.
- Localization of EO-based solutions by inventorying transformative projects carried out in the framework of Horizon EU.
- Gathering and networking of experts at two editions of the Human Planet Forum (2025 and 2027).
- Laying the foundations for a possible R2O pipeline evolution of GEO Human Planet.

GHP will use this new Work Programme cycle to test the requirements, address policy needs, and prototype the evolution in the R2O pipeline.

How We Work

GEO Human Planet is managed by two co-chairs, supported by coordinators. Specific activities, such as the Human Planet Forum, are steered by task teams composed of partners and contributors. Products are implemented by the partner organizations in coordination with the co-chairs. Human Planet members contribute to GEO Work Programme activities, such as Working Groups, Initiatives, and Flagships. Periodic calls are organized at management and working levels.

GEO Human Planet will continue to drive synergies with other GEO Work Programme activities, fostering collaboration and innovation. Some examples include:

- GEO Blue Planet will leverage Human Planet's data and knowledge to support the co-development of impactful case studies focusing on aspects related to human settlement resilience in coastal areas. The endeavor may result in engaging web content and related story maps.
- GEO-Mountains will leverage Human Planet's data and knowledge to develop Essential Socioeconomic Variables for mountainous regions. This collaborative approach is expected to yield tangible outcomes, including scientific and policy publications, and valuable contributions to the GEO Knowledge Hub.
- Global Heat Resilience Service will benefit from JRC Global Human Settlement Layer data, particularly the Urban Centre Database, to establish a baseline of exposure and vulnerability data.
- The Sustainable Development Goals Convener should ensure that Human Planet is well represented in SDG discussions and forums, including facilitating contacts with custodian agencies and co-organizing events.
- The Global Ecosystems Atlas, a new Flagship of GEO, may consider including layers from GEO Human Planet.

Donors

China	Chinese Academy of Sciences (CAS)
European Commission	Directorate-General for Defence Industry and Space (DG DEFIS)
	Directorate-General for Regional and Urban Policy (DG REGIO)
	Directorate-General for Research and Innovation (DG RTD)
United States	National Aeronautics and Space Administration (NASA)

Partners

GEO Members	
European Commission	
Greece	National Observatory of Athens (NOA)
United States	National Aeronautics and Space Administration (NASA)
GEO Participating Organizations	
European Space Agency (ESA)	
Geoscience and Remote Sensing Society (GRSS)	
International Institute for Geo-Information Science and Earth Observation (ITC)	
Mercator Ocean	
Sustainable Development Solutions Network (SDSN)	
Non-affiliated	
Laboratory for Geospatial Analysis, Organization for Economic Co-operation and Development (OECD)	
United Nations Human Settlements Programme (UN-Habitat)	

Point(s) of Contact

Michele Melchiorri michele.melchiorri@ec.europa.eu
Greg Yetman gyetman@ciesin.columbia.edu
Global Human Settlement Layer (GHSL) jrc-ghsl@ec.europa.eu

Pilots

Global Heat Resilience Service (GHRS)

Focus Area(s):

- **Climate, Energy, and Urbanization**
- **One Health**
- **Weather, Hazard, and Disaster Resilience**

Challenge

The Global Heat Resilience Service (GHRS) is GEO's contribution to the UN Secretary-General's Call to Action on Extreme Heat (June 2024), addressing the growing threat of extreme heat, exacerbated by climate change and urbanization. Vulnerable groups, such as the elderly, outdoor workers, and low-income populations, are disproportionately affected. By 2050, over 1.3 billion urban dwellers will face dangerous heat exposure, leading to significant health risks and economic losses. Urban areas, particularly in low- and middle-income countries, lack reliable, localized data, information, and insight to make the case for heat and guide effective heat resilience strategies.

Solution

The Global Heat Resilience Service (GHRS) aims to close critical knowledge and action gaps by providing cities with a comprehensive approach to heat resilience. Through standardized methodologies and integrated data services, GHRS helps identify urban "hot spots" and vulnerable populations, accounting for factors such as healthcare access, infrastructure quality, and socioeconomic status. These insights are translated into actionable intelligence through user-friendly digital tools that help cities make the case for action and guide investment decisions. GHRS then supports implementation through policy frameworks and community engagement, ensuring solutions are locally appropriate—particularly vital for low- and middle-income cities.

Intended Socioeconomic and Environmental Impact

GHRS aims to reduce the annual toll of 500,000 excess deaths from extreme heat, with a particular focus on vulnerable urban populations. By 2050, the service could benefit up to 7 billion urban residents, including 1.3 billion people projected to be directly exposed to extreme heat. Economic impacts include averting $2.4 trillion in annual losses from reduced labor productivity and preventing a projected $7.1 trillion burden on healthcare systems. The service will enhance urban livability through improved infrastructure and planning while supporting environmental benefits through heat-mitigating, nature-based solutions. These interventions will particularly benefit vulnerable urban communities in the Global South.

Objectives for 2025–2030

By 2030, GHRS will be an operational service providing every urban area in the world with actionable intelligence on the health and economic risks of extreme heat exposure. GHRS will help cities everywhere to:

- Understand local heat-health and related economic risks and make the case for action, and
- Select cost-effective, high-return-on-investment interventions that safeguard human health and economic activity in the face of climate change.

The GHRS objectives span three complementary areas: developing accessible EO-powered heat risk data and standardized heat risk assessment methodologies; prototyping digital decision-support tool(s); supporting urban implementation by integrating heat resilience into city planning and developing targeted action plans; and building community capacity through awareness campaigns, training programs, and knowledge-sharing networks between cities. These objectives will be delivered through a phased approach, scaling from pilot cities to global coverage, ensuring cities have the tools, knowledge, and support needed to implement effective heat resilience measures.

GHRS aims to scale from a targeted pilot to a comprehensive global service through three strategic phases over 2025–2030:

Phase 1 (2025–2027): Foundation & Pilot Testing

Component 1: Data & Methodology

- Select 6–8 pilot cities, reaching 12-20 million people.
- Systematically assess and capture user needs in relation to understanding and managing heat risks in cities.
- Establish a standardized scientific methodology for urban heat risk assessment.
- Specify/develop core data services and APIs for heat risk information.

Component 2: Decision Support

- Develop and test a functional prototype of digital decision-support tool(s) to gather user feedback and validate effectiveness.
- Evaluate prototype effectiveness and develop a roadmap for establishing GHRS as an operational service.

Component 3: Governance & Awareness

- Develop initial heat risk assessment knowledge products and guidance.
- Launch pilot communication campaigns.

Phase 2 (2027–2029): Network Expansion

- Evolve the prototype into a Minimum Viable Product based on pilot learnings.
- Scale to 30+ cities, reaching 60–100 million urban residents.
- Implement a comprehensive user feedback system.
- Engage city networks to support adoption and knowledge-sharing.
- Develop city-specific heat action plans with targeted interventions.

Phase 3 (2030 onwards): Global Operationalization (beyond the current GWP period)

- Transition to fully operational service under GEO management.

- Secure endorsement and promotion from key international organizations (UN-Habitat, World Bank, Climate Finance Institutions).
- Expand coverage to reach 1.3 billion people vulnerable to extreme heat.
- Establish a sustainable operational model for long-term service delivery.

Success metrics will include reduced heat-related mortality, increased adoption of heat-resilient infrastructure, and improved capacity of cities to manage extreme heat events through evidence-based decision-making.

How We Work

GHRS operates through a core project team at the GEO Secretariat, including a project manager, technical lead, and communications coordinator. Technical oversight is provided by a Science and Technical Committee with input from a range of organizations, including WMO, UN-Habitat, and UNDRR, while strategic guidance comes from an Advisory Board comprising representatives from the GEO Work Programme and key partners (C40 Cities, UN-Habitat, Resilient Cities Network). This structure is supported by a broader network of city partners, National Meteorological Services, and community organizations that ensure effective local implementation. Regular coordination between these bodies occurs through technical working groups and stakeholder workshops.

To ensure inclusive and transparent engagement with the broader GEO community, GHRS will implement a structured approach by working directly with and through GEO's Working Groups, Regional GEOs, Communities of Practice, and wider networks. This will include active participation in relevant GEO forums, collaborative workshops with key Working Groups, and regular knowledge exchange sessions with Regional Action Groups. Additionally, we will establish a public project dashboard to track milestones and share key learnings from pilot implementations. This engagement strategy will ensure that the GEO community not only remains informed of GHRS developments but also actively contributes to shaping the service's evolution and implementation approaches.

GHRS will also establish formal coordination mechanisms with other elements of the GEO Work Programme, including, but not limited to, the Resilient Cities and Human Settlements Working Group (RCHS-WG), the Disaster Risk Reduction and Adaptation Working Group (DRRA-WG), and GEONICE, to leverage their expertise and avoid duplication of efforts. This will include cross-membership in technical working groups, regular coordination meetings, and shared knowledge repositories. The project team will conduct a comprehensive mapping of relevant capacities within both initiatives to identify specific opportunities for collaboration, particularly in areas of urban heat resilience modeling and community engagement methodologies. This strategic alignment will enhance GHRS outcomes while strengthening connections across the GEO Work Programme.

Donors

European Commission

Partners

GEO Members	
Germany	Earth Observation Center (EOC)
	German Aerospace Center (DLR)
GEO Participating Organizations	
World Meteorological Organization (WMO)	
Non-affiliated	
C40 Cities Climate Leadership Group	

Point(s) of Contact

Martyn Clark mclark@geosec.org

In Situ Observations and Modeling for Weather, Water, Environment, and Climate Services in Africa (TEMBO)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Open Data, Knowledge, and Infrastructure**

Challenge

Hydrometeorological data in Africa should be publicly available, open, and free, but there is a lack of resources to realize this.

Sustainable data provision is also a necessary condition for progress, but suboptimal, expensive, and project-based acquisitions stand in the way.

Cost-effective solutions lead to localized service provision in selected areas that are promising, have societal relevance, and generate revenue (dam reservoir management, germination insurance, and flood early warning).

Even if enough income from services is generated, permission is needed from national meteorological agencies to make meteorological data open and free, in accordance with their national mandates and in fulfillment of WMO resolution 40.

Solution

A complementary effort is required beyond the delivery of meteorological data and information in Africa. To address the challenge of sustainable data provision, cost-effective solutions that require less funding are proposed. The combination of complementary efforts and cost-effective solutions leads to service provision in selected areas that are promising in terms of societal relevance and revenue generation (dam reservoir management, germination insurance, and flood early warning). The revenue generated is then used for additional data provision and to make this data open and freely available.

Advocacy, demonstrators, and support from GEO are required to achieve this goal.

Intended Socioeconomic and Environmental Impact

Lower costs of collecting, processing, disseminating, and increased availability of in situ observations on weather, water, environment, and climate lead to the following impacts for government organizations, financial service providers, farmers and, the (urban) populations:

- Support for sustainable agricultural transformation, food security, job creation, and climate resilience.
- Improved cost-efficiency and more targeted impact of government investment in flood early warning, reservoir management, and crop insurance.
- Better intelligence on flood early warning, reservoir management, and crop insurance allows for improved planning, resource allocation, and crisis management.

- Risk reduction through localized and real-time weather information, start-of-rainy-season advice, and flood early warning.

Objectives for 2025–2030

The objective of this initiative is NOT to have a separate pilot in the Post-2025 GEO Work Programme, but to contribute to, and be part of, other GEO initiatives. If initiatives are proposed in the areas of in situ observations, flood early warning, dam reservoir management, and germination insurance, we would like to be integrated in those proposals for the part that overlaps with their activities. In the current Work Programme, one can think of GEOGLOWS for flood early warning, GEOGLAM for germination insurance, and EO for Water-Energy-Food Pilot for dam reservoir management. As a result of this application, we would like to be connected through the GEO Secretariat with these initiatives to strengthen these activities where possible and to make our commitment visible. The name of the initiative is Transformative Environmental Monitoring to Boost Observations in Africa (TEMBO Africa). The TEMBO objectives are summarized below.

A key objective of TEMBO Africa is to leverage recent advances in sensor technology to build a cost-effective environmental monitoring network with services that cover the costs.

Additionally, the TEMBO services are designed to develop sustainable, resilient, in situ systems that can adapt to the region's evolving needs. By employing cost-effective sensors, innovative connectivity technologies, and advanced data collection, processing, and storage models, the TEMBO project aims to establish a robust infrastructure that supports ongoing improvement and innovation.

Ultimately, the successful exploitation of the TEMBO services will not only validate the initiative's mission but also create a positive feedback loop where improved data collection and analysis lead to better service delivery, which, in turn, generates more revenue and supports further advancements. This cyclical process is key to achieving the goal of advancing environmental monitoring and management in the region, ensuring that these efforts are both efficient and effective in addressing the unique challenges faced in sub-Saharan Africa.

How We Work

The activity starts with the TEMBO Africa project, which is funded by the European Commission through the Horizon Europe Programme for the period 2023–2026. It is an innovation action, which means that at the end of the project, the developed products and services are ready for market. A consortium of universities, government organizations, and companies from Africa and Europe develops the three services, improved and new sensors, and a number of ready-to-use products, such as rainfall maps.

The income generated from the services will allow for open and free delivery of the TAHMO weather data. From 2027 onward, operations are self-sustaining.

Donors

European Commission; own contribution (30%) from private sector participants; and revenue from services

Partners

GEO Members	
Netherlands	Delft University of Technology
	HCP International
Non-affiliated	
Trans-African Hydro-Meteorological Observatory (TAHMO)	

Point(s) of Contact

Mark Noort m.noort@hcpinternational.com

Conveners

Arctic GEOSS (ARCTIC-GEOSS)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **Weather, Hazard, and Disaster Resilience**
- **Community Impact**
- **Open Data, Knowledge, and Infrastructure**

Concept

The Arctic region faces unprecedented environmental changes, including rapid cryosphere change, biodiversity shifts, and increased hazards, which threaten local communities and have global impacts. Recognizing the urgent need for coordinated, sustained observations, the Arctic Council and international partners established a framework to strengthen multinational engagement in pan-Arctic observing. This initiative, Arctic GEOSS, builds on foundational efforts such as the 2006 Salekhard Declaration, which urged enhanced monitoring and data exchange to address Arctic change.

Arctic GEOSS provides a holistic framework for environmental information services, integrating scientific, Indigenous, and local knowledge. It facilitates open-access data, advanced technologies, and co-designed tools to support safety, resource optimization, and sustainable development. By linking existing national and international systems—such as Copernicus and services developed under the EU-funded project Arctic PASSION—Arctic GEOSS aims to deliver actionable insights for communities, policymakers, and industries, ensuring resilience against environmental risks while promoting equitable participation and data transparency.

Objectives

- **Develop a Roadmap for an Integrated Pan-Arctic Observing System**: Coordinate international efforts to create a comprehensive, long-term observing network that addresses spatial and temporal gaps in data collection.
- **Ensure Free and Ethical Open Data Access**: Promote universal access to Arctic observational data, including scientific, Indigenous, and community-based knowledge, adhering to open data principles.
- **Enhance Sustainability of Observations**: Secure long-term funding, infrastructure, and partnerships to maintain and expand observing capabilities across the Arctic.
- **Leverage Advanced Technologies and Co-Design**: Integrate user-driven tools to improve service accessibility, accuracy, and relevance for diverse stakeholders.
- **Support Societal Needs**: Deliver tailored services (e.g., wildfire risk management, ice condition monitoring) to enhance public safety, economic efficiency, and environmental conservation.

Point(s) of Contact

Jan Rene Larsen jan.rene.larsen@amap.no

Nexus on Climate, Energy, and Urbanization (GEONICE)

Focus Area(s):

- **Climate, Energy, and Urbanization**

Concept

In the context of GEONICE, "nexus" refers to the common space where the three areas—climate, energy, and urbanization—intersect. It represents the interdependencies and synergies among these fields rather than a simple union of separate areas. This nexus is where integrated approaches are most valuable, allowing for coordinated actions that leverage Earth Observation (EO) data to address overlapping challenges, foster commonalities, and drive solutions that benefit all three areas simultaneously, and ultimately, cities.

GEONICE is proposed to be a collaborative partnership within the context of a GEO Convener, bringing together global expertise across climate change, urban sustainability, and energy transformation. Considering rapid urbanization and the increased impacts of climate change on cities, this activity aims to dive deeply into the nexus—scientific and policy complications—where research and innovation partners, together with stakeholders, can jointly develop and deploy solutions that optimize the leveraging of EO data, digital platforms, and interdisciplinary research.

Investing on existing and ongoing projects (initially linked to EuroGEO, e.g., e-shape Eiffel and RethinkAction), as well as developing initiatives like DestinE, and drawing in critical partners, GEONICE will foster discussion and the prioritization of solutions that enable cities to become more climate-resilient and energy-efficient.

Scope

GEONICE will integrate climate, urban, and energy initiatives within the GEO framework, creating a collaborative space for cities to co-design and implement solutions tailored to their needs. By leveraging EO data from various platforms, GEONICE aims to promote value-added products, tools, and services that support urban policies, energy transitions, and climate adaptation and mitigation. This approach will also influence common practices, processing, and EO data requirements for this nexus.

This Convener will prioritize activities that advance specific products through the "Research to Operations (R2O)" pipeline, ensuring scientific insights are transformed into practical tools for cities to manage needs like seasonal climate forecasts, urban climate pressures, mitigation planning, and energy resilience. GEONICE will also collaborate with stakeholders, including city administrations, energy providers, and climate scientists, to create actionable paths from research to implementation.

Potential Topics and Anticipated Results

To support cities facing climate pressures, GEONICE will focus on three priority areas during its initial phase, while exploring, refining, and further conceptualizing its strategic direction:

- **Seasonal Forecasting for Urban Resilience**: Provide tools that allow cities to anticipate and manage seasonal climate variations, including extreme heat events, which impact urban infrastructure, energy demand, and public health.
- **Long-Term Support for Urban Policy**: Deliver EO-based insights and tools to support long-term policy planning, helping cities design climate-resilient and energy-efficient growth strategies while confronting urban stresses.
- **Extreme Heat in Cities**: Enable city-level decision-making to address both short- and long-term impacts of extreme heat on energy consumption and urban populations in a warming climate.

GEONICE's outputs will include:

- A priority list, and initial concept frames and/or mockups of Urban Climate Resilience and Energy Tools.
- A portfolio composed of Success Stories and Best Practices to guide effective, sustainable urban planning.
- Policy Recommendations and the initiation of R2O products delivery.

Objectives

The GEONICE Convener will play a central role in fostering interdisciplinary connections and driving the integration of EO assets across the GEO Work Programme (GWP), particularly within the Climate, Energy, and Urbanization Focus Area. The key objectives are:

- **Facilitate Strategic Partnerships**: Establish collaborations with key GEO partners—including DestinE, NASA's Earth Action Program, DLR, and Copernicus—to strengthen the collective capability of EO-driven solutions for urban climate resilience and energy transitions. These partnerships will integrate diverse EO resources and expertise to serve cities effectively, positioning GEONICE as a central hub for collaborative innovation. Links with the existing GEO activity of GUOI are under inquiry, whereas close links, feedback, and resources will be maintained through the participation of core members in the Urban, Energy, and Climate EuroGEO Action Groups, respectively.
- **Showcase Success Stories to Drive Uptake**: Capture and share successful applications of GEONICE-proposed tools within cities to demonstrate EO's transformative potential. These case studies will serve as exemplars, inspiring wider adoption within GEO communities and helping to align the Climate, Energy, and Urbanization Focus Area around tangible, impactful outcomes.
- **Promote Research to Operations (R2O)**: Support cities in transitioning from research outcomes into tools and services that can be operationally integrated into their day-to-day workflows. By working closely with urban stakeholders to co-develop and refine EO applications that meet real-world needs, this approach will streamline the path from scientific insights to practical implementation, enhancing the uptake and usability of EO data through the proposal of specific solutions to be escalated into GEO's R2O pipeline.

Point(s) of Contact

Eleni Athanasopoulou eathana@noa.gr
Iphigenia Keramitsoglou ik@noa.gr

Urban Heritage Climate Observatory (UHCO)

Focus Area(s):

- **Climate, Energy, and Urbanization**
- **Weather, Hazard, and Disaster Resilience**

Concept

Scope

The scope of UHCO is to reveal to the cultural heritage community the fast-paced growth of EO technology and information to help address climate change risks and impacts on World Heritage cities, and to co-design strategies for contributing to innovative conservation solutions for cultural heritage where needs exist. It will also support global efforts for the conservation of World Heritage properties through the use of EO data, products, and services in the framework of sustainable development, including the UN 2030 Agenda for Sustainable Development and the World Heritage Policy for Sustainable Development, while at the same time enhancing the presence of cultural heritage in local, regional, and national climate adaptation plans.

Need

Increasing exposure to both slow-onset climatic processes and extreme weather events is the most obvious threat to cultural and natural heritage properties. In the case of urban heritage, there is an additional critical need to integrate different aspects of the sustainable development agenda, including urban resilience and sustainable urbanization, with the protection of heritage values, especially in World Heritage Cities, considering the centrality of cultural heritage's social, ecological, and economic dimensions for sustainable urban development. While Earth observations hold great potential to shield urban heritage from climate change risks, UHCO currently stands as the only activity in GEO that brings together those two communities, EO and cultural heritage.

Within the context of GEO Work Programme, the uniqueness of UHCO stems from the fact that it intersects all four engagement priorities, can serve as an excellent example of understanding the relevant nexus complexities, brings together (and closer to GEO) UN-level organizations (like UNESCO), urban stakeholders/planers, and networks (essential for the new Resilient Cities and Human Settlements Engagement Priority), and finally attempts—by default—to link global to local policies and actions.

Timeliness

Climate change is one of the most critical issues of our time, and its impact on World Heritage properties is more evident than ever. Especially in World Heritage Cities, EO-derived information can facilitate the creation of bridges between climate change and cultural heritage communities and offer a framework for the design of joint, multidisciplinary, and multi-governmental approaches to tackle climate change risks and impacts on cultural heritage. Yet, gaps exist in relation to the integration and usability of different EO assets, along with increasing technical capacity.

UHCO, led by the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Centre (WHC) and the Greek GEO Office (GGO), has been operating within the GEO Work Programme since 2021, aiming to develop a network of competent stakeholders for the effective and coordinated preservation, monitoring, and management of urban heritage. Being very active in spreading the word about EO's benefits in the domain and creating common ground for more tangible discussions, the time has now matured to start designing specific solutions and paving their way into the new GEO Work Programme.

Anticipated Results

- To deliver the foundation for the use of EO in cultural heritage preservation and conservation, as well as for its testing and evaluation in different geographical contexts.
- To pave the path for a wide range of qualitative and quantitative open datasets and propose methodological approaches to address climate change risks and impacts on World Heritage Cities.
- To contribute to improved urban cultural heritage preservation, urban biodiversity conservation (through natural heritage), the mitigation of climate change impacts (e.g., disaster risk reduction through preparedness), and the alignment of local measures with new urban frameworks.

Objectives

UHCO is positioned mainly in the "Climate, Energy, and Urbanization" Focus Area, where it strongly introduces the necessity of considering the conservation of cultural heritage within activities for localized adaptation, mitigation, and resilience strategies. These are developed within different policy frameworks to ensure that urban areas and other human settlements can thrive under unprecedented climatic conditions, and a variety of EO-based solutions are already being put to use, enabling a specific focus on Cultural Heritage. Secondarily, it also falls within the "Weather, Hazard, and Disaster Resilience" Focus Area, as it organizes and facilitates the collection of vital EO-based information in support of decision-making and the enhancement of disaster resilience against potential disasters affecting cultural heritage assets.

Overall, UHCO operates upon the common ground of climate, heritage, and urban-related Sustainable Development Goals (SDGs). It strives to protect cultural heritage assets from climate change, such as through SDG 13 to "combat climate change in all its aspects," and, in particular, Targets 13.1, 13.3 and 13.b, the latter focusing on LDCs, SIDS, and Africa as a priority. The Convener also directly addresses SDG 11, which aims to "make cities and human settlements inclusive, safe, resilient, and sustainable," with its Target 11.4 to "strengthen efforts to protect and safeguard the world's cultural and natural heritage," among others, while it also explores how it can contribute to and work in alignment with the UNESCO Culture|2030 Indicators, including the contribution of culture in climate adaptation and resilience.

Finally, UHCO cuts across and supports the other three GEO priority engagement areas. In particular, it serves the Paris Agreement, as climate-aware World Heritage Cities will serve as visible and strong advocates for the cause of carbon-neutral and resilient cities, also connecting to the Urban Agenda and providing climate adaptation lessons from the past, as well as climate analogues of today. By developing indicators and pinpointing climate change impacts on World Heritage Cities and the risks for urban heritage due to climate change, the Convener serves the

Sendai Framework for Disaster Risk Reduction, especially enhancing preparedness as well as the other disaster risk management cycles.

Point(s) of Contact

Arezina Sakka asakka@noa.gr
Nefta-Eleftheria Votsi nvotsi@noa.gr

Ecosystems, Biodiversity, and Carbon Management

Mature Flagships

Global Forest Observations Initiative (GFOI)

Focus Area(s):

- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**

Challenge

There is a growing need for countries to better understand their forests, how they change over time, and in particular the role they can play in addressing climate change and enabling sustainable development. For this reason, tropical countries are seeking to develop national forest monitoring systems (NFMS) and associated emissions measurement reporting and verification (MRV) procedures to generate more accurate information to inform decision-making and action.

Furthermore, the increased demand for improved forest information has coincided with a boom in the availability of data, tools, other products, and international support to help countries enhance their forest monitoring capabilities.

Without global coordination and a targeted effort to align the boom in both the demand for better forest information and the supply of new products and support, developing countries risk being overwhelmed by diverse approaches, making it difficult to implement systems that best suit their needs.

Solution

GFOI is a partnership focused on coordinating international support for improving forest monitoring and associated greenhouse gas (GHG) estimation capabilities in tropical countries. Through collaborative action, GFOI partners support countries in designing, developing, and operationalizing their own national forest monitoring systems and associated measurement reporting and verification procedures to guide forest management and track progress in climate action.

Intended Socioeconomic and Environmental Impact

Through global coordination, tropical countries receive more coherent package support from the international community, which better enables them to operationalize their NFMS and associated MRV procedures. These systems and procedures provide countries with meaningful information, empowering them to better manage their forests and take responsible action on climate change. There are also significant co-benefits, such as improved livelihoods and biodiversity protection.

Objectives for 2025–2030

During the period 2025–2030, the GFOI community will continue to support tropical countries in developing NFMS that utilize Earth Observation technologies to address major challenges, including forest management, climate change, sustainable development, and biodiversity loss. This effort will focus particularly on helping countries operationalize and sustain their NFMS through the new Country-Led Planning (CLP) program. GFOI will also continue to produce new guidance modules, provide capacity building, deliver operationally focused Research and Development (R&D), and coordinate the availability of data and tools to further enhance forest and carbon monitoring efforts globally.

How We Work

GFOI coordinates assistance from international development partners to tropical countries across four central components: (1) Capacity Building, (2) Data, (3) Methods and Guidance, and (4) R&D. International coordination relies heavily on regular partner meetings and the exchange of information with the broader community of forest monitoring stakeholders (or experts), which GFOI organizes, and ultimately on the productive working relationships fostered within the Initiative. GFOI has also developed a series of structured coordination mechanisms to enhance global collaboration and support for tropical countries. These mechanisms include the new Country-Led Planning initiative, the GFOI Family of Resources, the GFOI Inventory Activities, Focused Discussions, Expert Meetings, and the biennial GFOI Plenary. Furthermore, GFOI components work in close coordination to achieve their respective objectives and goals.

Donors

Norway and United Kingdom

Partners

GEO Members
Australia; Germany; Norway; United Kingdom; United States
GEO Participating Organizations
Committee on Earth Observation Satellites (CEOS)
European Space Agency (ESA)
Food and Agriculture Organization of the United Nations (FAO)
World Bank

Point(s) of Contact

GFOI Office gfoi-office@fao.org
Tom Harvey tom.harvey@gfoi.org

Flagships

GEO Biodiversity Observation Network (GEO BON)

Focus Area(s):

- **Ecosystems, Biodiversity, and Carbon Management**

Challenge

Global biodiversity change, including variation within and between species and ecosystems, is happening faster now than at any time in human history due to habitat loss, climate change, pollution, harvesting, and invasive species. There is often insufficient data on biodiversity and ecosystems, hindering effective monitoring of changes needed to guide conservation actions. Different sources of biodiversity data are often fragmented and not easily comparable or interoperable, making it difficult to assess biodiversity trends and drivers of biodiversity loss. Furthermore, the existing biodiversity monitoring capacity, in the form of structured and actively funded monitoring networks, is unequally distributed across the globe, yet policymakers are expected to make informed decisions about biodiversity management in all countries. The key challenge is, therefore, the mobilization of monitoring capacity (data, variables, models, and indicators) at the pace and scales required to support those decisions worldwide.

Solution

GEO BON is a global network of researchers dedicated to improving the acquisition, coordination, and delivery of biodiversity information at global, regional, and national levels. It facilitates the collection of biodiversity data from various sources, including remote sensing, field surveys, and citizen science, and develops standardized protocols and methodologies for data collection and reporting, ensuring consistency across different spatial scales and elements of biodiversity through essential biodiversity and ecosystem service variables. GEO BON and its partners support the monitoring of biodiversity change by coordinating and collaborating among biodiversity observation networks and developing indicators, tools, forecasts, and various information services in an open and transparent manner.

Intended Socioeconomic and Environmental Impact

By providing open and standardized tools and methodologies, GEO BON aims to grow the capacity of local and national monitoring efforts. A clear performance and impact indicator is the role GEO BON is playing in accelerating biodiversity monitoring worldwide. Increased visibility and accessibility to GEO BON's Essential Variables framework, models and suite of indicators. GEO BON seeks to create local-to-national capacity for biodiversity monitoring and a comprehensive and sustainable network of biodiversity observation networks (BONs) that can inform conservation efforts and policies worldwide.

Objectives for 2025–2030

GEO BON's objectives for the period from 2025 to 2030 focus on enhancing the coordination of global biodiversity monitoring. Key objectives include:

- Assembling the network of biodiversity observation networks. GEO BON continues to expand and support the development of new Biodiversity Observation Networks (BONs) and align existing monitoring schemes to address gaps in biodiversity data. GEO BON is focused on improving data collection, especially in regions such as megadiverse countries and stressed ecosystems, including freshwater and productive marine areas where data are lacking. To coordinate monitoring efforts, GEO BON facilitates and promotes standardization in data collection and analysis across BONs to capture biodiversity changes over time. These efforts involve diverse contributors, including scientists, citizens, and indigenous and local communities, and focuses on creating coordinated peer-networks and integrating biodiversity monitoring across marine, freshwater, and terrestrial ecosystems. This is a significant challenge, by networking BONs, GEO BON aims to establish a Global Biodiversity Observing System.
- GEO BON is mandated to support countries implementing the monitoring framework of the Kunming-Montreal Global Biodiversity Framework. GEO BON has contributed headline, component and complementary indicators, as well as the methods and data that underlie them. GEO BON also offers an indicator selection, calculation, and visualization service via its BON in a Box platform, providing an open-source platform that allows a user to select indicators and calculate them using national or global datasets, assisting users to report progress towards the Kunming-Montreal Global Biodiversity Framework. The platform ensures the indicator calculation process is repeatable, transparent, and rigorous. BON in a Box also supports collaboration between the indicator provider community and the indicator user community. It also help users to develop BONs by offering tools and models to improve data collection and optimize monitoring site selection.
- GEO BON is developing a detection and attribution framework to quantify the impact of anthropogenic drivers on biodiversity changes, similar to methods used in climate science. This framework helps attribute changes, such as species distribution shifts or habitat loss, to factors like climate change or human activity, while considering natural variability. GEO BON aims to create a network of monitoring schemes across scales to provide essential biodiversity data, enabling the detection and attribution of trends, reducing uncertainty, and supporting scenario modeling for effective conservation policies and interventions.
- Linking data to models and indicators with essential variables is an important ongoing objective of GEO BON. Essential Biodiversity Variables (EBVs) are a key set of standardized metrics used to track biodiversity changes, while Essential Ecosystem Service Variables (EESVs) focus on the contributions of nature to human well-being. GEO BON provides a central hub for accessing EBV data through its online portal, with new datasets and technologies such as satellite remote sensing and molecular methods being integrated to improve biodiversity monitoring.
- GEO BON is deepening its engagement with stakeholders to ensure that scientific evidence more effectively informs action on biodiversity. To address concerns about the slow translation of research into practice and enhance transparency, GEO BON is establishing Knowledge to Action Hubs (K2A Hubs) to foster collaboration between knowledge producers and users, following an iterative process that involves generating, synthesizing, and creating tools or products from biodiversity data. By assembling expertise from GEO BON's Working Groups, Task Forces, and partners, the K2A Hubs

will focus on key areas such as biodiversity indicators, modeling, and the detection and attribution of biodiversity changes.

How We Work

The GEO BON member network consists of over 3,600 voluntary scientific experts from numerous academic institutions and organizations in 152 countries around the world. Our members provide on-the-ground expertise and data needed for biodiversity monitoring.

The Secretariat team of GEO BON is responsible for coordinating the network's activities, outreach, implementing its strategic objectives, and managing day-to-day operations. This team includes staff working on technical, scientific, engagement, and administrative tasks that drive GEO BON's mission to enhance biodiversity observation on a global scale.

The governance bodies of GEO BON consist of the Management Committee, Implementation Committee, and Advisory Board. The Management Committee works closely with the Secretariat team, sets priorities, makes operational day-to-day decisions, and ensures alignment with GEO BON's long-term goals. The Implementation Committee offers granular feedback from the perspective of its working groups, BONs, and task forces to ensure GEO BON's initiatives are moving in the right direction. The Implementation Committee also provides oversight and strategic guidance from the perspective of other international activities and initiatives. The Advisory Board represents international organizations, governments, and experts, and provides strategic direction and feedback on GEO BON while also helping to secure funding.

Donors

Canada	Fonds de recherche du Québec - Nature et technologies (FRQNT)
	Government of Canada
	Montréal International
	Parks Canada
United States	Microsoft

Partners

GEO Members	
Australia	Commonwealth Scientific and Industrial Research Organisation (CSIRO)
United States	National Aeronautics and Space Administration (NASA)
GEO Participating Organizations	
Committee on Earth Observation Satellites (CEOS)	
Convention on Biological Diversity (CBD)	
European Space Agency (ESA)	
Global Biodiversity Information Facility (GBIF)	

Point(s) of Contact

Katie Millette katie.millette@mcgill.ca

Initiatives

Forest Biomass Reference System from Tree-by-Tree Inventory Data (GEO-TREES)

Focus Area(s):

- **Ecosystems, Biodiversity, and Carbon Management**

Challenge

With no credible path to keeping global heating within 1.5 degrees without healthy forests, humanity needs to know exactly where forest biomass carbon is, whether forests' vital functions are changing, and what their future holds. Verifiable and consistent measurement of forest carbon stocks and fluxes supports nature-based solutions, enabling communities to quantify the ecosystem services of their lands. Space agencies have made enormous investments in mapping forest biomass across continents to support climate science and carbon markets. However, satellites do not measure biomass directly; they measure proxies for biomass, which undermines confidence in space-based carbon estimates.

Solution

Since 2018, the CEOS community has made efforts to create a global Forest Biomass System as an equitable and sustainably funded system of recurrent site-based measurements. This system will serve as a lasting interface between Earth Observation (EO) agencies and ground-based tree-by-tree measurement initiatives. This infrastructure is designed to become a common good for the entire EO community. The GEO-TREES initiative will be the world's first ground-based, open-access, equitably developed forest biomass reference system, designed to make global satellite-based forest carbon assessments actionable.

Intended Socioeconomic and Environmental Impact

The GEO-TREES initiative is a win-win, as site partners benefit from funding for data acquisition and capacity building, as well as increased visibility. Existing networks benefit from continuity in funding streams and contribute to data security. Finally, the Earth observation community gains free access to ground-based data on forest structure (height, biomass) on a continuous and long-term basis. Partners are fully engaged and involved in every step of the project. Only with strong representation of partners, particularly from the Global South, along with fair compensation for their work and investment in their institutions and skills, can science capacity be advanced. This is essential for the long-term sustainability of GEO-TREES.

Objectives for 2025–2030

In the pilot phase of GEO-TREES, we have built the infrastructure and governance and successfully raised funds from a diverse range of donors. For the 2025–2030 phase, we plan to ramp up the operational activities of GEO-TREES to up to 60 sites worldwide, with a focus on tropical forests, where ground reference data are most lacking. We will also consolidate data processing streams to ensure that ground measurements deliver the maximum Return on

Investment by providing the required confidence in data products. The four pillars of GEO-TREES for the 2025–2030 phase will be:

- **Partnerships & Engagement**: GEO-TREES collaborates with ecological and botanical specialists worldwide to generate high-quality ground measurements. Partners are fully engaged and involved in every step of the project, with funding ensured to foster science and technology advancements in partner countries.
- **Innovative Technologies**: GEO-TREES builds on preexisting forest research sites, benefiting from the field experience of on-site teams and forming part on long-term research efforts. Supported forest biomass reference sites will represent the various environmental and anthropogenic dimensions of forests globally. Ground measurements involve four integrated sets of measurements: forest inventory plots with high-quality botanical identification, airborne laser scanning, terrestrial laser scanning, and climate monitoring.
- **Long-term Commitment**: Forest carbon and biomass are highly dynamic across space and time. Maintaining current and accurate estimates of carbon and biomass stocks requires continued long-term measurements. Long-term measurements also ensure the continued engagement and participation of partners throughout the system.
- **Open-access Data**: GEO-TREES is committed to equitably produced, fully funded, and openly shared global forest biomass reference measurements. High-quality, high-resolution maps of the world's forests, developed through Earth Observation missions in partnership with GEO-TREES, will be made openly accessible to all.

How We Work

The core team is structured around the Executive Board. Its composition reflects the expertise required for implementing GEO-TREES, including two Directors and two representatives from each of the three founding partner networks: ForestGEO, ForestPlots.net, and TmFO. Additionally, a Scientific Advisory Board represents the GEO-TREES scientific community and provides advice and insights on the overall GEO-TREES strategy. The Scientific Advisory Board is structured around three Technical Implementation Groups, which oversee data acquisition, quality assessment, and quality control (QA/QC) for (1) tree inventories, (2) airborne laser scanning, and (3) terrestrial laser scanning.

Donors

European Space Agency (ESA)	
France	Government of France
	National Centre for Scientific Research (CNRS)
United States	Bezos Earth Fund
	Gordon and Betty Moore Foundation
	Smithsonian Tropical Research Institute

Partners

GEO Members	
Australia	Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Brazil	Universidade do Estado de Mato Grosso
Colombia	National University of Colombia
Côte d'Ivoire	Institut national polytechnique Félix Houphouët-Boigny (INP-HB)
France	French Agricultural Research Centre for International Development (Cirad)
	National Centre for Scientific Research (CNRS)
Philippines	University of the Philippines
United Kingdom	University of Leeds
United States	Smithsonian Institution
GEO Participating Organizations	
European Space Agency (ESA)	

Point(s) of Contact

Jerome Chave jerome.chave@univ-tlse3.fr
Klaus Scipal klaus.scipal@esa.int

Global Ecosystems Atlas (THE ATLAS)

Focus Area(s):

- **Ecosystems, Biodiversity, and Carbon Management**

Challenge

Protecting biodiversity and ecosystem integrity is crucial for human survival, providing essential services like food, water, and climate regulation. The Convention on Biological Diversity's Global Biodiversity Framework (GBF) commits to halting nature loss by 2030, but success depends on quality ecosystem information. While frameworks exist for monitoring and reporting ecosystem health, significant knowledge gaps remain—55% of the world's ecosystem types lack distribution data, and only 14% of terrestrial ecosystems are comprehensively monitored. Existing data on the world's ecosystems is inconsistent, incomplete, or fragmented.

Historically, ecosystems have been classified in varied ways, resulting in discrepancies in international monitoring, reporting, and verification. While nations may develop and utilize their national ecosystem maps and classifications, achieving international comparability requires a unified, common reference classification. Therefore, there is an urgent need for a trusted global map linked to a common classification reference, harmonizing definitions, standards, and approaches to facilitate effective conservation and restoration efforts worldwide.

Solution

The Global Ecosystems Atlas ("the Atlas") initiative will create a trusted common resource for mapping and monitoring the world's ecosystems to facilitate consistent and coherent monitoring, reporting, and verification of conservation, sustainable management and restoration goals, and natural capital accounting at the national, regional, and global levels, and across companies' value chains and investors' portfolios. At its foundation, the Atlas is an innovative geospatial data product. It combines existing national and global ecosystem distribution data with resources to support countries in creating new ecosystem maps where none currently exist. By engaging with an international community of experts, the Atlas provides tools and guidance to enhance and harmonize mapping efforts and promote informed decision-making for countries.

The Atlas will:

- Integrate existing high-quality ecosystem maps, standardize and harmonize approaches to offer the best available spatial data on ecosystem extent, condition, and risks.
- Identify and work with countries to fill gaps in knowledge regarding the extent and condition of ecosystems using the latest Earth observation data and AI/ML technologies combined with relevant ecological data.
- Provide tools to support global, regional, and national assessments, reporting, and accounting related to ecosystems.
- Enable businesses to develop coherent nature accounts and assess, report, and verify nature-related risks and key nature metrics with commonality and transparency.

All ecosystem information in the Atlas will be harmonized according to the 110 Ecosystem Functional Groups outlined in the Global Ecosystem Typology (GET). The International Union for Conservation of Nature (IUCN)'s GET has been recognized by the UN Statistical Commission

as an international statistical classification, including its application in the System for Environmental Economic Accounting—Ecosystem Accounting (SEEA EA) framework, and has been recommended as the foundation for ecosystem indicators under the GBF. Additionally, the Taskforce on Nature-related Financial Disclosures (TNFD) has incorporated the IUCN GET into its guidance for identifying and assessing nature-related issues. This standardized and harmonized classification system facilitates global comparisons across countries and the private sector.

Intended Socioeconomic and Environmental Impact

The Atlas is designed to enable intelligent conservation and restoration practices by equipping governments, businesses, and other stakeholders with actionable data and tools. This supports decision-making on national targets and commitments, effective land use and spatial planning, sustainable investments, and corporate sustainability reporting. By fostering data-driven solutions, the Atlas empowers users to strategically target conservation and restoration efforts and sustainably manage ecosystems.

A particular focus is on supporting medium- and low-income countries, many of which face capacity constraints. By providing essential tools to map, monitor, and manage ecosystems, the Atlas helps these countries to implement their biodiversity strategies, monitor progress, and contribute meaningfully to global targets under the GBF and other multilateral environmental agreements.

Ultimately, the Atlas contributes to maintaining and enhancing critical ecosystem services, such as clean water, climate regulation, and land productivity, which are vital for climate adaptation, food and water security, and safeguarding lives and livelihoods. By informing intelligent evidence-based practices, it sustains biodiversity and ecosystems while fostering resilience and improving quality of life globally.

Objectives for 2025–2030

The key outcome of Phase 1 of the Atlas project (2025–2026) is enhanced knowledge of the spatial distribution of the world's ecosystems. This will be achieved by undertaking several key activities, which will result in the creation of a Global Ecosystems Atlas synthesis map by the end of 2026. Between 2026 and 2030, the Atlas will continue to be refined and updated, and the goal by 2030 is to provide information about the change in ecosystem extent, condition, and risk globally.

How We Work

We work with a project team comprising a project manager, science lead, country engagement specialist, business engagement specialist, team assistant, etc. The Atlas initiative has an established governance comprising a Steering Board and a Scientific and Technical Committee. Other working groups may be created on an ad hoc basis to address specific workstreams of the Atlas implementation.

Donors

Norway	Norwegian Agency for Development Cooperation (Norad)
United Kingdom	Department for Environment, Food & Rural Affairs (Defra)
United Nations Environment Programme (UNEP)	

Partners

GEO Participating Organizations
Convention on Biological Diversity (CBD)
International Union for Conservation of Nature (IUCN)

Point(s) of Contact

David Patterson dpatterson@geosec.org
Lela Gomersall lgomersall@geosec.org

Global Network for Observations and Information in Mountain Environments (GEO-MOUNTAINS)

Focus Area(s):

- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Open Data, Knowledge, and Infrastructure**

Challenge

Mountains have high bio- and geodiversity, are a key component of the Earth's system, and provide essential resources and services to people living in and around mountains and downstream areas. However, with the accelerating pace of change, e.g., climate change, impacts from these changes are compounding and/or increasing and having serious consequences for both people and ecosystems. Adapting to and mitigating these impacts is imperative for safeguarding human well-being, functional ecosystems, and water and energy security. Access to and use of reliable data and information are fundamental for supporting monitoring efforts, which remain fragmented and deficient in many mountain regions.

Solution

Enhancing the quality, range, and availability of data and information at the global and regional scales continues to be a key objective, but it is insufficient given the scale of the challenges faced. Previous work through GEO Mountains and partners identified user needs for integrating data and knowledge concerning biophysical changes with information on socioeconomic and human dimensions of change. This integration could not only support systemic predictive capacities but also help substantiate policies and practices, including governance and financial capacities to sustain well-coordinated, long-term observations and formats that are accessible and fit for multiple applications.

Intended Socioeconomic and Environmental Impact

Generally, GEO Mountains seeks to: (1) strengthen the availability and use of observation data and knowledge products on coupled biophysical and socioeconomic aspects that affect mountains; (2) improve monitoring and modeling capacities and knowledge on strategies that address key impacts; and (3) transfer that knowledge through science-policy-practice platforms to inform decision-making in national, regional, and global policy processes. In pursuing these goals, GEO Mountains makes concrete contributions towards closing observation gaps in mountains, which, in turn, helps reduce losses and damages from disasters, support the conservation and protection of ecosystems, and safeguard key resources, such as water.

Objectives for 2025–2030

In this period, GEO Mountains will continue connecting and supporting a worldwide community network of data and information providers and users working in and for mountain regions, and will take concerted steps towards fulfilling a greater "research-to-operations" function. Building

on its legacy and growing community, it will establish a functional platform and network that not only provides access to relevant data, models, and information on key drivers and processes of change in mountains but also enables the capabilities needed to generate outputs that respond to knowledge needs on challenges and opportunities relevant to mountains. These objectives are concurrent with activities planned between 2025 and 2027, for which funding is secured through a contribution from the SDC to the MRI for coordination purposes.

Ongoing and forthcoming activities include advancing and coordinating the processing and population of inventories and databases with information for subsequent analyses, with particular emphasis on generating outputs that integrate data and information across natural and human system domains. Other tasks include facilitating processes for the co-production of knowledge in the form of surveys, focus groups, expert elicitation, and workshops, among others, to ensure the relevance and improvement of the platform, including inputs on its utility from a user perspective. Synergies and connections with other relevant and well-established networks, such as ICOS, LifeWatch, eLTER, and iLTER, among others, are a key part of improving this platform.

A sustainability strategy is also part of what GEO Mountains will focus on developing in this period, particularly in sustaining the access and longevity of data and information gathered, resource mobilization, defining governance options, and evolving the Initiative post-2027.

GEO Mountains will also seek to contribute to the MRI's key objectives in 2023–2026, specifically in helping to consolidate the state of the art based on 25 years of scientific advances, research, syntheses, data, and information fostered via the MRI.

How We Work

The MRI and CNR co-lead the Initiative. As a Flagship Activity of the MRI, the Initiative aligns with its mission and vision and responds to its programmatic and strategic priorities on long-term mountain data and monitoring. MRI staff provide secretariat support and coordination. A core group of partners provides ad hoc strategic and programmatic advice. A website and monthly news mailout are used to communicate with our 743 members (as of 13 November 2024). Biannual General Meetings are convened to interactively connect this community, share progress, and exchange information. Defining a governance structure for a post-2025 phase will be a focus in 2025.

Donors

Italy	Institute of Geosciences and Earth Resources, National Research Council (CNR-IGG)
Mountain Research Initiative (MRI)	
Switzerland	Swiss Agency for Development and Cooperation (SDC)

Partners

GEO Members	
Canada	École de technologie supérieure (ÉTS Montréal)
	University of Calgary

European Commission	Joint Research Centre (JRC)
Italy	Institute of Geosciences and Earth Resources, National Research Council (CNR-IGG)
South Africa	South African Environmental Observation Network (SAEON)
Switzerland	Centre for Development and Environment (CDE), University of Bern
	Institut WSL pour l'étude de la neige et des avalanches (SLF)
	MétéoSuisse
	Swiss Federal Agency for Development and Cooperation (SDC)
	Swiss Federal Office for the Environment
	University of Geneva
United Kingdom	University of Portsmouth
	University of Reading
United States	United States Geological Survey (USGS)
GEO Participating Organizations	
Belmont Forum	
European Centre for Medium-Range Weather Forecasts (ECMWF)	
European Long-Term Ecological Research Network (eLTER)	
European Space Agency (ESA)	
Future Earth	
Institute for Environment and Human Security, United Nations University (UNU-EHS)	
Integrated Carbon Observation System, European Research Infrastructure Consortium (ICOS ERIC)	
International Centre for Integrated Mountain Development (ICIMOD)	
International Long-Term Ecological Research Network (iLTER)	
Mountain Partnership, Food and Agriculture Organization of the United Nations (FAO)	
Mountain Research Initiative (MRI)	
Regional Centre for Mapping of Resources for Development (RCMRD)	
United Nations Educational, Scientific and Cultural Organization (UNESCO)	
United Nations Environment Programme (UNEP)	
World Climate Research Programme (WCRP)	
World Meteorological Organization (WMO)	
GEO Associates	
Centre for Ecological Research and Forestry Applications (CREAF)	
Non-affiliated	
African Mountain Research Foundation (AMRF)	
Albertine Rift Conservation Society (ARCOS)	
Consortium for the Sustainable Development of the Andean Ecoregion (CONDESAN)	
Eurac Research	
FluxNet	

Global Mountain Biodiversity Assessment (GMBA)
Inter-American Institute for Global Change Research (IAI)
LifeWatch European Research Infrastructure Consortium (LifeWatch ERIC)
Science for the Carpathians Network
Sustainable Caucasus
Virtual Alpine Observatory (VAO)

Point(s) of Contact

Antonello Provenzale antonello.provenzale@cnr.it
Carolina Adler carolina.adler@unibe.ch

Pilots

GEO Wetlands (GEO-WETLANDS)

Focus Area(s):

- **Ecosystems, Biodiversity, and Carbon Management**
- **Water and Land Sustainability**

Challenge

Wetlands, vital for biodiversity, climate, and hydrology, provide essential benefits to humankind. Accurate data is crucial for their protection and for fulfilling countries' commitments under the Convention on Wetlands, the Sustainable Development Goals, and the three Rio Conventions. Countries face challenges in wetlands inventory and its application in assessment, monitoring, management, and reporting, and have formally identified needs for enhanced use of Earth observation (e.g., Convention on Wetlands Resolution XIII.10 §23). Challenges arise from the temporal dynamics and diversity of wetlands, a lack of harmonization of approaches, limited accuracies, and constraints in the ability of countries to utilize them.

Solution

GEO Wetlands will play a pivotal role in addressing countries' needs through open collaboration to empower users to benefit from the EO-derived wetland geospatial data. This will include developing and promoting harmonized methods for wetland inventory, assessment, and monitoring, such as consistent definitions; facilitating access to and utilization of EO data; and addressing identified capacity and technical needs through guidance, capacity-building, and sharing of information. GEO Wetlands is being co-designed, responding directly to needs identified by parties to the Convention on Wetlands, complementing ongoing efforts to strengthen national wetland inventory, and contributing to enhanced planning and reporting under other MEAs.

Intended Socioeconomic and Environmental Impact

GEO Wetlands will enhance wetland protection, restoration, and sustainable use by providing knowledge, tools, and capacity to support national and international policies. It helps the 172 Contracting Parties to the Convention on Wetlands establish or improve National Wetland Inventories, integrate wetland measures into national plans, and address biodiversity, climate, and water goals. GEO Wetlands also closes knowledge gaps with updated global inventories, improves mapping of specific wetland types, enhances data sharing for better reporting across frameworks, and develops Essential Wetland Variables for precise assessments of wetland health and ecosystem services.

Objectives for 2025–2030

The overall objective of GEO Wetlands is to support national wetland inventory as a key tool towards effective implementation of the Convention on Wetlands, and to harness wetlands in delivering biodiversity, climate, and sustainable development outcomes. The objectives, products, and services of GEO Wetlands will be further developed through ongoing consultation

led by the Scientific and Technical Review Panel (STRP) of the Convention, and the outcomes of the Convention on Wetlands' 64th Standing Committee Meeting in January and COP15 in July 2025.

Specific objectives are expected to address:

- Core variables for identifying wetland location, delineation/extent, type, and condition, and their changes over time, and the harmonization of methods to promote interoperability, inter alia drawing on experiences from the development of Essential Climate Variables and Essential Biodiversity Variables, as well as ongoing efforts to map wetlands.
- Enhancing data accuracy through advanced EO techniques and new technologies to address the high temporal and spatial variability and diversity of wetland ecosystems.
- Facilitating access to and use of EO data from a variety of sources and associated knowledge products, customized to specific user requirements, with a focus on national wetland inventory.
- Increasing capacity for effective wetland inventory and its application in monitoring and assessment, planning, and reporting through technical training, providing access to tools and guidance, and promoting knowledge sharing.

How We Work

GEO Wetlands is envisaged as a voluntary and collaborative network, with membership open to organizations/entities with a relevant mandate and commitment to the aims and objectives of GEO Wetlands. Arrangements are to be further developed based on the ongoing EO consultation and outcomes from the Convention on Wetlands' COP15, but are expected to encompass a dedicated secretariat for day-to-day management and facilitation of work, as well as community engagement; technical groups co-chaired by countries and partner organizations; and a steering group including representatives from the Convention on Wetlands (STRP and Secretariat), as well as co-chairs of technical groups.

Donors

Convention on Wetlands and Wetlands International

Partners

GEO Members	
France	Tour du Valat/Mediterranean Wetlands Observatory
Japan	Japan Aerospace Exploration Agency (JAXA)
United Kingdom	Aberystwyth University
United States	Goddard Space Flight Center, National Aeronautics and Space Administration (NASA)
GEO Participating Organizations	
European Space Agency (ESA)	
Non-affiliated	
Convention on Wetlands	

Wetlands International

Point(s) of Contact

Hugh Robertson strp@ramsar.org
Jerker Tamelander tamelander@ramsar.org
Lammert Hilarides lammert.hilarides@wetlands.org
Marc Paganini marc.paganini@esa.int
Osamu Ochiai ochiai.osamu@jaxa.jp

Global Ecosystems and Environment Observation Analysis Research Cooperation (GEOARC)

Focus Area(s):

- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **Open Data, Knowledge, and Infrastructure**

Challenge

Global ecosystems are increasingly threatened by urban expansion, climate change, and unsustainable resource use, leading to biodiversity loss and disruptions in the carbon cycle. Limited access to integrated, high-quality environmental data complicates efforts to address these issues. Policymakers and stakeholders urgently need accessible, coordinated information and knowledge to guide actions on ecosystem conservation, biodiversity, carbon management, and sustainable urbanization.

Solution

GEOARC provides an open-access, multi-source data platform for monitoring ecosystems and urban impacts with biodiversity and carbon management tools. GEOARC enables users to make data-driven decisions for ecosystem conservation and climate adaptation by integrating advanced remote sensing, in situ observations, artificial intelligence technology, etc. Through partnerships and platforms, such as the GEO Knowledge Hub, GEOARC promotes collaboration and knowledge-sharing to support ecological resilience and sustainable development regionally and worldwide.

Intended Socioeconomic and Environmental Impact

GEOARC aims to create substantial socioeconomic and environmental benefits by enhancing biodiversity conservation, sustainable land management, and resilience to climate change. GEOARC supports policies that protect ecosystems and biodiversity and strengthen ecological resilience against climate-related risks by providing timely and actionable insights. By 2030, GEOARC will contribute to essential ecosystem preservation, climate adaptation, and achieving the Sustainable Development Goals, thus supporting a sustainable and resilient global environment.

Objectives for 2025–2030

Through the following objectives, GEOARC will contribute significantly to global efforts in ecosystem conservation, climate adaptation, and sustainable development by 2030.

- **Enhance Data Precision and Accessibility**: By 2030, refine the spatial and temporal resolution of ecosystem, biodiversity, and carbon data through advanced remote sensing and AI-driven analytics. This enhancement will support precise and real-time ecosystem monitoring, providing policymakers and researchers with actionable insights at both local and global scales.
- **Expand Partnerships and User Engagement**: Strengthen collaboration with research institutions, regional governments, and international organizations, such as UNEP,

UNESCAP, and FAO, to co-develop targeted data products and tools. This partnership expansion aims to align GEOARC's resources with ecosystem protection, ecological resilience, and biodiversity conservation goals.

- **Develop Targeted Monitoring Tools and Reports**: Introduce new products for tracking ecosystem changes, the impacts of climate change and anthropogenic activities, and declining service functions in vulnerable ecosystems. These tools will aid effective ecosystem assessment, early warning, and protection policymaking.
- **Empower Capacity Building and Knowledge Sharing**: Enhance global capacity building by providing environmental agencies, researchers, and local communities with targeted training through workshops, webinars, and collaborative platforms. These efforts will enable diverse stakeholders to interpret GEOARC's data effectively, fostering informed decision-making and resource management.
- **Drive Policy Alignment and SDG Support**: Focus on developing tools and insights that support regional countries and international organizations in meeting the Sustainable Development Goals, specifically those related to ecosystem protection, resilience, and biodiversity conservation.

How We Work

GEOARC operates through a core team supported by governance bodies and a global network of partners. The core team manages daily operations, data generation, and project execution, while the governance bodies, including an international steering committee, provide strategic direction and oversight. This collaborative structure integrates regional and global partners, such as UNEP, FAO, UNESCAP, and national agencies, to foster innovation and ensure GEOARC's outputs align with international standards. Regular meetings, workshops, and data-sharing platforms enhance coordination and knowledge exchange, enabling GEOARC to deliver reliable, actionable insights that support sustainable development and worldwide environmental resilience.

Donors

China	China National Space Administration (CNSA)
	Chinese Academy of Sciences (CAS)
	Ministry of Science and Technology (MOST)

Partners

GEO Members	
Bangladesh	Jahangirnagar University
Cambodia	Ministry of Environment
China	Aerospace Information Research Institute, Chinese Academy of Science (AIR-CAS)
	Chinese Academy of Forestry
	Institute of Agricultural Resources and Regional Planning, Chinese Academy of Agricultural Sciences

	Satellite Application Center for Ecology and Environment, Ministry of Ecology and Environment
Ghana	University of Energy and Natural Resources (UENR)
India	Indian Agricultural Research Institute (IARI)
Malaysia	Universiti Teknologi Malaysia
Maldives	Maldives Meteorological Service
Mongolia	Information and Research Institute of Meteorology, Hydrology and Environment
Pakistan	Punjab University
GEO Participating Organizations	
Asian Disaster Preparedness Center (ADPC)	
Food and Agriculture Organization of the United Nations (FAO)	
United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)	
United Nations Environment Programme (UNEP)	
Non-affiliated	
University of Technology Sydney (UTS)	

Point(s) of Contact

Faisal Mumtaz faisal@aircas.ac.cn
Junjun Wu wujj@aircas.ac.cn
Qinhuo Liu liuqh@aircas.ac.cn

One Health

Flagships

Global Observation System for Mercury (GOS4M)

Focus Area(s):

- **One Health**

Challenge

The Minamata Convention on Mercury was established to control mercury supply and trade, reduce the use, emission, and release of mercury, raise public awareness, and build the necessary institutional capacity. The proposed Flagship aims to: (1) enhance the availability and quality of Earth observation data and information to contribute to tracking mercury released into the global environment and, where appropriate, anticipating changes in the environment; (2) harmonize metadata production, archiving, and data sharing within the mercury network; and (3) develop advanced monitoring and reporting services in support of a policy mandate through the Minamata Convention.

Solution

GOS4M developed the GOS4M Knowledge Hub, which includes tools to discover and access available in situ mercury datasets, satellite observations used in regional- and global-scale chemical models, the online GDQM QA/QC system, the HERMES emulator for modeling outputs under different anthropogenic emission scenarios, and scientific references for the adopted methodology.

Intended Socioeconomic and Environmental Impact

The UNEP Global Fate and Transport Partnership (UNEP F&T) is a stakeholder-driven effort initiated in 2006 to protect human health and the global environment from the release of mercury and its compounds by minimizing, and, where feasible, ultimately eliminating global anthropogenic mercury releases to air, water, and land. The initiative has been recognized as a fundamental partnership supporting the development of technical and scientific knowledge in alignment with the Minamata Convention on Mercury. The GOS4M activity can strongly contribute to monitoring and reporting activities aimed at reducing health risks, particularly for sensitive populations.

Objectives for 2025–2030

During the period, the activity will focus on improving the GOS4M Knowledge Hub to better support the activity of UNEP and the Minamata Convention Secretariat for monitoring and reporting purposes, with the aim of becoming the official tool in the context of the Conference of Parties. The platform is being upgraded to include a check-in service for Authentication and Authorization, incorporating a data license subscription. An improved data monitoring system will include meteorological parameters and an automatic reporting system, while AI modules for human language queries on the data will enhance the platform's user experience. Capacity-

building and interaction with regional monitoring networks will continue as a background activity, aiming to include larger datasets on mercury in the environment and biomonitoring data.

Governance

Chair: Nicola Pirrone, CNR, Italy (nicola.pirrone@cnr.it)

Co-chairs:

- Alexandra Steffen, Environment Canada, Canada (alexandra.steffen@canada.ca)
- Shuxiao Wang, Tsinghua University, China (shxwang@tsinghua.edu.cn)
- Lynwill Martin, South Africa Weather Service (SAWS), South Africa (lynwill.martin@weathersa.co.za)

Regional Focal Points:

- Europe: Aurélien Dommergue (aurelien.dommergue@univ-grenoble-alpes.fr)
- North America: David Schmeltz, United States Environmental Protection Agency (USEPA)
- Africa: Lynwill Martin, SAWS, South Africa (lynwill.martin@weathersa.co.za)
- Asia and Oceania: Shuxiao Wang, Tsinghua University, China (shxwang@tsinghua.edu.cn)

Donors

European Commission	
Italy	Ministry of University and Research
	National Research Council (CNR)

All participating institutions provide in-kind contributions to the monitoring and modeling activities of GOS4M.

Partners

GEO Members	
Argentina	Instituto de Investigaciones en Biodiversidad y Medioambiente, Consejo Nacional de Investigaciones Científicas y Técnicas (INIBIOMA-CONICET)
Canada	Environment and Climate Change Canada (ECCC)
Chile	
China	Institute of Geochemistry, Chinese Academy of Sciences (IG-CAS)
	Tsinghua University
Czech Republic	Global Change Research Institute (CzechGlobe)
Finland	Finnish Meteorological Institute (FMI)
France	Géosciences Environnement Toulouse (GET)
	Institut des Géosciences de l'Environnement (IGE)
	Institut français de recherche pour l'exploitation de la mer (IFREMER)
	Littoral Environnement et Sociétés (LIENSs)

	Mediterranean Institute of Oceanography (MIO)
	Université de Pau et des Pays de l'Adour (UPPA)
Germany	Helmholtz Centre for Materials and Coastal Research (HZG)
Italy	Institute of Atmospheric Pollution Research, National Research Council (CNR-IIA)
Russia	Limnological Institute, Siberian Branch of the Russian Academy of Sciences (LIN SB RAS)
	Lumex-Marketing LLC
Slovenia	Institut "Jožef Stefan" (JSI)
South Africa	South Africa Weather Service (SAWS)
United Kingdom	University of York
United States	Biodiversity Research Institute (BRI)
	National Atmospheric Deposition Program (NADP)

Point(s) of Contact

GOS4M info@gos4m.org

Pilots

DigiGEO Wildfire-Health Nexus (GEO WHN)

Focus Area(s):

- **One Health**

Challenge

Wildfires are escalating globally due to climate change and land use shifts, causing cascading health-environment-socioeconomic crises. Current systems face critical gaps:

- **Fragmented monitoring**: Siloed data on fire emissions, ecological damage, and health impacts.
- **Reactive responses**: Limited capacity for preventive health protection and infrastructure resilience.
- **Knowledge disparities**: Weak integration between scientific research and community needs.

The WHO estimates wildfire smoke causes 340,000 premature deaths annually, while the World Bank projects $100B+ yearly economic losses by 2050. Vulnerable populations face five times higher respiratory risks, and biodiversity hotspots lose keystone species irreversibly. A unified science-to-action framework is urgently needed.

Solution

The Wildfire-Health Nexus integrates nine modules across three functional tiers. Real-time monitoring (EYE) feeds predictive analytics (FAST, EMIT) to assess fire and emission dynamics. Damage mapping (MAP) couples with long-term projections (SCALE) to guide ecological restoration (ECOR), while emergency (RESP), economic (ECON), and health (LIFE) modules translate insights into actionable protocols.

Aligned with GEO's Earth Observation Value Chain, we establish standardized interfaces enabling modular interoperability. Regional demonstrations in China and Senegal validate full-cycle solutions—from early detection to ecosystem recovery—through tight integration with important GWP projects (e.g., GWIS, GOS4POPs, HEALTH-CoP). Annual Nexus Reports synthesize cross-module findings, advancing global best practices for wildfire resilience.

From observation to policy action, we close the wildfire-health governance loop.

Intended Socioeconomic and Environmental Impact

The Wildfire-Health Nexus will fundamentally transform wildfire governance by:

- Catalyzing cross-domain collaboration through integrated fire-health-ecosystem response protocols, establishing the first end-to-end solution covering prevention, real-time response, and long-term recovery.
- Setting global standards with open-access data products (e.g., harmonized exposure indices) and annual State of Fire & Health Reports, advancing the field's methodological rigor.

- Exemplifying GEO's Earth Observation Value Chain by demonstrating how integrated data flows can drive actionable policies.

This systemic approach will redefine best practices for translating Earth observations into multi-sectoral resilience, positioning the Wildfire-Health Nexus as the benchmark for nexus-based environmental health interventions.

Objectives for 2025–2030

2025 – Foundation

- Finalize nine-module roadmaps through regional workshops (Asia/Africa).
- Establish Integrated Demonstration Zones in China and Senegal.
- Form Science-Policy Steering Group with observers from international organizations (e.g., GEO, WHO, WMO, and UNEP).

2026 – Interoperability and Standardization

- Deliver first-generation products per module.
- Draft Integrated Experiment Plan through collective workshop.
- Develop cross-module validation framework.

2027 – Full Operational Capability

- Achieve 90% uptime for core modules in demo zones.
- Operationalize automated report generation (AI-assisted).
- Certify over three national agencies adopting standards.

2028 & 2029 – Institutionalization

- Deploy full-stack solutions in demo zones.
- Institutionalize biennial Nexus State Reports.

2030 – Global Scaling

- Transfer system to over five GEO Members.
- Institutionalize Nexus Solutions Marketplace for:
    - Commercial service providers.
    - Community innovation adaptations.
- Establish GEO Wildfire Resilience Certification.

How We Work

- **Steering Committee**: GEO Work Programme leaders and global experts for strategic guidance.
- **Core Tech-Science Team**: Biannual progress reviews, embedded liaisons for GEO projects (e.g., GWIS/GOS4POPs/HEALTH-CoP).
- **Annual Stakeholder Assemblies**: Co-design implementation roadmaps.
- **GEO Plenary Engagement**: Launch products (e.g., Wildfire-Health Nexus Annual Report).

- **Funding Phases**: Host-funded R&D (2025–2027), GEO Associate-backed scaling (2028–2030).

Donors

PIESAT Information Technology Co., Ltd., China

Partners

GEO Members
China; Senegal; Spain

Point(s) of Contact

Amadou Sall amadou.sall@cse.sn
Emilio Chuvieco emilio.chuvieco@uah.es
Fang Li lifang@mail.iap.ac.cn
Suju Li isujuff@vip.sina.cn
Weimin Hou hwm@hebust.edu.cn
Yuqi Bai yuqibai@tsinghua.edu.cn
Yufeng Cao yfcao@bjfu.edu.cn

Conveners

Earth Observations for Health (HEALTH-CoP)

Focus Area(s):

- **One Health**

Concept

The GEO Health Community of Practice (HEALTH-CoP) serves as a global network of governments, organizations, and observers who seek to use Earth observation data to improve health decision-making at international, regional, country, and district levels. The HEALTH-CoP focuses on implementing a One Health approach, utilizing Earth observation data among interdisciplinary and multi-agency teams to significantly advance scientific knowledge of ongoing public health threats by integrating human, animal, and ecosystem health. These efforts can facilitate spatial, analytical, and timely solutions needed to make Earth observation data and technology more accessible to the health community, especially for epidemiological analysis, risk modeling, surveillance, investigation, and emergency management.

The GEO HEALTH-CoP recognizes the urgency of applying novel technologies, products, data, and analytical approaches to develop timely action plans and decision-support tools that promote environmental sustainability and public health. To achieve established goals, the GEO Health CoP continues to identify and engage health partners, clarify and address health and training needs, and elucidate and manage observation and prediction gaps and needs through four specific approaches.

- **Addressing user-identified priority coverage gaps**: The GEO HEALTH-CoP coordinates bimonthly teleconferences with rotating themes to capture leading experts on topics and divulge in scientific dialogue that elucidates critical needs, gaps, and potential next course of action.
- **Developing user-driven, actionable tools and services**: It supports six work groups (Heat, Air Quality, Infectious Diseases, Food Security and Safety, Health Care Infrastructure, and Animal Health), composed of co-leads who organize bimonthly teleconference agendas, collaborative articles, and group discussions on timely topics.
- **Building capacity and expanding networks across geographic regions**: The GEO HEALTH-CoP organizes capacity-building opportunities as a platform for scientific exchange (e.g., Special Edition webinars to highlight research across regions) and establishes rapport with academic institutions (e.g., UNITEC-Honduras), Ministries of Health (Costa Rica and Ecuador), the Ministry of Environment and Natural Resources (Costa Rica and Dominican Republic), and space-based agencies (Canada, Mexico, and Paraguay).
- **Supporting youth engagement to address gaps and challenges**: It supports student engagement opportunities with co-designed/mentored projects and offers career and science talks to promote STEM careers in the United States and the Americas Region (Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Panama, and Paraguay).

Anticipated results will effectively promote novel and practical applications of Earth observations, in situ data, and other geospatial data sources to examine complex environmental

challenges. The GEO HEALTH-CoP will prioritize three specific tasks aligned with bridging the Earth and health science communities. First, by supporting the six work group activities, contributing members will share timely technical expertise on research applications that can leverage and incorporate scientific knowledge on pressing health-related topics into decision-support tools (e.g., Cholera Prediction Hub) and capacity training (e.g., workshops). Second, by expanding connections to GEO Work Programme initiatives, the GEO HEALTH-CoP can build cross-collaborations with GEO AquaWatch, GEO Blue Planet, and GEO Biodiversity Observation Network, focusing on the interconnectedness between health, water quality, biodiversity, and pathogen transmission. Third, by framing a regional focus, timely partnerships with regional GEOs can offer a platform to explore local and national priorities related to diverse environmental topics.

Objectives

The GEO HEALTH-CoP provides scientific expertise, technical coordination, and programmatic support to co-produce Earth intelligence solutions addressing complex One Health challenges. The five objectives are: (1) Engaging with end-user communities to better understand and identify their data needs and requirements; (2) Implementing activities addressing the needs and requirements of end-user communities; (3) Improving the use of, and clarifying future needs for, Earth observations in health; (4) Providing timely insight and feedback on future Earth observation actions for health; and (5) Participating with other individuals, GEO communities of practice, and institutions to leverage the expertise that produces far-reaching outcomes.

They prioritize three specific tasks to strengthen One Health as a Focus Area across the GEO Work Programme.

- **Supporting work group activities**: Six GEO HEALTH-CoP work groups help facilitate the development and implementation of Earth observation science and technology, where contributing members and participating organizations provide scientific and technical expertise on selected health-related topics (Heat, Infectious Diseases, Air Quality, Food Security and Safety, Health Care Infrastructure, and Animal Health) for specific project tasks, deliverables (including white papers), and activities.
- **Expanding connections to GEO Work Programme initiatives**: Renewed collaborations with GEO AquaWatch (e.g., information sharing and access to water quality information), GEO Blue Planet (e.g., water-associated diseases), and GEO Biodiversity Observation Network (e.g., bird migration, habitat fragmentation, vector-borne disease impacts, and thermal microrefugia detection) help examine cross-cutting synergies between health, water quality, biodiversity, and pathogen transmission, as they relate to the SDGs (targets 3.3, 3.9, and 3.d) and the Sendai Framework for Disaster Risk Reduction (target g and priority 3).
- **Framing a regional focus**: Highlighting robust applications of Earth observations across Regional GEOs (AfriGEO, AmeriGEO, EuroGEO, and AOGEO) can help leverage expertise, identify regional research gaps, encourage youth and student engagement, and broaden scientific networks across Earth and health science communities.

Point(s) of Contact

Juli Trtanj juli.trtanj@noaa.gov
John Haynes jhaynes@nasa.gov
Didier Davignon didier.davignon@ec.gc.ca
Helena Chapman helena.chapman@nasa.gov
Alice Lau alice.lau@noaa.gov

Water and Land Sustainability

Flagships

GEO Land Degradation Neutrality (GEO-LDN)

Focus Area(s):

- **Agriculture and Food Security**
- **Ecosystems, Biodiversity, and Carbon Management**
- **Water and Land Sustainability**

Challenge

Up to 40% of the world's land is degraded, affecting half of humanity and having dire consequences for our climate, biodiversity, and livelihoods. We are degrading 100 million hectares of healthy and productive land each year. If current trends continue, restoring 1.5 billion hectares of land by 2030 will be necessary to achieve a land degradation-neutral world.

Global voluntary commitments to restore degraded land have reached one billion hectares by 2030, but this will require the ability to map and monitor land degradation at the national level across all land types. Without this information, investments, policies, and interventions will be ineffective.

Solution

The GEO Land Degradation Neutrality (GEO-LDN) Initiative aims to improve land degradation monitoring and mapping while also contributing to land degradation neutrality (LDN).

GEO-LDN does this through four key services: facilitating access to space-based information and in situ measurements; providing expertise, tools, and training to build national capacities; assisting with the further development of international standards for geospatial indicators; and supporting robust Earth observation value chains that provide co-designed Earth insights and intelligence for decision-making.

Intended Socioeconomic and Environmental Impact

The ultimate goal of GEO-LDN is to reduce the extent of degraded land and support the achievement of land degradation neutrality by 2030 (SDG target 15.3) by strengthening countries' capacity to utilize coordinated, comprehensive, and sustained Earth observations for integrated land use planning, evidence-based decision-making, as well as monitoring and reporting of progress towards national and global restoration commitments. Optimizing how land is used and managed across the landscape can contribute to climate and biodiversity targets, close the food gap, and promote human health, economic growth, prosperity, and well-being. In fact, healthy land can accelerate the achievement of all 17 Sustainable Development Goals.

Objectives for 2025–2030

The GEO-LDN Flagship will continue to be a close partner for the UNCCD in the coming five years, fulfilling its mandate received through decisions of previous UNCCD Conference of the

Parties (COP). Current efforts are the creation of higher-resolution, multi-decadal time series of satellite data for the SDG 15.3.1 sub-indicators, especially for small countries, including SIDS. GEO-LDN will also improve support for other geographies and landscapes where existing methods and data availability are not ideal, such as mountainous, tropical areas and desert landscapes.

Building on developed minimum quality standards, a standard for geospatial reporting indicators will be established through the Open Geospatial Consortium (OGC), benefiting all SDG indicator reporting.

Further global and regional dialog formats and the expansion efforts of Working Group 4 ("Decision support") aim to double our capacity for outreach and engagement.

The close contact with implementing government authorities and national experts in countries affected by land degradation worldwide enables GEO-LDN to provide recommendations to UNCCD, also for the post-2030 agenda and the reframing of the SDGs.

Additional efforts will be made to leverage synergies between the three Rio Conventions and to collaborate and exchange with the GEO activities supporting those conventions. An example is the connection with UNCBD and GEO BON regarding targets of the Kunming-Montreal Global Biodiversity Framework (GBF). SDG Indicator 15.3.1, which underpins the UNCCD LDN framework, has been endorsed by the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the CBD as a component indicator under Target 2. Minimizing the reporting burden is a key feature of the SDG process, and the dual use of SDG indicator 15.3.1 to underpin LDN and the GBF is a great example for synergies between UNCCD and UNCBD, further extending our opportunity for outreach.

Collaboration with GEOGLAM will be enhanced at both the national and regional levels. National entry points for GEOGLAM products and services in LDN interventions will be identified and tested in at least one pilot country. The two Flagships will collaborate at the regional level to develop GEO Helpdesks as a readily accessible entry point for countries to get technical advice on using EO data for their specific challenges.

GEO-LDN will continue to develop the LDN toolbox as an easily accessible, user-oriented entry point to Earth observation and decision-support tools for experts and non-experts alike. New tools will be added as they become available or are co-created according to demand. Particular attention is paid to increased federation of content and the underlying interoperability of toolbox elements. The potential of the GEO Knowledge Hub to host documentation of use cases and workflows, and possibly the toolbox itself, is being assessed at this time.

How We Work

The governance structure of GEO-LDN consists of four structural elements:

- The Group of Members represents key stakeholder groups of the network. It validates and legitimizes strategic decisions of the Flagship through the election of members of the Leads Group.
- The Leads Group oversees resource allocation and provides strategic guidance to the Working Groups. It consists of 12 members from the Working Groups and other relevant institutions.

- The four Working Groups carry out the operational work of GEO-LDN and provide thematically organized services to the network.
- The Secretariat coordinates operations and supports the Leads Group and the Working Groups.

Donors

German Ministry for Economic Cooperation and Development (BMZ) through the German Agency for International Cooperation (GIZ)

Partners

GEO Members	
Australia	Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Germany	Agency for International Cooperation
Ghana	University of Energy and Natural Resources (UENR)
Switzerland	Centre for Development and Environment (CDE), University of Bern
United States	Apacheta LLC
GEO Participating Organizations	
Committee on Earth Observation Satellites (CEOS)	
Conservation International	
Open Geospatial Consortium (OGC)	
Regional Centre for Mapping of Resources for Development (RCMRD)	
United Nations Convention to Combat Desertification (UNCCD)	

Point(s) of Contact

Amos Tiereyangn Kabo-Bah akabobah@gmail.com
Antje Hecheltjen antje.hecheltjen@giz.de
Neil Sims neil.sims@csiro.au
Sara Minelli sminelli@unccd.int

Pilots

Earth Observations for Global Typical Karst (EO4KARST)

Focus Area(s):

- **Ecosystems, Biodiversity, and Carbon Management**
- **Water and Land Sustainability**

Challenge

Karst is a unique type of landscape formed by the dissolution of soluble rocks, such as limestone, dolomite, and gypsum, creating distinctive features like caves, sinkholes, and underground rivers. These landscapes cover approximately 22 million km² worldwide and are home to around 16.5% of the global population. Additionally, nearly 25% of the world's population depends on karst water sources.

Karst environments are characterized by stunning landscapes and abundant, yet unstable, water resources due to their interconnected dual-layer hydrogeological structure. The presence of soluble rocks and complex underground drainage systems makes them particularly vulnerable to human activities, as surface impacts can easily extend underground. Establishing thresholds for human activities to mitigate negative effects is an urgent priority, yet no dedicated research has been conducted on this issue.

Solution

- **Establishing a Comprehensive Database**: This will involve collecting and integrating monitoring data from an observation network, combining in situ measurements with remote sensing (RS) data. The goal is to assess and understand the impact of human activities on karst regions.
- **Developing Integrated Models**: Utilizing the compiled database, advanced models will be created to identify critical thresholds for human activities, ensuring sustainable development and conservation of karst landscapes on a global scale.
- **Creating an Intelligent System**: A user-friendly system will be developed to facilitate data sharing, assess environmental and resource conditions, and provide actionable insights for different stakeholders to implement appropriate measures.
- **Enhancing Awareness and Management**: Outreach materials and educational activities will be designed to promote awareness of karst protection. Additionally, efforts will be made to strengthen decision-making processes and advance research capabilities for better management and conservation of these fragile ecosystems.

Intended Socioeconomic and Environmental Impact

- Improve the management of karst water resources by implementing high-efficiency and sustainable approaches for their utilization.
- Maintain a healthy environment to support biodiversity conservation and prevent related geohazards.
- Enhance development patterns by reducing negative impacts on karst landscapes.

Objectives for 2025–2030

- Facilitate effective data sharing on karst resources and the environment by establishing an observation network in key karst areas.
- Develop comprehensive models to assess the sustainability of karst areas under the influence of human activities, particularly in relation to water, land, and landscape resources, providing valuable references for policymaking.
- Create an intelligent system that enables users to assess the status of resources and the environment in key karst areas, implement early interventions for potential hazards, share relevant data, and support policymaking efforts.
- Promote outreach and capacity-building by facilitating the use of project outputs through training programs, educational initiatives, internships, workshops, and other related activities.

How We Work

The core team consists of four working groups, with scientists from various countries contributing. These groups provide relevant existing data, establish in situ monitoring stations for data sharing, develop sustainable models, and conduct outreach activities. Experts from around the world are invited to join as members of the Advisory Group.

Within the initiative, the Leader Group primarily consists of the leaders of the working groups, while the Coordination Group is composed of key contacts for the initiative. Scientists from other countries are encouraged to participate by submitting applications to the Leader Group through designated contacts.

Donors

China	China Geological Survey
	Department of Science and Technology of Guangxi
Croatia	University of Split
International Union of Geological Sciences (IUGS)	
United States	Westen Kentucky University

Partners

GEO Members
Brazil; Croatia; Indonesia; Iran; Italy; Serbia; Slovakia; Slovenia; Thailand; Turkey; United States; Zimbabwe
GEO Participating Organizations
International Research Centre on Karst (IRCK)
International Union of Geological Sciences (IUGS)
United Nations Educational, Scientific and Cultural Organization (UNESCO)
Non-affiliated
International Organization for Standardization (ISO)

Point(s) of Contact

Qukan Luo luoqukan11@163.com
Bing Bai baibing@mail.cgs.gov.cn
Liang Zhong zhongliang@mail.cgs.gov.cn

Conveners

AquaWatch (AQUAWATCH)

Focus Area(s):

- **Climate, Energy, and Urbanization**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Community Impact**
- **Open Data, Knowledge, and Infrastructure**

Concept

The mission of GEO AquaWatch is to enhance the coordination, delivery, and utilization of water quality information for the benefit of society. This is achieved through a global water quality community of practice that includes individuals across the entire value chain—from data providers to end-users, including the public—and NGOs, governments, industry, academia, and nonprofit scientific research laboratories.

Water quality is essential for the health and well-being of individuals and societies. It is inextricably linked to food, sanitation, energy, transportation, flood control systems, and aesthetic and recreational benefits. Degraded water quality, pollutants, waterborne diseases, and the proliferation of harmful algal blooms are indisputably associated with human-induced climate change.

Many entities (local, state/national, regional, and global), including within the framework of the United Nations Sustainable Development Goals (SDGs), have an implicit or implied legal mandate for monitoring and assessing water quality, underscoring the need for GEO AquaWatch to remain in the GEO Work Programme. Additionally, GEO AquaWatch connects to other SDG-related convener proposals.

GEO AquaWatch has already positively impacted global Earth observations of water quality monitoring and assessment and seeks to continue this through its Convener status within GEO. Its domains include water quality Earth observations of inland freshwaters, marine waters, coastal zones, and open oceans. GEO AquaWatch aims to improve understanding of climate change impacts and support the implementation of mitigation or adaptation strategies. Moreover, it seeks to influence local-to-global water quality and Earth observation policies.

The goal of GEO AquaWatch is to enhance global capacity and the utility of Earth Observation-derived water quality data, products, and information to support effective monitoring, management, and decision-making. To achieve this, GEO AquaWatch encourages activities to engage, and be led by, early-career scientists worldwide, ensuring continuity with the next generation of world leaders in aquatic remote sensing.

There are ample instances for alignment between GEO AquaWatch's planned activities and the work of the Committee on Earth Observation Satellites (CEOS) Working Groups and Virtual Constellations, as well as training opportunities with the Earth Observation Training, Education,

and Capacity Development Network (EOTEC DevNet). These opportunities can be further explored over the next five years.

Objectives

- Facilitate effective partnerships among producers, providers, and users of water quality data, products, and information.
- Improve the analysis and integration of in situ and remote sensing water quality data.
- Develop and deliver fit-for-purpose water quality products and information services.
- Support communication, technology transfer, and access to water quality data products and information.
- Advocate for increased education and capacity in the use of water quality information for decision-making.

Point(s) of Contact

Flora Kerblat flora.kerblat@csiro.au
Ghada El Serafy ghada.elserafy@deltares.nl
Merrie Neely mbneely@geoaquawatch.org, merrie.neely@noaa.gov

Earth Observations for Multi-Scale Monitoring of Mining Impacts (GEOMIN)

Focus Area(s):

- **Water and Land Sustainability**

Concept

In the 21st century, it is imperative for the mining industry to embrace transparency, sustainability, and social responsibility. Throughout the mining life cycle of exploration, extraction, closure, and mine-site rehabilitation, it is crucial to implement technologies that minimize environmental impact and enable effective monitoring. Earth Observation (EO) data, combined with in situ information, plays a significant role in promoting sustainable management of mineral resources and facilitating comprehensive monitoring of mining activities at various scales.

Despite the widespread use of EO data in fields such as environmental conservation, forestry, agriculture, and land use planning, the mining industry has yet to fully leverage these technologies for efficient and transparent environmental monitoring. Fortunately, there is a wealth of freely available EO data from ESA and NASA, including the Copernicus program, as well as value-added products and services like Copernicus Land Monitoring Services (CLMS) and EMIT Aggregated Surface Mineralogy products.

While EO solutions have primarily been presented in research papers, ongoing projects are focused on developing innovative monitoring techniques specifically tailored for mining stakeholders. These approaches are expected to be finalized soon and will be made accessible as open-access resources. Additionally, efforts are underway to create strategic public documents that outline EO indicators for monitoring the mining environment. GEOMIN, under the Group on Earth Observations (GEO), will play a key role in disseminating these resources to broader communities, fostering knowledge sharing, and enhancing their overall impact. By harnessing the potential of EO technologies and data, the mining industry can advance towards a more sustainable and environmentally conscious future.

GEOMIN's activities will focus on the following key areas:

- Promoting freely available EO data, platforms, and tools.
- Showcasing state-of-the-art EO methods tailored to the scale of mining operations.
- Developing EO indicators for monitoring the environmental impact of mining activities.
- Exploring the added value of ready-to-use products/services (mineral product, EGMS) for applications beyond mining and geology, such as agriculture (e.g., using soil mineral composition to assess soil quality and erosion vulnerability).

Additionally, GEOMIN will share open-access and open-source software tools developed under ESMIN (the network for European Commission-funded mining innovation projects: MultiMiner, GoldenRAM, S34I, m4mining, and AGEMERA) via the GEO Knowledge Hub. Product videos, success stories, as well as reports and guidelines on utilizing EO data, products, and software tools to create EO indicators, will be made accessible through the GEOMIN/GEO website.

Objectives

- To promote and demonstrate new EO-based use cases, tools, products, and services developed for the monitoring and sustainable management of mineral resources, as well as effective multi-scale monitoring of mining impacts.
- To share knowledge and best practices to accelerate the adoption of open EO data for optimizing mining operations.
- To explore the potential of EO data and services tailored for mining applications to be used in other sectors, such as agriculture.

Despite the vast availability of free EO data, there is currently a lack of global or regional products/services tailored specifically to meet the unique needs of the mining sector. As a result, the utilization of EO data at the operational level is limited, with existing products primarily at lower Technology Readiness Levels (TRLs 3–5). Through the GEOMIN initiative, our goal is to promote and showcase the added value of these solutions at lower TRLs, with the aim of helping them to advance to higher TRLs.

To address these gaps, GEOMIN proposes to convene under the Focus Area of Water and Land Sustainability while also aligning with other relevant Focus Areas, such as Ecosystems, Biodiversity, and Carbon Management. By focusing on these key themes, GEOMIN can play a vital role in enhancing the utilization of EO data for sustainable mining practices and beyond.

This activity supports multiple United Nations Sustainable Development Goals (SDGs). Key goals include SDG 6 (Clean Water and Sanitation), by promoting monitoring of water quality around mining sites, and SDG 12 (Responsible Consumption and Production), through sustainable resource management. SDG 15 (Life on Land) is addressed by mitigating land degradation, SDG 13 (Climate Action) is supported by reducing environmental impacts of mining operations, and SDG 9 (Industry, Innovation, and Infrastructure) is supported by advancing mining technologies. The initiative also indirectly contributes to SDG 17 (Partnerships for the Goals), by fostering knowledge-sharing and collaboration for sustainable development.

Point(s) of Contact

Veronika Kopackova-Strnadova veronika.kopackova@seznam.cz
Pierre Lacroix pierre.lacroix@unige.ch
Jinghui Fan jhfan2004@qq.com

GEO Blue Planet (GEO-BLUE-PLANET)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **One Health**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Community Impact**
- **Open Data, Knowledge, and Infrastructure**

Concept

GEO Blue Planet is an international initiative under the Group on Earth Observations (GEO), gathering over a hundred members from all stakeholders' communities, including academia, national, regional, and international decision-making bodies, UN specialized agencies, and the non-profit and private sectors. GEO Blue Planet aims to advance sustainable ocean and coastal management through the development and use of ocean and coastal observations for the benefit of society.

Its scope encompasses global efforts to address key marine challenges, including pollution, climate adaptation, biodiversity conservation, and sustainable fisheries. By supporting the integration of satellite, in situ, and model-based data, GEO Blue Planet helps make comprehensive ocean information accessible to policymakers, researchers, and communities. GEO Blue Planet works with stakeholders to understand their information needs and connects them with technical experts who provide data and products. GEO Blue Planet encourages the co-design of tools that meet their requirements and works with them to strengthen their capacity to make informed decisions. This process requires a close collaboration between scientists who gather ocean and coastal data, those who extract information from observations and anticipate future conditions, and those who use the knowledge and forecasts in the management of our living world.

The need for GEO Blue Planet arises from escalating threats to ocean health, such as marine litter, habitat degradation, and climate impacts like sea-level rise. Coastal areas, especially in developing regions and island nations, face heightened vulnerabilities that require timely, actionable data to inform adaptation and resilience-building strategies. GEO Blue Planet's regional offices and global collaborations support global-to-local actors in making science-based decisions for sustainable development.

The timeliness of GEO Blue Planet's work is underscored by global climate and biodiversity crises, which demand urgent, data-driven interventions. The initiative aligns with international frameworks, including the United Nations Sustainable Development Goal 14 (Life below Water) and the global negotiations for a legally binding instrument on plastic pollution, supporting the need for coordinated, global efforts to protect marine environments. Digital tools, such as the Sargassum Information Hub for real-time Sargassum bloom monitoring and the development of

the Integrated Marine Debris Observing System, illustrate how GEO Blue Planet addresses these urgent needs with practical, scalable solutions.

Anticipated results include improved global access to ocean data-based information, strengthened general knowledge on marine monitoring and prediction, and the integration of observation and prediction data into policies that enhance resilience and sustainability. By providing essential, tailored information and fostering partnerships, GEO Blue Planet contributes to a resilient and sustainable future for global oceans, bridging the gap between science and policy to drive impactful change.

Objectives

GEO Blue Planet's main objective is to bridge the gap between ocean and coastal data and decision-making by transforming Ocean and Coastal Observation and Prediction data into accessible, policy-relevant information that aids in making informed decisions and policies in the pursuit of sustainable development. GEO Blue Planet works with stakeholders to understand their information needs, connects them with available data and products, supports the development of tools, and works with them to strengthen their capacity to make informed decisions.

GEO Blue Planet's objectives are organized across three core action areas: Stakeholder Engagement, Cooperation and Co-design, and Capacity Development:

- **Stakeholder Engagement** focuses on understanding end-user needs through outreach materials, regional workshops, consultations, and the development of white papers that translate Earth observation science into policy-relevant insights.
- **Cooperation and Co-design** connect experts, scientists, and users to co-develop tools and indicators for sustainable ocean and coastal management. These include support for global frameworks like the SDGs and the Paris Agreement. Information hubs are also co-created to make complex data accessible for non-experts.
- **Capacity Development** aims to build long-term capabilities in using Earth observation data. This includes offering targeted training for institutions, facilitating information exchange through best practices and ambassador programs, and ensuring the sustainability of useful tools by transferring them to operational agencies. GEO Blue Planet ensures that applications developed are maintained beyond temporary project lifecycles by securing long-term institutional support.

Point(s) of Contact

Audrey Hasson ahasson@geoblueplanet.org

Weather, Hazard, and Disaster Resilience

Flagships

GEO Global Water Sustainability (GEOGLOWS)

Focus Area(s):

- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Community Impact**
- **Open Data, Knowledge, and Infrastructure**

Challenge

Water security, a global issue with significant political, economic, social, and environmental implications, is not just a crucial factor but a fundamental necessity for maintaining stability across the world. Its importance cannot be overstated.

Many countries face the urgent task of maintaining monitoring networks and developing and providing information critical for protecting lives and property while supporting economic prosperity. The repercussions of insufficient water information and forecasting can be dire, especially for vulnerable regions and communities that may not receive timely warnings about potential flooding. The lack of water information leads to increased damage and loss of life. It disrupts planning for water resource allocation in agriculture, hydropower generation, and domestic use.

A critical challenge in achieving global water security is the fragmentation and inconsistency of water data infrastructure across different regions, organizations, and scales. However, the potential for significantly improved decision-making with unified data systems is a beacon of hope in this scenario. While vast amounts of water data exist globally, they often remain siloed, using different identifiers, formats, and access methods. This creates significant barriers to discovering and integrating relevant water data across jurisdictional boundaries, especially during critical events that affect multiple regions. The lack of a unified, standards-based approach to water data publication and discovery means valuable information about water resources often remains hidden or underutilized, hampering effective water management and response to water-related challenges, especially in developing accurate hydrological forecasting.

The lack of actionable information poses significant risks to infrastructure and disrupts economic activities due to unexpected flooding or droughts. Without timely information, policymakers are left grappling with the challenges of planning and mitigating droughts or floods, leading to inefficient resource management and heightened costs. Initiatives such as the United Nations' Early Warnings for All underscore the critical need for timely and actionable water data to enhance decision-making and reduce crisis vulnerability.

Solution

Equity is the cornerstone of GEOGLOWS, ensuring fair treatment and equal opportunities for all users, regardless of their individual circumstances. GEOGLOWS provides global, free, open

access to high-quality information on streamflow forecasts, historical streamflow data, and other related products, thereby connecting stakeholders from all corners of the world in the shared goal of effective water resource management.

Since its inception, GEOGLOWS has been a groundbreaking technology that revolutionizes the generation of hydrologic information. It is distinct for its unique approach to providing tailored hydrologic data services, which help bridge global knowledge and information gaps. Through a user-driven approach, GEOGLOWS ensures that stakeholders are integral to its success, identifying cost-effective and trustworthy EO components that improve the service to meet policy and decision-making needs. GEOGLOWS integrates EOs, models, and cutting-edge technologies to provide Earth Intelligence on water security.

The benefits of water information and forecasting are significant for water resources management, including more efficient resource allocation and reduced economic costs. However, the most crucial benefit is the potential to save lives. GEOGLOWS provides reliable 15-day ensemble forecasts and 80 years of historical streamflow data for every river in the world through a free and open web service. GEOGLOWS has been recognized by the WMO as an important initiative contributing to the objectives of the UN Secretary-General's call to ensure the implementation of "Early Warnings for All" by 2027.

GEOGLOWS has been designed as a supportive tool for local forecasters, with an emphasis on the crucial role of local knowledge and monitoring networks. In situ water data is part of the downscaling process from global to local information and the cornerstone of accurate streamflow forecasting. This collaborative approach ensures that GEOGLOWS is not just a global flagship but one that is deeply rooted in local expertise and understanding.

The Geoconnex system, currently operating in the United States, could provide a foundational data infrastructure solution supporting GEOGLOWS if extended to a global scope by creating a globally scalable infrastructure for water feature and monitoring data discovery and integration. Geoconnex enables discovery and linking of water-related geospatial features—like rivers, watersheds, aquifers, monitoring locations, and water infrastructure facilities—by establishing persistent identifiers for these features and standardized metadata publishing patterns. HydroServer complements this by providing the infrastructure to collect, store, manage, and share time series observations (like streamflow, water quality, or groundwater levels) from monitoring locations that can be linked to the features indexed in Geoconnex.

Together, these platforms support GEOGLOWS by providing the linking infrastructure needed to connect GEOGLOWS forecasts with both the social and hydrologic context for any given river reach of interest and the local observational data that can feed or benchmark forecast models. For example, a monitoring location identified in Geoconnex can be linked to both its position on a specific river reach and to its historical streamflow observations stored in HydroServer, allowing GEOGLOWS forecasts to be evaluated and bias-corrected using local data. The Geoconnex approach of using linked data principles and community reference features allows organizations to maintain sovereignty over their data while making both water features and their associated observations discoverable and interoperable within a global context.

Intended Socioeconomic and Environmental Impact

The GEOGLOWS Flagship is poised to transform water security by delivering critical Earth Intelligence to local stakeholders. Through enhanced data access and global hydrologic modeling, we aim to mitigate the socioeconomic impacts of floods and droughts, thereby reducing loss of life and economic hardship.

GEOGLOWS, in collaboration with the Lincoln Institute of Land Policy, the USGS, and Utah State University, is expanding its infrastructure capabilities to include Geoconnex, a community open-source project using persistent HTTP Uniform Resource Identifiers (URI) and associated web resources for spatial features that are meaningful to environmental science, and HydroServer, a comprehensive platform for water data collection, management, and sharing. This collaborative approach empowers vulnerable communities to implement effective water management practices, paving the way for sustainable development and resilience against climate impacts.

The expansion of Geoconnex to a global scope and its integration with GEOGLOWS, along with capacity development for data publication software suites such as HydroServer, would enable innumerable water data providers and users worldwide to place their data in local and regional contexts while enriching global forecasts with additional observational data.

For example, during transboundary flood events, emergency managers in shared river basins like the Mekong could rapidly discover and access information about flood control structures, port facilities, and power infrastructure from multiple countries alongside GEOGLOWS forecasts, improving response coordination. Agricultural planners could integrate local groundwater monitoring with regional streamflow and global drought forecasts to better manage irrigation scheduling. Dam operators along major rivers could combine upstream monitoring data from multiple agencies with forecast products to optimize reservoir operations while meeting downstream ecological flow requirements. Water quality managers could link point source monitoring data with watershed characteristics and streamflow predictions to better understand and manage pollution risks.

By providing the digital infrastructure to link water data across borders, Geoconnex and HydroServer will amplify the impact of the GEOGLOWS streamflow service by connecting their outputs with the entire ecosystem of water information. This would create a more complete and nuanced understanding of water resources globally while respecting the autonomy and expertise of local data providers, ultimately enabling more informed and coordinated water management decisions at all scales.

Objectives for 2025–2030

We aim to reach a high level of maturity and independence while remaining open to permanent innovation in delivering actionable information through open data and services using a global hydrologic model. GEOGLOWS will seek to empower local decision-makers, making them integral to solving the interconnected issues of water security and achieving the objectives of EW4ALL. GEOGLOWS seeks to remain in the GWP as a Mature Flagship, maintain the GEO brand, and exploit further opportunities for advancement and synergy.

Looking ahead to activities post-2025, we aim to strategically expand our collaborations to include essential elements of the service, such as flood mapping, groundwater information,

infrastructure for data management, and satellite water altimetry data. To achieve these objectives, we will connect projects sponsored by programs supporting innovation and co-creation development to advance water prediction and thus build community resilience to water-related challenges. Sharing data and expertise with other countries, particularly through organizations like the World Meteorological Organization (WMO), can significantly enhance our collective ability to provide accurate hydrological forecasts.

We will also integrate the theory of change in our capacity development initiatives to adequately measure the comprehensive impact of GEOGLOWS on climate change and adaptation, and to build confidence by effectively responding to stakeholder needs. Importantly, we are committed to continuously enhancing our service's functionality, ensuring it remains adaptable and future-ready by incorporating additional internet technologies for improved data access.

How We Work

Members of the GEOGLOWS Steering Committee

The GEOGLOWS Steering Committee provides strategy, policy, and technically related advice and recommendations to GEOGLOWS and to GEO when and as necessary and assesses progress on GEOGLOWS activities.

AQUAVEO (Michael Soufront), AWS (Joe Flasher), COPERNICUS (Peter Salamon), Esri (Steve Kopp), INAMHI (Bolivar Erazo), NASA-SERVIR (Dan Irwin), NOAA (Angelica Gutierrez), World Bank (Nagaraja Rao Harshadeep), and WMO (Dominique Berod).

Members of the GEOGLOWS Executive Board

Program Director (Angelica Gutierrez, NOAA), Technical Director (Riley Hales, BYU), Operations Director (Michael Souffront, AQUAVEO), and Partnerships Director (Jim Nelson, BYU).

GEOGLOWS Executive Secretary

AQUAVEO (Heidi Creer)

GEOGLOWS Components

Partnerships and Policy: BYU (Jim Nelson), Lincoln Institute of Land Policy (Peter Colohan), NASA-SERVIR (Dan Irwin), NBI (Calvince Wara), NOAA (Angelica Gutierrez), and WMO Secretariat (Rodney Martinez).

Products and Services: AQUAVEO (Michael Soufront), BYU (Riley Hales), and Esri (Steve Kopp).

Infrastructure: AQUAVEO (Michael Soufront), AWS (Joe Flasher), Lincoln Institute of Land Policy (Kyle Onda), and Utah State University (Jeff Horsburgh).

Capacity Development: AQUAVEO (Jorge Luis Sanchez) and BYU (Karina Larco).

Donors

European Centre for Medium-Range Weather Forecasts (ECMWF)	
United States	Amazon Web Services (AWS)
	Brigham Young University (BYU)
	Environmental Systems Research Institute (Esri)
	National Aeronautics and Space Administration (NASA)
	National Geospatial-Intelligence Agency (NGA)
	National Oceanic and Atmospheric Administration (NOAA)
	PREPARE Initiative
	United States Agency for International Development (USAID)
World Bank	
World Meteorological Organization (WMO)	

Partners

GEO Members	
United States	Amazon Web Services (AWS)
	AQUAVEO
	Brigham Young University (BYU)
	Lincoln Institute of Land Policy
	National Aeronautics and Space Administration (NASA)
	National Geospatial-Intelligence Agency (NGA)
	National Oceanic and Atmospheric Administration (NOAA)
	United States Agency for International Development (USAID)
	United States Geological Survey (USGS)
	Utah State University
GEO Participating Organizations	
European Centre for Medium-Range Weather Forecasts (ECMWF)	
World Bank	
World Meteorological Organization (WMO)	
GEO Associates	
Environmental Systems Research Institute (Esri)	
Non-affiliated	
Tethys Geoscience Foundation (TGF)	

Point(s) of Contact

Angelica Gutierrez angelica.gutierrez@noaa.gov

Geohazard Supersites and Natural Laboratories (GSNL)

Focus Area(s):

- **Weather, Hazard, and Disaster Resilience**

Challenge

Improve knowledge of seismic and volcanic hazards and deliver state-of-the-art scientific information to appropriate risk management agencies for immediate decision-making in the Prevention and Response phases of Disaster Risk Management (DRM).

Solution

We identify seismic or volcanic areas with strong geohazard levels, incomplete knowledge of geophysical processes, high vulnerability and/or exposure levels (high risk) and establish Geohazard Supersites or Natural Laboratories. Then, within an international collaboration framework, the local monitoring agencies, the CEOS space agencies, and the global scientific community work together, using an Open Science approach, to share EO and in situ data, knowledge, HW/SW resources, and instruments to support the best possible scientific information for hazard knowledge and risk management for local decision-makers. The Supersites are organized in a network to facilitate the sharing of knowledge, methods, data, resources, and researchers.

Intended Socioeconomic and Environmental Impact

The impacts at the scale of the Supersite are improved seismic and volcanic hazard assessment, improved geophysical monitoring, development of improved research/monitoring capacities for local agencies/institutes, increased international collaboration, and reduced loss of life and property during earthquakes and volcanic eruptions.

The general impact of the initiative is to demonstrate the advantages of using the Open Science approach, especially in developing countries, showing that data and knowledge sharing, as well as ethical international collaboration, are fundamental elements for enabling more effective risk management in society.

Objectives for 2025–2030

- We aim to establish a few additional Supersites (2–4), possibly in low-/middle-income countries.
- We will continue our capacity development activities, providing training (at least one training course per year) and HW/SW resources (at least four Virtual Machines for remote data processing/modeling) to support the development of state-of-the-art geohazard monitoring and scientific capacities at Volcano Observatories and geophysical institutes (at least two institutes involved in the training).
- We will continue to collaborate with the CEOS WG on Disasters to ensure that the Supersites are granted large quantities of satellite EO data (over 2,500 SAR images and 50 VHR optical images per year) for their monitoring and scientific needs.
- We will continue to promote the full Open Science approach at all the Supersites, stimulating open data sharing by the Supersite communities.

How We Work

The GSNL Chair and the Steering Committee decide on approval of new Supersites and strategic matters. The Management Board performs operational activities. Satellite data obtained from CEOS space agencies are open to the community via web services/catalogues. In situ data are made openly available by the local agencies. Digital data infrastructures are used as much as possible for easy sharing of information.

According to the procedures of national risk management frameworks, research results of direct use for hazard assessment and risk prevention/reduction are delivered by the Supersite coordinators to decision-makers, who exploit the information received in Prevention and Response activities.

Donors

Argentina	Comisión Nacional de Actividades Espaciales (CONAE)
France	Centre national d'études spatiales (CNES)
Germany	German Aerospace Center (DLR)
Italy	Agenzia Spaziale Italiana (ASI)
	Istituto Nazionale di Geofisica e Vulcanologia (INGV)

Partners

GEO Members	
Chile	Observatorio Volcanológico de los Andes del Sur (OVDAS), Servicio Nacional de Geologia y Mineria (SERNAGEOMIN)
China	Aerospace Information Research Institute, Chinese Academy of Sciences (AIR-CAS)
Democratic Republic of the Congo	Goma Volcano Observatory (GVO)
Ecuador	Instituto Geofísico de la Escuela Politécnica Nacional (IGEPN)
Iceland	Vedurstofa Islands, Icelandic Meteorological Office (IMO)
Italy	Istituto Nazionale di Geofisica e Vulcanologia (INGV)
New Zealand	GNS Science - Te Pū Ao, Institute of Geological and Nuclear Sciences
Nicaragua	Instituto Nicaragüense de Estudios Territoriales (INETER)
Philippines	Institute of Volcanology and Seismology (IVS)
Turkey	Kandilli Observatory and Earthquake Research Institute (KOERI)
United States	United States Geological Survey (USGS)
GEO Participating Organizations	
Working Group on Disasters, Committee on Earth Observation Satellites (CEOS)	

Point(s) of Contact

Michelle Parks michelle@vedur.is
Stefano Salvi stefano.salvi@ingv.it

Global Wildfire Information System (GWIS)

Focus Area(s):

- **Ecosystems, Biodiversity, and Carbon Management**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**

Challenge

Wildfires are one of the critical hazards that regularly cause very large damage to our environment, human health, and assets, and they create feedback for climate change by producing large amounts of CO_2 every year. Climate change is worsening the effects of wildfires by increasing the length of the fire season and the intensity of wildfires, which affect diverse areas and countries globally.

Solution

Basic needs for assessing and tackling the effects of wildfires on a global scale are the existence of: (1) an early warning system that helps populations and firefighting services increase preparedness before wildfires occur; (2) a near-real-time monitoring system for wildfires that provides accurate and rapid information on the distribution and impact of wildfires on a global scale; and (3) a global wildfire database at the country and sub-country levels that provides historical data on past wildfire events, including information on annual wildfire trends, seasonality, frequency, land cover damage, and emissions, supporting wildfire risk assessments.

These three applications are brought together in the modular structure of GWIS. The system supports the aims of the Early Warnings for All initiative of WMO and UNDRR. GWIS provides critical information on wildfire danger for all countries and near-real-time information on active fires and fire impacts, which is used by international, national, and regional organizations across the globe, while also providing critical information for countries to elaborate their National Determined Contributions to reduce greenhouse gas emissions as part of climate change mitigation.

GWIS provides the following services:

- **Fire danger forecast**: The GWIS fire danger forecast module provides forecast maps for one to nine days of fire danger levels.
- **Thermal anomalies** are retrieved by different satellite sensors. GWIS continuously updates its data sources and currently provides eight daily updates of wildfire activities across the globe.
- **Country profiles**: Country profiles include historical information, from 2002 to 2024, on the number of fires, burnt areas, land cover damage, fire seasonality, fire frequency, emissions, and more for all countries in the world at both country and sub-country levels (e.g., states within a country).
- **Monthly and seasonal temperature and precipitation anomalies**, as these variables are the main triggers of long-term or seasonal wildfire danger. This information is provided on a regional basis for all continents and regions in the world.

- **Weekly reports on wildfire activity**: These reports describe wildfire trends in a region over a specific period, comparing fire activity in the region to previous fire seasons, using a time series of data from 2012 to the current year.
- **Near-real-time statistical trends on wildfires**: Statistics are provided at the national level and for regions of interest.

Currently, GWIS runs using the data from Copernicus Emergency Management Services (JRC Copernicus EMS), Copernicus Atmosphere Monitoring Service & Global Fire Assimilation System (ECMWF), TERRA & ACQUA (NASA), and VIIRS (NASA/NOAA) SNPP, N20, N21.

Foreseen is the inclusion of new satellite sensors from geostationary satellite sensor, as well as the links to other global initiatives on wildfire monitoring.

Intended Socioeconomic and Environmental Impact

The activity aims to provide data and tools for countries and international organizations to enhance wildfire management and mitigate wildfire impacts. GWIS already provides up-to-date reports on the environmental impact of wildfires for all countries in the world, including information on the number of fires, burnt areas, thermal anomalies, emissions of pollutants, and wildfire danger. This information is automatically updated in GWIS up to ten times every day.

The data are used by, for example: (1) countries in Latin America and the Caribbean, engaged through the AMAZONIA+ program of the European Union; (2) the African Union, through weekly bulletins generated from GWIS data; (3) the Amazon Treaty Cooperation Organization (ACTO), in its Amazon Regional Observatory (ARO); and (4) the UN FAO Global Fire Hub.

GWIS contributes to UNDRR and WMO activities, being part of the Task Force on Fire Weather.

Objectives for 2025–2030

The objective of GWIS is to address specific needs regarding wildfire information and management at the following scales:

- Global, through WMO, UNDRR, FAO, and UNEP.
- Regional, through collaboration with regional networks, such as Expert Group on Forest Fires in Latin America and the Caribbean, Expert Group on Forest Fires in Europe, Middle East and North Africa, Amazon Cooperation Treaty Organization (ACTO), African Union, and Artic Council.
- National, through direct collaboration with countries, specifically in Europe, South America, Mexico, the USA, and Canada.

Enhance GWIS services through:

- Inclusion of new satellite sensors and new technology, e.g., AI for image processing and wildfire behavior.
- Support from the EU and USA project on AI for Public Good, to be implemented by the JRC with US partners starting in 2025.

How We Work

The GWIS core team is at the Joint Research Centre (JRC). This team cooperates with European and global partners through three expert networks, in which JRC acts as coordinator:

- Expert Group on Forest Fires in Europe, Middle East and North Africa.
- Expert Group on Forest Fires in Latin America and the Caribbean.
- GWIS/Global Observation of Forest Cover Fire Implementation Team, composed of remote sensing experts for wildfire monitoring.

In addition, GWIS collaborates with other regional initiatives, such as those of NASA-SERVIR in South America, the Himalayas, and the ASEAN region regarding smoke pollution from wildfires.

Donors

European Commission	Artificial Intelligence Office, Communications Networks, Content and Technology (CNECT)
	Civil Protection and Humanitarian Aid Office (ECHO)
	Defence Industry and Space (DEFIS)
	International Partnerships (INTPA)
	Joint Research Centre (JRC)

Partners

GEO Members	
Canada	Canada Natural Resources
European Commission	
United States	National Aeronautics and Space Administration (NASA)
	National Oceanic and Atmospheric Administration (NOAA)

Point(s) of Contact

Fernando Sedano fernando.sedano@ec.europa.eu
Jesus San-Miguel jesus.san-miguel@ec.europa.eu

Initiatives

Earth Observations for Disaster Risk Management (EO4DRM)

Focus Area(s):

- **Climate, Energy, and Urbanization**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Open Data, Knowledge, and Infrastructure**

Challenge

Disasters, including climate-related disasters, are increasing in frequency and intensity, placing immense pressure on vulnerable communities worldwide. Small Island Developing States (SIDS) and Least Developed Countries (LDCs) are particularly at risk and are already facing devastating impacts, such as storms, floods, droughts, and rising sea levels. These communities bear the brunt of climate crises, and the need for risk-informed policies and disaster risk reduction measures has never been more urgent.

Unleashing the power of innovation and technology based on Earth observations is needed more than ever. Significant reductions in fatalities and property damage can be achieved by strengthening cooperation and data sharing for satellite and surface data to manage risks posed by fires, floods, earthquakes, and other hazards. Better information, made widely accessible, leads to improved understanding of disaster risk.

Solution

EO4DRM consists of a series of disaster risk-related activities involving the use of Earth observation satellite data and its integration into standard risk management practices, including work relating to hazards, vulnerability, and exposure. This is applied across the full cycle of disaster risk reduction (DRR) and disaster risk management (DRM), as well as the two pillars of the United Nations Early Warnings for All (EW4All) initiative: Pillar 1, on disaster risk knowledge, and Pillar 2, on detection, observations, monitoring, analysis, and forecasting of hazards.

EO4DRM serves this purpose by bringing together efforts from CEOS WG Disasters (leveraging EO satellite observations), in coordination and collaboration with GEO DRR-WG and the GEO Secretariat, including support for scaling up EO technology and innovation for the implementation of EW4All. Satellite-based solutions are developed and tested in pilot (standalone activity) and demonstrator (towards sustainability and scale-up) phases in the areas of numerous natural hazards, such as floods, volcanoes, landslides, seismic events, and wildfires, as well as multi-thematic issues related to post-disaster support.

Within EO4DRM, there are six pilot and demonstrator activities in accordance with each of the thematic areas: Wildfire Pilot, Flood Pilot, Seismic Hazards Demonstrator, Volcano Demonstrator, Landslide Demonstrator, and Recovery Observatory Demonstrator. Through them, various actionable risk information is produced, such as maps on flood extent and depth, and impact assessment maps for the Post Disaster Needs Assessment (PDNA), two semi-

operational products that this application focuses on. Other work on wildfire, seismic and volcanic hazards, and landslides continues to further define output products.

Intended Socioeconomic and Environmental Impact

EO4DRM's disaster knowledge solutions have been developed in coordination and collaboration with development agencies and finance mechanisms, such as UNDP and the World Bank, with and for relevant government agencies to use as the basis for disaster risk management policy and actions. Overall, the socioeconomic and environmental impact that EO4DRM aims to create is to support the livelihoods of affected populations/governments, achieve monetary savings, and protect agricultural and environmental assets.

Similarly, improved mappings of floodwater extent and depth help users understand the level of flood inundation. Users, such as emergency management communities, receive support for their emergency operations and longer-term work on recovery planning and operations after a flooding event with improved estimates of damage and impacts.

Objectives for 2025–2030

The major objectives for 2025–2030 are improvement of existing products and user expansion.

How We Work

As mentioned above, the core team is the CEOS Working Group Disaster team, consisting of CEOS members from EO satellite agencies. The CEOS Working Group Disaster is currently chaired by CONAE. The working group meets twice a year in a hybrid format, while each team of independent thematic activities works continuously throughout the year.

Donors

Centre national d'études spatiales (CNES), France

Partners

GEO Members	
Argentina	Comisión Nacional de Actividades Espaciales (CONAE)
Canada	Canadian Space Agency (CSA)
	Natural Resources Canada (NRCAN)
France	National Centre for Scientific Research (CNRS)
Italy	Istituto Nazionale di Geofisica e Vulcanologia (INGV)
United States	National Aeronautics and Space Administration (NASA)
	National Oceanic and Atmospheric Administration (NOAA)
GEO Participating Organizations	
European Space Agency (ESA)	
Food and Agriculture Organization of the United Nations (FAO)	
United Nations Office for Outer Space Affairs (UNOOSA)	

Point(s) of Contact

Laura Frulla	lfrulla@conae.gob.ar
Lorant Czaran	czaran@un.org
Marcelo Uriburu Quirno	muriburu@conae.gob.ar
Working Group on Disasters, CEOS	ceos-wgd.conae@conae.gov.ar

Night-Time Light Remote Sensing for Sustainable Development Goals (NIGHT-LIGHT)

Focus Area(s):

- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **Weather, Hazard, and Disaster Resilience**

Challenge

GEO Night Light, a Pilot Initiative of the GEO Work Programme 2023-2025, was set up to support the 2030 Sustainable Development Goals by using night-time light remote sensing. It has achieved significant international impact, attracting more scientists and users to join and build a wider network. However, the current GEO Night Light team is small, with China and the United Nations Satellite Centre as its two major members, and this limitation has hindered wider applications of GEO Night Light because its channels to deliver products and receive requests are narrow. Therefore, it is urgent to upgrade GEO Night Light team with more participants and greater diversity.

Solution

We aim to upgrade GEO Night Light from a Pilot Initiative to an Initiative in the Post-2025 Work Programme. During the post-2025 period, we will make GEO Night Light more actionable and more beneficial to users.

Firstly, new participants will include international organizations, such as UNOOSA and UN-Habitat, which are also users of GEO Night Light. Secondly, the participants will be much more regionally representative, especially in the Global South. Lastly, we will add experts from well-known global institutes (e.g., NASA and CBAS), who are able to provide high-quality night-time light data and related products.

Intended Socioeconomic and Environmental Impact

GEO Night Light is expected to make (but not limited to) the following impacts. Firstly, disaster products from night light data will help humanitarian relief organizations provide more efficient aid and, thus, may save lives. Secondly, light pollution maps and reports from night light data will help persuade municipalities and national park managers to control light pollution, which will help save energy and protect local residents and ecosystems from light pollution. Thirdly, wealth index maps from night light data will help development agencies take poverty reduction actions in regions and for populations that need aid the most. Fourthly, the urban living condition evaluation product will help development organizations rehabilitate cities in the Global South.

Objectives for 2025–2030

The following are the four products that will be provided by GEO Night Light in the post-2025 period:

- **Humanitarian Disaster Evaluation Report**: Activated by users, we will provide power supply evaluation and regional damage reports for major disasters and conflicts each year.

The way to produce and release these products is relatively mature within GEO Night Light, but users will be expanded to more international organizations, such IFRC, ICRC, and WFP.

- **Light Pollution Map and Evaluation Report**: We will produce a global light pollution change monitoring map annually, and we will evaluate the impact of light pollution on biodiversity in cities and ecological protection areas. This product will directly support biodiversity conservation and dark sky protection by controlling light pollution, and users will include UNEP and environmental protection organizations.
- **Wealth Index Map**: The Wealth Index is the foundation for estimating poverty and economic development for the SDGs. Currently, Wealth Index data consists of sparsely available ground-survey data. Our product will be at 500-meter resolution over the African Continent, Southeast Asia, and Latin America, as well as other regions in need of assessment, and it will be updated annually. In this product, there will be a special subproduct for indigenous settlements, for which the production process will incorporate indigenous knowledge. It will help users, such as UNDP and the Asian Development Bank, make more accurate decisions on poverty reduction.
- **Urban Living Condition Report**: The comprehensive living conditions, considering lighting infrastructure and other factors, such as greenery, will be evaluated for cities with more than five million people in the Global South. This kind of evaluation report will add knowledge to the World Cities Report produced by UN-Habitat.

How We Work

GEO Night Light will have more than 30 individual participants, and the organizational structure is simple. Each lead, with a strong technical background in night-time light remote sensing, will direct one or two sub-teams of GEO Night Light. Each lead or other core member will be connected to one or more users/stakeholders and will discuss with them to design and deliver appropriate products. Some of the GEO Night Light participants are also users, such as experts from UN-Habitat, who not only work on providing products but also use and share the products with their colleagues in UN-Habitat.

Donors

China	Duke Kunshan University
	Wuhan University
	Zhilan Foundation
Ghana	University of Energy and Natural Resources (UENR)
United States	National Aeronautics and Space Administration (NASA)

Partners

GEO Members	
Armenia	Disaster Risk Reduction National Platform, ARNAP Foundation
Brazil	Federal University of Santa Maria
China	Chinese University of Hong Kong
	Duke Kunshan University

	Hong Kong Polytechnic University
	Origin Space Technology Co., Ltd.
	Shenzhen Astronomical Observatory
	Sun Yat-sen University
	Wuhan University
Germany	German Research Center for Geosciences
Ghana	University of Energy and Natural Resources (UENR)
Ireland	Trinity College Dublin
Mongolia	Mongolian Geospatial Association
Netherlands	University of Twente
South Africa	University of the Witwatersrand
Spain	Complutense University of Madrid
Switzerland	Swiss Federal Technology Institute of Lausanne
United States	National Aeronautics and Space Administration (NASA)
Uzbekistan	Tashkent Institute of Irrigation and Agricultural Mechanization Engineers Institute
GEO Participating Organizations	
International Research Center of Big Data for Sustainable Development Goals (CBAS)	
Regional Centre for Mapping of Resources for Development (RCMRD)	
United Nations Institute for Training and Research (UNITAR)	
United Nations Office for Outer Space Affairs (UNOOSA)	
World Food Programme (WFP)	
Non-affiliated	
United Nations Global Service Centre (UNGSC)	
United Nations Human Settlements Programme (UN-Habitat)	

Point(s) of Contact

Xi Li lixi@whu.edu.cn, li_rs@163.com

Pilots

A Decision-Making System for Slope Risk Deduction (SLOPE-RISK-GPT)

Focus Area(s):

- **Weather, Hazard, and Disaster Resilience**

Challenge

The availability of open-access databases offering free access to multi-source data has greatly accelerated global efforts in landslide risk management. Researchers have been actively working to develop various methods for interpreting landslide-related data. However, the effective application of open data in landslide risk reduction is still hindered by the lack of general-purpose data mining methods. While open data holds immense potential for landslide risk management, its transformation into actionable knowledge for decision-making and slope reinforcement remains a significant challenge. This gap underscores the need for further advancements in knowledge extraction techniques to make open data truly usable in landslide risk reduction.

Solution

To tackle the challenge, an autonomous decision-making system is proposed for slope risk assessment and landslide mitigation based on multimodal large models. By utilizing multimodal large models, the system can retrieve multi-source data, analyze unstructured data, integrate information, and intelligently extract disaster factors. It also supports traceability and human-in-the-loop corrections to minimize model hallucinations. The system autonomously applies specialized algorithms for slope stability analysis, 3D reconstruction, and disaster prediction. The integration of engineering insights, industry reports, research papers, and policies into its knowledge base, using multi-agent and chain-of-thought reasoning, consequently provides reliable engineering suggestions, risk assessments, and impact analyses.

Intended Socioeconomic and Environmental Impact

This system serves as an operational example of transforming open data into open knowledge, specifically for geohazard management, providing a practical reference for other domains. Its capability for autonomous data acquisition and information extraction creates a user-friendly environment, enabling users to effectively manage and mitigate geohazards with essential slope-related data input. Additionally, its intelligent reasoning-based autonomous decision-making technique further enhances users' capabilities. By streamlining data processing and analysis, the system facilitates faster, more accurate response strategies, improving emergency efficiency and enabling effective resource allocation. As such, the system can play a key role in minimizing potential damage and safeguarding communities.

Objectives for 2025–2030

- **Introduction of New Products**: Develop a multi-source data interpretation and autonomous decision-making system for disaster prevention using multimodal large models.
- **Improvements to Existing Products**: Enhance the system's ability to integrate and analyze unstructured data, extract key disaster factors, and ensure information reliability. Incorporate advanced reasoning capabilities for professional analyses, such as numerical slope stability analysis and statistical modeling-based disaster prediction.
- **User Expansion**: Increase adoption among local governments and organizations by providing reliable, automated disaster prevention solutions, thereby broadening the user base.
- **New Impact**: Enable intelligent and autonomous disaster management, improving the efficiency and effectiveness of disaster prevention and mitigation efforts.

How We Work

The project involves a core working group from Beihang University (China), the University of Urbino (Italy), the United Nations University Institute for Water, Environment and Health (Canada), and Srinakharinwirot University (Thailand). The project is structured into three groups: (1) science and engineering team, (2) secretariat, and (3) supervisory committee.

The first Project Coordination Committee (PCC) meeting will discuss the project's goals, methodology, expected outcomes, milestones, and deadlines. The PCC will convene biannually to review progress, with overall project supervision led by the Team Lead.

Donors

Hangzhou International Innovation Institute, Beihang University, China

Partners

GEO Members	
China	Guangxi Traffic Investment Group

Point(s) of Contact

Lingfeng He lingfeng_he@buaa.edu.cn

Conveners

Space and Security (SPACE-SECURITY)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Water and Land Sustainability**

Concept

Scope

This Convener, building on the foundation laid by the SPACE-SECURITY initiative (since 2015), aims to serve as a vital link for fostering connection and integration across the GEO Focus Areas. It addresses the increasing need for comprehensive solutions to enhance the safety and security of citizens and societies by leveraging Earth observation (EO) data, continuing the mission to raise awareness of and promote the adoption of geospatial open data and advanced technologies among relevant stakeholders. Emphasizing food, water, and climate security as critical global challenges, the initiative focuses on fostering collaboration, articulating research and innovation actions, and supporting evidence-based decision-making to enhance the decision-making processes of stakeholders working in relevant scenarios. Aligned with the first goal of the GEO 2025–2030 Strategy Implementation Plan, the Convener will support the development of impactful applications to deliver Earth Intelligence while fostering collaboration and the co-design of solutions within the GEO framework.

Need

Security is an intricate domain. Scenarios are very diverse in terms of actors, actions, and decision-making processes, which leads to a wide range of needs to be satisfied. Today, global issues have further broadened the scope of security scenarios. Food, water, and climate security are examples of these relatively new scenarios in which actors and practitioners are demanding more and more reliable information to enhance their decision-making processes.

EO data is a recognized key tool for monitoring local, regional, and global issues and for supporting the understanding of their consequences. Its unique characteristics (e.g., historical registry to identify trends and anomalies, continuous monitoring of large areas, estimation and prediction of physical variables, and access to observations in remote locations where in situ data is not available) open the door to innovative ideas and solutions in support of civil security.

Timeliness

GEO gathers hundreds of actors working to foster the use of EO data in different domains. Focused on addressing the diverse security scenarios emerging in recent years, this Convener will serve as a vital link for continuously identifying relevant ongoing and planned activities across the different Focus Areas, facilitating cross-domain cooperation for a more holistic and comprehensive approach to civil security.

Expected Results

By leveraging Earth Observation (EO) data, collateral data, and associated technologies, the group will create a collaborative platform that brings together partners from diverse sectors engaged in security-related activities, facilitating cross-domain cooperation.

SPACE-SECURITY will bring together different stakeholders, including governmental and non-governmental organizations, private sector entities, and academia, that either currently benefit from or seek to benefit from space-based EO data and related technologies to respond to food, water, and/or climate security issues.

The list of initial stakeholders involved in SPACE-SECURITY includes:

- The European Union Satellite Centre (SatCen) will act as the leader of the group, leveraging its operational role in the provision of geospatial intelligence products and applications to the EU community to identify new needs and use cases that would be better addressed with innovative EO-based solutions.
- The European Space Agency (ESA) will act as a technology advisor, a potential space data provider, and a facilitator for access to technologies or platforms.
- The World Food Programme (WFP) will act as an operational partner, facilitating connections with field offices in key locations suffering from food, water, and climate issues.
- EuroGeoSurveys will contribute its geoscience expertise, fostering inter-regional and international cooperation to access data and share information about environmental risk assessment and common-interest scenarios.
- The IHE Delft Institute for Water Education will support capacity building and offer specialized knowledge in water management.

In addition, the following stakeholders are involved in initial discussions and are expected to also contribute to the cross-domain fertilization activities:

- The European Commission could provide advice in line with EU policies and programmes.
- EuroGEO, represented by the European Commission, and AmeriGEO, represented by NOAA, could contribute with up-to-date information about regional initiatives, policy support, and advisory inputs, aligning SPACE-SECURITY with relevant environmental and security strategies.
- The National Aeronautics and Space Administration (NASA) could support the use of global EO datasets, exploiting outcomes from scientific research and technological innovations.
- The European Association of Remote Sensing Companies (EARSC) could foster industry engagement, facilitating collaboration with the private sector.
- The United Nations Office for Disaster Risk Reduction (UNDRR) could contribute as an advisor for disaster-related scenarios concerning food, water, or climate security.
- The World Resources Institute (WRI) could act as a point of contact with local entities and research organizations, promoting data-driven insights and policy recommendations for sustainability.

A major focus of the group will be identifying observational and capability gaps that can be addressed through space-based assets. It will work towards the integration of relevant innovative

applications, services, and platforms to fill these gaps, helping stakeholders assess risks more effectively and make informed decisions.

Through these efforts, the Convener aims to strengthen the security footprint within the Global Earth Observation System of Systems (GEOSS), improving coordination across domains. It will also extend the role of EO in providing reliable, actionable data for global security frameworks, such as the United Nations 2030 Agenda, the Paris Agreement, and the Sendai Framework for Disaster Risk Reduction. By enhancing collaboration and knowledge-sharing, this Convener will contribute to achieving Sustainable Development Goals (SDGs) relevant to security.

Objectives

- Disseminate and communicate space and security activities, and engage stakeholders by actively communicating activities aligned with global security frameworks while also engaging new partners to expand the GEO community. Focus on involving users and policymakers in developing pre-operational services to address security issues.
- With a focus on cross-domain security scenarios, facilitate connections between activities performed in different Focus Areas or between a specific Focus Area and a security need.
- Articulate research and innovation actions, supporting cross-Focus-Area security-related solutions.

Point(s) of Contact

Sergio Albani sergio.albani@satcen.europa.eu
Paula Saameno paula.saameno@satcen.europa.eu

Enabling Mechanisms

Community Impact

GEO Capacity Building in the Balkans, Black Sea, Middle East, Africa, and Pacific Asia Regions (GEO-CRADLE)

Focus Area(s):

- **One Health**
- **Weather, Hazard, and Disaster Resilience**
- **Community Impact**
- **Open Data, Knowledge, and Infrastructure**

Concept

The purpose of the GEO-CRADLE Enabler is to coordinate sustainable GEO capacity-building action and support feasibility studies for demonstrating the value of EO, leveraging GEO and EuroGEO innovation in the Balkans, Black Sea, Middle East, Africa, and Pacific Asia regions.

It is strongly motivated by the need to capitalize on, sustain, and scale up the important results achieved by European activities:

- GEO-CRADLE, initially an H2020 Project, then a GEO Community Activity, and later a GEO Initiative.
- e-shape H2020 Project, which brought together key European actors to ensure the optimal implementation of EuroGEO and the delivery of EO-based benefits to a wide range of stakeholders in key societal areas.
- The EuroGEO Disaster Resilience and Health Action Group, including the Early Warning System for Mosquito Borne Diseases (EYWA), Winner of the first EIC Horizon Prize on Early Warning for Epidemics, a prototype system addressing critical public health needs in Europe, Sub-Saharan Africa, and beyond.

GEO-CRADLE will receive strong support through the engagement of new, large, and skilled EO communities:

- The scientific communities, in cooperation with IEEE-GRSS, a community of researchers, academicians, and practitioners collaborating and designing tools to understand our interaction with Earth's ecosystems, monitor Earth's environments, oceans, and ice caps, and characterize potential risks by exploiting EO and big data.
- The Indigenous communities, in cooperation with the GEO Indigenous Alliance, which protects and conserves Indigenous Cultural Heritage by using EO science, data, and technology to create a knowledge base that sustains the Earth we live on.
- The volunteer and societal communities, in cooperation with HOT, an international team dedicated to humanitarian action and community development through open mapping, working together with local communities and Indigenous people in Africa, Asia, and the Pacific.

- UN-SPIDER, which conducts international workshops, training courses, and pilot projects and also prepares and distributes reports, studies, and publications for the benefit of developing nations.
- Digital Earth Africa, which provides open data and infrastructure, processes openly accessible and freely available EO data, leveraging and building on existing capacity, working closely with the AfriGEO community to produce decision-ready products in response to the information needs, challenges, and priorities of the African continent, and also implements a capacity-building program for all African countries, targeting multi-sectoral users.
- Digital Earth Pacific, which provides decision-makers with the information needed to make sound decisions addressing the Pacific's challenges, most notably climate change, food security, and disaster, using EO at scale to achieve sustainable development.
- The private sector, with the SMEs of the GEO-CRADLE network, the EuroGEO Disaster Resilience and Health Action Group, EARSC, EDGE, which provides state-of-the-art EO products and services, as well as tailor-made technical support and training, and Healthsites, building a global commons of health facility data by making OpenStreetMap useful to the medical community and humanitarian sector.
- The ERATOSTHENES Centre of Excellence, a hub for EO activities in the Eastern Mediterranean area (North Africa and the Middle East).

Objectives

- Analyzing and assessing the EO needs and priorities in the regions under consideration and reporting on the existing EO gaps to build an inclusive action and intelligence for all, by running maturity assessment studies in EO, leveraging the GEO-CRADLE methodology, which is widely used and serves as the methodological standard today.
- Mapping the existing EO observational capacities and skills and developing a roadmap for integrating them at a regional scale for the benefit of all.
- Identifying stakeholder and decision-making communities and practitioners, and reporting on the EO gaps; concluding on needed training and curriculum support locally in the specific GEO Focus Areas (Weather, Hazard, and Disaster Resilience and One Health).
- Training young professionals and motivating the creation of EO curricula. Delivering training workshops and advancing the level of trainers, users, and practitioners on the use of EO locally. Focusing on the use of GEO, EuroGEO, and Copernicus, as well as the exploitation of data, expertise, tools, capacities, training, and skills offered by the collaborating Institutions, namely Digital Earth Africa, Digital Earth Pacific, UN-SPIDER, IEEE-GRSS, EARSC, HOT, and the GEO Indigenous Alliance.
- Increasing awareness about EO and supporting the uptake of GEO, Copernicus, and EuroGEO solutions with the support of Digital Earth Africa, Digital Earth Pacific, EDGE, HOT, Healthsites, UN-SPIDER, EARSC, the GEO Indigenous Alliance, the GEO Disaster Risk Reduction WG and the GEO Capacity Development WG. Considering how user experiences can be transformed through various elements of the EO value chain, such as data collection (improving timeliness for quicker decision-making), data processing (using AI for more accurate results), co-design (using citizen science for real-world impact), and decision support (using automated alerts for non-experts to leverage EO).

- Facilitating cooperation among three Regional GEOs: EuroGEO, AfriGEO and AOGEO.

Point(s) of Contact

Haris Kontoes kontoes@noa.gr
Alexia Tsouni alexiatsouni@noa.gr

GEO Indigenous Alliance (GEO-IA)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **One Health**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Community Impact**
- **Open Data, Knowledge, and Infrastructure**

Concept

The establishment of the GEO Indigenous Alliance (GEO-IA) in 2019 stems from the urgent need to recognize and address the historical marginalization and exclusion of Indigenous Peoples in the development and use of geospatial data and Earth observation initiatives. Indigenous Peoples, with their deep connections to land, ecosystems, and traditional knowledge, offer unique insights and perspectives that are essential for understanding and sustainably managing the Earth's resources.

For centuries, Indigenous Peoples have been stewards of their ancestral lands and have a deep understanding of their environment. However, as the space sector and Earth observation technologies have evolved, the meaningful participation and inclusion of Indigenous Peoples have often been neglected, resulting in a significant information gap and lack of cultural sensitivity in data collection, analysis, and decision-making processes.

Recognizing the importance of rectifying this historical injustice and promoting meaningful collaboration, the GEO Indigenous Alliance was established by Indigenous leaders as an essential platform. Its creation acknowledges the urgency of honoring the rights, knowledge systems, and perspectives of Indigenous Peoples as key stakeholders in global efforts to understand, manage, and protect our planet.

GEO-IA recognizes that the active participation of Indigenous Peoples is not only a matter of inclusion but a necessity for finding comprehensive and effective solutions to the world's environmental challenges. Indigenous Peoples' knowledge, passed down through generations, encompasses a holistic understanding of ecosystems, climate patterns, biodiversity, and sustainable resource management. By integrating this valuable knowledge with modern Earth observation technologies, we can enhance our collective understanding of the Earth's systems and develop more sustainable and equitable solutions. By leveraging Indigenous knowledge and expertise, GEO-IA contributes to a more inclusive, equitable, and sustainable approach to Earth observation initiatives that benefit Indigenous communities, the scientific community, and global efforts to harmoniously coexist with our planet.

As a candidate for the Convenor role within the GEO community, GEO-IA seeks to foster meaningful engagement with Indigenous Peoples and their communities while bridging relationships with GEO partners and the space sector. This culturally qualified group of spatial experts will assist GEO's programs by ensuring cultural balance and respect throughout the

engagement and outcome process. One of the primary goals of GEO-IA is to assist the GEO community in fulfilling its obligations under the United Nations Declaration on the Rights of Indigenous Peoples. This declaration recognizes the rights and inherent sovereignty of Indigenous Peoples and emphasizes the importance of their participation and involvement in decision-making processes that affect their lands, territories, and resources.

By utilizing GEO-IA as a Convenor within the GEO community, GEO will pragmatically fulfill its obligations under the UN Declaration on the Rights of Indigenous Peoples and actively promote Indigenous participation and the utilization of Earth observation Data.

Objectives

GEO-IA aims to:

- Provide a qualified, trusted, two-way conduit between the key global Indigenous partners and the GEO community.
- Establish a collaborative and supportive global network of Indigenous and non-Indigenous leaders who will advocate for the Indigenous participation and the utilization of Earth observation data.
- Promote access to and use of Earth observation data and tools to assist decision-making by Indigenous communities.
- Support Indigenous and underrepresented communities in accessing and co-developing the suite of Earth observation tools within the cultural context of their lands.
- Acknowledge the benefits for all parties to learn from the inclusion of and lessons learned by Indigenous populations.
- Advocate for policies and practices that recognize and respect the rights and knowledge of Indigenous peoples in accessing and using Earth observation data.
- Facilitate the exchange of knowledge, experiences, and best practices among Indigenous peoples, Earth observation experts, and other stakeholders on the use of Earth observation data by Indigenous peoples.

Point(s) of Contact

Diana Mastracci diana@space4innovation.com
James Rattling Leaf Sr. jamesrl413@gmail.com
Kriton Glenn kriton.glenn@gmail.com
Mario Vargas Shakaim shakaimmario@hotmail.com
Titus Letaapo titus@sararafoundation.org

GEO Youth Community of Practice (GEO-YOUTH)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **One Health**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Community Impact**
- **Open Data, Knowledge, and Infrastructure**

Concept

The proposal aims to strengthen and institutionalize youth engagement within the Group on Earth Observations (GEO) by clearly defining and expanding youths' role across GEO. The Enabler will rejuvenate the GEO Youth Community of Practice (CoP) to create an inclusive, global platform that fosters meaningful interaction between young professionals and GEO's decision-making structures. By embedding youth governance and co-production into GEO activities, this initiative ensures that youth perspectives shape GEO's transformative Earth Intelligence solutions, enhancing global sustainability efforts.

There is a longstanding demand for GEO to move beyond participatory youth engagement. Since its inception in 2021, the GEO Youth CoP has explored the needs of the community and identified potential areas for development. Youth in the GEO community have requested formal positions in the GEO governance structure and "engagement beyond representation." Additionally, a key component identified in the Post-2025 Strategy, and raised at the 2023 Cape Town Youth Declaration, was the necessity of incorporating diverse voices (including Indigenous knowledge, geographical diversity, and youth) to successfully build an interdisciplinary Work Programme. These insights highlight that youth in the GEO community are invested in gaining structured representation within GEO, are unsatisfied with participatory engagement alone, and are already aware of Earth Intelligence's potential as a solution to global challenges.

These insights highlight the massive untapped potential for GEO and GEO Youth to mutually benefit from critical, deliberate engagement with one another. GEO-YOUTH is an essential step toward realizing, rather than merely acknowledging, this potential. It also addresses the disparity between the youth engagement goals outlined in the Post-2025 Strategy and the current Strategic Implementation Plan.

The approach of GEO-YOUTH will directly respond to GEO's Post-2025 Strategy, which calls for increased youth participation in developing Earth Intelligence and recognizes young people as catalysts for sustainable development. GEO-YOUTH will enhance GEO's existing participatory youth engagement and forge pathways to youth representation, ensuring GEO youth are equipped with the skills, networks, and resources to maximize their potential to contribute to the EO community.

The GEO Youth CoP will transform into an active, global network that promotes the co-production of EO services, fosters knowledge exchange, and empowers youth as central

contributors to GEO's objectives and Work Programme activities. It will proactively engage the youth community across other Focus Areas within the GEO Work Programme, such as GEO Land Degradation Neutrality, GEO Indigenous Alliance, as well as regional GEOs, to fully leverage existing resources.

Objectives

As digital natives, youth bring fresh, innovative perspectives and advanced technical skills. Their academic backgrounds are often more current and aligned with today's technological landscape, making their expertise particularly relevant and adaptable to modern challenges. GEO-YOUTH will facilitate formal representation of youth within GEO governance structures and the active participation of youth in GEO Work Programme activities, ensuring that their contributions are integral to GEO decision-making, strategic planning, and programmatic implementation. This initiative aims to establish mechanisms that promote equitable, interdisciplinary youth collaboration across GEO's Work Programme.

Specific objectives include:

- Fostering connections between the GEO youth community and academia, academic institutions, and international and civil society organizations.
- Ensuring youth gain skills and an understanding of how to apply EO data effectively in a variety of contexts.
- Active youth participation in GEO governance.
- leveraging and elevating existing youth engagement mechanisms within regional GEOs to strengthen the Youth CoP's impact and reach.
- Developing and implementing strategies that will enable the Youth CoP to become self-sustaining, ensuring its long-term visibility and reducing dependence on external resources.

Point(s) of Contact

Lela Gomersall lgomersall@geosec.org
Samuel Amos samos@geosec.org

Linking and Connecting Women in Earth Observation and Earth Intelligence (GEO-WOMEN)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Weather, Hazard, and Disaster Resilience**
- **Open Data, Knowledge, and Infrastructure**

Concept

The adoption of Earth observation (EO) and Earth Intelligence (EI) technologies has significantly advanced global understanding of environmental dynamics and challenges, enabling data-driven decision-making across sectors such as agriculture, food security, disaster resilience, and climate change. As the Group on Earth Observations (GEO) prepares its Post-2025 Strategy, fostering collaboration and strengthening the networks of women's participation in marginalized communities within these fields is essential for building a collaborative, accessible Earth data ecosystem. However, despite their role in EO and EI, women remain underrepresented, with many impact stories left untold, limiting their participation in applying EO and EI to solve environmental challenges.

Women's role in agriculture, food security, and community resilience against climate-related hazards and disasters, especially in rural and marginalized areas of the Global South, cannot be underestimated. They are often the primary stewards of natural resources, key players in household food production and supply management, and central to community disaster preparedness, resilience building, and recovery. Yet, participation and active engagement in EO and EI fields remain limited due to barriers such as limited access to training, technology, and financial resources. Similarly, women in the Global North face biases and limited access to opportunities, resulting in underrepresentation in leadership positions within EO and EI.

Objectives

The purpose of this project is to contribute to an inclusive GEO Post-2025 Strategy by measuring and communicating the role women play and the impact they make in EO and EI, creating a more inclusive environment where women can lead and innovate in EI for sustainable development. Empowering women in these critical areas will not only enhance EO and EI applications but also drive transformative participation in global challenges in agriculture, disaster management, energy, and climate change.

Bridging this gap by connecting women in EO and EI from the Global North and South can enhance knowledge-sharing and mentorship and provide a safe space for collaboration and innovation. By focusing on areas where women play essential roles—such as agriculture and food security, weather forecasting, hazard monitoring, and climate resilience—we aim to harness women's insights and lived experiences to address pressing challenges using EO and EI. Such collaboration will foster data accessibility, capacity-building, and technology transfer, empowering women to contribute equitably to GEO's Work Programme and Strategy.

Point(s) of Contact

Catherine Akinyi Odera akinyi180@gmail.com
Mary Namukose nmary9@gmail.com
Omowonuola Akintola omowonuola52@gmail.com
Samira Barzin samira.barzin@gmail.com
Stella Chelangat Mutai stellachela1@gmail.com

Understanding the Impacts and Value of Earth Observations (GEOVALUE)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **One Health**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Open Data, Knowledge, and Infrastructure**

Concept

There is a growing emphasis on understanding the societal and economic benefits derived from the applications of Earth science information. Concurrently, there is an increased availability of remotely sensed data from space about the Earth, especially from private sector sources, along with improved analytic capabilities. Determining the specific societal and economic value, particularly in quantitative terms, can be challenging, yet these assessments are critical to justifying the value proposition of Earth science information, guiding future investments, and expanding its use in environmentally related policymaking, business, and other decisions. Equally important is the communication of these benefits to audiences beyond the Earth science community, demonstrating the tangible returns from scientific pursuits. GEOVALUE seeks to generate new knowledge and serve as an expert within this realm.

GEOVALUE is an international community focused on the value and socioeconomic impacts of geospatial information for decision-making. The community envisions a multidisciplinary international network that pursues trustworthy, evidence-based methodologies to assess the use-value of Earth observations. GEOVALUE's mission is to facilitate the development of capacity, including technically valid methods and resources, to enable widely accepted and broadly adopted assessments of Earth observations' impacts, and it is committed to the GEO Post-2025 Strategy of providing "Earth Intelligence for All." As presented in the Strategy, GEOVALUE sees itself as pivotal in the Earth Observation Value Chain, mapping the Triple Planetary Crisis to societal, environmental, and economic benefits through rigorous and established methodologies.

The GEOVALUE Framework consists of accessible case studies, community-accepted methodologies, peer-reviewed publications, and a structured repository to guide practitioners in assessing the impacts of Earth observations. Geospatial information significantly contributes to decisions made by societal decision-makers, business leaders, and individuals. As issues grow more complex, the effective use of this information becomes crucial for future economic and social development. To achieve this vision, GEOVALUE's community includes a diverse range of disciplines across natural sciences, social sciences, economics, management, and communication. Their activities focus on fostering collaboration across specialties, building trust across disciplines, developing frameworks to structure analyses, providing method options to assess program value, compiling a structured inventory of use cases and methodologies, and organizing international events and webinars. GEOVALUE also publishes peer-reviewed open literature, workshop proceedings, and other materials. GEOVALUE acknowledges the partners

that have guided and supported its international efforts: CSA, EARSC, ESA, NASA, NOAA, Four Bridges, and USGS.

GEOVALUE sees itself as an evergreen component of GEO, focused on supporting other aspects of GEO to better understand how activities connect to society and the value realized from their work. As GEO is primarily composed of natural scientists, incorporation of GEOVALUE ensures GEO has access to trained economists, social scientists, and other valuation researchers within the realm of Earth science, and that any studies pursued make use of cutting-edge techniques and new literature.

Objectives

As stated above, GEOVALUE sees itself as an overarching component of GEO and is happy to provide expertise and guidance across the entire Group. Within FY25, GEOVALUE has committed to releasing the "GEO Impact Assessment Toolkit" to support the assessment of impacts on users and society as derived from specific EO-based GEO solutions. It will also convene a side event at GEO in Rome, Italy, and at ESA's Living Planet conference in Vienna.

Beyond this, GEOVALUE is focused on:

- Providing expertise to enable the integration of socioeconomic insights and Earth observation data to assist in modeling future scenarios for anticipatory leadership.
- Fostering collaboration across specialties and building communication and trust across social, economic, and natural sciences.
- Developing a framework to help structure analyses and provide options for appropriate methods to assess program value.
- Compiling a structured inventory and repository of use cases and analysis methodologies.
- Organizing international events, conference sessions, presentations, and webinars to address methodologies, use cases, and applications.
- Publishing peer-reviewed, open-literature articles, workshop proceedings, and other GEOVALUE material.

Point(s) of Contact

Alessandra Tassa alessandra.tassa@esa.int
Crista Straub cstraub@usgs.gov
Geoff Sawyer geoff.sawyer@earsc.org
Hendrik Hamacher hendrik.hamacher@esa.int
Joseph Conran joseph.conran@noaa.gov

Open Data, Knowledge, and Infrastructure

Artificial Intelligence for Earth Observations (AI4EO)

Focus Area(s):

- **Open Data, Knowledge, and Infrastructure**

Concept

The proposed Artificial Intelligence for Earth Observations (AI4EO) Enabler within GEO aims to integrate AI into Earth Intelligence by establishing a network of AI experts across the GEO community. The Enabler's scope includes advancing AI applications within the GEO Work Programme, fostering cross-disciplinary collaboration, and addressing ethical considerations related to AI in Earth observations. It will serve as a central hub to explore, develop, and apply AI-driven EO solutions that support GEO's Post-2025 Strategy.

As global challenges like climate change, biodiversity loss, and disaster risk increase, there is a growing need for advanced tools that can process complex EO data at scale. AI offers transformative potential for improving data analysis, enhancing predictive capabilities, and providing actionable insights. Many GEO Work Programme activities already apply AI, but a dedicated Enabler is essential to streamline efforts, standardize approaches, and expand AI's use to deliver meaningful, accessible Earth Intelligence.

Given the rapid advancements in AI and the urgency of addressing global environmental challenges, the establishment of AI4EO is timely. With AI now prioritized in the Post-2025 GEO Strategy, the Enabler will help GEO stay at the forefront of technological innovation, enabling inclusive access to Earth Intelligence services.

AI4EO is expected to foster greater collaboration and knowledge sharing across GEO by organizing events, workshops, and training sessions. Key outputs include a comprehensive report on AI's current and future role within GEO, a white paper on AI's potential in EO, and a network of AI experts. These efforts will support decision-making, expand the adoption of AI across GEO, and contribute to GEO's goal of providing accessible, actionable Earth Intelligence.

Objectives

- **Promote Cross-Community Collaboration on AI for EO**: AI4EO aims to connect experts in AI, data science, and EO from various GEO communities, including members of different GWP Focus Areas. By creating a network of AI practitioners, the Enabler facilitates cross-disciplinary knowledge sharing and collaborative innovation on AI-driven EO applications, ensuring that advancements in AI can be applied to multiple sectors.
- **Support Capacity Building and Knowledge Exchange**: AI4EO will organize training sessions, webinars, and workshops to share best practices, tools, and techniques for applying AI in EO. This objective ensures that GEO Members and associated organizations have the knowledge and resources needed to integrate AI into their EO activities, particularly in areas such as climate, biodiversity, disaster resilience, and sustainable development.

- **Develop and Disseminate Crosscutting AI Tools and Resources**: AI4EO will curate and advocate for accessible, reproducible AI-driven tools and applications that can be used across various GEO initiatives. These tools—covering areas such as image classification, change detection, predictive modeling, and real-time monitoring—serve as cross-cutting assets that enhance EO capabilities and make Earth Intelligence more actionable and accessible.
- **Enhance Data-Driven Decision-Making and Policy Support**: By integrating AI insights into GEO's data ecosystem, the Enabler aims to translate complex data into actionable intelligence. This supports evidence-based decision-making and aligns with international frameworks, benefiting sectors such as disaster risk reduction, water management, and urban resilience.

Point(s) of Contact

Yifang Ban yifang@kth.se
Claudio Persello c.persello@utwente.nl

Data and Knowledge Working Group (DK-WG)

Focus Area(s):

- **Open Data, Knowledge, and Infrastructure**

Concept

The Data and Knowledge Working Group (DK-WG) focuses on enhancing the use of Earth observation (EO) data by addressing and sharing data management principles, data policy, and governance issues within the GEO community. The group collaborates with both internal and external stakeholders to improve data interoperability, accessibility, and management, supporting the GEO Post-2025 Strategy. This includes advancing open data and open knowledge practices and aligning with broader frameworks like FAIR (Findable, Accessible, Interoperable, and Reusable) and CARE (Collective Benefit, Authority to Control, Responsibility, and Ethics).

With increasing reliance on EO data for global challenges such as climate change, disaster response, and sustainable development, there is a critical need for cohesive data-sharing policies and standards. Many GEO members face barriers in data access, interoperability, and privacy, hindering the widespread adoption of EO technologies. The DK-WG addresses these gaps by promoting best practices and legal frameworks that ensure data quality, accessibility, and responsible use.

The DK-WG's work is especially timely as GEO embarks on its Post-2025 Strategy, emphasizing data-driven solutions for complex environmental challenges. With rapid advancements in data technologies and increasing demand for real-time, actionable insights, there is an urgent need to establish robust policies and frameworks that facilitate seamless EO data integration and ethical use.

Objectives

The DK-WG has several key objectives focused on enhancing connectivity and integration across the GEO Work Programme (GWP) and increasing the accessibility and usability of EO:

- **Promote Open Data Practices**: Encourage the adoption of open data principles across GEO's Focus Areas, aligned with standards like FAIR and CARE, to improve EO data accessibility and interoperability.
- **Facilitate Data Integration**: Recommend standards to make EO data interoperable across areas such as climate action and disaster risk reduction, addressing cross-cutting needs within the GWP.
- **Coordinate Data Governance**: Engage GEO Working Groups on data policy and ethical issues to ensure responsible, consistent data use and governance across GEO.
- **Build Capacity**: Provide GEO members with resources, reports, and training on data sharing, governance, and best practices to maximize EO data impact.
- **Monitor Data Trends**: Track global data trends, offering updated recommendations to GEO for effective data management and decision-making.

Point(s) of Contact

Paola De Salvo pdesalvo@geosec.org

Data Integration and Analysis System (DIAS)

Focus Area(s):

- **Open Data, Knowledge, and Infrastructure**

Challenge

Climate change, a significant planetary crisis, poses numerous challenges to our lives, and the necessity of establishing societal adaptation policies has been increasing. These include the development of social capacity and early warning systems for water-related disasters. While Earth observation data has the potential to serve as crucial evidence for decision-making, it is often impractical for decision-makers who are not familiar with handling such data, especially over extended periods. Therefore, it is more beneficial to provide applications that integrate various data and models and deliver "Earth Intelligence," which is action-ready information.

Solution

The Data Integration and Analysis System (DIAS) is a platform that develops a data lake to support the creation of interactive applications for decision-making on cross-cutting issues by integrating domain data with climate change and weather prediction datasets. One such application is the forecasting system for river levels and flood inundation, which has been developed and is operational in Sri Lanka, West Africa, and the Philippines.

Intended Socioeconomic and Environmental Impact

Applications created in DIAS will support decision-making in areas such as the development of disaster risk reduction policies to adapt to climate change and the monitoring and management of ecosystems. Additionally, DIAS will help reduce the costs associated with utilizing large climate change prediction datasets. Furthermore, one of the applications developed on DIAS—the forecasting systems for river levels and flood inundation—is intended to serve as a tool for creating timelines to respond to heavy rainfall events and for hazard mapping and risk assessment.

Objectives for 2025–2030

DIAS will expand its platform to allow users to access the latest information by updating climate change prediction datasets. Additionally, DIAS will develop new infrastructure that enables the creation of simple application widgets and the analysis of full-scale scenarios through server-side computing. Furthermore, as part of the DIAS initiative, plans are in place to train "facilitators" to accelerate capacity development in local institutions.

How We Work

The core team is responsible for project management and the applications of DIAS, as well as the development and operation of the hardware and software needed to manage the massive database on which the applications are built. For individual applications, a team of experts, assembled based on their interests and aims, is responsible for application development, operation, and user communication.

Donors

Japan	Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
	Ministry of Education, Culture, Sports, Science and Technology (MEXT)
	University of Tokyo

Partners

Regional GEOs
Thematic Task Groups of Asia-Oceania GEO

Point(s) of Contact

Yoichi Ishikawa ishikaway@jamstec.go.jp

Digital Earth Africa (DE AFRICA)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Community Impact**
- **Open Data, Knowledge, and Infrastructure**

Challenge

Communities across the African continent are experiencing the human and economic impacts of food and water insecurity, land degradation, and urbanization, exacerbated by climate change. Even though many satellite images are freely available, accessing and translating them into meaningful and usable information for decision-making to address these threats remains a significant challenge.

Solution

Digital Earth Africa (DE AFRICA) provides a routine, reliable, and operational service that uses Earth observations to deliver decision-ready products, enabling policymakers, scientists, the private sector, and civil society to address social, environmental, and economic changes across the continent and developing an ecosystem for innovation across sectors.

Intended Socioeconomic and Environmental Impact

DE AFRICA aims to improve the lives of people across Africa by providing planners and policymakers with tailored Earth observation information to support better decision-making and enhance sustainable development outcomes. The platform provides continental-scale, analysis-ready data, hosted in Africa, increasing accessibility and driving efficiency in implementing Earth observation-based analysis and generating decision-ready products for all African countries.

Objectives for 2025–2030

An array of new data pipelines, continental services, analytical workflows, and associated training modules are planned by DE AFRICA from 2025 through 2030, all with the goal of ensuring that DE AFRICA is consistently used by key stakeholders to drive environmental, social, and economic impacts while also being sustained on the Africa continent. DE AFRICA is currently developing a new 5–10-year strategy for the program, which will be finalized and made available in 2025.

How We Work

The DE AFRICA team is hosted by the Research Institute for Innovation and Sustainability in Johannesburg, South Africa, with staff members based in South Africa, Ghana, Kenya, Rwanda, Zambia, Sri Lanka, and Australia. The team is supported by global advisors located around the world.

DE AFRICA has a distributed operational model that emphasizes working with and through existing organizations and partners with Earth observation capabilities, as well as facilitating new networks to allow the flow of information and end-users (e.g., policy and program decision-makers) to be connected to the technical platform and the data and decision-support tools it offers. In 2020, key parts of the model were put in place, including agreements with several Implementing Partner Organizations.

DE AFRICA has engaged closely with five national and regional Implementing Partners, who together represent the interests of 43 African countries. These partners include:

- African Regional Institute for Geospatial Information Science and Technology (AFRIGIST), Nigeria
- AGRHYMET, Niger
- Centre de Suivi Écologique (CSE), Senegal
- Regional Centre for Mapping of Resources for Development (RCMRD)
- Sahara Sahel Observatory (OSS), Tunisia

DE AFRICA Implementing Partners are selected based on their existing roles in supporting the uptake of Earth observation in decision-making and their strengths in providing technical support to affiliated countries. The Implementing Partners themselves will also be key users of DE AFRICA.

Donors

Australia	Australian Government
United States	Leona M. and Harry B. Helmsley Charitable Trust

Partners

GEO Members	
Australia	Geoscience Australia
Gabon	Agence Gabonaise d'Étude et d'Observation Spatiales (AGEOS)
Ghana	University of Energy and Natural Resources (UENR)
Kenya	Kenya Space Agency (KSA)
Rwanda	Rwanda Space Agency (RSA)
Senegal	Centre de Suivi Écologique (CSE)
South Africa	Kartoza
Tanzania	Tanzania Data Lab
United States	Amazon Web Services (AWS)
GEO Participating Organizations	
African Regional Institute for Geospatial Information Science and Technology (AFRIGIST)	
AGRHYMET	
Committee on Earth Observation Satellites (CEOS)	
International Water Management Institute (IWMI)	
Regional Centre for Mapping of Resources for Development (RCMRD)	

Sahara and Sahel Observatory (OSS)
United Nations Economic Commission for Africa (UNECA)
GEO Associates
Environmental Systems Research Institute (Esri)
Research Institute for Innovation and Sustainability (RIIS)
Regional GEOs
AfriGEO
Non-affiliated
Open Data Cube
World Economic Forum (WEF)

Point(s) of Contact

Lisa-Maria Rebelo lisa.rebelo@digitalearthafrica.org

Digital Earth Approaches for GEO (GEO-DECOP)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **One Health**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Open Data, Knowledge, and Infrastructure**

Concept

The proposed Enabler aims to support GEO Members in advancing and operationalizing Digital Earth, at an initial stage, bringing together the different GEO actors already working on the Earth Observation (EO) Data Cubes, with a focus on implementing global principles in local contexts. Building on the "Think Global, Implement Local" framework, this Community of Practice (CoP) will bridge the gap between the high-level objectives of Earth Intelligence and the practical, context-specific needs of GEO Member States. Recognizing that each region and nation has unique technical, environmental, and policy requirements, this CoP will emphasize local adaptation of Digital Earth, initially through EO Data Cube technologies, leveraging both global best practices and local expertise.

Currently at GEO, EO Data Cubes have achieved notable global coverage, exemplifying the potential for wide-scale application across regions and demonstrating that EO Data Cubes provide a sound basis for a Digital Earth Platform. Notable amongst existing demonstrators are:

- Digital Earth Africa provides comprehensive EO data services for the entire African continent and supports initiatives relating to, for example, land use monitoring, agricultural management, and climate adaptation.
- Digital Earth Pacific provides data services for coastal management and climate adaptation over the Pacific region and recently launched climate and coastal adaptation services.
- Digital Earth Australia provides national capacity for characterizing, mapping, and monitoring the Australian continent and islands.
- The Swiss Data Cube provides the capability for monitoring a range of environments across Switzerland.
- The Wales Data Cube (United Kingdom) provides open access to EO data and the Living Earth system for mapping land cover/habitats and change.

Other examples include the Antarctica Data Cube, the Armenia Data Cube, the Australia Government CSIRO's EASI Data Cube, the Brazil Data Cube, the Catalan Data Cube, the Vietnam Data Cube, and Digital Earth Americas. Collectively, their successful implementation has shown how diverse environmental and social challenges may be addressed in varied geographic contexts, from the tropics to the poles and from the coasts through to high mountains. In Europe, the Copernicus Data Space Ecosystem is a step towards Data Cubes that are based on OpenEO.

At a first stage, this Digital Earth initiative will start by leveraging the experience of these existing EO Data Cubes, the CoP will proactively assist GEO Members in applying lessons and best practices in a way that is adaptable to their specific needs, from local to regional scales. The initiative further addresses the current disparities in EO Data Cube readiness across GEO Members and the operational challenges associated with expertise, resources, and infrastructure.

The CoP will promote user uptake of EO Data Cubes by:

- Creating accessible and shareable resources.
- Developing tools and mechanisms for assessing their impacts.
- Conducting targeted outreach.
- Engaging diverse stakeholders to ensure EO data solutions are widely understood, adopted, and applied.
- Providing evidence of the tangible benefits of EO Data Cubes, strengthening their case for continued investment and support.

The CoP will further consider additional technological approaches that contribute to Digital Earth, including Analysis Ready Data, shared application algorithms, Digital Twins, Data Spaces, and the Internet of Things. The CoP will further address issues of privacy, security, interoperability, and trust in Digital Earth systems.

Objectives

The Enabler will facilitate connection and integration within the GEO community by:

- Convening and formulating a dedicated CoP that aligns stakeholders on goals and opportunities and includes terms of reference that ensure focused networking adds value and provides a unified approach to the Digital Earth concept through EO Data Cube development and operationalization.
- Developing technical and operational support tools that enable GEO Members to implement Digital Earth, initially based on EO Data Cubes tailored to local needs and scaling globally demonstrated and/or developed methodologies to local contexts.
- Promoting interoperability by aligning with global standards, including data discovery and accessibility protocols (e.g., STAC, OGC APIs, OpenEO), and concurrently accommodating local data sources and user requirements.
- Fostering a community where GEO Members can share region-specific challenges and solutions, contributing to a global knowledge pool.
- Advancing local capacity building through partnerships and mentorship programs with experienced Data Cube initiatives, ensuring the long-term sustainability of EO practices.
- Developing joint advocacy efforts to communicate the value and benefits of EO Data Cubes, promoting uptake among GEO Members, and mobilizing resources to support sustainable EO infrastructure.
- Fostering stakeholder engagement to drive the adoption of EO Data Cubes, provide guidance on impact assessment toolkits, and develop best practices for evaluating the long-term benefits and outcomes of EO Data Cube initiatives.
- Facilitating the increase and diversification of EO data providers for easy access and use at different spatial and temporal resolutions by GEO Members.

- Exploring additional components of Digital Earth (e.g., Analysis Ready Data, Digital Twins, Data Spaces, and the Internet of Things) and consider privacy, security, and trust in Digital Earth systems.

Point(s) of Contact

Andiswa Mlisa andiswam@spc.int
Gilberto Camara gilberto.camara@inpe.br
Gregory Giuliani gregory.giuliani@unige.ch
Joan Maso joan.maso@ieee.org
Mario Hernandez mariohernandezvaldes@gmail.com

Digital Earth Pacific (DE PACIFIC)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Open Data, Knowledge, and Infrastructure**

Challenge

Pacific Island nations face significant challenges from climate change and natural disasters, including rising sea levels, coastal erosion, and extreme weather events. These challenges threaten livelihoods, infrastructure, and ecosystems, necessitating timely and accurate data for effective decision-making.

Solution

Digital Earth Pacific (DE PACIFIC) provides a public digital infrastructure with free and open access to Earth observation data. By delivering decision-ready products, DE PACIFIC enables Pacific Island countries to monitor environmental changes, assess risks, and implement informed strategies to mitigate the impacts of climate change and natural disasters.

Intended Socioeconomic and Environmental Impact

DE PACIFIC aims to support climate resilience, environmental conservation, and economic development by providing crucial, up-to-date information to mitigate losses, enhance resource management, and support sustainable development across various sectors, including fisheries, agriculture, and disaster management.

Objectives for 2025–2030

DE PACIFIC intends to evolve into a comprehensive EO data ecosystem, expanding its user base and enabling regional innovations where users can generate their own products and share innovations using the DE PACIFIC infrastructure. By 2030, DE PACIFIC will validate and continuously improve its three existing regional products while introducing additional ones, including seagrass, marine habitat, satellite-derived bathymetry, fractional cover, and land cover land use. It will scale capacity development and foster sustainable data infrastructure for continuous monitoring and analysis in the Pacific. This long-term vision includes engaging local stakeholders to co-develop and apply DE PACIFIC products in areas critical to resilience, sustainable growth, and environmental stewardship.

How We Work

DE PACIFIC operates through a collaborative framework involving the Pacific Community (SPC), Pacific member governments and administrations, and various partners. The core team, the Programme Management Team, manages daily operations, while the governance body, the Steering Committee, provides strategic direction and policy guidance. SPC's Committee of

Representatives of Governments and Administrations (CRGA) provides opportunities for political-level engagement with the program. Engagement with local stakeholders ensures that products are tailored to regional needs, fostering a user-centric approach to service delivery. SPC's convening power across various sectors provides an opportunity for broader user needs that can inform DE PACIFIC deliverables.

Upon the publication of the new Post 2025 GWP, collaborations will be sought with like-minded activities, such as the proposed Enabler for Digital Earth Approaches, regional GEOs (AOGEO/AmeriGEO), the GEO Capacity Building Working Group, and efforts will be made to link products and services with the GIDTT.

Donors

New Zealand	Ministry of Foreign Affairs
United Kingdom	
United States	Patrick J. McGovern Foundation

Partners

GEO Members	
Australia; Tonga	
United States	Amazon Web Service (AWS)
	National Oceanic and Atmospheric Administration (NOAA)
GEO Participating Organizations	
Committee on Earth Observation Satellites (CEOS)	
Pacific Regional Environment Programme (SPREP)	
World Food Programme (WFP)	
GEO Associates	
D4DInsights	
Environmental Systems Research Institute (Esri)	
Non-affiliated	
Cook Islands; Fiji; Papua New Guinea; Solomon Islands; Tuvalu; Vanuatu	
Pacific Geospatial & Surveying Council (PGSC)	

Point(s) of Contact

Andiswa Mlisa andiswam@spc.int
Sachindra Singh sachindras@spc.int

Europe-Africa EO Data Sharing for EW/Climate/DRR (EO-NREN)

Focus Area(s):

- **Open Data, Knowledge, and Infrastructure**

Concept

The sixth African Union-European Union Summit, held in February 2022, emphasized digital transformation and space cooperation as vital drivers for sustainable development and climate action. There is an increasing need for enhanced digital infrastructure and cooperation to leverage Earth observation (EO) data effectively, addressing shared challenges such as climate change, disaster management, and sustainable development.

This proposed GEO activity aims to integrate ongoing initiatives between Africa and Europe to facilitate seamless access, sharing, and use of EO data, in alignment with the "EO Intelligence for All" strategy. While the initial focus will be on Africa, this activity will connect with similar efforts in other regions. Stakeholders from regions such as Latin America, the Caribbean, and the Asia-Pacific will be invited to share good practices and experiences. Over time, the scope of the activity can grow to become more global, but the initial priority is to deliver tangible results and concrete outcomes in Africa. Partnerships with organizations such as RedCLARA will help extend the initiative's reach to Latin American users.

The key ongoing initiatives include:

- AfricaConnect, which enhances digital access for education and research institutions across Africa.
- The Africa-EU Space Partnership Programme, with its three ongoing projects: GMES & Africa (focused on natural resources and marine services), ClimSA (providing climate services), and SEWA (Space for Early Warnings in Africa).

While these projects have made significant progress, further integration is needed to create a cohesive and scalable impact. This proposal, supported by partners such as WACREN, UbuntuNet, EUMETSAT, GÉANT, and key African EO centers in Ghana, Kenya, and South Africa, will leverage National Research and Education Networks (NRENs) and the EUMETCast-Terrestrial data flow to strengthen EO data accessibility and sharing.

The strategic linkage of these initiatives under GEO will foster collaboration between key stakeholders shaping Africa's digital landscape and EO data providers and users, initially focusing on weather, climate, and early warning systems. The primary purpose is to share best practices and extend the use of existing NREN infrastructure to promote effective EO data utilization between Europe and Africa.

The initiative will also establish strong links with NREN activities in Latin America (e.g., via RedCLARA) and initiatives under the GEO Infrastructure Task Team (e.g., the one proposed by NRENs).

This activity aligns with global efforts to improve data sharing and capacity building, enhancing climate resilience and disaster risk reduction through better early warning systems for extreme weather (e.g., Early Warnings for All). Anticipated outcomes include improved data sharing,

strengthened research and decision-making capabilities, and partnerships that contribute to Sustainable Development Goals and support robust early warning systems.

This activity represents an evolution of the GEONETCast system, ensuring continuity while addressing new challenges and opportunities in EO data sharing.

Objectives

The primary objective of this GEO activity is to create an integrated framework that connects key partners to facilitate the cross-cutting use of digital infrastructure and Earth observation (EO) data. This proposal aims to strengthen collaboration across the Global Work Programme (GWP), focusing on the Open Data, Knowledge, and Infrastructure pillars of the "EO Intelligence for All" strategy.

The initiative seeks to leverage National Research and Education Network (NREN) infrastructure to improve the sharing and practical use of EO data from both European and African sources, including (but not limited to) Copernicus, Meteosat Third Generation, GMES & Africa, and ClimSA. By doing so, it will enhance the accessibility and interoperability of EO data, fostering its use in addressing key challenges, such as climate change, disaster management, and sustainable development.

The initiative will also establish links with global initiatives to share good practices and promote cross-regional collaboration, while maintaining a focus on delivering concrete outcomes in Africa.

A critical element of this activity is to promote engagement between NREN infrastructure providers and EO institutions, including EO data providers, service providers, and users, such as researchers and policymakers. This engagement will facilitate knowledge exchange, promote collaborative innovation, and ensure that infrastructure and data solutions are effectively aligned with user needs.

By building on AfricaConnect's extensive digital infrastructure (including its EUMETCast-Terrestrial component) and leveraging the expertise of partners such as EUMETSAT, GÉANT, and African EO institutions, the activity aims to deliver robust assets and tools for seamless data availability. Additionally, it will support the development of partnerships and capacity-building initiatives that empower regional and national institutions with the skills needed to utilize EO data effectively.

This effort will reinforce the existing research and policy ecosystem, fostering a culture of open, data-driven decision-making. By engaging key stakeholders and promoting coordinated use of digital and EO resources, the activity will enhance resilience and sustainable development, contributing to improved early warning systems and informed responses to extreme weather and climate change-induced challenges.

Deliverables

The expected deliverables of this initiative are:

- **Connecting Institutions and Expanding EO Access**:
    - Additional institutions will be connected to NREN infrastructure and provided with relevant EO data for early warning and disaster resilience. This includes

operational entities, such as national meteorological services, disaster management situation rooms from the Africa Multi-Hazard Early Warning and Early Action (AMHEWAS) program, regional climate centers, and universities.
    - These connections will ensure a broader reach and enable users to receive near-real-time EO data for operational and research purposes.
- **Enhancing Decision-Making**:
    - The activity will increase the availability of timely and accurate EO information to support decision-making processes for early warning and disaster resilience. This includes facilitating the flow of critical EO data to entities responsible for raising warnings in a timely and adequate manner.
- **Data Sharing Principles**:
    - Most of the data shared through this activity will be free of charge and openly accessible to a broad user community. However, some data may require licensing (free of charge) to ensure appropriate user identification. This approach is fully compatible with the GEO Data Sharing Policy and adheres to its protocols.

Point(s) of Contact

Vincent Gabaglio vincent.gabaglio@eumetsat.int

GEO Connected Community: Advancing Communication Infrastructure and Services (GEO-CONNECTIONS)

Focus Area(s):

- **Open Data, Knowledge, and Infrastructure**

Concept

The GEO infrastructure will be essential for promoting full and open access to Earth observation data, supporting GEO's mission to facilitate data and knowledge sharing. The GEO infrastructure needs to be accessed by the Earth observation community in a unified, reliable, and trustworthy way. GÉANT and the Regional and National Research and Education Networks can play a crucial role in ensuring that the GEO infrastructure is accessible to the Earth observation community worldwide.

In the context of this proposal, we will keep GÉANT's commitment to supporting National Research and Education Networks (NRENs) in continuing their collaboration with GEO and exchanging information about existing services, communication infrastructure, and requirements, and to developing relevant activities together. This proposal also continues the engagement with AfriGEO and AmeriGEO, as well as with GEO community data providers to ensure the exchange of information and to seek potential cooperation in supporting this community. There will also be activities planned to reach out to the Asia-Oceania region through AOGEO and engage our partner NRENs within that region to further integrate them with GEO activities.

While connectivity has been supported by dedicated links, networking services, and NREN collaboration, there is a growing need within the GEO community to address effective data access across diverse organizations, stakeholders, and geographic boundaries. In response, this proposal aims to foster collaboration between GÉANT and the GEO community, specifically around trust and identity services, to support the design and implementation of secure and efficient authentication and authorization processes.

GÉANT's trust and identity services portfolio includes services such as eduroam, eduGAIN, and MyAccessID. These services facilitate the federation of identity providers across research and education institutions, enabling single sign-on (SSO) access for users from over 6,000 organizations in 78 countries and regions. By leveraging these solutions, researchers and users can securely access federated services using their institutional credentials, streamlining access to Earth observation data.

One of the objectives of this proposal is to work with the GEO community to understand their specific needs regarding single sign-on and assess the potential use of these services within the community. This effort will support the GEO infrastructure's goal of making Earth observation data more accessible, secure, and integrated across diverse user groups.

Objectives

- Explore the design and implementation of an Authentication and Authorization Infrastructure (AAI) solution, based on the AARC Blueprint Architecture interoperability

framework and open standards, to facilitate single sign-on (SSO) access to the GEO infrastructure, enabling seamless access to Earth observation data and services in Europe.

- Engage with GEO Flagships, Initiatives, and Pilots to evaluate network and identity management requirements, promoting data dissemination and federated identity services across GEO's collaborative environment.
- Support National Research and Education Networks (NRENs) from around the world, in partnership with Regional Research and Education Networks (RRENs), to discuss and exchange information about existing services, communication infrastructure, requirements, and developing activities that are aligned with GEO Flagships, Initiatives, Pilots, and Regional GEOs (continuing engagement with AfriGEO, AmeriGEO, and NRENs in these regions), and also with GEO community data providers in the context of Earth observations, aligning with SDG 17 (Partnership for the Goals). Reach out to the Asia-Oceania region through AOGEO to engage our partner NRENs in that region and integrate them into GEO activities.

Point(s) of Contact

Chris Atherton chris.atherton@geant.org
Daniela Brauner daniela.brauner@geant.org

Global UAV Observation Network (GEO-UAV)

Focus Area(s):

- **Open Data, Knowledge, and Infrastructure**

Concept

This activity aims to establish the GEO UAV Observation Network, integrate it into the GEO infrastructure, collaborate with various GWP working groups, and apply it across multiple fields and countries worldwide. The proposed cooperation on technical research and development includes advancements in UAV observation network technology, hangar-based UAV systems, data processing, applications, and the formulation of standards for the UAV observation network.

In recent years, UAV remote sensing has been widely used in various fields, including urban management, ecological and environmental monitoring, regional dynamic monitoring, and emergency response to sudden natural disasters. Due to its compactness, flexibility, quick response, high precision, cost-effectiveness, and ability to operate independently of terrain constraints, UAV remote sensing has partially met the demands of these applications. To address the growing need for fast, centimeter-precision geospatial information acquisition, UAV remote sensing has expanded rapidly over the past decade. The number of remote sensing UAVs is estimated to exceed one million units worldwide.

Typically, UAVs must be transported to the intended location and manually operated for takeoff, landing, data transmission, and battery replacement. Single or small-scale UAV remote sensing systems have several limitations, including reliance on manual operation, the need for highly skilled operators, low inspection efficiency, difficulty achieving large coverage and simultaneous observations, and the inability to provide timely responses in any location. Recently, UAV remote sensing technology has been shifting from single UAVs to large-scale networks with autonomous, pilot-free operation in the field.

The demand for rapidly acquiring UAV remote sensing data with synchronized phases, wide coverage, and centimeter-level accuracy is increasing across various industries. Single and dispersed UAV remote sensing operations can no longer meet this demand; however, UAV observation network technologies enable rapid response and precise monitoring. The UAV observation network is currently the only solution capable of providing simultaneous centimeter-level observation data with extensive coverage.

The development of UAV automated hangars has made it possible to construct and deploy a UAV observation network. These hangars serve as highly integrated, fully automated, unmanned operation platforms for UAV storage and deployment. They support UAV automation in takeoff and landing, battery charging, environmental monitoring, and remote control, ensuring the long-term stable operation of UAVs. Hangars play a crucial role in enabling UAV automation and intelligent operations.

Our primary focus is on advancing the technology of a hangar-based UAV observation network, which consists of multiple UAV remote sensing systems, hangars, and a central control system. In China, we have deployed over one thousand hangars to support urban management, environmental monitoring, power line inspection, and transportation.

In this activity, the hangar-based UAV observation network will be deployed where feasible in select countries through cooperating partners. It is anticipated that the UAV observation network applications within GEO will help fill observation gaps not covered by satellite remote sensing or field observations, support local government decision-making—particularly in developing countries—and contribute to the implementation of the GEO Post-2025 Strategy, "Earth Intelligence for All."

Objectives

The objective of this activity is to collaboratively develop a global UAV remote sensing network and its applications across various fields in partnership with GEO member countries, organizations, and end users involved in GEO UAV remote sensing. Within the UAV observation network, two approaches can be applied:

- Based on local needs, partners of this activity independently establish UAV remote sensing networks and engage in exchanges and cooperation on UAV remote sensing technology, especially hangar-based UAV remote sensing technology.
- The Chinese partner can assist other partners in constructing local UAV remote sensing networks and provide UAV remote sensing monitoring services for local governments to enhance the application capabilities of UAV remote sensing in those regions.

Currently, several African partners have begun developing UAV remote sensing network capacity and applications. These partners include the National Transmission Company South Africa (NTCSA), which requires UAV power line inspections; Tanzania, which seeks UAV-based border inspections; Nigeria, which requires UAV monitoring of oil fields. The network of cooperating countries and partners will gradually expand to other African countries, as well as to the Middle East, West Asia, and Southeast Asia.

This activity aims to strengthen the application of UAV remote sensing networks within GWP, integrate UAV remote sensing data with satellite remote sensing and ground measurement data, and develop targeted applications. Currently, this activity plans to collaborate with Digital Earth Africa and GEO Capacity Building in North Africa, Middle East, Balkans and Black Sea Region to provide data that enhances the fusion of UAV and satellite remote sensing applications.

Point(s) of Contact

Huanyin Yue yuehy@lreis.ac.cn

Application Driver

Disaster Risk Reduction and Adaptation Working Group (DRRA-WG)

Focus Area(s):

- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **Weather, Hazard, and Disaster Resilience**

Concept

The Disaster Risk Reduction and Adaptation Working Group (DRRA-WG) brings together the GEO Work Proragmme, DRR and climate change experts nominated from GEO Members, Participating Organizations (POs), Associates, and other relevant stakeholders to promote the integration of Earth Intelligence into disaster management and climate adaptation and mitigation strategies. The DRRA-WG promotes the scaling up of EO use in the context of global policy frameworks, such as the Sendai Framework and the Paris Agreement, aligning and promoting activities with GEO's Post-2025 Strategy.

With disasters increasing in frequency and intensifying due to climate change, and countries facing challenges in utilizing Earth observations effectively, the DRRA-WG addresses critical gaps by highlighting accessible Earth observation tools, data, and best practices for countries to enhance their climate adaptation and disaster risk reduction policies and implementation, such as those under the UN Secretary-General's Early Warnings for All initiative.

The escalating frequency of extreme events and the narrowing window for impactful climate action underscore the urgency of the DRRA-WG's mandate. Climate change amplifies disaster risks, making cohesive strategies for adaptation and resilience-building indispensable. The working group's efforts are pivotal in translating international goals into actionable plans, equipping countries to improve EO integration, strengthen policy coherence, and reduce vulnerabilities.

Key outcomes of the DRRA-WG include providing inputs for policy-related documents to increase the adoption of EO tools and knowledge in disaster and climate planning. Considering the previous role of GEO's former Working Groups on DRR, climate change, and capacity building, the new DRRA-WG conducts activities to enhance stakeholder capacity through knowledge-sharing, and to improve coordination within GEO to be aligned with global policy frameworks.

Objectives

The DRRA-WG aims to foster connections among GEO Members, POs, and GWP across all Focus Areas to enhance the uptake of EO through climate adaptation and mitigation planning efforts and disaster preparedness, prevention, mitigation, and recovery:

- **Support Multilateral DRR and Climate Change Frameworks**: By aligning and synergizing its efforts with relevant POs, such as the UN Office for Disaster Risk Reduction (UNDRR) and the United Nations Framework Convention on Climate Change

(UNFCCC), the DRRA-WG facilitates GEO Work Proragmme contributions to policy formation and implementation related to DRR and adaptation. In doing so, the WG fosters partnerships with relevant national, regional, and international organizations, ensuring that their EO practices support these goals and initiatives through publications and events, including during relevant conferences. This is not only to support national EO applications but also to strengthen GEO's impact on international policies and practices in DRR and climate change. For example, the DRRA-WG brings together relevant Members and organizations to develop coordinated approaches for EO-related events and negotiations. The WG also provides support for the formulation and implementation of GEO's supplemental materials for National Adaptation Plans. Other Flagship reports the WG plans to contribute to include UNDRR's Global Assessment Reports on DRR and the State of the Climate Report by WMO.

- **Knowledge Sharing**: The DRRA-WG aims to work with GEO Members and POs to share GEO's knowledge and best practices, helping stakeholders integrate EO into the early warning value chain, e.g., through climate and disaster risk assessment. For example, building on the WG's previous work of providing technical inputs to the UNFCCC Technology Executive Committee-GEO Policy Brief, the WG will expand the technical content to be elaborated in learning modules that UNDRR is creating and rolling out in EW4All-implementing countries. This will help policymakers in developing countries learn about EO solutions from GWP, which were already highlighted by the Policy Brief. The DRRA-WG will also aim to increase GEO's coordinated contribution to climate-biodiversity nexus areas by identifying relevant GWP activities to coordinate and integrate their efforts and to highlight GEO's harmonized efforts at the Conferences of Parties.
- **Build Capacity and Promote Synergies with Other Working Groups**: The DRRA-WG also plans to conduct a series of activities to enhance the capacity of vulnerable countries by promoting access to training resources and expanding its collaborative network. The WG will engage with policymakers, technical staff members, and local stakeholders, starting in Latin America and the Caribbean (LACI), in assessing climate impacts, vulnerability, and risks, and catalyzing partnerships to inform decisions. For example, the WG is co-developing geospatial decision-support tools and providing capacity-building support in Jamaica, developing a climate change vulnerability and risk atlas in El Salvador, assessing climate impacts on compound disasters in the La Plata Basin, and training Indigenous Peoples and local communities in the Amazon region on EO climate-informed decision-support tools.
- **Promote Synergies with Other Working Groups**: The DRRA-WG works closely with other GEO Working Groups, aligning activities to leverage shared expertise, avoid duplication, and optimize resource use. This integration enables a comprehensive approach to disaster resilience and climate adaptation by connecting data and insights from various GEO Focus Areas, such as Climate, Health, and Ecosystems. The DRRA-WG leads the organization of cross-WG coordination meetings at GEO Symposia and other GEO events as necessary.

Point(s) of Contact

Akinola Babarunde	akinolatunde20032001@gmail.com
Allison Craddock	allison.b.craddock@jpl.nasa.gov
Antonio Bombelli	abombelli@wmo.int
Gensuo Jia	jiong@tea.ac.cn
Kene Onukwube	kene.onukwube@gmail.com
Lennox Gladden	lgladden@sica.int
Mandira Shrestha	mandira.2024@outlook.com
Prakash Tiwari	pctiwari@gmail.com
Rui Kotani	rkotani@geosec.org

Earth Observations for the Sustainable Development Goals (EO4SDG)

Focus Area(s):

- **Agriculture and Food Security**
- **Climate, Energy, and Urbanization**
- **Ecosystems, Biodiversity, and Carbon Management**
- **One Health**
- **Water and Land Sustainability**
- **Weather, Hazard, and Disaster Resilience**
- **Community Impact**
- **Open Data, Knowledge, and Infrastructure**

Concept

EO4SDG will help GEO organize efforts to promote Earth Intelligence in support of the advancement of the UN SDG Agenda and the multilateral framework(s) on sustainable development that will follow beyond 2030. The cross-cutting nature of the SDG Agenda lays out paths for specific Earth intelligence solutions in support of human and environmental prosperity via targets and indicators.

It is crucial that an outlet remains for the GEO community to keep sharing expertise and amplifying EO data and methodology successes for sustainable development policy and to elevate external awareness of GEO's capacity to assist countries with progress monitoring and reporting as frameworks evolve. This Enabler will also reinforce the complementary nature of in situ and remotely sensed EO data, geospatial data, and citizen science to advance cooperation between national statistical, mapping, and space agencies, and UN custodian agencies. Likewise, EO4SDG will welcome new people from across the GEO community to bring diverse perspectives to the acceleration of sustainable development through technology.

EO4SDG will play three key roles for the GEO community:

- Internal and external communication of achievements to foster replication of successful Earth intelligence methods for sustainable development themes in coordination with the respective GWP elements.
- Consulting GEO Members and GWP elements on navigating the SDG policy landscape for decision-making, solutions deployment, and engagement with UN custodian agencies.
- Advocating for GEO's participation in planning activities of the post-2030 sustainable development agenda and other MEAs to maintain a strong voice on the integration of Earth observations, ensuring it remains integral to decision-making at global, regional, national, and local levels.

With the approach of 2030 and the anticipated transition to new multilateral frameworks, EO4SDG's mission remains crucial. In the next five years and beyond, countries will still need assistance with EO adoption, capacity building, and scaling. The programmatic assets and community fostered by EO4SDG as a GEO Initiative from 2016–2025 will continue to support the nexus of sustainable development data contributors and users. However, this will be a renewed

community with new leadership and forward-thinking activities to propel GEO's deployment of solutions for EO-driven decision-making.

The GEO Post-2025 Strategy recognizes the importance of supporting the UN Common Agenda's key elements to "accelerate an integrated response and to enhance GEO's global partnership along all stages of the Earth observation value chain." Built around the desire to accelerate SDG implementation, the Common Agenda prioritizes the improvement of global digital cooperation and planetary protection efforts. By bringing together Members, Regional GEOs, Participating Organizations, and Associates, EO4SDG will help GEO demonstrate its broad applicability to support those focal points and many others as the UN looks toward the next few decades.

Objectives

Sustainable development encompasses the realms of human well-being, economy, and environment on a local-to-global scale. Its natural multidimensionality as a concept and as a policy framework through the current 2030 Agenda requires this Enabler to be in alignment with all six Focus Areas, as well as the pursuits of Equity & Inclusion and Open Data, Knowledge, and Infrastructure. Although EO data can support the assessment of many more SDG indicators, much methodological focus has been placed on applications for SDG 6: Clean Water & Sanitation, SDG 11: Sustainable Cities & Communities, SDG 13: Climate Action, SDG 14: Life Below Water, and SDG 15: Life on Land.

In alignment with the IAEG-SDGs Working Group on Geospatial Information, we affirm the importance of strengthening global coordination and coherence of all EO- and geospatially enabled SDGs. This Enabler will also help the GEO community navigate processes to influence the development of the post-2030 framework, such that Earth observations and geospatial data are well-represented.

EO4SDG can illuminate how the Post-2025 Enablers and R2O activities are aligned with the current SDGs and, later, the goals established in the next sustainable development framework. This would help the GEO community understand where data product gaps may exist, where opportunities exist for cross-GWP co-development, and how to connect global stakeholders to the data and expertise they need. By engaging with other GWP elements, this Enabler can use its network within the sustainable development community to showcase knowledge and solutions that can anchor GEO's reputation as a viable provider of sustainable development data and analytical solutions.

It is also important that EO4SDG stays in close collaboration with the other three Strategic Engagement Priority Enablers, on account of the natural synergies of those topic areas and their respective multilateral frameworks with the SDG Agenda.

Point(s) of Contact

Corena Pincham corena.m.pincham@nasa.gov
Lawrence Friedl lfriedl@nasa.gov
Osamu Ochiai ochiai.osamu@jaxa.jp

Resilient Cities and Human Settlements Working Group (RCHS-WG)

Focus Area(s):

- **Climate, Energy, and Urbanization**

Concept

The Resilient Cities and Human Settlements Working Group (RCHS-WG) focuses on integrating Earth observations into urban resilience and sustainable urbanization efforts across cities and human settlements worldwide. Its primary goal is to support cities in using Earth observation data for informed decision-making to guide urban resilience, economic and social prosperity, and environmental sustainability, particularly aligning with the New Urban Agenda and other global frameworks. Through collaboration with other GEO Working Groups, this group aims to promote a cross-cutting approach that incorporates Earth observations into city planning and resilience-building efforts.

Urbanization represents both a pivotal opportunity and a challenge of our time, as cities become increasingly central to human development and environmental sustainability. While rapid urban growth can strain infrastructure, contribute significantly to global greenhouse gas emissions (over 70% of the global total), and increase vulnerability to climate impacts and natural disasters, cities also serve as engines of innovation, economic growth, and cultural exchange. In developing countries, where urban expansion is most dramatic, this transformation offers possibilities for leapfrogging traditional development patterns toward smarter, more sustainable solutions. Moreover, cities present unique opportunities to pursue climate-resilient development, where investments in low-carbon infrastructure and nature-based solutions can simultaneously reduce emissions, enhance adaptive capacity, and improve quality of life. The RCHS-WG leverages Earth observations to help cities capitalize on these opportunities while building resilience across multiple dimensions—from robust infrastructure and efficient resource management to social cohesion and adaptive governance. This data-driven approach enables urban centers to pursue development pathways that enhance quality of life, reduce environmental impact, and strengthen their capacity to withstand and recover from shocks and stresses.

The urgency of climate change and urban growth makes this initiative especially timely. With the Post-2025 GEO Strategy prioritizing urban resilience and linking it to key international frameworks like the Paris Agreement and the Sendai Framework, the RCHS-WG's formation aligns with current global priorities. This is a critical period for cities to adopt data-driven strategies to mitigate risks and adapt to environmental changes.

The Resilient Cities and Human Settlements Working Group (RCHS-WG) operates through a dual approach that converges on developing and implementing coherent, cross-cutting Earth observation solutions for urban resilience. On one side, the group translates urban stakeholder needs into specific requirements for Earth observation data, tools, and services. On the other side, it works on translating advancements in Earth observation science and technology into practical solutions for human settlements. These complementary efforts come together to advance the use of Earth observations in support of urban resilience and sustainable urbanization efforts across human settlements, cities, and countries. Through this balanced approach and collaboration with other GEO Working Groups, the RCHS-WG ensures Earth observation data effectively supports informed decision-making for urban resilience, economic and social prosperity, and

environmental sustainability, particularly aligning with the New Urban Agenda and other global frameworks.

Objectives

RCHS-WG aims to foster connections and integration across the GEO Work Programme (GWP), particularly within its Focus Areas, to enhance the uptake of Earth observations (EO) in urban resilience efforts.

- **Enhance Cross-Cutting EO Resources**: The RCHS-WG aims to develop and promote tools, data, and practices that support the use of EO across urban resilience applications. By providing adaptable EO resources for urban planning, climate adaptation, and infrastructure resilience, the group ensures that EO assets are integrated into various GWP Focus Areas, creating a cohesive and comprehensive approach to urban sustainability.
- **Promote Synergies with Other Working Groups**: The RCHS-WG actively collaborates with other GEO Working Groups to leverage shared expertise and resources. This coordinated approach maximizes resource efficiency, aligns goals, and integrates EO insights across different thematic areas, addressing urban challenges from multiple perspectives.
- **Support Multilateral Urban Frameworks**: By aligning its efforts with international frameworks, such as the New Urban Agenda, the RCHS-WG facilitates connections between GEO initiatives and global urban resilience goals. This alignment not only supports city-level EO applications but also strengthens GEO's impact on international policies and practices related to sustainable urbanization.
- **Build Capacity and Knowledge Sharing**: The RCHS-WG aims to build capacity among urban planners, policymakers, and local stakeholders by promoting access to training, resources, and knowledge-sharing opportunities. Through workshops, best practices, and collaborative networks, the group helps stakeholders integrate EO into urban management, enhancing local capabilities in sustainable city planning and disaster resilience.

Together, these objectives create a platform for effective collaboration, cross-sector integration, and broader EO adoption, ensuring that cities can harness EO data to address complex urban challenges sustainably and resiliently.

Point(s) of Contact

Martyn Clark mclark@geosec.org

Table of Acronyms

AAFC	Agriculture and Agri-Food Canada
AAI	Authentication and Authorization Infrastructure
AARC	Authentication and Authorization for Research and Collaboration
ACTO	Amazon Cooperation Treaty Organization
ADPC	Asian Disaster Preparedness Center
AfriGEO	African Group on Earth Observations
AFRIGIST	African Regional Institute for Geospatial Information Science and Technology
AGEMERA	Agile Exploration and Geo-Modeling for European Critical Raw Materials
AGEOS	Agence Gabonaise d'Étude et d'Observation Spatiales, Gabon
AGRS	China Aero Geophysical Survey and Remote Sensing Center for Natural Resources
AI	Artificial Intelligence
AI4EO	Artificial Intelligence for Earth Observations
AIR-CAS	Aerospace Information Research Institute, Chinese Academy of Science
AIS-MONITORING	Antarctic Ice Sheet Monitoring
AmeriGEO	Americas Group on Earth Observations
AMHEWAS	Africa Multi-Hazard Early Warning and Early Action
AMRF	African Mountain Research Foundation
AOGEO	Asia-Oceania Group on Earth Observations
API	Application Programming Interface
AQUAWATCH	AquaWatch
ARCOS	Albertine Rift Conservation Society
ARCTIC-GEOSS	ArcticGEOSS
ARO	Amazon Regional Observatory
ASEAN	Association of Southeast Asian Nations
ASI	Italian Space Agency
AWS	Amazon Web Services
BMZ	Ministry for Economic Cooperation and Development, Germany
BON	Biodiversity Observation Network
BRI	Biodiversity Research Institute, United States
BYU	Brigham Young University, United States
CABI	Centre for Agriculture and Bioscience International
CARE	Collective Benefit, Authority to Control, Responsibility, and Ethics
CAS	Chinese Academy of Sciences

CBAS	International Research Center of Big Data for Sustainable Development Goals
CBD	Convention on Biological Diversity
CC-WG	Climate Change Working Group
CD-WG	Capacity Development Working Group
CDE	Centre for Development and Environment, University of Bern, Switzerland
CDMVAVE	Dynamic Monitoring and Vulnerability Assessment of Vegetation in Typical Arid Oasis Urban
CEOS	Committee on Earth Observation Satellites
CHEMICAL-EARTH	Global Geochemical Observation Network and Digital Chemical Earth
Cirad	French Agricultural Research Centre for International Development, France
ClimSA	Intra-ACP Climate Services and Related Applications Programme
CLMS	Copernicus Land Monitoring Services
CLP	Country-Led Planning
CNECT	Artificial Intelligence Office, Communications Networks, Content and Technology, European Commission
CNES	Centre national d'études spatiales, France
CNR	National Research Council, Italy
CNR-IGG	Institute of Geosciences and Earth Resources, National Research Council, Italy
CNR-IIA	Institute of Atmospheric Pollution Research, National Research Council, Italy
CNR-IMAA	Institute of Methodologies for Environmental Analysis, National Research Council, Italy
CNRS	National Centre for Scientific Research, France
CNSA	China National Space Administration
CONAE	Comisión Nacional de Actividades Espaciales, Argentina
CONDESAN	Consortium for the Sustainable Development of the Andean Ecoregion
COP	Conference of the Parties
CoP	Community of Practice
COSCO	China Ocean Shipping Company
CPTEC	Centro de Previsão de Tempo e Estudos Climáticos, Brazil
CREAF	Centre for Ecological Research and Forestry Applications
CRGA	Committee of Representatives of Governments and Administrations, Pacific Community
CRMIP	Global Climate Risk Monitoring and Adaptive Intelligence Platform

CSA	Canadian Space Agency
CSE	Centre de Suivi Écologique, Senegal
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DBAR	Digital Belt and Road Program
DE AFRICA	Digital Earth Africa
DE PACIFIC	Digital Earth Pacific
DEFIS	Defence Industry and Space, European Commission
Defra	Department for Environment, Food & Rural Affairs, United Kingdom
DG DEFIS	Directorate-General for Defence Industry and Space, European Commission
DG REGIO	Directorate-General for Regional and Urban Policy, European Commission
DG RTD	Directorate-General for Research and Innovation, European Commission
DIAS	Data Integration and Analysis System
DK-WG	Data and Knowledge Working Group
DLR	German Aerospace Center
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DRRA-WG	Disaster Risk Reduction and Adaptation Working Group
DRR-WG	Disaster Risk Reduction Working Group
DWD	Deutscher Wetterdienst, Germany
EAMF ATLAS	Atlas for the Endangered East African Montane Forest Ecoregion
EARSC	European Association of Remote Sensing Companies
EAV	Essential Agricultural Variable
EBV	Essential Biodiversity Variable
ECCC	Environment and Climate Change Canada
ECHO	Civil Protection and Humanitarian Aid Office, European Commission
ECMWF	European Centre for Medium-Range Weather Forecasts
ECRV	Essential Cold Regions Variable
EDI	Equality, Diversity, and Inclusion
EESV	Essential Ecosystem Service Variable
EGMS	European Ground Motion Service
EIC	European Innovation Council
eLTER	European Long-Term Ecological Research Network
EMIT	Earth Surface Mineral Dust Source Investigation
EMS	Emergency Management Services

ENVIRONMENT DATA GAPS	Data Gaps at the Nexus between Biodiversity, Geodiversity, and Ecosystems
EO	Earth observation
EO4DRM	Earth Observations for Disaster Risk Management
EO4EA	Earth Observations for Ecosystem Accounting
EO4EcoIntel	Land Cover & Land Intelligence Action Group
EO4KARST	Earth Observations for Global Typical Karst
EO4SDG	Earth Observations for the Sustainable Development Goals
EO4WEF	Earth Observations for the Water-Energy-Food Nexus
EOC	Earth Observation Center
EO-NREN	Europe-Africa EO Data Sharing for EW/Climate/DRR
EOTEC DevNet	Earth Observation Training, Education, and Capacity Development Network
ERIC	European Research Infrastructure Consortium
ESA	European Space Agency
ESMIN	European Sustainable Mining and Innovation Network
Esri	Environmental Systems Research Institute
ÉTS Montréal	École de technologie supérieure, Canada
EU	European Union
EUMETSAT	European Organization for the Exploitation of Meteorological Satellites
EuroGEO	European Group on Earth Observations
EW	Early Warning
EW4ALL	Early Warnings for All
ExCom	Executive Committee
EYWA	Early Warning System for Mosquito Borne Diseases
FAIR	Findable, Accessible, Interoperable, and Reusable
FAO	Food and Agriculture Organization of the United Nations
FMI	Finnish Meteorological Institute
FRQNT	Fonds de recherche du Québec - Nature et technologies, Canada
GBF	Kunming-Montreal Global Biodiversity Framework
GBIF	Global Biodiversity Information Facility
GDIS	Global Drought Information System
GÉANT	Gigabit European Academic Network
GEO	Group on Earth Observations
GEO BON	GEO Biodiversity Observation Network
GEO WHN	GEO Wildfire-Health Nexus
GEO-BLUE-PLANET	GEO Blue Planet
GEO-CITSCI	GEO Citizen Science

GEO-CONNECTIONS	GEO Connected Community: Advancing Communication Infrastructure and Services
GEO-CRADLE	GEO Capacity Building in the Balkans, Black Sea, Middle East, Africa, and Pacific Asia Regions
GEO-DECOP	Digital Earth Approaches for GEO
GEO-EDI	Equality, Diversity, and Inclusion
GEO-EV	GEO Essential Variables
GEO-EV-PRODUCTS	Global Products of Common Essential Variables from Multiple Satellite Data
GEO-IA	GEO Indigenous Alliance
GEO-LDN	GEO Land Degradation Neutrality
GEO-MOUNTAINS	Global Network for Observations and Information in Mountain Environments
GEO-PDRS	Global Vegetation Pest and Disease Dynamic Remote Sensing Monitoring and Forecasting
GEO-REWET	Response and Restoration of Wetland Environments
GEO-TREES	Forest Biomass Reference System from Tree-by-Tree Inventory Data
GEO-VENER	GEO Vision for Energy
GEO-WETLANDS	GEO Wetlands
GEO-WOMEN	Linking and Connecting Women in Earth Observation and Earth Intelligence
GEO-YOUTH	GEO Youth Community of Practice
GEOARC	Global Ecosystems and Environment Observation Analysis Research Cooperation
GEOCRI	GEO Cold Regions Initiative
GEODESY4SENDAI	Geodesy for the Sendai Framework
GEOGLAM	GEO Global Agricultural Monitoring
GEOGLOWS	GEO Global Water Sustainability
GEOMIN	Earth Observations for Multi-Scale Monitoring of Mining Impacts
GEONICE	Nexus on Climate, Energy, and Urbanization
GEOSS	Global Earth Observation System of Systems
GEOVALUE	Understanding the Impacts and Value of Earth Observations
GET	Géosciences Environnement Toulouse
GET	Global Ecosystem Typology
GFOI	Global Forest Observations Initiative
GGO	Greek GEO Office
GHG	Greenhouse gas
GHRS	Global Heat Resilience Service
GHSL	Global Human Settlement Layer

GIDTT	GEOSS Infrastructure Development Task Team
GIZ	Agency for International Cooperation, Germany
GMBA	Global Mountain Biodiversity Assessment
GMES	Global Monitoring for Environment and Security
GOS4M	Global Observation System for Mercury
GOS4POPs	Global Observation System for Persistent Organic Pollutants
GRID	Global Resource Information Database
GRSS	Geoscience and Remote Sensing Society
GSNL	Geohazard Supersites and Natural Laboratories
GUOI	Global Urban Observation and Information
GVO	Goma Volcano Observatory, Democratic Republic of the Congo
GWIS	Global Wildfire Information System
GWP	GEO Work Programme
HEALTH-CoP	Earth Observations for Health
HiMAC WG	High Mountain and Cold Region Working Group, Digital Belt and Road Program
HOT	Humanitarian OpenStreetMap Team
HTTP	Hypertext Transfer Protocol
HUMAN-PLANET	GEO Human Planet
HW/SW	Hardware/Software
HZG	Helmholtz Centre for Materials and Coastal Research
IAEG	International Aerospace Environmental Group
IAI	Inter-American Institute for Global Change Research
IARI	Indian Agricultural Research Institute
ICIMOD	International Centre for Integrated Mountain Development
ICOS	Integrated Carbon Observation System
ICRC	International Committee of the Red Cross
IEEE	Institute of Electrical and Electronics Engineers
IFRC	International Federation of Red Cross and Red Crescent Societies
IFREMER	Institut français de recherche pour l'exploitation de la mer, France
IG-CAS	Institute of Geochemistry, Chinese Academy of Sciences
IGE	Institut des Géosciences de l'Environnement, France
IGEPN	Instituto Geofísico de la Escuela Politécnica Nacional, Ecuador
IIASA	International Institute for Applied Systems Analysis
IMO	Icelandic Meteorological Office
IN-SITU-ESC	In-Situ Observations and Applications for Ecosystem Status of China and Central Asia
INAMHI	Instituto Nacional de Meteorología e Hidrología, Ecuador
INAR	Institute for Atmospheric and Earth System Research, Finland

INETER	Instituto Nicaragüense de Estudios Territoriales, Nicaragua
INGV	Istituto Nazionale di Geofisica e Vulcanologia, Italy
INIBIOMA-CONICET	Instituto de Investigaciones en Biodiversidad y Medioambiente, Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina
INP-HB	Institut national polytechnique Félix Houphouët-Boigny, Côte d'Ivoire
INTAROS	Integrated Arctic Observation System
INTPA	International Partnerships, European Commission
IRCK	International Research Centre on Karst under the auspices of United Nations Educational, Scientific and Cultural Organization
ISDE	International Society for Digital Earth
ISO	International Organization for Standardization
ITC	International Institute for Geo-Information Science and Earth Observation
iTLER	International Long-Term Ecological Research Network
ITP-CAS	Institute of Tibetan Plateau Research, Chinese Academy of Sciences
IUCN	International Union for Conservation of Nature
IUGS	International Union of Geological Sciences
IVS	Institute of Volcanology and Seismology, Philippines
IWMI	International Water Management Institute
JAMSTEC	Japan Agency for Marine-Earth Science and Technology
JAXA	Japan Aerospace Exploration Agency
JRC	Joint Research Centre, European Commission
JSI	Institut "Jožef Stefan," Slovenia
K2A Hubs	Knowledge to Action Hubs
KARI	Korea Aerospace Research Institute, South Korea
KOERI	Kandilli Observatory and Earthquake Research Institute, Turkey
KSA	Kenya Space Agency
LACI	Enhancing Capacity for Climate Risk Assessment and Catalyzing Partnerships to Inform Decisions in Latin America and the Caribbean
LDCs	Least Developed Countries
LIENSs	Littoral Environnement et Sociétés, France
LIN SB RAS	Limnological Institute, Siberian Branch of the Russian Academy of Sciences
m4mining	Multi-scale, Multi-sensor Mapping and dynamic Monitoring for sustainable extraction and safe closure in Mining environments
MEA	Multilateral Environmental Agreement

MEXT	Ministry of Education, Culture, Sports, Science and Technology, Japan
MIO	Mediterranean Institute of Oceanography
ML	Machine Learning
MMU	Manchester Metropolitan University, United Kingdom
MOST	Ministry of Science and Technology, China
MRI	Mountain Research Initiative
MRV	Measurement Reporting and Verification
NADP	National Atmospheric Deposition Program, United States
NASA	National Aeronautics and Space Administration, United States
NATESC	National Agro-tech Extension and Service Center, China
NBI	Nile Basin Initiative
NCEI	National Centers for Environmental Information, United States
NDMC	National Drought Mitigation Center, United States
NIEER-CAS	Northwest Institute of Eco-Environment and Resources, Chinese Academy of Science
NESDIS	National Environmental Satellite, Data, and Information Service, United States
NFGA	National Forestry and Grassland Administration, China
NFMS	National Forest Monitoring Systems
NGA	National Geospatial-Intelligence Agency, United States
NGO	Non-governmental Organization
NIDIS	National Integrated Drought Information System, United States
NIGHT-LIGHT	Night-Time Light Remote Sensing for Sustainable Development Goals
NIPR	National Institute of Polar Research, Japan
NMEFC	National Marine Environmental Forecasting Center, China
NOA	National Observatory of Athens, Greece
NOAA	National Oceanic Atmospheric Administration, United States
Norad	Norwegian Agency for Development Cooperation
NRCAN	Natural Resources Canada
NREN	National Research and Education Network
NSR	Northern Sea Route
NSSC-CAS	National Space Science Center, Chinese Academy of Sciences
NTCSA	National Transmission Company South Africa
OEA	Open Earth Alliance
OECD	Organization for Economic Co-operation and Development
OGC	Open Geospatial Consortium
OSS	Sahara and Sahel Observatory
OVDAS	Observatorio Volcanológico de los Andes del Sur, Chile

PCC	Project Coordination Committee
PEEX	Pan-Eurasian Experiment
PGSC	Pacific Geospatial & Surveying Council
PMAS-AAUR	PMAS-Arid Agriculture University Rawalpindi, Pakistan
PO	Participating Organization
QA/QC	Quality Assurance/Quality Control
R&D	Research and Development
R2O	Research to Operations
RADI-CAS	Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences
RCHS-WG	Resilient Cities and Human Settlements Working Group
RCMRD	Regional Centre for Mapping of Resources for Development
RedCLARA	Latin American Cooperation of Advanced Networks
RESTEC	Remote Sensing Technology Center, Japan
RIIS	Research Institute for Innovation and Sustainability
RNC	Regional Network Coordinator
RREN	Regional Research and Education Network
RS	Remote Sensing
RSA	Rwanda Space Agency
S34I	Secure and Sustainable Supply of Raw Materials for EU Industry
SAEON	South African Environmental Observation Network
SAON	Sustaining Arctic Observing Networks
SAR	Synthetic Aperture Radar
SatCen	European Union Satellite Centre
SAWS	South Africa Weather Service
SBA	Societal Benefits Area
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice, Convention on Biological Diversity
SDC	Swiss Agency for Development and Cooperation
SDG	Sustainable Development Goals
SDSN	Sustainable Development Solutions Network
SEEA EA	System of Environmental Economic Accounting—Ecosystem Accounting
SERNAGEOMIN	Servicio Nacional de Geologia y Mineria, Chile
SEWA	Space for Early Warnings in Africa
SIDS	Small Island Developing States
SLF	Institut WSL pour l'étude de la neige et des avalanches, Switzerland
SLOPE-RISK-GPT	A Decision-Making System for Slope Risk Deduction
SME	Small and medium enterprise

SMN	Servicio Meteorológico Nacional, Mexico
SNPP	Suomi National Polar-orbiting Partnership
SPACE-SECURITY	Space and Security
SPC	Pacific Community
SPREP	Pacific Regional Environment Programme
SSO	Single Sign-On
STAC	Spatio-Temporal Asset Catalog
STRP	Scientific and Technical Review Panel, Convention on Wetlands
TAHMO	Trans-African Hydro-Meteorological Observatory
TCT	Thematic Coordination Team
TEMBO	Transformative Environmental Monitoring to Boost Observations
TGF	Tethys Geoscience Foundation
THE ATLAS	Global Ecosystems Atlas
TNFD	Taskforce on Nature-related Financial Disclosures
TRL	Technology Readiness Level
TUW	Technical University of Vienna, Austria
UAV	Unmanned Aerial Vehicle
UCL	University College London
UENR	University of Energy and Natural Resources
UHCO	Urban Heritage Climate Observatory
UiT	The Arctic University of Norway
UN	United Nations
UN-Habitat	United Nations Human Settlements Programme
UN-SPIDER	United Nations Platform for Space-based Information for Disaster Management and Emergency Response
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNGSC	United Nations Global Service Centre
UNITAR	United Nations Institute for Training and Research
UNOOSA	United Nations Office for Outer Space Affairs
UNU-EHS	Institute for Environment and Human Security, United Nations University

UPPA	Université de Pau et des Pays de l'Adour, France
URI	Uniform Resource Identifier
US	United States
USA	United States of America
USAID	United States Agency for International Development
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTCI	Universal Thermal Climate Index
UTS	University of Technology Sydney, Australia
VAO	Virtual Alpine Observatory
VHR	Very High Resolution
VIIRS	Visible Infrared Imaging Radiometer Suite
VITO	Flemish Institute for Technological Research
WACREN	West and Central African Research and Education Network
WCRP	World Climate Research Programme
WEF	World Economic Forum
WFP	World Food Programme
WG	Working Group
WHC	World Heritage Centre
WMO	World Meteorological Organization
WP	Work Programme
WRI	World Resources Institute
XIEG-CAS	Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences