



EARTH OBSERVATIONS FOR THE
SUSTAINABLE DEVELOPMENT GOALS

EO4SDG: Earth Observations

*in Service of the 2030 Agenda for
Sustainable Development*

STRATEGIC IMPLEMENTATION PLAN

2023-2025



PREFACE

Well-being, economic growth, hunger, sanitation, poverty, energy, disease, fresh water, disasters, air quality, biodiversity, deforestation, hygiene, urbanization, food security, environmental challenges These all happen somewhere in space and through time.

A significant opportunity exists to address these challenges by bringing together data and applying information about people and places into national monitoring and evaluation systems to improve human and environmental conditions.

In September 2015, the United Nations General Assembly endorsed *Transforming Our World: the 2030 Agenda for Sustainable Development*, a global development agenda for all countries and stakeholders to use as a blueprint for progress on economic, social and environmental sustainability.

Seventeen Sustainable Development Goals (SDGs) and associated Targets and Indicators anchor the *2030 Agenda*, which specifically calls for new data acquisition and exploitation of a wide range of data sources to support implementation. Article 76 states, “We will promote transparent and accountable scaling-up of appropriate public-private cooperation to exploit the contribution to be made by a wide range of data, *including Earth observation and geo-spatial information*, while ensuring national ownership in supporting and tracking progress.”

In 2016, the Group on Earth Observations launched the *Earth Observations for Sustainable Development Goals (EO4SDG)* initiative to contribute to the *2030 Agenda* and realize the potential that Earth observations and geospatial information offer to the SDGs and the normative benefits they represent.

Mid-way to 2030, countries and stakeholders have increased their use of Earth science information to inform development indicators; manage targets; prioritize sustainable development implementation programs; and evaluate outcomes. From measuring climate risks and urban growth, to monitoring biodiversity hotspots and sustainable forest management, Earth science data and derived insights play a key role in sustainable solutions.

There are now more examples of fit-for-purpose data, tools, and methodologies that advance integration of Earth observations in support of sustainable development applications. In addition, capacity development and resource mobilization efforts have been focusing on strengthening the ability of countries to integrate a range of new data sources into national statistical systems, and address data needs for the full implementation of the 2030 Agenda.

This document provides a n update to the strategic implementation plan for EO4SDG, guiding GEO’s activities for 2023-2025. We plan to continue to demonstrate practical and innovative uses of Earth observations, build skills and capacity, promote free and open data access, and support country and stakeholder adoption, especially in hopes of enabling the use of Earth observations in broader ways to inform decisions and actions. We also plan to continue to provide technical guidance for SDG relevant projects developed under other GEO activities, serving a coordination role to GEO’s overall service to the SDGs.

We welcome your involvement and contributions in the service of the GEO community and Earth observations to the societal benefits achievable through the Sustainable Development Goals.

Cordially,

The EO4SDG Team

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EXECUTIVE SUMMARY

Earth Observations for Sustainable Development Goals (EO4SDG) Initiative

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The 2030 Agenda for Sustainable Development calls for new data acquisition and integration approaches to improve the quality, coverage, and availability of data to support the implementation of the development agenda at all levels. Article 76 states, “We will promote transparent and accountable scaling-up of appropriate public-private cooperation to exploit the contribution to be made by a wide range of data, including Earth observation and geospatial information, while ensuring national ownership in supporting and tracking progress.” This presents a unique opportunity for Earth observations and geospatial information to be integrated into national information systems and monitoring frameworks, as well as real-world applications that can reduce and mitigate environmental risk and disasters, creating more sustainable and resilient societies.

To support this call with concerted action, the GEO Mexico City Declaration from the 2015 GEO Ministerial affirmed that “GEO and its Earth observations and information will support the implementation of, inter alia, the 2030 Global Goals for Sustainable Development...” and called on GEO to “...launch a GEO initiative to leverage Earth observations to support the implementation, monitoring and evaluation of the 2030 Global Goals for Sustainable Development, building on the recent success of GEO’s engagement with the United Nations on this issue.” Furthermore, at the GEO-XII Plenary meeting, GEO enacted the GEO Engagement Priorities, approving three policy initiatives as initial priorities for GEO, including the 2030 Agenda for Sustainable Development, the Paris Agreement on climate and the Sendai Framework for Disaster Risk Reduction.

The Earth Observations for Sustainable Development Goals (EO4SDG) Initiative organizes and realizes the potential of Earth observations and geospatial information to advance the 2030 Agenda and enable societal benefits through achievement of the SDGs. EO4SDG works with GEO Members, Participating Organizations and other GEO Initiatives and Flagships to integrate Earth Observations in local, national and global SDG processes. In addition, EO4SDG is integrating Earth observations into trusted portals across communities; engaging countries in capacity building and co-learning efforts (e.g., webinars, toolkits); and increasing awareness (e.g., via awards, scientific workshops, special issues of scientific journals) of effective uses of Earth observations to achieve benefits and positive impacts, thereby encouraging nations and stakeholders to pursue using Earth observations themselves.

The EO4SDG initiative, in partnership with CEOS, engages in efforts that advance the provision, access, discoverability, and applicability of Earth observations and geospatial information for use with the SDG. This element draws on GEO’s efforts to characterize user needs, especially in the collection of information from SDG user organizations, to help refine approaches to enable greater use of Earth observations for the SDG. EO4SDG also serves to “federate” all of GEO’s Community Activities, Initiatives and Flagships that include an SDG element to increase SDG-related knowledge sharing across the GEO Work Programme. The Initiative provides technical and other guidance for projects developed under other GEO activities, serving a coordination role to GEO’s overall service to the SDG.

The prime users of EO4SDG are National Statistical Offices (NSOs), National Mapping Agencies, line ministries, international statistical agencies, UN custodian agencies, and other major groups and stakeholders. The Initiative promotes the emergence and scaling-up of joint efforts and collaboration between these users and the geospatial and Earth observation communities to demonstrate effective uses of Earth observation data in complementing traditional data systems such as census data, administrative data, household survey data, and vital statistics, to help achieve the SDG.

EO4SDG, in collaboration with thematic GEO Work Programme elements, works closely with custodian agencies responsible for specific indicators relevant to their thematic expertise and mandate – such as the UN Environment Programme, the UN Convention to Combat Desertification (UNCCD), and the UN Habitat – on SDG indicator method development, testing, refinement, adoption, and widespread, sustained use. These efforts have led to proposals within the UN system to elevate the readiness status of global methodologies related to fresh water, terrestrial ecosystems, and sustainable urbanization, with Earth observations integrated as notable inputs. This resulted in the precedent setting elevation of four indicator methodologies¹ to a higher classification tier, with GEO having been recognized as a key contributor in this process.

EO4SDG works in close coordination with other GEO activities that cover thematic areas of relevance to the SDGs. For example, GEO BON, the Biodiversity Observation Network of GEO, is working towards linking the biodiversity data and metadata to GEOSS, *the Global Earth Observation System of Systems*, in support of the UN CBD (related to SDG15, life on land); the GEO Global Agricultural Monitoring initiative (GEOGLAM) increases market transparency and improves food security by producing and disseminating relevant, timely, and actionable information on agricultural in support of SDG2 (zero hunger).

In addition, EO4SDG works with the UN Inter-Agency Expert Group on Sustainable Development Goals (IAEG-SDG)² Working Group on Geospatial Information (WGGI), a working group responsible for reviewing the Global Indicator Framework through a “geographic location lens” and identifying how geospatial information, including Earth observations, can contribute toward addressing the SDG. In 2022, the WGGI, with significant input from EO4SDG, launched the SDGs Geospatial Roadmap, a resource to communicate, guide, and enhance the awareness of how geospatial information and Earth observations are used to achieve the SDGs. The 53rd session of the Statistical Commission adopted the roadmap, recognizing that geospatial information, including Earth observations, serves as official data to aid countries in activities related to the SDGs.

EO4SDG piloted the SDG Toolkit concept in 2020. SDG Toolkits provide rich, coordinated guidance about integrated EO data and tools, methodologies, use case examples and capacity development resources to strengthen SDG monitoring, reporting, and implementation efforts. In 2021, at a United Nations (UN) Statistical Commission side event, EO4SDG launched the Earth Observations Toolkit for Sustainable Cities and Human Settlements in partnership with the UN Human Settlements Program (UN-Habitat) and the Group on Earth Observation (GEO). The toolkit is a collaborative effort that improves countries’ and cities’ capacity to use and access Earth science resources related to human settlements indicators. It involves participation from over 40 organizations and contributes to the global urban monitoring framework, designed by UN-Habitat and adopted at the 53rd session of the Statistical Commission.

EO4SDG maintains a dedicated [website](#) and social media accounts ([Twitter](#), [Facebook](#)) to convey achievements and stories about how Earth observations and GEO serve the SDGs. The portal shares information about projects, communities, and programs that support the EO4SDG mission.

¹ These include indicators 6.3.2 (ambient water quality), 6.6.1 (spatial extent of water-related ecosystems), 11.7.1 (average share of the built-up area of cities that is open space for public use for all) and 15.3.1 (proportion of degraded land per total land). Additional progress has been made towards scaling the use of Earth observations in support of indicator 11.3.1 (land consumption per population growth).

² The UN Inter-Agency Expert Group on Sustainable Development Goals (IAEG-SDG), established in 2015 by the UN Statistical Commission (UNSC), is responsible for developing and implementing the Global Indicator Framework for the Goals and Targets of the 2030 Agenda.

VISION

Countries, stakeholders, and the global community desire additional Earth observations and geospatial information to continue progress on improved social, economic, and environmental sustainability.

By 2030, the Group on Earth Observations envisions a world in which uses of Earth observations and geospatial information to support progress on the Sustainable Development Goals are valuable, routine and customary. Mid-way to 2030, the foundation has been laid for governments and organizations to capitalize on the benefits of Earth observations, Earth science research and derived knowledge provide to monitor, plan, and report on the SDGs through 2030.

Realizing this vision implies that: the global community is aware of effective ways to use Earth observations and geospatial information relative to the SDGs; countries and stakeholders have the skills and capabilities necessary to apply the data and information; the global community employs smart practices and solutions on uses of Earth observations in planning, tracking, and reporting; Earth observations provide real, value-added benefits and are recognized for their contributions to support positive social, economic, and environmental impacts; and there is demonstrated progress on the Goals and broad desire for more.

Achieving this vision also implies that countries and stakeholders have timely access to needed data and information, and they can seamlessly integrate them where applicable – that data and derived knowledge is freely and openly available, especially where achieving SDGs requires multi-national or regional approaches and coordination. There are on-going collaborations among Earth observation providers, stakeholders, and countries, especially with national statistical offices and line ministries. Additionally, there are open lines of dialogue to consider and appropriately support needs for data, training, method testing, product validation and capacity development. Countries and stakeholders recognize the value of the data and information for the SDGs, and they want additional data and enhanced information for the SDGs and for broader activities, planning, and decisions. Overall, they envision and are motivated to pursue new opportunities to enable societal benefits.

As GEO is approaching the end of its 2016-2025 decade, EO4SDG is fully supporting the evolution towards a post-2025 GEO Work Programme that will emphasize objectives of integration and collaboration, open knowledge, operationalization, and user orientation as defined by the GEO plenary-17. Collaboration with other GEO WP activities to support effectively numerous SDG targets and value all that the GEO community can bring, avoiding duplication of efforts, has always been at the core of the EO4SDG mandate. In addition EO4SDG recognises that Earth Observations support the understanding of the interactions between the SDGs that will help countries to maximize synergies to achieve multiple SDGs and resolve existing trade-offs. Looking at SDGs interactions while integrating knowledge from different GEO WP activities to support multiple SDGs will be a challenge that EO4SDG will handle in close collaboration with other GEO activities to be post-2025 ready and participate in the transformation of GEO for more impact.

PURPOSE Extend and apply Earth observations, geospatial information and derived knowledge to advance the *2030 Agenda* and enable societal benefits through achievement of the Sustainable Development Goals.

EO4SDG serves a fundamental role to advance global knowledge about effective ways that Earth observations and geospatial information can support the SDGs. The Initiative seeks to advance the benefits of effective use of Earth observations for the realization of the global goals. And, these uses can lead to greater awareness of, and interest in, Earth observations to enable even greater societal benefits.

The 2030 Agenda specifically calls for new data acquisition and exploitation of a wide range of data sources to support comprehensive review and implementation processes at global, national, and sub-national levels. Article 76 states, “We will promote transparent and accountable scaling-up of appropriate public private cooperation to exploit the contribution to be made by a wide range of data, including Earth observation and geospatial information, while ensuring national ownership in supporting and tracking progress.” This presents a unique opportunity for Earth observations and geospatial information, combined with demographic data, statistical data and other non-traditional sources of data, to enable countries and stakeholders to inform SDG indicators; monitor change over time in a consistent and standardized manner; evaluate impacts across sectors and regions; enhance visualization capabilities leveraging common platforms; and support planning and informed policy decisions.

EO4SDG involves technical, organizational and programmatic components. Collectively, these items meld in the projects, data, outreach and engagement, and capacity development related to how Earth science information sources can support the *2030 Agenda*.

When countries and stakeholders actively use Earth observations on a sustained basis for their SDG activities, can attribute efficacy of their efforts towards the goals on Earth Observations, increased collaboration across multiple stakeholders on use of Earth Observations for SDG-related decision making, the EO4SDG initiative will be successful. And, if their SDG-related use of Earth observations leads to broader uses or stimulates new and improved collections of Earth observations, this initiative will have truly helped GEO fulfill its overall purpose and vision.

INITIATIVE GOALS

EO4SDG has three goals and associated objectives to realize the vision and serve the purpose described above. The goals describe overarching, desired outcomes and the objectives articulate specific, measurable results.

- GOAL I Demonstrate how Earth observations, geospatial information, and socio-economic and other data effectively contribute in novel and practical ways to support sustainable development efforts and the SDGs.

- GOAL II Increase skills and capabilities in uses of Earth observations for SDG activities and their broader benefits.

- GOAL III Broaden access, interest, awareness, and understanding of Earth observations support to the SDGs and contributions to social, environmental, and economic benefits.

Goal I focuses strongly on the development and uptake of quality methods using Earth observations for use with the SDGs, associated Targets, and the global Indicator framework. Applied research, feasibility testing, development, and operationalization of innovative and practical methods are part of this goal, including assessments across users and regions as well as of data availability and suitability. User engagement and co-development of methods and testing are important and integral to successful development and broader uptake.

The prime users of EO4SDG are National Statistical Offices (NSOs), National Mapping Agencies, line ministries, international statistical agencies, and UN entities. EO4SDG promotes the emergence and scaling-up of joint efforts between these users and the Earth observation/ Geospatial Information (EO/GI) community to demonstrate the effective uses of EO/GI data in complementing traditional data, such as census data, administrative data, household survey data, and vital statistics, to achieve the SDGs. In addition to addressing timely access to needed data and information, the goal includes efforts to integrate Earth observations and geospatial information into internationally approved guidelines, national development plans and national monitoring systems for the SDGs. Partnerships with organizations and communities to support broad use of effective methods and solutions is implicit, and this goal entails significant work to enable the adoption of these methods.

EO4SDG has established priority areas for the development of methods applying Earth observations to the SDGs. These include Goals 6 (clean water and sanitation), 11 (sustainable cities and human settlements), 14 (life below water) and 15 (life on land). In addition, the UN IAEG-SDGs WGGI has developed a shortlist of 24 indicators where geospatial information and Earth observations, together with statistical data, can contribute directly (or indirectly) to the production of these indicators (Appendix A). These are considered priority indicators for GEO, particularly those that are categorized as Tier II — i.e., indicators with an established methodology but where data are not regularly produced by countries. As of February 2022, the global indicator framework includes 136 Tier I indicators, 91 Tier II indicators and 4 indicators that have multiple tiers.

The following are objectives under Goal I:

By 2025, develop 30 good practice examples with GEO members and the wider international community to drive impact.

Over 30 countries have specific examples on how they have applied EO in assessing, and reporting on, SDG indicators.

Collaborate with SDG custodian agencies to develop or refine ten (or more) methods that the IAEG-SDGs adopts by 2025, contributing to the advancement of 10 indicators to a higher tier (Tier I).

The Initiative seeks to ensure methods are endorsed, meet the statistical community's standards, and help countries apply EO to SDG.

By 2025, develop examples of fifteen (or more) indicators using Earth observations.

The Initiative seeks a spread across environmental, social, and economic themes.

Produce five (or more) examples on uses of Earth Observations for SDG Targets.

The Initiative strives to broaden application of EO to inform the Goals and Targets, in hopes of encouraging other GEO Work Programme activities to follow suit.

Advance 25% of country pilot projects by one Method Useability Level (MuL) - see Appendix C; deliver one project per year to MuL 7 in 2023-2025, and show three new EO products in planning by 2024.

The Initiative promotes demonstrable progress in the development of methods and their sustained, widespread utilization by countries for SDG monitoring and reporting, while encouraging new data and information collection.

Advance the development of fifteen SDG examples completed under other GEO Work Programme Activities.

The Initiative promotes good practice examples of EO uses with SDG developed under other GEO Work Programme Activities independent of (or with guidance from) EO4SDG.

Goal II improves underlying capabilities of Earth observations, focusing especially on support to countries and stakeholders in the implementation of methods using Earth observations to address the *2030 Agenda*. The goal includes activities to coordinate and foster capacity development to effectively employ methods, enable access to EO data and data literacy, and sustain use of Earth observations in the context of the SDGs. The goal spans human, scientific, technological, organizational, institutional, and resource-based capacities.

Efforts to develop capabilities to substantiate and quantify the social, environmental, and economic benefits from Earth observations in serving the SDG are included, especially as this articulation may contribute to greater uptake. Activities to develop capabilities within GEO and the Earth observations community on the principles and practices established by NSOs for the calculation and measurement of SDG indicators, as well as new capacities to use geo-visualization methods of data to support the analysis and planning of alternative scenarios regarding the SDGs; and, increase use cases, and interdisciplinary collaboration. This initiative also “federates” GEO’s community Activities, Initiatives and Flagships that include an SDG element so as to increase SDG-related knowledge sharing across the GEO Work Programme.

The following are objectives under Goal II:

By 2025, involve twenty (or more) countries in the development and delivery of trainings.

The Initiative ensures continuous geographic breadth (including representation per continent and a balance among high, middle and low-income countries).

Produce and share valuations and impact assessments of fifteen methods with GEO members, partners and the wider international community.

The Initiative strives to ensure the methods are valuable in addition to being sound.

Roll-out three (or more) SDG Toolkits by 2025, linking them with the GEO Knowledge Hub and GEOSS.

The Initiative supports capacity development through functional tools, which will also be integrated into other vehicles (e.g., the Federated System of UN SDG Data Hubs, the UN Sustainable Development Solutions Network).

Document national experiences and good practices including case studies, and maintain a handbook on SDGs and Earth observations.

The Initiative provides a platform for knowledge sharing across all GEO Work Programme activities that include an SDG element, and the broader EO/GI and statistical communities.

Develop a Massive Open Online Training Course on Earth Observations for SDGs.

The Initiative promotes stakeholder engagement, exchange of user experiences and skills building to raise awareness and enable easier, broader country adoption.

Goal III addresses outreach, engagement, and communications to showcase effective uses of Earth observations to achieve benefits and positive impacts, thereby encouraging nations and stakeholders to pursue uses themselves. Traditional and innovative approaches are included to convey achievements and quality stories about roles of Earth observations and GEO to serve development goals. In communicating use-cases, examples and successes, the Initiative emphasizes where nations and stakeholders clearly gain from their use of Earth observations for the SDGs. The materials showcase Countries, initiatives, collaborations, stakeholders and achieved impact. Communication efforts on the progress of the Initiative overall are included. Outreach and engagement activities include efforts to support user-generated methods, refinement of the ideas, and brokering connections between users and technical experts. The goal involves innovative work to visualize and convey status and trends in progress toward the SDGs. A foundational element of this Goal is to increase awareness of the need for open data and information, benefits of utilizing earth observations especially in underserved communities and emerging economies, to enable policy makers at all levels to make informed decisions based on the use of Earth observations.

The following are objectives under Goal III:

Starting in 2019, issue annual awards on uses of Earth observations for SDG.

The Initiative recognizes excellence and innovation, generating examples that users can consider and pursue.

Produce videos, handouts, and podcasts on three SDG by 2024 and seven by 2025.

The Initiative seeks a spread across social, environmental, and economic themes.

Organize special issues, and publish one or more articles per year, in popular and scientific/trade literature on Earth observations and SDGs.

The Initiative shares examples about effective ways to apply Earth observations to the SDGs.

Continue conducting one or more events at UN, GEO, scientific conferences, and trade shows in 2019-2024.

The Initiative demonstrates benefits of Earth observations for the SDG at places where users gather, across regions.

Arrange partnerships with two major entities at the nexus of science, decision support, and sustainability.

The Initiative supports institutions and leverages assets to achieve mutual benefits.

Produce annual reports and a mid-way to 2030 Summary Report.

The Initiative documents activities and conveys smart practices.

IMPLEMENTATION ELEMENTS

This section describes the primary implementation elements to address the goals and objectives. The EO4SDG Initiative maintains four elements as lines of business: Projects, Capacity Building, Data and Information Products, and Outreach and Engagement. Each line serves each of the goals and contributes to the objectives. Some lines may have desirable overlaps and synergies with other lines, and they collectively address technical, organizational and programmatic aspects of the Initiative.

The EO4SDG team of GEO Member Countries, Participating Organizations, and additional contributors pursues these implementation elements in partnership with suitable, apposite organizations (see Stakeholder Engagement).

The seventeen Goals of the *Agenda 2030* entail 169 Targets and 232 Indicators in the Global Indicator Framework. Some Goals, Targets, and Indicators are well-suited for Earth observations support. In some cases, Earth observations can directly serve an Indicator. In others, Earth observations may provide ancillary information toward indirectly serving an Indicator. Still, in others, Earth observations may not meet the stated Indicator, yet they can contribute to progress on the associated Target (and the results will show up in the Indicator). Table 1 in Appendix A presents an analysis carried out by GEO, which identifies 72 (42%) targets and 35 (15%) indicators where Earth observations can contribute to as a direct measure or as indirect support. A more recent analysis by Kavvada et al. (2020) shared an updated assessment of existing EO systems available to generate data for SDG indicators, including main resolution characteristics, identifying 33 indicators for which EO data plays a significant role. Based on this analysis, SDGs 6: Clean water and sanitation, 14: Life below water, 15: Life on land and 11: Sustainable cities and communities offer the greatest opportunities for the application of EO data. Appendix A also includes Table 2, which describes alignments of the seventeen Goals with specific types of Earth observations and geospatial information.

In addition, Tables 3 and 4 in Appendix A demonstrate results from an analysis carried out by the UN IAEG-SDGs WGGI. This includes a shortlist of 15 indicators where GI/EO, together with statistical data, can contribute directly to the production of these indicators (Figure 3); and, a shortlist of six indicators where GI and EO significantly support the measurement of these indicators (Table 4). Tables 3, 4 also share information about which of those indicators include UN adopted, EO integrated methods and documented country examples, as of April 2022.

The EO4SDG Team uses these assessments to guide its foci during implementation.

Projects

The EO4SDG Initiative directly supports and pursues projects for method development, distribution, and adoption. The Initiative also provides technical and other guidance for projects developed under other GEO activities, serving a coordination role in a federated approach to GEO's overall service to the SDGs.

Collectively, this portfolio of projects develops and deploys uses of Earth observations to support the tracking of, and reporting on, the SDGs, including integration with national statistical accounts

for the indicators. The projects conceive, develop, test, and validate relevant methods, building on proven, existing methods and applications when appropriate. Projects and methods may range from traditional and practical approaches to novel and innovative ones.

Projects encompass simple feasibility studies, pilot projects, and in-depth endeavors. As projects mature, their activities address suitability assessments, sensitivity analyses, frequency testing, and other factors to characterize uses of Earth observations and their appropriateness across users³ and regions. Their activities may involve innovative uses of visualizations, dashboards, infographics, and graphic design approaches to communicate status and trends in SDG indicators.

Some project activities may focus on one country and address several SDG indicators; others may focus on a particular SDG indicator and apply it to several countries. Overall, the Initiative pays particular attention to the ability to scale a method to multiple nations or stakeholders on a regional or global scale. In addition, the Initiative emphasizes the strong collaborations that projects must have with the statistical community at national and global levels.

The range of activities in the GEO Work Programme provide multiple ways for GEO and Earth observations to support the SDGs. As part of a federated approach, the EO4SDG Initiative serves a communication function to share smart practices and provide guidance, encouraging consistent approaches and quality standards. Collectively, the projects help enhance the global knowledge and capacity on how to use Earth observations in the implementation and monitoring of the SDGs.

Building on these projects, the EO4SDG initiative documents and broadcasts examples, case studies, lessons learned, and smart practices using Earth observations with the SDG indicators. The initiative identifies and conveys feedback from user organizations on their experiences with and recommendations for Earth observations data and derived information, such as formats and access. The projects include efforts to support qualitative and quantitative evaluation on the broader benefits of Earth observations to enable societal benefits. The projects also aim to illustrate how Earth observations can be employed in the development and implementation of policies and programs that extend beyond the SDGs.

Capacity Building

A portfolio of capacity building activities provides support to institutions and individuals in the ideation, development, and implementation of methods. The activities build capabilities directly with the SDG methods and more broadly with accessing and applying Earth observations. Activities here draw on and contribute to GEO's established capacity building activities and expertise, and they may examine inventive approaches, such as social media, to support the testing and refinement of methods by users.

This element supports the use of Earth observations for the SDGs in all aspects, such as planning, tracking, and reporting. The portfolio includes virtual and physical activities, such as trainings, webinars, joint projects, applied research, and workshops, among many other successful capacity

³E.g., the UN Habitat, the United Nations Environment Program (UNEP), the U.S. Census Bureau, the National Statistics Office in Colombia (DANE), Institute of Hydrology, the Institute of Meteorology and Environmental Studies in Colombia, the National Authority of Water in Peru (ANA), the Ministry of Agriculture, Livestock, Fisheries and Irrigation in Kenya, among others.

building practices. The element uses and supports GEO's efforts to characterize user needs, especially in fostering effective ways to enable sustained uptake of the methods and related data access.

Given the basis of the SDGs in statistical data, this element includes engagement with the SDG statistical and geospatial communities about Earth observations, as well as capacity building within GEO and the Earth observations community about SDG statistical principles and practices.

Data and Information Products

The element encompasses a portfolio of activities advancing the provision, access, discoverability, and applicability of Earth observations and geospatial information for use with the SDG. The element draws on GEO's efforts to characterize user needs, especially in the collection of information from SDG user organizations about data characteristics, usability, preferred formats, etc. to help GEO refine approaches to enable greater use of Earth observations for the SDG. This element especially includes efforts to provide feedback from user communities in less-developed areas about data and information products, as well as co-creating EO-enabling tools and platforms. It also helps develop recommendations about how global datasets of information products provide a source of information for countries, in the absence of, or to complement, national data sources. This is very relevant for countries that face major difficulties in collecting national data.

The activities in this element support GEO's efforts to promote and encourage open data policies. In particular, this element focuses on open availability and the Findability, Accessibility, Interoperability, and Reusability (FAIR) principles of data and information products where achievement of SDG needs multi-national or regional approaches and coordination. The element includes data visualization methods to support alternative analysis and planning regarding the SDG. The element assesses data and information needed to be available, working with GEO data activities and others to improve discovery, access, and usability. This element also supports activities to identify and enable new observing systems, data acquisition, and exploitation of a wide range of data types and sources— including global datasets of information products in the absence of, or to complement, national data sources – supporting data systems enabling this. EO4SDG is working with other GEO Work Programme activities (e.g., GEOGLAM) to set up a framework for assessing the availability and applicability of fit-for-purpose datasets, including their accuracy, latency and other specifications, to SDG indicators and inform relevant decisions. In addition, this element supports development of guidance to enable end-users to mainstream “analysis ready” EO datasets into national statistical processes and systems, in close collaboration with CEOS.

Outreach and Engagement

This element focuses on creating awareness about the benefits of Earth observations in support of the UN SDGs. It focuses on outreach and engagement to encourage nations and stakeholders to use Earth observations as part of their SDG activities. Working closely with the other elements, this element includes the creation and maintenance of a portfolio of materials that showcases effective methods, available capacity building support, and accessible data and information products to promote the consideration and adoption of Earth observations for the SDGs by nations and stakeholders. The Initiative facilitates the

accessibility and dissemination of SDG-relevant information, lessons learned, products and other material through the development of SDG Toolkits. SDG Toolkits (see Appendix B) help people use EO to advance the SDGs. Toolkits provide rich, coordinated guidance about integrated EO data and tools, methodologies, use-case examples and capacity development resources to strengthen SDG monitoring, reporting, and implementation efforts. Key user audiences are municipalities, national statistical offices, national mapping agencies, ministries, SDG custodian agencies, and other major stakeholders. The SDG Toolkits are also connected with the GEO Knowledge Hub, an open-source digital repository of freely accessible, authoritative and reproducible knowledge created by the GEO community. This element also encourages collaboration between GEO and stakeholders in developing new methods and approaches.

The materials include a range of traditional to innovative approaches for outreach and engagement. For instance, a series of thematic examples can articulate how Earth observations relate to specific SDGs and can be integrated with traditional statistical approaches; these examples also support efforts by GEO member countries to engage with their own national statistical offices. Additional outreach and engagement activities envisioned include events, such as workshops and sessions at key conferences; trainings, including webinars and hands-on sessions; awards for innovative uses of Earth observations to advance the SDGs; and publications, such as a handbook or library of guidance handbooks on uses of Earth observations with SDG indicators. The element also pursues social media and crowdsourcing to solicit ideas and support the testing and refinement of methods by users.

PAST ACHIEVEMENTS

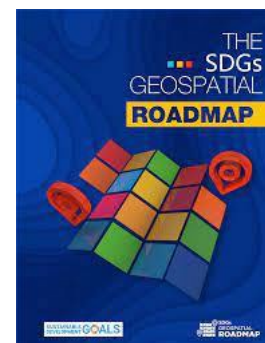
EO4SDG has made progress on a range of the quantitative breakdown objectives set against its three goals, outlined in the 2020-2024 Implementation Plan.

Below we include select examples of past achievements.

Indicator Methodology Improvements. The Initiative has been instrumental in working with UN custodian agencies to support the development and refinement of EO-integrated indicator methodologies, and facilitate the definition of new SDG indicators/sub-indicators that can more effectively inform related goals and targets. Examples include collaboration with:

- UN Environment on indicators 6.6.1 (spatial extent of water-related ecosystems) and 6.3.2 (ambient water quality)
- UNCCD on Indicator 15.3.1 (proportion of degraded land per total land), and,
- UN Habitat on indicators 11.1.1 (slums and informal settlements), 11.2.1 (access to public transport), 11.3.1 (land use efficiency) and 11.7.1 (average share of the built-up area of cities that is open space for public use).

Launch of the SDGs Geospatial Roadmap. As a member of the IAEG-SDGs' WGGI, EO4SDG provided substantial input to the [SDGs Geospatial Roadmap](#), a resource to communicate, guide, and enhance the awareness of how geospatial information and Earth observations are used to achieve the SDGs. WGGI officially launched the SDGs Geospatial Roadmap at a UN Statistical Commission side event on February 11, 2022. The 53rd session of the Statistical Commission adopted the roadmap, recognizing that geospatial information, including Earth observations, serves as official data to aid countries in activities related to the SDGs.



Country Demonstrations and Good Practice Examples

EO4SDG has been facilitating multi-stakeholder partnerships to implement, monitor and report on SDGs at local, national, regional, and global levels. One approach has been through partnerships involving the Earth observations sector, national statistics offices, and relevant ministries to develop and apply methodologies based on Earth observations at the national or local level. EO4SDG has directly supported and pursued projects to develop, distribute, and adopt methods to meet the Global Goals. Examples include:

Japan’s Mountain Green Cover Index. In 2021, Japan responded to a request to verify a new UN Food and Agriculture Organization (FAO) methodology for monitoring and reporting on SDG indicator 15.4.2, the Mountain Green Cover Index (MGCI). This new method leverages global-level land cover and mountain elevation range data resampled at 300 meters to compute the MGCI at national and elevation-range levels for all countries. The method advises countries to leverage their own national land cover maps, if they are of higher spatial resolution and comparable or better quality than the global data. In response to this request, Japan Aerospace Exploration Agency (JAXA), a co-chair of the EO4SDG initiative, joined forces with Japan’s National Office of Statistics and related ministries to validate this FAO method at the country level. Their findings confirmed the FAO proposed methodology for 15.4.2 and also highlighted the importance of country validation efforts and the usefulness of national datasets to improve the accuracy of indicator monitoring, especially when monitoring small and highly heterogeneous landscapes. Read about Japan’s national experience to calculate SDG indicator 15.4.2 in this [Storymap](#).

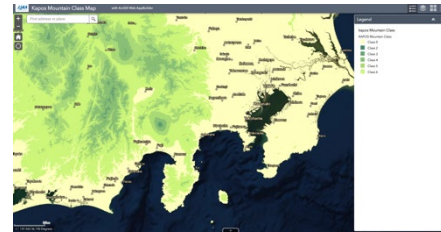


Figure SEQ Figure * ARABIC 1. Kapos mountain classification map created from the Shuttle Radar Topography Mission (SRTM) digital elevation model (90m resolution).

Guinea Land Cover Mapping Project. Launched in 2021 as a joint venture between the World Bank, the Universities Space Research Association (USRA), and NASA Goddard Space Flight Center, this project team has worked closely with the Government of the Republic of Guinea to inform Guinea’s SDG 15.1.1 (Forest Area) and SDG 15.2.1 (Sustainable Forest Management) monitoring efforts. The government of Guinea has leveraged land cover/change and forest maps for the coastal zone of Guinea—including the coastal prefectures of Boffa, Boke, Conakry, Coyah, Dubreka, and Forecariah—to monitor the downward trend in mangrove extent, caused primarily by the conversion of forest into rice fields and the urbanization of the Conakry region. Guinea used these maps, based on United States Geological Survey (USGS)/NASA Landsat and NASA Global Ecosystem Dynamics Investigation (GEDI) data, to develop its 2021 National Determined Contributions (NDC), and enhance its climate commitments to the UN Framework Convention on Climate Change (FCCC). This work was highlighted in the [Twitter account](#) of the head of the UNFCCC as well as in Guinea’s NDC [report](#). Guinea has used the same maps to plan for 17 new national parks, including the [Moyen Bafing National Park](#), established in May 2021.

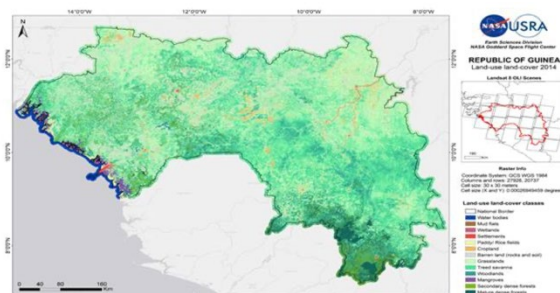


Figure 1 : Carte d'occupation du sol 2014 pour la République de Guinée

Figure SEQ Figure * ARABIC 2. This land use change map shows forest loss in the Republic of Guinea from 2015 to 2020 and remaining forest land in 2020. Credit: Republic of Guinea’s 2021 [NDC report](#).

WorldWater Project: Surface Dynamics from Space. The WorldWater project, funded by the European Space Agency (ESA), is to advance the monitoring of surface water extent dynamics through the use of the latest generation of open and free satellite data. In 2021, the project organized a round robin exercise to compare EO algorithms for surface water detection, and produce monthly maps of surface water presence at 10-meter spatial resolution for two consecutive years over three mandatory sites located in Mexico, Colombia, and Zambia, and over two optional sites in Gabon and Greenland. In total, 15 organizations representing a mix of research institutions, private companies, government agencies and non-governmental organizations have participated in the WorldWater round robin. Initial results confirm that highly accurate surface water mapping can be achieved with optical and synthetic aperture data (SAR) data, and that optical data are better at capturing spatial detail, while SAR data provides better seasonal characterization.



Figure SEQ Figure * ARABIC 3. The WorldWater pilot countries and test sites. <https://worldwater.earth/pilot-countries/>

Maintaining Life on Earth Under Scenarios of Land Use and Climate Change in Colombia, Ecuador, and Peru (Life on Land Project)

This project team worked closely with leading scientific institutions and governmental ministries in Colombia, Ecuador, and Peru to help sustain forest ecosystems. The team used remote sensing and other spatial data to calculate comprehensive indicators, validated these indicators for national use, and made them available via a decision support system for policy development and reporting on SDG 15 (Life on Land).

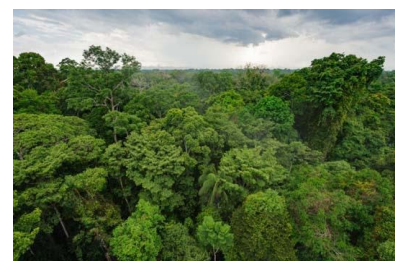


Figure SEQ Figure * ARABIC 4. Ecuador Landscape

In 2022, the team will incorporate all relevant datasets and indicators into an existing decision-support system based on UN Biodiversity Lab, a geospatial information platform that maps and monitors natural resources and environmental risks in real time using the best available data and emerging digital technologies. Through the UN Biodiversity Lab, project data and indicators will be regularly updated through 2030 in response to requests from participating institutions in Colombia, Ecuador, and Peru.

For more information, access the related [Storymap](#). Learn more about additional featured projects and success stories by visiting the EO4SDG website.

Launch of the Earth Observations Toolkit for Sustainable Cities and Human Settlements. In February 2021, at a UN Statistical Commission side event, EO4SDG launched the [Earth Observations Toolkit for Sustainable Cities and Human Settlements](#) in partnership with the UN Human Settlements Program (UN Habitat) and GEO. The toolkit is a collaborative effort that improves countries' and cities' capacity to use and access Earth science resources related to human settlements indicators. It involves contributions from over 40 organizations, including representatives from national statistical organizations, city authorities, space agencies, academia, research institutions, the private sector, and independent Earth observation data producers. The toolkit contains resources such as data, tools, use cases, and learning opportunities that are

related to four primary thematic areas: adequate housing, open spaces, access to public transport, and spatial urbanization.



This effort has actively contributed to, and is part of, the global urban monitoring framework that is designed by UN Habitat as a flexible framework for monitoring SDGs and other city objectives such as inclusiveness, resilience, and safety. During its 53rd session, the UN Statistical Commission endorsed this monitoring framework and its implementation as part of a global urban UN strategy (read UN Habitat's [report](#)).

Given the broad applicability of this approach, EO4SDG is working with the GEO community to explore implementation of additional toolkits for other SDGs.

GEO SDG Awards 2021. Since 2019, EO4SDG has administered annual GEO SDG awards to recognize institutions, organizations, and countries that are applying Earth observations towards the achievement of the SDGs. The initiative openly shares information on awarded projects via its web portal to encourage further use of EO for the SDG.

Trainings. EO4SDG has coordinated and fostered capacity development activities to effectively employ methods, enable data awareness and access, and sustain EO use in the context of the SDGs.

As an example, EO4SDG organized a three-part, introductory webinar on the “Earth Observations Toolkit for Sustainable Cities and Human Settlements” in collaboration with NASA’s Applied Remote Sensing Training Program (ARSET), UN Habitat, the GEO Human Planet initiative, and the Committee on Earth Observation Satellites (CEOS) Working Group on Capacity Building & Data Democracy (WGCapD). The training attracted over 1204 participants from over 600 organizations and 102 countries. Participating organizations included UN Habitat, Colombia’s National Office of Statistics, South Africa’s Space Agency, the National Observatory of Athens, Colombia’s Center for International Earth Science Information Network, the European Commission’s Joint Research Center and Costa Rica’s Ministry of Environment. The training included an overview of the Earth Observations Toolkit for Sustainable Cities and Human Settlements; demonstrations of toolkit resources and how to apply them to measure and analyze SDG indicators; and an overview of three use cases from Colombia, Greece, and South Africa.



STAKEHOLDER ENGAGEMENT

At the global level, the UN Statistical Commission is the oversight body of SDG efforts supported by the UN Statistical Division (UNSD). In 2015, the UNSC created the Inter-agency Expert Group on SDG Indicators (IAEG-SDGs) to develop and implement the global indicator framework for the Goals and Targets of the 2030 Agenda. To tackle specific topics relevant to the SDG Indicator implementation, the IAEG-SDGs formed the Working Group on Geospatial Information (WGGI).

EO4SDG participates in the WGGI and actively contributed to the development of the SDG Geospatial Roadmap, which was adopted at the 53rd Session of the UN Statistical Commission.

SDG custodian agencies, usually UN bodies (and in some cases, other international organizations), are responsible for compiling and verifying country data and metadata for specific indicators, and for submitting the data, along with regional and global aggregates, to UNSD. The agencies are also responsible for developing international standards and recommending global monitoring methodologies to enable comparability across country data on SDG indicators.

EO4SDG, and the broader GEO community, work closely with custodian agencies on method development, testing, refinement, adoption, and widespread, sustained use.

EO4SDG collaborates with global initiatives that facilitate the dissemination of best practices and promote integrated approaches to address the economic, social, and environmental aspects of the 2030 Agenda. Examples of such initiatives include: the UN Sustainable Development Solutions Network (SDSN), the UN Committee of Experts on Global Geospatial Information Management (UN-GGIM), and the Global Partnership for Sustainable Development Data (GPSDD).

Overall, EO4SDG enables countries and organizations to leverage Earth observations to support the implementation, planning, measuring, monitoring, reporting, and evaluation of the SDGs and their normative societal benefits.

Countries are at the center of SDG monitoring and reporting and oversee the SDG process via their national statistical systems, line ministries, and other national institutions. National statistical systems, and in particular national statistical offices (NSOs), play a pivotal role in this process, and in particular, in the areas of data collection, coordination, validation, and reporting of statistics for the SDGs.

At the national level, it is essential for the GEO representative organizations to engage with the respective NSOs in their efforts to extend EO uses in national SDG analysis and reporting. In addition, communication with national mapping agencies (NMAs) is key to enable the sharing of information and proper guidance on the quality and quantity of official geospatial data of SDG relevance, available at country level. Decentralized Units such as counties, municipalities and cities are increasingly driving the SDGs. Since these governance units are closer to citizens and largely charged with service delivery, they present an immense opportunity for EO4SDG to drive impact at the local level.

The EO4SDG Initiative pursues partnerships as a key element of the strategic implementation, leveraging knowledge, resources, and skills of partner organizations in collective support of the SDGs. The Initiative focuses on organizations with sound activities related to the SDGs, working with established GEO partners and seeking to expand GEO's set of partners where possible. Involvement of the individual GEO Member Countries and Participating Organizations is central to the Initiative's activities, including efforts to support the engagement of and collaboration with national statistical offices. The Initiative seeks to enhance GEO's strong relationship with the United Nations and continuously engages and informs the global Earth observations and geospatial information communities of developments and opportunities. Some key additional potential partners include development banks, non-governmental organizations, learned societies, corporations, foundations, and civil society.

Engagement and partnership with these entities help build processes, mechanisms, and human capacity to include Earth observations in national development plans and to integrate them with national statistical accounts to improve the measuring, monitoring and achievement of the SDGs. These partnerships and collective efforts can support broader societal ownership of the Goals and Targets to strengthen the effectiveness and accountability of their implementation.

Key organizations that the EO4SDG has pursued partnerships with include the following, adding others over the course of the initiative:



Sustainable Development Solutions Network, SDSN

The SDSN is a UN-sanctioned body mobilizing global scientific and technical expertise to promote practical problem solving for sustainable development. Supporting the implementation of the SDGs at all scales, SDSN promotes integrated approaches to interconnected social, economic, and environmental challenges. With national and regional networks, SDSN promotes Solutions Initiatives to accelerate progress toward sustainable development. <http://unsdsn.org>

GEO participates in the SDSN Thematic Research Network on Data and Statistics, TReNDS, which convenes cross-sector technical and policy knowledge from across the global scientific, development, and public community. The EO4SDG Initiative has also engaged with SDSN Youth and their Local Pathway Fellowship program to localize the Earth Observations Toolkit on Sustainable Cities and Human Settlements and the SDGs Today program.



UN Committee of Experts on Global Geospatial Information Management, UN-GGIM

The UN-GGIM is a UN intergovernmental entity which guides the making of joint decisions and sets directions on the production and use of geospatial information within national and global policy frameworks. UN-GGIM provides a platform for the development of effective strategies to strengthen national capacity on geospatial information, disseminates best practices, and promotes the use of geospatial information to address

The EO4SDG Initiative partners with UN-GGIM and its Secretariat to work effectively with the UN Statistics Division, IAEG-SDG, and other UN System entities. A collaboration with the UN IAEG-SDG WGGI pursues opportunities for disseminating smart practices, documenting effective methods and successful projects, and developing guidelines to facilitate the integration of EO into national and global SDG indicator methodologies.



Global Partnership for Sustainable Development Data

The Global Partnership for Sustainable Development Data is a global network of governments, NGOs, and businesses working together to strengthen the inclusivity, trust, and innovation in the way that data is used to address the world's sustainable development efforts. The Global Partnership supports data-driven decision-making by initiating more open, new, and usable data. <http://www.data4sdgs.org/>

The EO4SDG Initiative works with the Global Partnership on the openness, availability, and usability of Earth observations data and geospatial information to support the SDGs. EO4SDG has been working with GPSDD on its country-level data roadmap process, which focuses on developing and implementing whole-of-government, multi-stakeholder data

roadmaps for sustainable development at both national and sub-national levels. EO4SDG is providing resources and expertise to more directly engage with countries on meeting key data gaps and challenges. Country examples include Colombia, Kenya, Senegal and Ghana, among others.



International Institute for Sustainable Development, IISD

IISD promotes human development and environmental sustainability through research, communication, and partnerships. IISD provides practical solutions to the challenge of integrating environmental and social priorities with economic development. IISD's work covers strategies, policy advice, and tools across a range of programs and topics. IISD is a GEO Participating Organization. <http://iisd.org>

The EO4SDG Initiative will pursue collaboration with IISD to support the broad distribution of productive methods to use Earth observations and geospatial information for the SDGs and sustainable development decisions. A partnership can support efforts to integrate Earth observations into government policy and public management practices as well as strong outreach and communications activities.

The EO4SDG Initiative collaborates with other activities in the GEO Work Programme that have established, or potential, connections to the SDGs. To date, EO4SDG has worked closely with GEO Blue Planet, GEOGLAM, GEO AquaWatch, GEO Wetlands, Human Planet, AmeriGEO, GEO Cradle, and GEO-LDN Initiative. Moving forward, EO4SDG will strengthen its connection with regional GEOs by assessing the existing and potential impact of regional-specific activities. Regional GEOs can play a key role in promoting exchange on best practices across GEO and upscaling or downscaling successful products, while also exploring funding opportunities at the regional level. EO4SDG will also collaborate with select GEO thematic initiatives to explore opportunities to apply each initiative's data, tools, and existing methods to one or more SDG targets or indicators that cut across multiple reporting frameworks. EO4SDG will document such synergies in a cohesive collection of short papers and policy briefs and share it with the GEO community.

The Initiative also pursues partnerships with major scientific unions and management-oriented associations. Examples include the IEEE Geoscience and Remote Sensing Society (IGARSS) and the American Geophysical Union (AGU). Organized efforts with these groups can integrate the sustainable development goals in the context of these organizations' duties. They can include and feature the SDGs in their meetings and conferences, allowing opportunities to engage researchers, technicians, managers, and others to inform and energize them and catalyze contributions.

EO4SDG also engages with the private sector to explore and leverage existing platforms and initiatives that help track progress, identify priority areas for action, and enable broad community engagement while leveraging a wide range of data sources, including Earth observations. Examples include Esri, a private sector company specializing in Geographic Information System (GIS) mapping, as well as Google Earth Outreach and Google Earth Engine, which use and develop Google's infrastructure to address global environmental, health and humanitarian issues. Furthermore, the European Association of Remote Sensing Companies (EARSC) - a professional industrial body with the mission to foster growth of the EO services sector - is an active EO4SDG contributor. Looking ahead, EO4SDG will pursue approaches to further engage with the private and commercial sectors and create use cases that illustrate specific applications and document the added value of public-private partnerships.

SCHEDULE

The EO4SDG Initiative has general events and activities that occur every year and ones specific to a given year. Examples of events and activities include GEO Plenaries, UN Statistical Commission meetings, conferences, annual meetings, trainings, workshops, and webinars, among others. In addition, the Initiative may hold special events, such as a biennial conference of the partners.

The following is a list of recurring annual events that are part of a general schedule:

QI: January - March

UN Statistical Commission meeting

QII: April - June

EGU and JpGU meetings

GEO Work Programme Symposium

QIII: July-Sept

UN High Level Political Forum

UN-GGIM Annual Meeting

QIV: October - December

UN-GGIM Americas

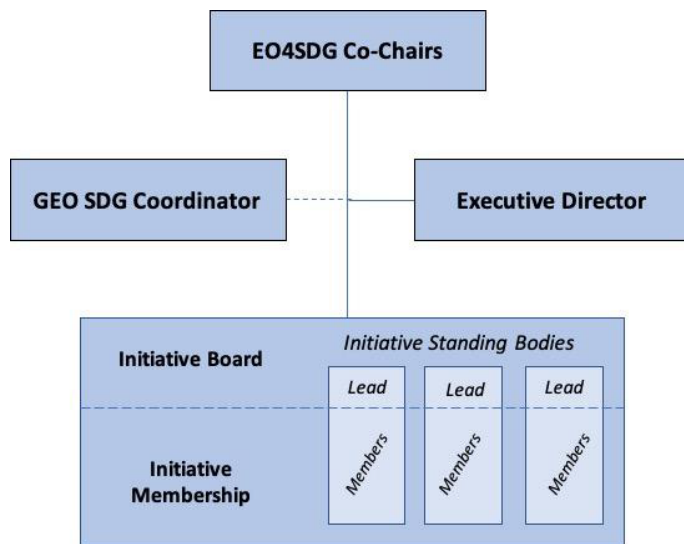
GEO Plenary & EO4SDG Side Event &
Annual Meeting

UN World Data Forum

AGU meeting

GOVERNANCE

This section describes the management of the EO4SDG Initiative, including governance, internal communications, schedule, and evaluation. Overall, there are four levels of involvement in EO4SDG: Community, Initiative Membership, Board and Leadership. The Community includes the broad universe of people who are interested in GEO’s activities with the SDGs, but are not necessarily involved in any specific activity. The Initiative Membership includes people who are directly involved with EO4SDG activities. The EO4SDG Board provides initiative-level support and serves interests of the Initiative, spanning strategic direction-setting to tactical aspects. The Board catalyzes and motivates activities and progress, including promoting dynamic communication with EO4SDG Team members to increase participation in the initiative.



The EO4SDG Co-Chairs provide a facilitation role, guide agenda-setting, set priorities and make decisions, as necessary. The EO4SDG Executive Director coordinates the initiative, manages implementation, and communicates continually with the Co-Chairs, Board and Initiative members, as well as with the GEO SDG Coordinator, to assess and expedite the initiative’s workings, progress, and results.

By monthly calls, outreach meetings, and projects, EO4SDG interacts proactively with GEO Members, Participating Organizations, other GEO Work Programme activities, as well as custodian agencies responsible for

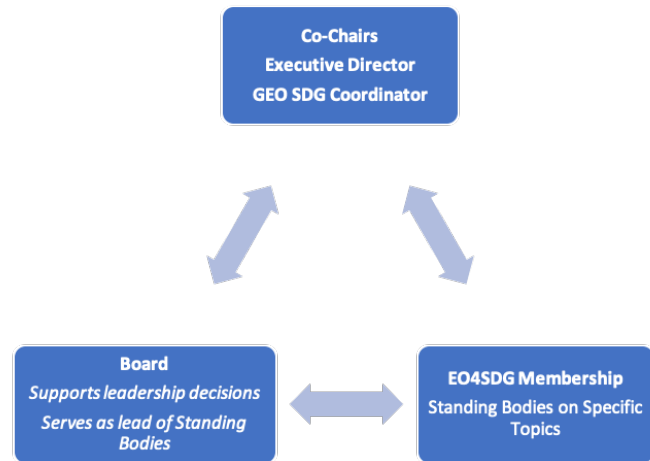
SDG indicators of relevance to their thematic expertise or mandate. The Initiative forms standing bodies to address on-going functions as well as ad hoc groups for special activities, topics, and events that arise. Standing bodies address strategic planning, membership, projects, capacity building, data and information, outreach, partnerships, evaluation, and reporting. Interaction among standing bodies is encouraged and expected. Board members actively support one or more major initiative activities per year and serve on at least one EO4SDG standing body or ad hoc group.

The Board selects one or two of its members to serve as lead(s) of the EO4SDG Board. At an annual meeting every two years, Board members can nominate themselves to be lead(s). Subsequently, the Board reviews nominations and selects the new, incoming lead(s), who assume the role after a brief transition period with the outgoing lead(s). In line with the GEO Statement on Equality, Diversity and Inclusion, geographic, gender balance and other diversity factors are considered in recruitment and selection. Appendix XX includes the Terms of Reference for the EO4SDG Board.

Internal Communications

The Initiative Leadership holds routine teleconferences to review status and progress reports of EO4SDG activities. Standing bodies provide routine status reports, and Team members identify new topics and opportunities. The Executive Director and Co-Chairs develop the teleconference agendas with input from Team members, and the Executive Director provides a summary.

Figure 7 provides an overview of the collaborative environment among different levels of involvement in EO4SDG to understand perspectives, challenges, needs, and desires for improvement to extend Earth science information and knowledge to achieve the SDGs and benefit society. We listen to understand perspectives, challenges, needs, and desires for improvement. We pursue and leverage partnerships, working together to extend information and services to benefit society.



There is an annual, in-person team meeting for the EO4SDG Initiative. The annual meeting reviews the Initiative in depth and provides a key time to evaluate the Initiative (see Evaluation below). The annual meetings provide dedicated time for attendees to address and resolve major issues requiring longer discussions than the status teleconferences provide. The annual meetings involve the partners, and the meetings are open to the broad EO4SDG Team and Community.

As needed, the EO4SDG Team and its standing bodies arrange in-person meetings in conjunction with major GEO events, such as the GEO Plenary and the GEO Symposium. As possible, these meetings allow teleconference capabilities for Team members not present at the event.

The Initiative may arrange special meetings to address GEO requirements and requests, such as input to GEO Plenary documents or Work Programme revisions.

Evaluation

The annual meeting (and preparations for it) serves as the primary event for the Leadership, Board, Team, and Community to reflect on the Initiative – its progress, its challenges, and its direction. The attendees review projects and activities, discussing successes as well as items that did not go as planned. Attendees assess progress and performance with respect to expectations, review resource needs, and evaluate the Initiative’s ability to execute plans with acceptable risk.

This event provides an opportunity to evaluate whether the functional and performance requirements for the Initiative are properly formulated, responsive to GEO objectives, and represent achievable capabilities; assess the credibility of the Initiative’s targets and schedule; and set or revise targets and the schedule for the upcoming year. A key decision for each annual meeting is the status of the Initiative and whether to recommend changes to the GEO Programme Board.

Standing bodies also conduct evaluations of their respective functions. They report at periodic teleconferences as well as the annual meeting.

Performance

A key measure of the Initiative’s performance is the achievement of the objectives for the three EO4SDG goals. The team strives to achieve all of them, and recognizes that the complete set serves as an ambitious target. At the half-way mark of this implementation plan, the team will assess the Initiative’s

performance and make adjustments to activities and expectations.

Largely, the EO4SDG initiative promotes the uptake of Earth observations and geospatial information by nations and stakeholders in SDG planning, tracking, and reporting. Such use is through sound, accepted SDG methods. A primary focus of the Initiative's performance is the enablement of these methods in their development and use, which inherently includes the capacity development, data and information products, and outreach activities of EO4SDG.

The EO4SDG team leverages a seven-stage metric to track the maturation of SDG methods using Earth observations and geospatial information. This Method Useability Level (MUL) index provides a scale for the expected advancement along a continuum – from initial idea, through development and field testing, to adoption and sustained utilization. The MUL index allows the EO4SDG team to convey expectations for project and method development, assess progress and diagnose problems, and report on EO4SDG performance both for individual projects and the overall portfolio. Appendix C provides additional information on the MUL index and the definitions for each level.

Communications

In addition to outreach focused on encouraging nations and stakeholders to use Earth observations for the SDGs, the EO4SDG Initiative conducts broad activities to communicate progress of the Initiative overall. The Initiative communicates achievements and quality stories as ways to inform the global community about GEO, Earth observations, and GEO's activities to serve development goals. The Initiative regularly informs the EO4SDG team and community of its progress, potentially encouraging community members to become more involved in activities. And, the Initiative communicates with the GEO community, partners, and stakeholders to demonstrate GEO activities and achievements in the use of Earth observations to provide societal benefits.

The Initiative works with the GEO communications team and others to prepare stories, infographics, and messages; coordinate with partners; and support communications across appropriate channels. These efforts include the creation and maintenance of a portfolio of materials, such as examples, stories, articles, and web features. These materials are ones the EO4SDG team and community can use to broadcast EO4SDG activities, progress, and successes broadly. EO4SDG maintains a dedicated [website](#) and social media accounts ([Twitter](#), [Facebook](#)) to convey achievements and stories about how Earth observations and the Group on Earth Observation (GEO) serve SDGs. In 2021, the website brought in over 25,000 visitors, and the total number of pages viewed exceeded 85,000. Our Twitter account reached over 3,500 followers.

RESOURCES

The EO4SDG Initiative operates through in-kind contributions of financial and other resources to conduct its activities. As in-country pilot projects and other activities articulated in each two-year EO4SDG Work Plan, the Initiative develops a clear statement of the types of resources the EO4SDG Team is prepared to commit to successfully implement the Initiative. While specific resource allocations depend on the needs of a given project or activity, it is critical that representatives of EO4SDG be able to demonstrate to potential country-level partners a strong commitment to engaging in collaborations early in the development of the projects.

Resources can take multiple forms, including:

- Engagement by staff and officials from EO4SDG participating organizations in planning, oversight, and management of EO4SDG activities;
- Provision of data resources and other technical capabilities to pilot countries;
- In-kind services related to capacity development training sessions and materials; and,
- Publications and other communication material related to EO4SDG activities.

The Initiative leverages existing capacities and focuses on streamlining existing programmes and funding schemes for SDG-relevant EO products, tools, and platforms.

DATA POLICY


The initiative directly conducts projects for method development, distribution and adoption. The data contributed to national SDG measuring and monitoring efforts may be extant in the Global Earth Observation System of Systems (GEOSS), or within the on-going activities of other GEO Community Activities, Initiatives, Flagships, Foundational Tasks and other elements of the GEO Work Programme, or they may be new data resources developed to address specific national/regional needs. The additional data resulting from EO4SDG in-country engagements will reside with the country involved in the pilot project and will contribute to the national reporting requirements on the SDGs mandated by the United Nations. The extent to which the data is made fully and freely available by each government is an internal decision, but the EO4SDG team will make every effort to encourage that the data be made freely and openly available, and subsequently incorporated into GEOSS, in keeping with GEO's Data Sharing Principles.

APPENDIX A: EARTH OBSERVATIONS AND SDG GOALS, TARGETS, AND INDICATORS

Table 1. This table indicates the most likely targets and indicators that Earth observations can contribute as a direct measure or as indirect support.

GEO GROUP ON EARTH OBSERVATIONS		SUSTAINABLE DEVELOPMENT GOALS EARTH OBSERVATIONS IN SERVICE OF THE 2030 AGENDA										EARTH OBSERVATIONS FOR THE SUSTAINABLE DEVELOPMENT GOALS					
TARGET								GOAL	INDICATOR								
<i>Contribute to progress on the target yet not the indicator per se</i>									<i>Direct measure or indirect support</i>								
						1.4	1.5		1.4.2								
					2.3	2.4	2.c		2.4.1								
			3.3	3.4	3.9	3.d			3.9.1								
							5.a		5.a.1								
	6.1	6.3	6.4	6.5	6.6	6.a	6.b		6.3.1	6.3.2	6.4.2	6.5.1	6.6.1				
				7.2	7.3	7.a	7.b		7.1.1								
							8.4										
				9.1	9.4	9.5	9.a		9.1.1	9.4.1							
					10.6	10.7	10.a										
11.1	11.3	11.4	11.5	11.6	11.7	11.b	11.c		11.1.1	11.2.1	11.3.1	11.6.2	11.7.1				
			12.2	12.4	12.8	12.a	12.b		12.a.1								
			13.1	13.2	13.3	13.b			13.1.1								
	14.1	14.2	14.3	14.4	14.6	14.7	14.a		14.1.1	14.2.1	14.3.1	14.4.1	14.5.1	14.a.1			
15.1	15.2	15.3	15.4	15.5	15.7	15.8	15.9		15.1.1	15.1.2	15.2.1	15.3.1	15.4.2	15.5.1	15.7.1	15.8.1	
							16.8										
17.2	17.3	17.6	17.7	17.8	17.9	17.16	17.17		17.6.1	17.18.1							

Table 2. This table indicates alignments of the Goals with specific types of Earth observations and geospatial information.



	Population distribution	Cities and infrastructure mapping	Elevation and topography	Land cover and use mapping	Oceanographic observations	Hydrological and water quality observations	Atmospheric and air quality monitoring	Biodiversity and ecosystem observations	Agricultural monitoring	Hazards, disasters and environmental impact monitoring
1 No poverty										
2 Zero hunger										
3 Good health and well-being										
4 Quality education										
5 Gender equality										
6 Clean water and sanitation										
7 Affordable and clean energy										
8 Decent work and economic growth										
9 Industry, innovation and infrastructure										
10 Reduced inequalities										
11 Sustainable cities and communities										
12 Responsible consumption and production										
13 Climate action										
14 Life below water										
15 Life on land										
16 Peace, justice and strong institutions										
17 Partnerships for the goals										

Table 3. This table presents an assessment of SDG indicators for which geospatial information has direct contributions (credit: WGGI) and EO applicability (credit: GEO). It also demonstrates indicators with EO-integrated global methods and documented country examples, as of April 2022.

Tier	SDG indicators where geospatial information directly contributes (Assessment by WGGI)	EO Applicability (Assessment by EO4SDG)	EO Integration in Global Indicator Methodology	Country Examples & Use Cases	Notes
Tier I					
9.c.1	Population covered by a mobile network				
14.5.1	Protected areas in relation to marine areas	✓			
15.1.1	Forest area	✓		✓	Based on Forest Resources Assessment. Data collection categories include national forest inventories, sample based remote sensing assessments (e.g., Collect Earth), among others.
15.2.1	Important sites for terrestrial and freshwater biodiversity	✓		✓	Based on Forest Resources Assessment. Data collection categories include national forest inventories, sample based remote sensing assessments (e.g., Collect Earth), among others.
6.6.1	Change in the extent of water related ecosystems over time	✓	✓	✓	
6.5.1	Transboundary basin area	✓			
15.3.1	Proportion of land that is degraded over total land area	✓	✓	✓	
15.4.2	Coverage by protected areas of important sites for mountain biodiversity	✓	✓	✓	
Tier II					
11.7.1	Population that has convenient access to public transport	✓	✓	✓	
11.3.1	Ratio of land consumption rate to population growth rate	✓	✓	✓	
2.4.1	Agricultural area under sustainable agriculture	✓		✓	
6.3.2	Bodies of water with good ambient water quality	✓		✓	
9.1.1	Rural population who live within 2km of an all-season road	✓	✓	✓	
11.7.1	Built-up area of cities that is open space for public use	✓	✓	✓	
14.2.1	National exclusive economic zones managed using ecosystem-based approaches	✓			

Table 4. This table presents an assessment of SDG Indicators that geospatial information significantly supports (credit: WGGI); and corresponding EO applicability (credit: GEO) It also demonstrates indicators with EO-integrated global methods and documented country examples, as of April 2022.

Tier	Indicators that geospatial information significantly supports (Assessment by WGGI)	EO Applicability (Assessment by GEO)	EO Integration in Global Indicator Methodology	Country Examples & Use Cases	Notes
Tier I					
1.1.1	Proportion of the population living below the international poverty line by sex, age, employment status and geographic location (urban/rural)				
1.4.2	Proportion of total adult population with secure tenure rights to land, (a) with legally recognized documentation, and (b) who perceive their rights to land as secure, by sex and type of tenure	✓			
15.4.2	Mountain Green Cover Index	✓	✓	✓	Based on Forest Resources Assessment. Data collection categories include national forest inventories, sample based remote sensing assessments (e.g., Collect Earth), among others. Link: https://hqfao.maps.arcgis.com/apps/MapJournal/index.html?appid=d5f2b3da13af487fb0f939bd32e66fe7
Tier II					
5.2.2	Proportion of women and girls aged 15 years and older subjected to sexual violence by persons other than an intimate partner in the previous 12 months, by age and place of occurrence				
5.4.1	Proportion of time spent on unpaid domestic and care work, by sex, age and location				
11.7.2	Proportion of persons victim of physical or sexual harassment, by sex, age, disability status and place of occurrence, in the previous 12 months				

APPENDIX B: GEO SDG Toolkits

While EO are a critical data source for monitoring and driving progress against the SDGs, UN member states do not always recognize or have the capacity to leverage this value. Sustainable Development Goals (SDG) Toolkits help people use Earth observations (EO) to advance the SDGs. Toolkits provide rich, coordinated guidance about integrated EO data and tools, methodologies, use-case examples and capacity development resources to strengthen SDG monitoring, reporting, and implementation efforts. Key user audiences are municipalities, national statistical offices, national mapping agencies, ministries, SDG custodian agencies, and other major stakeholders.

EO4SDG piloted the SDG Toolkit concept in 2020. The GEO community and EO4SDG collaborated with UN Habitat for the Earth Observations Toolkit for Sustainable Cities and Human Settlements dedicated to SDG 11 and the New Urban Agenda. This Toolkit launched in February 2021 (<https://eotoolkit.unhabitat.org>) and it involves contributions from over 40 organizations.

It is an online, continuously updated resource, which serves as a first step for governments and stakeholders interested in applying EO to support SDG 11 monitoring and urban policy planning needs. Key toolkit components include a catalogue of EO data products and tools that can support the definition and monitoring of urban SDG indicators, as well as national and city-level experiences of EO uses for SDG 11 and the New Urban Agenda. The toolkit facilitates engagement among local and national governments, academia, and the private sector and promotes knowledge sharing and collaboration between cities and countries.

Given the replicability and usefulness of this resource, the Group on Earth Observations (GEO) community is exploring implementation of additional Toolkits for other SDGs.

Learn more about it by accessing this [StoryMap](#). It is featured as part of SDGs Today, a global hub focusing on real-time SDG data developed by the United Nations Sustainable Development Solutions Network (SDSN), in partnership with Esri and the National Geographic Society.

A concept note for the GEO SDG Toolkits is available [here](#).

APPENDIX C: SDG METHOD USEABILITY LEVELS (MULS)

The EO4SDG Initiative introduces a seven-stage metric to track the maturation of SDG methods using Earth observations and geospatial information. This Method Useability Level (MUL) index provides a scale for the expected advancement along a continuum – from initial idea, through development and field testing, to adoption and sustained utilization. The MUL index allows the EO4SDG Task Team to convey expectations for project and method development, assess progress and diagnose problems, and report on EO4SDG performance for both projects and the overall portfolio.

The MUL reflects three main stages in method development. In general, MUL levels 1-2 encompass conception and feasibility; MUL 3-5 address development, testing, and demonstration; and, MUL 6-7 focus on deployment and adoption. Advancements towards MUL 5 (method utility report) and MUL 6 (deployment and use) may be pursued concurrently.

The following are the seven MUL levels:

1. Idea and Method Invention

Method invention and formulation of concept begins here. Initial understanding and characterization are articulated for how Earth observations and geospatial information can support the SDG Target and Indicator. The method is still speculative and there is no proof or detailed analysis to support the assumption.

Key milestone: Convincing plan to prove feasibility is established.

2. Proof of Method Concept

Feasibility studies to assess the potential viability of and provide a proof-of-concept for the method are conducted. A more complete characterization of the Target and Indicator and the role of Earth observations and geospatial information is completed. Performance standards are established. An information template on geospatial components for an Indicator is drafted and shared with the custodian agency(ies) and the WGGI.

Key milestone: Convincing case for method is made and viability is established.

3. Method Verification and Validation

Basic components of Earth observations and geospatial information are integrated into a prototype method to establish they work together and are tested in a simulated environment(s). At this level, the technical, organizational, and human process issues are considered and worked out, as is the initial standardization of the method. Verification and validation that the information functions to performance standards is achieved.

Key milestone: Potential to address the Target/Indicator is determined and articulated.

4. Field Testing and Refinement

Prototype method is demonstrated and field-tested in relevant user environments for usability (e.g., difficulty vs. expectation, user error rates, data access, etc.). Modifications are made and the method is further refined and standardized to conform to end-users' environments and standard interfaces. Documentation of the method as a standardized process is established. Achieving this level represents a major increase in the method's demonstrated readiness.

Key milestone: Potential to address the Target/Indicator is demonstrated and documented.

5. Method Utility (or Suitability) Report

The completed method is fully characterized and qualified for deployment, including data availability and possible succession plans for data sources. Functionality of the method is demonstrated to win the confidence of the user(s) and custodian agency(ies). The method is presented to the custodian agency(ies), the WGGI and the IAEG-SDG.

Key milestone: Method Utility Report presented to the custodian agency(ies) and the IAEG-SDG.

6. Deployment and Use

Deployment plan to encourage adoption is established and pursued. Most user documentation, training documentation, and maintenance documentation are completed. Outreach, training, and capacity building about the method are conducted. User experience assessment conducted. Case studies with testimonials developed and shared with the UN custodian agency(ies), the WGGI and the IAEG-SDG.

Key milestone: Demonstrated use by one or more countries.

7. Widespread Sustained Utilization

On-going outreach, training, capacity building, and adoption activities are conducted. On-going usability and user experience assessments are conducted. Necessary maintenance, refinements, and improvements of method occur and support is given for any succession of data sources. On-going publication of results and testimonials are conducted. Communication with IAEG-SDG (or successor organizations) via the WGGI (or individual UN Member States) and the UN Statistical Commission is maintained.

Key milestone: Demonstrated use by 10 or more countries.

Key milestones for each level are listed above. A project's MUL is determined at any given time by the highest level for which all milestones preceding it have been completed in full.

APPENDIX D: GLOSSARY OF SDG-RELEVANT TERMS AND ACRONYMS

UN HLPF

The United Nations High Level Political Forum is the UN central platform for follow-up and review of the 2030 Agenda for Sustainable Development and the SDGs, providing for the full and effective participation of all States Members of the United Nations and States members of specialized agencies.

UNSC

The United Nations Statistical Commission has the mandate for the development and implementation of the Global Indicator Framework. The Statistical Commission oversees the work of the United Nations Statistics Division (UNSD).

IAEG-SDGs

The United Nations Inter-agency and Expert Group on Sustainable Development Goals, established at the forty-sixth session of the UN Statistical Commission, is responsible for developing, reviewing, and supporting the implementation of the Global Indicator Framework, for the Goals and Targets of the 2030 Agenda for Sustainable Development.

WGGI

The United Nations Inter-agency and Expert Group on Sustainable Development Goals Working Group on Geospatial Information, established at the forty-seventh session of the UN Statistical Commission, reports directly to the IAEG-SDGs and is responsible for ensuring from a statistical and geospatial perspective that one of the key principles of the 2030 Agenda, to leave no one behind, is reflected in the Global Indicator Framework.

UN Custodian Agencies

Usually UN bodies (and in some cases, other international organizations), responsible for compiling and verifying country data and metadata for specific indicators, and for submitting the data, along with regional and global aggregates, to UNSD. Custodian agencies are also responsible for developing international standards and recommending global monitoring methodologies to enable comparability across country data on SDG indicators.

UN-GGIM

The United Nations Committee of Experts on Global Geospatial Information Management aims at playing a leading role in setting the agenda for the development of global geospatial information and to promote its use to address key global challenges. It provides a forum to liaise and coordinate among Member States, and between Member States and international organizations.

Tier Classification for SDG Indicators

Tier 1: Indicator is conceptually clear, established methodology and standards are available and data are regularly produced by countries; **Tier 2:** Indicator is conceptually clear, established methodology and standards are available but data are not regularly produced by countries; **Tier 3:** Indicator for which there are no established methodology and standards or methodology/standards are being developed/tested.

CEOS SDG COORDINATION TEAM

A Committee on Earth Observation Satellites (CEOS) dedicated coordination team that focuses on coordination efforts around satellite Earth observation contributions to the SDGs. <http://ceos.org/ourwork/ad-hoc-teams/sustainable-development-goals/>

GPSDD

The Global Partnership for Sustainable Development Data is an open, multi-stakeholder network that focuses on building an enabling environment for harnessing the data revolution for sustainable development.

UN SDSN

The UN Sustainable Development Solutions Network aims to mobilize global scientific and technological expertise to promote practical problem solving for sustainable development, including the design and implementation of the Sustainable Development Goals (SDGs).

IISD

The International Institute for Sustainable Development promotes human development and environmental sustainability through innovative research, communication and partnerships.