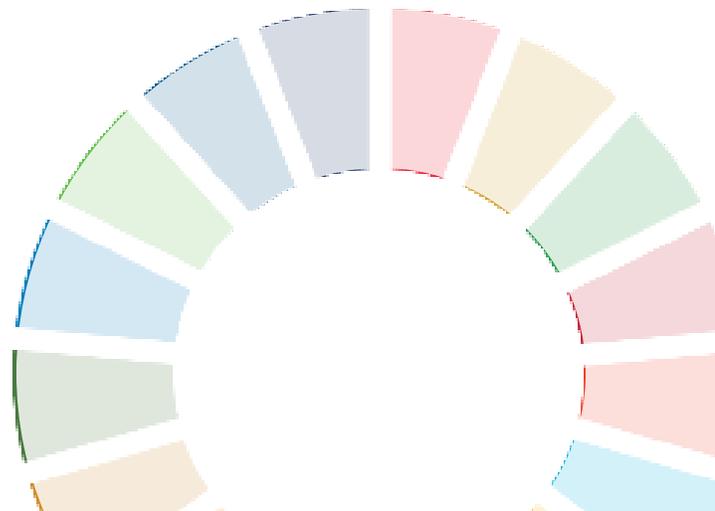# EARTH OBSERVATIONS FOR SUSTAINABLE DEVELOPMENT GOALS REPORT 2020

We are pleased to share the Earth Observations for Sustainable Development Goals Initiative Report 2020. This year has brought significant global challenges related to the COVID-19 pandemic. However, the Initiative's agility and its contributors' hard work have helped us cultivate new opportunities and develop new approaches due to the changing situation.

We hope you will find this report informative and useful for how your work can support the Sustainable Development Goals and their derived societal benefits. We welcome suggestions for further development, improvement, and sharing of our approaches.
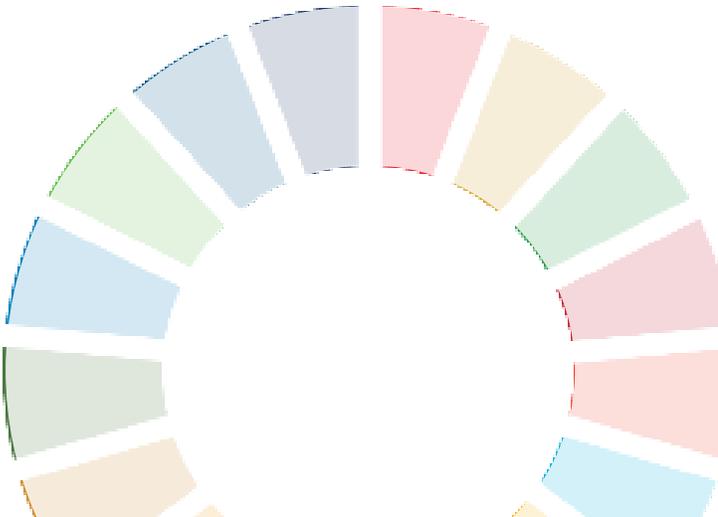
I am proud of our Initiative and its continued achievements in 2020 despite many difficulties due to the global pandemic. I am also grateful to our Co-chairs, Lawrence Friedl, Paloma Merodio, and Osamu Ochiai, and our growing, dynamic group of contributors and collaborators for their hard work and dedication.

Dr. Argyro Kavvada
EO4SDG Executive Director

EARTH OBSERVATIONS FOR THE
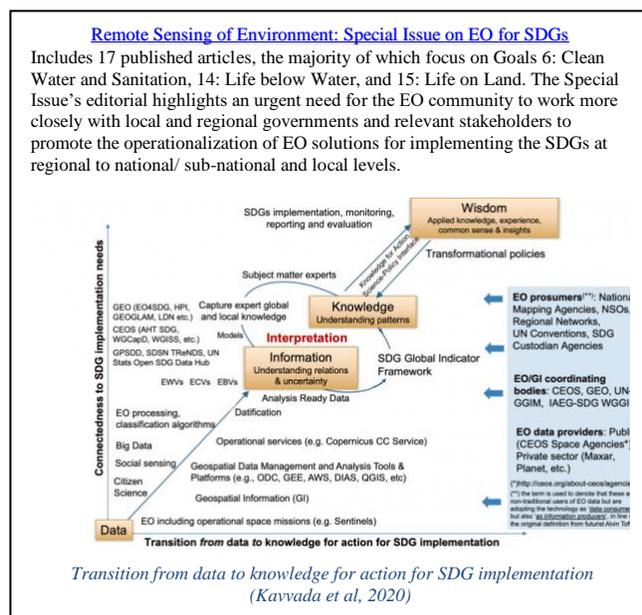SUSTAINABLE DEVELOPMENT GOALS

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1. INTRODUCTION

EO4SDG serves a fundamental role to advance global knowledge about effective ways that Earth observations and geospatial information can support the Sustainable Development Goals (SDGs). The Initiative seeks to advance the benefits of the SDGs through sustained, effective use of Earth observations.

2020 was a milestone year for EO4SDG. Five years into the implementation of the 2030 Agenda for Sustainable Development, EO4SDG has sought to lay the foundation for governments and organizations across regions to capitalize fully on the benefits Earth observations provide to monitor, plan, and report on the SDGs through 2030.

In 2020, EO4SDG promoted effective ways to use Earth observations (EO) and geospatial information relative to the SDGs; increased skills and capabilities necessary for countries and stakeholders to apply EO data and information for SDG activities and their derived benefits; and, facilitated timely access to EO data and interactive tools to ensure that countries and stakeholders can seamlessly integrate them where applicable – and that data is openly available, especially where achieving SDGs requires multi-national or regional approaches and collaboration.

2. 2020 ACCOMPLISHMENTS AT A GLANCE

◆ We deepened cooperation with various United Nations agencies. For example, with UN-Habitat, we laid a solid foundation for the promotion of Earth observations in support of SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable, and the New Urban Agenda, through the launch of the Earth Observations Toolkit for Sustainable Cities and Human Settlements.

◆ We increased our engagement and virtual collaboration with partners and the end-user community, having added over 19 new, regionally representative end user and partner organizations (for example, see Contributors, https://eo-toolkit-guo-un-habitat.opendata.arcgis.com/)

◆ We implemented the 2nd GEO SDG Awards Program to highlight innovative uses of EO for the SDGs, and the number of nominations increased by 50% in comparison to 2019 (the program's inception year). We also organized a first ever virtual GEO SDG Awards ceremony (November 2020)

◆ We contributed to the SDGs Geospatial Roadmap that is led by the United Nations Inter-agency Expert Group on SDGs Working Group on Geospatial Information (WGGI). The SDGs Geospatial Roadmap aims to build the bridge between the statistical and geospatial communities working within the global indicator framework, and communicate the vision to see geospatial and location-based information recognized and accepted as official data for the SDGs and their global indicators.

Remote Sensing of Environment: Special Issue on EO for SDGs
Includes 17 published articles, the majority of which focus on Goals 6: Clean Water and Sanitation, 14: Life below Water, and 15: Life on Land. The Special Issue's editorial highlights an urgent need for the EO community to work more closely with local and regional governments and relevant stakeholders to promote the operationalization of EO solutions for implementing the SDGs at regional to national/ sub-national and local levels.

Transition from data to knowledge for action for SDG implementation (Kavvada et al, 2020)

♦ We launched two special issues at two thoroughly inter-disciplinary journals, Elsevier's Remote Sensing of Environment and MDPI's Remote Sensing on Earth Observations for Sustainable Development Goals, including a total of 27 peer-reviewed publications and an editorial.

♦ We expanded the collection of use case examples of EO uses for SDG monitoring and implementation, including a total of 22 cases from 8 countries - Sweden, Portugal, Germany, Ukraine, New Zealand, Japan, Canada, and Colombia – and the European Commission.

♦ We organized and hosted a Virtual Workshop titled "Digital Land of the Americas". The main objective of this event was to propose an initial scheme for the project "Digital Earth Americas," with a plan that helps build operational, analytical, sovereign and open capacity of users from the Americas for the analysis, use and management of satellite images through the Open Data Cube. Organizers included the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), the United States National Aeronautics and Space Administration (NASA) and the National Institute of Statistics and Geography of Mexico (INEGI).

AWARDS

♦ Our Co-chair, **Chu Ishida**, received the GEO 2020 Individual Excellence Award

♦ Our Co-chair, **Paloma Merodio**, was recognized among the Geospatial World's 50 rising geospatial experts

♦ Our Executive Director, **Argyro Kavvada**, received the 2020 NASA Headquarters Honor Award for Excellence in Innovation

♦ To engage with stakeholders and the broader user community, EO4SDG leadership and contributors conducted, and participated in, several events at UN, GEO, and other scientific conferences including: the annual UN Statistical Commission meeting, the UN High Level Political Forum, the UN-GGIM and AmeriGEO/ UN-GGIM Americas annual event, the UN World Data Forum, the GEO Virtual Symposium 2020, the GEO Week 2020, the American Geophysical Union and the International Astronautical Congress, among others.

♦ EO4SDG activities included participating in the Committee on Earth Observation Satellites (CEOS) Ad Hoc Team on SDGs, as well as strengthening partnership opportunities to reach new end-users, like the collaboration with regional GEOs, the Sustainable Development Solutions Network (SDSN) TReNDS, and SDGs Today, a partnership between SDSN TReNDS, Esri and the National Geographic Society.

♦ We promoted demonstrable progress in the development of methods and their sustained utilization by countries for SDG monitoring and reporting, while encouraging new data and information collection. As an example, Uruguay's Ministry of Environment completed local feasibility testing and validation on uses of Earth observations from the USGS/NASA Landsat 8/9 and Copernicus Sentinel 2 missions to support monitoring of water quality and reporting on SDG indicator 6.3.2: Ambient fresh water quality.

♦ The EO4SDG Executive Director was invited to participate in the GEO Program Board Urban Resilience Sub-group, contributing to the development of an engagement plan for Urban Resilience and promoting coordination of GEO efforts on urban resilience and sustainability.

♦ We released a compendium on "EO contributions to the SDG Targets and Indicators," produced by a project funded by the European Space Agency (ESA) in close cooperation with EO4SDG and the CEOS Ad-Hoc Team on SDGs.

♦ We organized interactive training sessions, such as the NASA Applied Sciences Remote Sensing Training (ARSET) webinar series, Remote Sensing for Mangroves in Support of the UN Sustainable Development Goals, which included over 1,000 participants across regions.

♦ We developed a challenge on the "SDG Impact of Covid-19" as part of the NASA Space Apps Covid-19 Challenge, which included over 15,000 participants in 150 countries who solved COVID-19 related challenges using NASA, ESA, JAXA, CSA, and CNES space agency data.

3. LAUNCH OF THE EARTH OBSERVATIONS TOOLKIT FOR SUSTAINABLE CITIES AND HUMAN SETTLEMENTS

The United Nations Statistical Commission officially launched the Earth Observation Toolkit for Sustainable Cities and Human Settlements at a side event of the on February 25, 2021. The event also introduced the SDGs Geospatial Roadmap, led by the UN Inter-Agency Expert Group on SDGs (IAEG-SDGs) WGGI.

The launch of the Toolkit marks the second major milestone in a collaborative effort led by EO4SDG, GEO and UN Habitat, which started during the 10th World Urban Forum held in Abu Dhabi in February 2020. The first milestone for the Toolkit development was a call for expressions of interest that attracted submissions from over 57 potential contributors. Of these organizations, 19 met the selection criteria and started contributing to the Toolkit's development, alongside other organizations and initiatives within GEO, such as the Human Planet Initiative and the Global Urban Observations and Information Initiative. Currently, there are over 40 members directly contributing to the Toolkit, including representatives from national statistical offices, national mapping agencies, city authorities, academic, research institutions, non-governmental organizations, space agencies, and the private sector. This strong engagement of stakeholders across regions is an important accomplishment, particularly during a year where city and national authorities were faced with immense challenges due to the global crisis resulting from COVID-19.

The Toolkit comprises:
- A catalogue of SDG 11 and New Urban Agenda - relevant **EO data sets** – mainly ready-to-use data products – and interactive **EO data processing tools** that can be filtered by different parameters – such as data type, format, source, spatial scale, temporal resolution, geographic level, keywords, SDG indicator – to help users discern application areas and distinct characteristics for the data and tools
- Broad **guidance** on how EO and geospatial technologies are, and can be leveraged, for urban monitoring across four thematic areas: housing, open spaces, public transport and spatial urbanization
- **Use cases** that illustrate experiences, successes, and challenges of countries and cities in leveraging EO data to fill urban-related monitoring gaps and address reporting needs or guide policy actions, and
- Opportunities and resources for **continuous learning** on how to leverage EO data and tools for urban monitoring

The Toolkit is a live resource, which will be continuously updated to integrate new data, tools, learning material, use cases or other relevant contributions. Currently, there are four working groups – **Impact, Awareness Building, Bench-learning across Levels, and FAIR Data** – within the Toolkit Steering Committee, whose aim is to further improve the usefulness and sharing of this resource.

The Toolkit can be accessed here, and contributions are open – these can be in the form of data sets, tools, use cases, learning material and opportunities for continuous capacity development of countries, cities and relevant stakeholders. For more information, read the Toolkit Overview and Progress to Date guidance document.

4. SDG PROJECT ADVANCEMENTS

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 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 approaches and applications when appropriate.

The global pandemic has impacted the timeline and activities of many of these projects and in-country activities, such as field campaigns or in-country technical workshops. Field sites became inaccessible due to country lockdowns and restrictions in travel, and other efforts experienced delays due to reduced work hours of the project teams and the in-country partners and collaborators, as a result of the pandemic. This situation has also provided an opportunity, however, for unique questions where EO can provide insights, particularly related to observed changes in the environment – air quality, water quality, agriculture, climate change – as communities around the world have changed their behavior in response to the spread of COVID-19. A project team has leveraged this opportunity, for instance, to study the impact of decreased terrestrial activities (especially tourism and agriculture) during the pandemic on water quality in the Belize Lagoon.

Below, we include some highlights that reflect project advancements in integrating EO data and tools in country SDG processes and informing related management and policy actions in 2020:

- Belize's government has agreed to integrate insights from locally calibrated satellite-based estimates of water quality (from Landsat and Sentinel 2), as well as historic land cover change analysis and future land cover and hydrologic modeling, into their Coastal Zone Management Plan, a critical document that provides national guidelines to sustainably manage Belize's diverse coastal and marine resources. For more information, read the related project post.
- Uruguay's Ministry of Environment and Universidad De La Republica Uruguay worked with UN Environment Latin America and the Caribbean Regional Office and the National Aeronautics and Space Administration (NASA) to complete local feasibility testing and validation on uses of Earth observations (Landsat 8/9 and Sentinel 2) to support monitoring of inland and nearshore water quality and reporting on SDG indicator 6.3.2.
- Japan's Ministry of General Affairs and the Japan Aerospace Exploration Agency (JAXA), collaborated to validate SDG indicator 15.4.2: Mountain Green Cover Index, using satellite-based land cover data.
- A NASA-funded science team, led by Montana State University, collaborated with the UN Development Program (UNDP), UNDP's National Coordinators and national stakeholders in Colombia, Ecuador and Peru to develop and implement a decision support system for scenario planning, forecasting, policy development, and reporting on SDG 15: Life on Land. The decision support system is the UN Biodiversity Lab. Here is a sneak peak of the UN Biodiversity Lab 2.0.
- An ESA-funded project, titled WorldWater, launched a call for countries to participate in a Round Robin inter-comparison of inland surface water detection and monitoring algorithms using Sentinel-1, Sentinel-2 and Landsat 8 imagery to complement existing EO initiatives and projects, such as the

Global Surface Water Explorer, and demonstrate how global coverage EO data can be used to systematically and accurately measure inland surface water resources. For more information, visit the project's [site](#).

5. GEO SDG AWARDS 2020

EO4SDG administered the GEO Sustainable Development Goal (SDG) Awards 2020 for the 2nd year, after the successful launch of the program in 2019. To best support this program, EO4SDG leadership spearheaded actions to garner nominations from across regions and sectors and secure a diverse review and evaluation panel. EO4SDG also worked closely with the GEO Secretariat to communicate outcomes and share details about the fourteen awarded organizations and projects, including the pre-recording of virtual announcement sessions, in addition to social media and blog posts, and the development of award certificates.

Some notable outcomes of these efforts included:

GEO SDG Awards 2020: Virtual Announcement Sessions

- Increased number of nominations (over 40 nominations received in 2020, compared to 22 nominations in 2019), a result of continued efforts to build awareness about the awards program and its derived benefits;

- Identification of a diverse [panel](#) of reviewers representing industry, government, non-government organizations, and the GEO Programme Board;

- Development of pre-recorded sessions to feature the awarded projects;

- Development of digital certificates, in collaboration with the GEO Secretariat;

- Development of blog posts shared via the EO4SDG, GEO and NASA Applied Sciences websites, in collaboration with the GEO Secretariat;

- Follow-up activities (in coordination with the GEO Secretariat) to continue sharing awareness about the winners and their projects (in development).

6. EO4SDG Annual Meeting 2020

The EO4SDG Annual Meeting was held virtually on November 18-19, 2020. The meeting included presentations from three of the four newly formed GEO Working Groups – Capacity Development, Climate Change, Disaster Risk Reduction – and the Urban Resilience Programme Board Subgroup; the GEO Secretariat; as well as representatives from the UN IAEG-SDGs WGGI, the CEOS SDG Ad Hoc Team, the Global Forest Observations Initiative (GFOI), GEO Blue Planet, GEO Human Planet and EuroGEO initiatives.

Over the course of the two-day event, headed by the EO4SDG Executive Secretary and Co-Chairs, attendees participated in interactive exercises to identify products and services that EO4SDG can prioritize in 2021. Attendees also discussed how EO4SDG can work with the GEO Work Programme –

flagships, initiatives and community activities – GEO Working Groups, GEO Participating Organizations, countries, cities and other relevant stakeholders to streamline the integration of Earth observation (EO) data, methods, tools and services into Sustainable Development Goals (SDG) implementation, monitoring, and reporting.

Access the [summary report](#) from the annual meeting to learn more about the outcomes of the annual event and the results of the EO4SDG Survey 2020 conducted among EO4SDG contributors and meeting participants in November 2020.

7. Looking Ahead

As the world moves on from the COVID-19 pandemic, EO4SDG will continue its pursuit of expanding knowledge and enabling the sustained and effective use of Earth observations to drive progress on meeting development challenges around the world and enabling the implementation and reporting on SDGs.

In 2021, EO4SDG will develop an innovative, coherent plan of coordination and engagement across the GEO Work Program and key GEO participating organizations and collaborators. To accomplish this, EO4SDG will collaborate with those working on the other GEO engagement priorities, especially through their dedicated GEO Working Groups – such as the Working Group on Disasters Risk Reduction and the Working Group on Climate. The Initiative will further pursue opportunities with regional GEOs and select thematic Initiatives – such as the GEO Blue Planet, GFOI and GEO BON Initiatives – to enhance knowledge sharing about existing EO data, tools, methods and use cases of EO uses in support of SDG targets and indicators, and to encourage the development of new activities to address identified gaps. In addition, EO4SDG will continue to coordinate and communicate regularly with the GEO Secretariat and GEO Programme Board to articulate end-user community priorities and facilitate coordination and collaboration across the GEO Work Programme.

In 2021, EO4SDG will continue to engage with the Committee on Earth Observations Satellites (CEOS) to better support the needs and priorities of the user community involved in SDG activities around: harmonizing, and sharing guidance on, the many EO data options and analytical tools that can address the monitoring and implementation needs of countries in a consistent way (to enable comparability); and supporting countries and related stakeholders in the application of complex data sets (to strengthen national ownership).

Furthermore, EO4SDG will continue to build strategic stakeholder partnerships and deepen relationships with existing collaborators, such as with the UN Habitat and the 40+ contributors to the EO Toolkit for Sustainable Cities and Human Settlements. EO4SDG will continue to serve as member of the UN IAEG-SDGs WGGI, contributing to the completion and delivery of the SDGs Geospatial Roadmap for adoption by the UN Statistical Commission in 2022. In 2021, the Initiative will also aim to increase private sector participation and arrange partnerships with at least two major private sector entities to spur innovation and achieve mutual benefits in support of EO4SDG's vision to see "countries, stakeholders, and the global community desire additional Earth observations and geospatial information to continue progress on improved social, economic, and environmental sustainability."

8. Appendix A: Publications and Online Resources

- RSE Special Issue on Earth Observations for Sustainable Development Goals. Link
- RS Special Issue on EO Solutions to Help Countries Address the SDGs Link
- The Earth Observations Toolkit for Sustainable Cities and Human Settlements: Overview and Progress to Date. Link
- Earth Observations Toolkit for Sustainable Cities and Human Settlements: Toolkit Portal
- Blog Post, Tools to enable UN Member States at national and local level to use Earth observations to help deliver SDG 11 and the New Urban Agenda
- Blog Post, Protecting Belize's Barrier Reef World Heritage Site
- Blog Post, Predictive Tracking of Aquatic Invasive Species Nation-Wide
- Kavvada, A., Metternicht, G., Kerblat, F., Mudau, N., Haldorson, M., Laldaparsad, S., ... & Chuvieco, E. (2020). Towards delivering on the sustainable development goals using earth observations.
- Prakash, M., Ramage, S., Kavvada, A., & Goodman, S. (2020). Open Earth Observations for Sustainable Urban Development. Remote Sensing, 12(10), 1646.
- Whitcraft, A. K., Becker-Reshef, I., Justice, C. O., Gifford, L., Kavvada, A., & Jarvis, I. (2019). No pixel left behind: Toward integrating Earth Observations for agriculture into the United Nations Sustainable Development Goals framework. Remote Sensing of Environment, 235, 111470.
- Hakimdavar, R., Hubbard, A., Policelli, F., Pickens, A., Hansen, M., Fatoyinbo, T., … & Carroll, M. (2020). Monitoring Water-Related Ecosystems with Earth Observation Data in Support of Sustainable Development Goal (SDG) 6 Reporting. Remote Sensing, 12(10), 1634.
- Dhu, T., Giuliani, G., Juárez, J., Kavvada, A., Killough, B., Merodio, P., … & Ramage, S. (2019). National open data cubes and their contribution to country-level development policies and practices. Data, 4(4)
- Kavvada, A., Cripe, D., Friedl, L. Earth Observation Application & Global Policy Frameworks, AGU Geophysical Monograph Series (in progress)
- CEOS EO Handbook 2018 Special Edition: Satellite Earth Observations in Support of the Sustainable Development Goals
- Twitter: @EO4SDG
- EO4SDG website
- CEOS website
- UN IAEG-SDGs WGGI website