Earth Observation Solutions for the Sustainable Development Goals

Earth Observations for Sustainable Development Goals (EO4SDG) Annual Meeting 2019 — Open Session
9th Session of UN-GGIM

http://eo4sdg.org
@EO4SDG

5 August 2019 / New York, U.S.A.
Evidence Informed Policy: EO4SDG

EO4SDG Annual Meeting, 5 August 2019

Steven Ramage, GEO Secretariat
@steven_ramage / sramage@geosec.org
Summary and recommendations

What?
Support greater links with UN-GGIM, notably via fundamental data themes and UNSN; Support greater connections of SDG activities across the GEO Work Programme; and Support the international community to find missing data and provide more timely data.

How?
Share scientific papers, methods, algorithms and data to develop long-term capacity; Work more closely with regional GEOs and align with regional UN-GGIM activities; and Increase awareness, understanding and use of EO to inform the SDGs at a policy level: consider developing an SDG MOOC (massive open online course) to build on the successful webinars, as well as contributions to GEO Report on Progress 2015-2019.
**GEO Vision and Mission**

**GEO Vision**
To realize a future where decisions and actions, for the benefit of humankind, are informed by coordinated, comprehensive and sustained Earth observation information and services.

**GEO Mission**
GEO’s mission is to connect the demand for sound and timely environmental information with the supply of data and information about the Earth. Advocacy for broad, open data policies helps ensure that the data collected through national, regional and global observing systems is both made available and applied to decision making for global priorities.

**GEO Value**
GEO is a partnership convening 105 national governments, 130+ partners comprised of international bodies with a mandate in and/or use of Earth observations. There are also international NGOs and the commercial sector contributing. Together, the GEO community is creating a Global Earth Observation System of Systems (GEOSS) to better integrate observing systems and share data by connecting existing infrastructures using common standards.
2030 Agenda: Integration of Information Systems

- Statistics
- Geospatial
- Earth observations
- Other data
GEO activities at a glance

- GEO members, partners & associates
- Regional GEOs
The GEO Work Programme is the primary instrument to plan and implement GEO activities. The work programme for 2020-2022 is now under review.

http://earthobservations.org/gwp2020_dev.php

Implementation Plans submitted for scores of international activities, including EO4SDG and a number of these activities include the private sector, ranging from Brockman Consulting to Esri to Zurich Insurance.
Results-oriented GEOSS

The first decade
Focus on provision of open data [ongoing challenge].

The future
Focus on results based on open science, notably reproducibility.
Results-oriented GEOSS

The driver for change

Easy access to the products and services developed in GEO.

Access to methods, code, models, source data, scientific papers, etc.

Enable others to reuse the results in their country, based on local circumstances.

Create a broad global network of EO practitioners who control of the tools they use, they are not just consumers of information.
Results-oriented GEOSS

Big earth observation time series analysis for monitoring Brazilian agriculture

Michelle Cristina Araujo Picolet*, Gilberto Camara, Jeda Sanches, Rolf Simões, Alexandre Carvalho, Adriene Macêdo, Alexandre Coutinho, João Esquerrado, Joana Antunes, Rodrigo Áureo Begetti, Danilo Arvéd, Cláudio Almeida

* Brazilian Space Research Centre (CDB), Sao José dos Campos, Brazil
1 University of Applied Sciences Research (FRA), Berlin, Germany
2 Institute of Geophysics and Remote Sensing (IGES), Brazil
3 Brazilian Institute of Geography and Statistics (IBGE), Brasilia, Brazil
4 Instituto do Meio Ambiente e dos Recursos Naturais Renováveis (IMAR), Brazil
5 Universidad de Chile, Chile
6 Instituto de Geociências e Geofísica (IGG), Brazil
7 Environment Agency, Brazil

Camara, Gilberto; Picolet, Michelle; Simões, Rolf; Maciel, Adriene; Carvalho, Alexandre X; Coutinho, Alexandre; Esquerrado, João; Antunes, Joana; Begetti, Rodrigo; Arved, Danilo; Almeida, Claudio (2018): Big earth observation time series analysis for monitoring Brazilian agriculture. ISPRS Journal of Photogrammetry and Remote Sensing, 146, 328-339.

https://doi.org/10.1016/j.isprsjprs.2018.08.007
Strengthening Institutions

EO data

Co-design co-production

and

Trust is the key!

Robust and reliable results

and
Focus areas are the UN 2030 Agenda for Sustainable Development, the Paris Agreement on Climate and the Sendai Framework for Disaster Risk Reduction.

UN-Habitat recently invited the GEO Secretariat to support ongoing efforts around Sustainable Development Goal 11 and the New Urban Agenda through the GEO Work Programme.
EO4SDG key results achieved in 2017-2019

EO in SDG Methodologies
- SDG indicators 6.6.1, 6.3.2, 11.3.1, 11.7.1, 15.3.1
- Feasibility studies, pilot projects, in-depth endeavors
- Focus on scalability & replicability of methods

Capacity Development
- In-person training: UN-GGIM 8, RCMRD Intern. Conf. 2018, AMERIGEO 2019
- Webinars (SDG awareness; thematic webinars)
- Contribution to UN-Habitat, UNEP and UNCCD

Stakeholder Engagement
- UN IAEG-SDG WGGI, UN-GGIM, UN Custodian Agencies
- Line ministries, NSOs, Mapping Agencies, GEO Community

Data & Information Products
- Survey to GEO Member Countries on EO data use with SDG
- Satellite data requirements, data acquisition, access, discovery and usability (with CEOS, GEOGLAM)

GEO Report, ‘Earth Observations and Sustainable Development Goals’
EO4SDG website: http://eo4sdg.org
SDG 6.6.1 Technical Brief, http://eo4sdg.org
SDG 11.3.1 Retrieved from: Training Module by UN-Habitat
CEOS EO Handbook on SDGs, http://eohandbook.com
EO4SDG Session: 2018 UN World Data Forum
EO4SDG Side Event – GEO Week 2018
GEO Associates means commercial and non-governmental, not-for-profit and civil society organizations can join national governments and international organizations as official GEO collaborators with no fees involved.

GEO Associates enable the application and use of GEO’s global solutions at regional and local scales. GEO Associates must be registered in the territory of a GEO member country, it’s the lead national government agency (GEO Principal) that reviews and approves Associates.
AfriGEO – value provided

• Framework for strengthening partnerships within Africa: AfriGEO fosters intra-continental partnership and connects Africa to international partners and programmes;
• Coordination framework and platform for Africa’s participation in GEO: understanding who is doing what where? Identifying capabilities, synergies and linkages and reducing duplication;
• “Co-design enabler”: gathering user requirements, translating policy needs to observations requirements by scientific community to satellite specifications; and establishing communities of practice;
• Pan African initiative to raise awareness on EO: raising awareness on the value of EO, availability of resources and tools to the EO community and engaging with policy makers;
• Infrastructure: AfriGEO is working on a coordinated EO data acquisition strategy for Africa Gateway into Africa for international partners; and
• Centralized capacity building to guide implementation and adoption of Earth observation to address key societal benefit areas (SBAs).
The AmeriGEOSS Platform is a regional community resource to promote collaboration and coordination among the GEO members of the American continent.
AOGEO – regional tasks

Integrated Priority Studies
- Integrated Priority Studies 1: Mekong River Basin
- Integrated Priority Studies 2: Small Island States
- Integrated Priority Studies 3: Himalayan Mountains

Applications and services
- Task 1: Asian Water Cycle Initiative
- Task 2: Asia-Pacific Biodiversity Observation Network
- Task 3: Carbon and GHG Initiative
- Task 4: Oceans, Coasts and Islands
- Task 5: Agriculture and Food Security
- Task 6: Drought monitoring and evaluation
- Task 7: Environmental Monitoring and Protection
- Task 8: Disaster Resilience
- Task 9: Himalayan GEOSS

Foundational tasks
- Task 10: Data Sharing
- Task 11: Data Hubs and Cubes
- Task 12: Users Engagement and Communication
EuroGEO – value provided

• Delivering an integrated European contribution to GEOSS and increasing GEOSS benefits for Europe;
• Acting as an incubator in cooperation with Copernicus/European countries/organisations to produce & test EO services and applications
• Delivering specific EO applications benefiting from integrating global datasets made available through GEOSS;
• Promoting, scaling up and developing EO applications in association with users;
• Building on Copernicus Data & Information Access Services (DIAS ) + Horizon 2020 resources; and
• Compliance with GEO engagement strategy: supporting the implementation of UN 2030 Agenda for Sustainable Development.
GEO-AMAZON WEB SERVICES – EARTH OBSERVATION CLOUD CREDITS PROGRAMME

GEO and AWS have awarded $1.5 million in grants, cloud services and technical support for projects in developing countries to use Earth observations to support sustainable environmental development based on GEO priorities.

DevelopmentSeed and Sinergise have both supported this programme from a European and North American perspective.

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<td>AWS4AgriSAR-Crop inventory mapping from SAR data on cloud computing platform</td>
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<td>Department of Geospatial Information Science and Technology (AFRIGIST)</td>
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<td>Monitoring Rice Paddy and Flood in the Lower Mekong Basin</td>
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<td>Air Quality Forecasting for Africa</td>
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<td>GEO–AWS 21 projects from 17 developing countries</td>
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GEO and Amazon Web Services Announce Cloud Grants to Improve Understanding of Our Planet

News / 10 June 2019

Today, the Group on Earth Observations (GEO) announced the 21 projects from 17 developing countries that will be awarded $1.5 million USD worth of cloud services, grants and technical support through the Earth Observation Cloud Credits Programme.

Under the Amazon Sustainability Data Initiative (ASDI), this programme will enable Earth observations and applications to support sustainable environmental development including the United Nations Sustainable Development Goals, the Sendai Framework for Disaster Risk Reduction, and the Paris Agreement on Climate Change.
Sustainable development will falter without data

Unless governments establish competent monitoring systems, the world will not reach the UN Sustainable Development Goals, says Jessica Espey.

With daily Earth observation data, governments could monitor erosion, sand mining and illegal development and then act to stabilize fragile coastlines. Interconnected administrative systems could help to give vulnerable people access to health facilities, social services and entitlements. Data systems are the mortar with which a sustainable planet and society will be built.
Landsat has produced annual cost savings in the United States ranging from US$350 million to $436 million for federal and state governments, nongovernmental organizations, and the private sector.

Landsat has provided an estimated worldwide economic benefit as high as $2.19 billion as of 2011.
POPGRID Data Collaborative

• Improving accessibility and documentation of data sets and data services
• Comparing and contrasting methods and implications of different data sources
• Convening technical experts from the geospatial and demographic monitoring communities at events and conferences worldwide
• Developing an intercomparison report and tool that clarify how different data sets fit different needs for statisticians, policymakers, development practitioners, and other applied users
DATA4NOW

We will increase the sustainable use of robust methods and tools that improve the timeliness, coverage, and quality of SDG data through collaboration and partnership, technical and capacity support, and information sharing.
WHAT WILL IT BE?

- **Number Of People In Extreme Poverty**: 76%
- **Number Of Women w/ Bank Account**: 76%
- **Hectares Of Forest Cover**: +269
- **Volume Of Freshwater Resources**: 64%
• Fully integrate innovative methods and tools into regular data production to inform the implementation of the SDGs in country.
• Increase the availability and use of timely data for policy and decision-making on the SDGs at the local and national levels.
• Integrate the timely data into existing national platforms for easy access by all users.
• Timely data not only for monitoring – but crucial to inform policies and action to achieve the SDGs.
Building on the work done in the Africa Regional Data Cube by CEOS, GPSDD and others, Digital Earth Africa will provide a unique continental-scale platform that delivers analysis ready data for operational purposes.

It will track changes across Africa in unprecedented detail, and provide data on a vast number of issues, including soil and coastal erosion, forest and desert development, water quality and changes to human settlements.

Announcement in March 2019, that almost $18m USD has been raised to support the launch of Digital Earth Africa.
Lake Sulumba in Tanzania

net loss of 3.8%

From 2014 to 2018, there is a net loss of 3.8% of water pixels. Analysis followed the SDG 6.6.1a indicator methodology (20 Jan 2017) and used the Landsat WOFS water detection algorithm.
Urbanization in Freetown, Sierra Leone – 2005 to 2015
SDG 15.3.1 – Land Degradation

Analysis completed along the coast of Ghana, near Accra. ESA CCI data was used for land classification training. Analysis used the SDG 15.3.1 Good Practice Guidance document by CSIRO and UNCCD (Sept 2017).

4.4% Urban Expansion
GEO WEEK 2019
MINISTERIAL SUMMIT
4 - 9 NOVEMBER / CANBERRA, AUSTRALIA / #GEOWEEK19
Canberra Ministerial Summit 2019
“Earth observations: investments in the digital economy”

**The importance of 2019 to GEO**

*Four years on from Mexico City*

In 2015, Ministers adopted a new Strategic Plan for GEO focussed on three key priorities: sustainable development, climate change and disaster risk reduction.

From 2015-2018, the GEO community has restructured itself around these priorities.

In 2019, Ministers and the broader GEO community will decide how they will step up and accelerate delivery of the GEO strategy.

**Policy issues that need Ministerial attention**

*Ministerial Summits enable Ministers to connect GEO to the bigger picture*

Topics will include:
- Engagement of GEO with the multilateral economic cooperation architecture
- Engaging with vulnerable and developing nations
- Future of Work
- Trade in Digital Services
- Privacy in a Big Data World
- Sharing Economy
JOIN US ON THE ROAD TO CANBERRA

www.earthobservations.org/geoweek19
#GEOWEEK19
Contact

Steven Ramage
@steven_ramage / sramage@geosec.org

#GEOWeek19

Collaborate and communicate with GEO:
Towards the Sustainable Development Goals

Improving the earth observation ecosystem in the United Kingdom

Ian Coady
UK Department for International Development

i-coady@dfid.gov.uk   @iancoady
UK First Voluntary National Report

74% of indicators have data (180 of the total 244) as of June 2019

Significant progress made against:
• high-quality health service;
• high and rising standards of education;
• increasing employment – women and disabilities;
• climate and the environment.

Disaggregation highlighted as a major gap in the data

UK remains committed to 0.7% GNI on development to support delivery of the Goals
Earth Observation in the UK

Data Science Campus

Centre of Excellence

Office for National Statistics

UKaid from the British people

Department for Environment, Food & Rural Affairs

Department for Business, Energy & Industrial Strategy

UK SPACE AGENCY

Ordnance Survey

Commercial Suppliers

Satellite Applications Catapult

Academia

Cross Government Expert Group - UK EO Policy
Classifying urban vegetation

Joint project between OS and Ordnance Survey
Aiming to identifying the proportion of vegetation for urban residential gardens in Great Britain.
Used remote sensing and machine learning techniques with high-quality aerial and satellite imagery
Developed a tool able to classify the contents of an image with accuracy – a neural network classifier
estimate that 62% of garden space is vegetation.
In urban areas this drops to between 45% and 54%
Future-proofing of arabica coffee production in Ethiopia

Arabica coffee is a critically important crop for Ethiopia and worldwide. Coffee as a whole it the second most traded commodity after oil.

Kew’s research has been fundamental in understanding climate change threats and opportunities for this species, and particularly in Ethiopia.

The outputs from the research include: (1) rigorous assessment of risks and opportunities for wild and farmed Arabica in Ethiopia; (2) documents and resources for decision makers; (3) resources and analyses for intervention planning and action.

Impacts:
• NGOs in Ethiopia are making decision on where and when to invest
• Ethiopian government is putting in place strategies for coffee production until 2100, based on Kew’s science data and expertise
• The science is now taught at Universities
• First set of Coffee Atlas sold out
Cefas’ earth observation case study: Commonwealth Marine Economies Programme - Pacific

UK Government programme in Caribbean and Pacific Small Island Developing States.

Supports sustainable initiatives to promote marine economic growth and prosperity.

Key Pacific issues include marine pollution and human health impacts, climate change and blue carbon potential (mangroves and seagrass).

**Pacific: Earth observation for pollution and blue carbon**

Combine:
- EO (satellites/drones)
- In-situ monitoring
- Ocean modelling

- Monitor on local and national scales
- Assess current situation, explore future scenarios

Assessing blue carbon habitats using satellite data: seagrass habitat map (left) of Efate Island, Vanuatu, derived from satellite colour data (right; false-colour image).
Enable all governments to collect, use and share geospatial data on population, settlement and infrastructure
Counting cattle using high resolution imagery

Estimate the post-war economy in South Sudan

Triangulate ground surveys and tether counts

Analysis options:

• Feature extract heads of cattle
• Feature extract herds of cattle and estimate based on density and distribution pattern
• Identify change between an image with cattle and an image without

Collaboration between ONS and DFID using the Data Science Campus
Potential to underpin a greater exploitation of EO data across DFID's range of programmes
Africa Regional Data Cube

Decades of analytically ready data allowing easily accessible geospatial analysis. Initial focus on algorithms to address priorities identified by 5 countries:

Ghana | Kenya | Senegal | Sierra Leone | Tanzania

20+ algorithms & 17+ years of data

- Cloud-free Mosaics
- Spectral Indices
- Land Classification
- Water
- Land Change
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<td>South Africa Safety Initiative for Small vessels' Operational Take-up (OASIS-TU)</td>
<td>exactEarth</td>
<td>Madagascar, South Africa</td>
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<td>Satellites for sustainable fishing</td>
<td>Inmarsat</td>
<td>Indonesia</td>
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<td><strong>Education</strong></td>
<td>Knowledge</td>
<td>Avanti Communications</td>
<td>Tanzania</td>
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<td><strong>Health</strong></td>
<td>Dengue fever Early Warning System (DEWS)</td>
<td>HR Wallingford</td>
<td>Vietnam</td>
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<td>SatCom for Nigerian Health Services</td>
<td>Inmarsat</td>
<td>Nigeria</td>
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International Partner Programme

32 Projects
33 Countries
15 Goals
Growing the use of earth observation: Challenges

National variation
- Lack of methods
- Lack of capability
- Cost of commercial imagery

Quality – input and output

Data sharing
- Lack of EO infrastructure
- Funding for earth observation
Growing the use of earth observation

- National variation
- Lack of methods
- Lack of capability
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- UN Global Data Platform
  - Quality – input and output
  - Data sharing
  - Lack of EO infrastructure
  - Funding for earth observation

- EO4SDG/IAEG-SDG
- WB Trust Fund
- WB Trust Fund
**Conclusion**

Need more consideration of earth observation capability as an end-to-end process rather than just developing methodology and storage

UK should work towards collaborative test-beds for earth observation projects rather than siloed projects

Greater support is needed for technical infrastructure – difficult as tied to organisation specific architecture

How do we work collaboratively across other spheres of influence – statistical agencies, development agencies, geospatial agencies etc

**FOCUS ON IMPACTS AND OUTCOMES**
ANY QUESTIONS?
Questions & Moderated Discussion

Earth Observations for Sustainable Development Goals (EO4SDG)
Annual Meeting 2019 — Open Session
9th Session of UN-GGIM

http://eo4sdg.org
@EO4SDG

5 August 2019 / New York, U.S.A.