

Open Earth Alliance 2020-2022 GEO Work Programme

1. Executive Summary

Full title and Acronym: Open Earth Alliance (OEA)

Category: Community Activity

As a GEO community activity, the Open Earth Alliance (OEA) will support global sustainability (and understanding) through the use of open technology solutions: open geospatial data infrastructures, open earth observation data, and open algorithms and analytics. The Open Earth Alliance seeks to close the gap that exists between open Earth Observation (EO) data and the end-user.

In recent years, the explosion of freely available EO Satellite data has presented significant opportunities and challenges for society, researchers, and industry. The opportunity to leverage free and open satellite data for public good is balanced by the technical challenge of properly storing, processing, and analyzing this invaluable big data.

While there has been some emphasis placed on the management of data, less emphasis has been placed on the end-user. An opportunity exists to add value to the entire decision-making value chain from data to user experience. The Open Earth Alliance is focused on providing technology solutions with the end-user in mind.

To achieve its goals, the Open Earth Alliance will focus on the following three key activities:

1. Development and deployment of **Data Cube solutions**
2. Creation of an **Algorithm Hub** providing a centralized repository of algorithms and software codes
3. Creation of **Analysis Hub** supporting user collaboration and shared analysis

In addition, the OEA will also support the following activities:

- Development of the Open Data Cube open source software project
- Development and delivery of capacity building and training for the Open Data Cube initiative.
- Creation of a Knowledge Hub supporting knowledge sharing of EO data applied to sustainable development problems.
- Creation of a Storytelling Hub allowing users to immerse themselves in EO data, information, and knowledge with the goal of providing better understanding and communication.

Though the OEA is technologic agnostic, OEA will leverage the Open Data Cube (ODC) as a core technology. Significant deployments in Africa, Australia, South America, Asia, and Europe have grown the ODC user base. Momentum has been built, and it is critical that the Open Earth Alliance helps facilitate the sustainability of the ODC.

Open Earth Alliance activities will be conducted on a global scale with prototype and development projects being focused at the country and regional scale. These prototype projects are seen as a stepping stone towards achieving the long-term vision of an Open Digital Earth platform for the world.

The Open Earth alliance is also passionate about using this platform to promote 3-G diversity (Geography, Generation, and Gender) through its associates and partners.

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2. Purpose

As the world becomes increasingly interdependent and complex, as a society, we must leverage all tools at our disposal to support our common goals. This includes working together on putting the massive investment in Earth Observation data to proper use. Earth Observation (EO) data has the potential to profoundly impact sustainable development at multiple scales (global to the individual). The Open Earth Alliance will support EO data-driven decisions and policy making that inform sustainable development.

In recent years, the explosion of freely available Earth Observation (EO) Satellite data has presented significant opportunities and challenges for society, researchers, and industry. The opportunity to leverage free and open satellite data for public good is balanced by the technical challenge of properly storing, processing, and analyzing this invaluable big data. As a society, true benefit of EO data is within sight. It is critical that the scientific, and more broadly, the technical community, step up to the challenge of making EO data work for everyone.

Solving the EO data management problem is just the first step. While there has been some emphasis placed on the management of data, less emphasis has been placed on the needs of the end-user. **An opportunity exists to add value to the entire decision-making value chain from data to end-user experience. Beyond data, we must look toward supporting the end-user with user-friendly open source algorithms and interface technology. The OEA is focused on providing technology solutions with the end-user in mind.**

As a core technology, the Open Earth Alliance will leverage the Open Data Cube (ODC), supporting country deployments and technology development around the globe. Significant deployments in Africa, Australia, South America, Asia, and Europe have grown the ODC user base. Momentum has been built, and it is critical that the Open Earth Alliance helps facilitate the sustainability of the ODC. The primary goal of the OEA is not long-term operations. Our focus will be initial systems deployment and training, providing technology roadmaps, and leaving long-term operations to relevant groups.

Unlike other open source software projects, the ODC requires a multidisciplinary skillset to deploy and operate effectively. Especially for developing countries, finding the relevant technical skills and IT infrastructure is nontrivial. Our experience is that even developed countries (and the development community at large) would also benefit from technical support. OEA seeks to provide technical support of this growing user base.

Additionally, the interest in the Open Data Cube has grown significantly with no cohesive plan (and associated mechanism) to foster this initiative, beyond the significant efforts by the partner institutions. While this model served the community well during formulation (2017 – 2019), the Open Data Cube has transformed into a project that needs better organization and resources, which will enable it to reach its full potential as a globally “linked” set of data cubes (and eventually as a global Digital Earth Platform).

We also believe that though the ODC is a proven solution, a broader, more technology-agnostic approach will best allow the Open Earth Alliance to fulfill the vision of supporting global sustainability and understanding through the use of open solutions. OEA seeks to close the gap that exists between data and end-user.

Actual and Planned Outputs of the Community Activity

Open Earth Alliance solutions will support decision making related to a broad range of sustainable development disciplines (e.g., water quality & supply, urbanization, agriculture, hazards) and will help tackle environmental, economic, and social challenges. Due to the wide-reaching nature of OEA, a broad range of users will be supported (leadership, management, technical) with global geographic scope.

Primary Activities:

Data Cube Solutions	OEA will support data cube deployments around the globe. Examples include data cube solutions in Africa, Pacific Islands, USA, Latin America, and Asia.
Algorithm Hub	Seeking to close the gap between data and end-user, the OEA will work toward providing users with a centralized mechanism that facilitates the use of compatible algorithms and software codes.
Analysis Hub	Seeking to close the gap between data and end-user, OEA will work toward providing users with a mechanism to leverage existing analysis and motivate collaboration between EO data users.

Secondary Activities:

Open Data Cube (ODC) Sustainability	Though OEA is technology agnostic, OEA will continue to support the ODC platform. As a leading EO Data Management and Analysis Platform, it is critical for our team to continue to mature and sustain ODC, especially given the significant user base.
Capacity Building	Through the development and deployment of open EO solutions, OEA will be focused on providing capacity building and training to a broad range of stakeholders (leadership, management, technical).
Knowledge Hub	OEA will seek to capture the knowledge gained through the development and deployment of open EO technology and will provide tools to leverage this knowledge.
Storytelling Hub	OEA will provide an innovative storytelling hub that allows users to immerse themselves in EO data, information, and knowledge with the goal of providing better understanding.

3. Background and Previous Achievements

The Open Earth Alliance team leans on its successful relationships with global organizations, universities, government space agencies, and big tech. The OEA team has significant experience working together on the Open Data Cube initiative (opendatacube.org). OEA consists of a team of highly talented and motivated scientists, engineers, computer scientists, with heavy international experience. The team has significant experience with the deployment of open data cube solutions around the world:

- 10+ countries have operational data cubes
- 15+ countries are developing (or planning to develop) data cubes,
- 30+ countries have expressed interest,
- The African Regional Data Cube (ARDC) (led by GPSDD/CEOS) has expanded the ODC to 5 African countries.
- Digital Earth Africa (led by GA) will significantly expand ODC deployment
- Other regional deployments of the ODC are in incubation (e.g., Digital Earth Latin America)
- The Open Data Cube has been deployed in support of UN Sustainable Development Goals

Through these successful deployments, strong relationships have been built with global organizations including: CEOS, GEO, UN, and the UN Foundation. Additionally, partnerships have been formed with big tech including Google, Amazon, and Microsoft, providing both computing infrastructure and technical guidance.

African Regional Data Cube Case Study

The OEA team has been instrumental in the successful development, deployment, and operation of the African Regional Data Cube. Implemented on a constrained budget, the ARDC provides a blueprint for success for other OEA solutions. The Africa Regional Data Cube (ARDC) is a tool that harnesses the latest Earth observation data and satellite technology to help Ghana, Kenya, Sierra Leone, Senegal, and Tanzania address various issues relating to agriculture, food security, deforestation, urbanization, water access, and more. The ARDC is a system that has been: (1) driven by user needs, (2) responsive to the country requirements; (3) responsive to capacity building and training needs; (4) responsive to the need to develop a governance framework supporting sustainable development. The ARDC is currently transitioning into Digital Earth Africa, an evolution to increase scale, sustainability, and functionality through a continental-wide operational services on EO data.

The Open Earth Alliance seeks to continue this success working closely with the Group on Earth Observations.

4. Key Activities

The following table outlines key tasks to be undertaken by the OEA during the 2020-2022 period.

1. Data Cube Solutions	Open Earth Alliance plans to support the following global data cube initiatives: <ul style="list-style-type: none"> a. Africa (2020 - 2022) b. USA – Virginia, California, Washington (2020 – 2022) c. Pacific Islands (2021 - 2022) d. Latin America (2021 – 2022)
2. Algorithm Hub	Open Earth Alliance will develop an Algorithm Hub to facilitate analysis: <ul style="list-style-type: none"> a. Work with the community to develop a common set of hub requirements (2020) b. Prototype the Algorithm Hub and deploy. Initially, we will prototype the system with focus on the ODC platform and then expand it to other data cube technologies. (2021) c. Work toward production system supporting a broad range of data cube technologies. The Open Earth Alliance Algorithm Hub seeks to be technology agnostic. (2022)
3. Analysis Hub	Open Earth Alliance will develop an Algorithm Hub to facilitate decision making: <ul style="list-style-type: none"> a. Work with the community to develop a common set of hub requirements (2020) b. Prototype the Analysis Hub and deploy. Initially, we will prototype the system with focus on the Open Data Cube platform. (2021) c. Work toward a production system focused on the Open Data Cube global deployments. This model may be expanded to other data cube platforms and may be taken up by other groups. (2022)

Secondary tasks:

4. Open Data Cube (ODC) Support	Open Earth Alliance will support Open Data Cube open source software development: <ul style="list-style-type: none"> a. Creation of an end-user focused user interface for the Open Data Cube b. Support of improved analysis capability with the ODC environment c. Support of improved data visualization and understanding d. Support of ODC core development e. Training and capacity building for solution development and deployment
5. Capacity Building	Open Earth Alliance will support global capacity development and training: <ul style="list-style-type: none"> a. Work with community to develop an integrated set of capacity building requirements b. Development of a Data Cube Data Catalog c. Development of training material for OEA solutions Capacity building for OEA solutions
6. Knowledge Hub	Open Earth Alliance will develop a Knowledge Hub to facilitate knowledge sharing: <ul style="list-style-type: none"> a. Work with the community to develop a common set of hub requirements b. Prototype the Knowledge Hub and deploy. Initially, we will prototype the system with focus on the Open Data Cube platform. c. Work toward a production system focused on the Open Data Cube global deployments. This model may be expanded to other data cube platforms and may be taken up by other groups.
7. Storytelling Hub	OEA will develop a Storytelling Hub to facilitate understanding and outreach: <ul style="list-style-type: none"> a. Work with the community to develop a common set of hub requirements b. Prototype the Storytelling Hub and deploy. Initially, we will prototype the system with focus on the Open Data Cube platform. <p>Work toward a production system focused on the Open Data Cube global deployments. This model may be expanded to other data cube platforms and may be taken up by other groups.</p>

Specific project requirements and timeline will be dependent on the level of successful fundraising.

5. Relationship to GEO Engagement Priorities and to other Work Programme Activities

It is envisioned that the Open Earth Alliance initiatives described in Section 4 will *likely* provide value toward a broad range of development frameworks including:

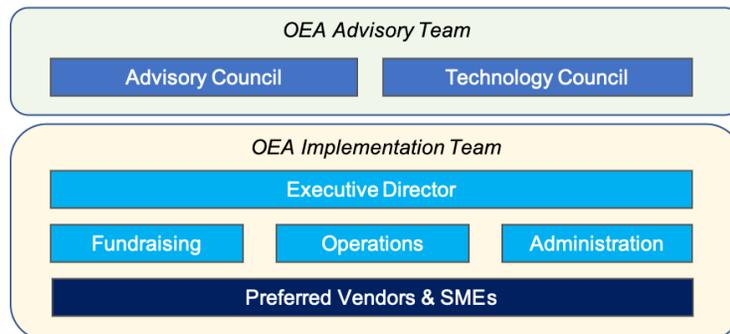
- United Nations Sustainable Development Goals – Our team’s efforts to date have already demonstrated impact here.
- Paris Agreement
- Sendai Framework

Additionally, we strongly believe the Open Earth Alliance aligns well with the Vision and Goals of GEO and hence will support flagships, initiatives, and community activities. Our team is very familiar with many elements of the GEO Work Programme and hopes to maximize value across various elements of the organization. These include, but are not limited to:

- Global Forest Observation Initiative GFOI
- GEO Global Agricultural Monitoring GLAM
- Digital Earth Africa DE-Africa

6. Governance

The Open Earth Alliance organization is reflected in the chart below.



The OEA will be organized into two teams:

- 1) Advisory team:
 - a. Advisory Council: Senior level officials charged with advocacy and relationship building. This council will also represent input from the Open Data Cube Advisory Board:
 - Geoscience Australia
 - Committee on Earth Observation Satellites
 - Commonwealth Scientific and Industrial Research Organisation
 - Satellite Applications Catapult
 - United States Geological Survey
 - Analytical Mechanics Associates
 - b. Technology Council – Provides technology advice and infrastructure support. Includes partners such as Amazon, Google, and Microsoft.
- 2) Implementation team:
 - a. Executive Director: The Open Earth Alliance will be led by an Executive Director with mandate to successfully execute key activities and work together with partners to support secondary activities.

- b. Fundraising: The OEA will have a fundraising team focused on bringing in financial resources and partners to help support the OEA visions and goals.
- c. Operations – Operations, solution development, product development
- d. Administration – The OEA administration team will leverage the GEO/WMO administrative and financial team to execute work.
- e. Preferred vendors and SMEs – Trusted network of support organizations

Initially (2020), OEA participants will be associated with various organizations including federal and international government agencies, private companies, and academic institutions. It is expected that a small team will join OEA (populated organization) as fundraising and opportunity present.

7. Data Policy

It is envisioned that the Open Earth Alliance will leverage open data and technology to provide open solutions for its stakeholders. In particular, OEA will primarily focus on Committee on Earth Observation Satellite (CEOS) Analysis Ready Data and leverage open source geospatial data management technology like the Open Data Cube (opendatacube.org).

Open Earth Alliance will seek to fully adhere to the GEOSS Data Sharing Principles and GEOSS Data Management Principles. The extent to which some systems are free and open, in some cases, may be an internal decision made by a government or organization. In these cases, OEA will make every effort to encourage that the data be made free and open.

Open Earth Alliance systems, to the extent possible, will be freely available via web URLs, centrally linked from the Open Earth Alliance web portal (openearthalliance.org).

Annex A: Project Leader CV

Sanjay Gowda, Ph.D.

Sanjay Gowda is a partner and Chief Innovation Officer at Analytical Mechanics Associates (www.ama-inc.com). Sanjay's interest includes: aerospace engineering, remote sensing, geospatial data systems, information technology, and advanced visualization. He has helped build multiple organizations both small and large. Sanjay has been supporting the Committee on Earth Observation Satellites (www.ceos.org) for over a decade, building tools and systems to advance the use of Earth Observation data. Sanjay has supported Open Data Cube solutions all over the world and is a founding partner of the Open Data Cube open source initiative (www.opendatacube.org).