

GEO Statement on Open Knowledge

This document is submitted to the 17th Plenary for decision.

1 INTRODUCTION

This document presents the GEO Statement on Open Knowledge (Annex A). It proposes that the statement be reformulated to focus on “Open Knowledge”. This concept, while inclusive of Open Science, is considered to be more closely aligned with the GEO Mission and Vision, which aim to support decision making and not only or primarily science.

As GEO moves further down the path towards providing its Members and Participating Organizations with the best evidence-based information from Earth observations possible, an Open Knowledge approach supports this ambition and the GEO Vision. The Statement provides a rationale and impetus for the open context of activities of the GEO Work Programme and the GEO community, the results of which will in turn be rendered accessible through the GEO Knowledge Hub.

2 DEVELOPMENT OF THE ORIGINAL STATEMENT

Impetus for the development of a statement on Open Science within GEO initially came from the GEO Secretariat as an outgrowth from the *Strategy for a Results-Oriented GEOSS* and the development of the GEO Knowledge Hub. Given the importance of Open Science to capacity building, particularly with respect to the capacity of GEO Members in developing countries to access and apply the solutions being developed through the GEO Work Programme, the Secretariat contacted the Capacity Development Working Group (CD-WG) to assist in the development of a statement. A drafting team was assembled, which included members of the CD-WG and others in the GEO community. Led by GEO Participating Organization ITC (Markus Konkol, ITC Open Science Officer), this team produced the statement which was presented to the Programme Board and the Executive Committee earlier this year.

3 FEEDBACK FROM THE GEO COMMUNITY

The presentation of the draft statement to the Programme Board at their 19th meeting met with a positive response. The Board endorsed the statement for presentation to the Executive Committee. It also requested that the CD-WG consider including references to the UNESCO statement, the TRUST principles and CARE principles, and to consider if changes were needed to address the relevance to models, methods, artificial intelligence, and machine learning. These changes were made to the statement prior to its presentation to the Executive Committee.

The Executive Committee, at its 54th meeting in March 2021, expressed support for the concept of Open Science, but recommended that further consultations with the GEO community be undertaken. These consultations were to include the Data Working Group, particularly with respect to the alignment with the GEOSS Data Sharing Principles and Data Management

Principles. The CD-WG shared the draft statement with the Data Working Group following the Executive Committee meeting. The Data Working Group provided a number of recommended revisions which were accepted into the document.

As part of the 2021 GEO Symposium, the Secretariat and the CD-WG offered a Spotlight Session on the Open Science Statement to explain its purpose and contents.

A comment which was frequently raised in the various consultations was the relevance of Open Science to GEO. While it is universally recognized that science is a foundation for GEO's work, many commenters pointed out that GEO is not itself a scientific research organization, but an organization which promotes science and its application within decision-making (at many levels and in many contexts). For example, the *2016-2025 GEO Strategic Plan* outlines the arc of the data-information value chain within GEO, as:

- Identifying needs;
- Ensuring the availability of data with which to develop information to address societal challenges; and
- Transforming that information into knowledge through the generation of products and services for end-users.

Further, in the Canberra Declaration (2019), the Ministers:

Reiterate the critical role that full, secure and open sharing of Earth observations data and knowledge will play in deeper integration of Earth observation technologies into the digital economy.

In reflecting on these responses, the Secretariat revised the Statement, including the title, so that this GEO Statement on Open Knowledge may serve as a foundational document in support of the generation and sharing of knowledge, especially for decision-making. This revised version of the statement builds upon, and broadens, the previous draft statement developed by the CD-WG, as refined by the Data Working Group.

4 FINAL REVIEW BY THE PROGRAMME BOARD

The revised version was presented to the Programme Board at its 21st meeting (28-30 September 2021). The Programme Board supported the change from Open Science to Open Knowledge, viewing the change as supporting the directions being taken in the 2023-2025 GEO Work Programme. Several requests for minor revisions were made during the meeting, these dealing with recognition of unique features of traditional knowledge, clarification of the text on open infrastructure, open hardware, and on licenses, as well as inclusion of references to open standards. These changes were made following the meeting and the final version was circulated to the Programme Board for confirmation.

5 RECOMMENDATION

The Programme Board recommends that the GEO Plenary approve the GEO Statement on Open Knowledge as guidance to the GEO Work Programme and to the GEO community generally.

Annex A

GEO Statement on Open Knowledge

According to the Open Knowledge Foundation¹, knowledge that is free to use, reuse, and redistribute without legal, social, or technological restriction may be defined as “open knowledge.” This definition clarifies the meaning of “open” with respect to knowledge, promoting a robust commons where collaborative community can thrive and interoperability is maximized.

Open Knowledge has proven to have played a pivotal role in tackling global challenges such as the COVID-19 pandemic. Open Knowledge is also beneficial for achieving the United Nation’s Sustainable Development Goals, the Paris Agreement objectives, the Sendai Framework for Disaster Risk Reduction, and a reduction in the knowledge divide among countries.

The authoritative nature of Open Knowledge does not exist in a vacuum but is rather the product of a number of open components working in concert to establish credibility and increase trust, such as open data, open source, open science, open licensing, and open education. We, the Group on Earth Observations (GEO), advocate the adoption of Open Knowledge to create a commons environment that is transparent, diverse, collaborative, timely and sustainable with respect to addressing societal challenges through the application of Earth observations. In so doing, GEO aims at lowering the barriers for everyone who might benefit from and contribute to the derivation of authoritative knowledge.

To this end, based on UNESCO’s [Open Educational Resources and Recommendation on Open Science](#), we promote the following principles with respect to the generation, dissemination, sharing and uptake of Open Knowledge:

Open Science: Openness in science is a fundamental requirement to ensure the integrity of research, accelerate scientific progress, and disseminate knowledge among scientists, decision-makers, and the general public. In this context, Open Science is an umbrella term comprising a set of practices to share scientific knowledge by making all stages of the research processes findable, accessible, and reusable.

As Open Science becomes the new norm across disciplines, it creates a scientific landscape that opens up the research process and allows everyone to verify, understand, and adopt new research results. Furthermore, we endorse the *San Francisco Declaration on Research Assessment (DORA)* to evaluate a scholar’s scientific outputs and impact.

Open Access: Everyone should be able to fully access and reuse all Open Knowledge contents and components, such as scholarly publications immediately after publication, free of charge, and without restrictions.

Citizen and Participatory Science: The active engagement and contribution of actors beyond the established research community can achieve a higher representation of the society and build up science literacy. Allowing citizens to contribute to science enables an evidence-based decision-making process by policy makers and the creation of a sustainable economy.

Open Data: The data needed to reproduce scientific results or support public decision making, including data stemming from publicly funded endeavors, should be released publicly under an open license and follow the GEO Data Sharing and Management Principles, the FAIR Principles

¹ <https://opendefinition.org/od/2.1/en/>

(Findable, Accessible, Interoperable, and Reusable) using human- and machine-readable data formats, the TRUST Principles (Transparency, Responsibility, User focus, Sustainability, and Technology), using trustworthy repositories, and the CARE Principles (Collective benefit, Authority to control, Responsibility, and Ethics). At the same time, the GEO Data Sharing Principles recognize the legitimate reasons to manage data access according to applicable international instruments, national policies and legislation, e.g., privacy, national security, and law enforcement.

Open Reproducible Research: The programming code or workflow needed to reproduce the analysis underlying the results (for example, figures, tables, and numbers) in scholarly publications should be released under an open license following the FAIR and TRUST Principles. The analysis should be executable and include any environment variables to facilitate understanding, verification, and reuse by others in new contexts.

Open Software: Any kind of software (including models and artificial intelligence) developed during the research process should be released under an open license and following the FAIR and TRUST Principles. Additionally, any reused software upon which the newly developed software is based or needed to execute the programming code or workflow should likewise be released under an open license as far as possible or made available according to the FAIR Principles.

Open Infrastructure: Any infrastructure needed to support Open Knowledge (for example, sharing platforms, data repositories, and computational infrastructures) should be non-proprietary and based on open standards, which are developed, approved, adopted and maintained via a collaborative and consensus driven open process to make data, information and services FAIR. Standards facilitate interoperability and data exchange among different systems, products, or services, prevent vendor lock-in, and provide long-term and unrestricted access to everyone.

Open Hardware: The design specifications of physical objects (hardware) should be released under an open license allowing others to study, modify, create, remix, and distribute.

Open Education: Teaching materials should be released under an open license (Creative Commons), allowing reuse and modification by others and following the FAIR and TRUST Principles. Open Education also involves teaching Open Science principles and using openly accessible materials (for example, data and software) as much as possible.

Open Evaluation: Scholarly articles should be evaluated in an Open Peer Review process resulting in publicly available reviews, at a minimum. To foster the transition to a new recognition and reward system, a researcher's reputation and output should be evaluated according to the Open Science principles, i.e., by focusing primarily on the content (see DORA) rather than the journal's impact factor and the h-index.

Diversity of Knowledge: The diversity of knowledge systems, holders, and producers should also be recognized in the production of Open Knowledge. This consideration requires acknowledging the rights of Indigenous People and the principles of non-discrimination based on income, gender, age, ethnicity, migratory status, disability, and geographic location. Weaving cultural knowledge bases together can maintain the validity and integrity of all methodologies and worldviews.

Overarching Goals of Open Knowledge

Openness in knowledge generation can help address society's local, regional, and global needs by creating an inclusive and interconnected environment. A thoughtfully designed open and

participatory environment provides more equitable opportunities and chances for all to gain academic literacy and benefit from new knowledge and innovation.

The digitalization era offers new possibilities to improve timely, equal access to knowledge, increasing the credibility and trust of academic findings, and political decisions that are expected to be based on verifiable facts. We want to achieve these objectives by providing the appropriate conditions to meet high scholarly standards while actively eliminating the barriers that stand in the way of practicing Open Knowledge (e.g., with the help of the GEO Knowledge Hub).

GEO strongly encourages practices that comply with the principles of Open Knowledge outlined above, to increase the impact of the GEO Work Programme, enhance discovery, shorten the time from discovery to application, and accelerate replication for broader societal benefits.