

First Steps Towards a GEO In Situ Data Strategy

This document is submitted by the Data Working Group to the Programme Board for discussion.

1 INTRODUCTION

This document has been prepared by the Data Working Group's Subgroup on In Situ Data (SG-ISD) and outlines key elements of the forthcoming GEO In Situ Data Strategy ("the Strategy") as well as the process and consultation phase leading to its finalisation.

Although preparatory work has just begun, the SG-ISD would appreciate feedback from the Programme Board with respect to:

- Key elements of the Strategy presented and their relevance;
- Additional elements that should be included in the Strategy;
- The proposed process and consultation phase as regards the involvement of stakeholders and timing;
- Recommendations and guidance vis-à-vis the implementation of the Strategy.

The feedback from the Programme Board forms an essential part of the initial consultation phase also comprising input from the Data Working Group members (including its subgroups), the GEO Secretariat, Regional GEOs, selected GEO Work Programme (GWP) activities, and the GEO Executive Committee. The timing of the consultation phase is as follows:

- The initial part of the consultation phase will be completed by end of October 2021.
- A draft outline of the In Situ Data Strategy will be made widely available for comment during the GEO Week 2021, and may be provided as an information document to support discussion at the GEO plenary
- The second iteration of the consultation phase will start January 2022.

2 BACKGROUND

Earth observations from diverse sources, including satellite, airborne, in situ platforms, and citizen observatories, when integrated together provide powerful tools for understanding the past and present conditions of Earth system components, as well as the interplay between them. GEO is a facilitator of policy-level dialogue on the importance and coordination of Earth observation systems (including ground-, air-, water- and space-based sensors, field surveys, and citizen observatories).¹

In view of a fragmented and rapidly evolving in situ data landscape, the GEO community has grappled with how to organize itself efficiently over this matter. Repeatedly, Declarations from GEO Ministerial Summits have called for strengthening this coordination (Cape Town 2007,

¹ GEOSS Non-Space-Based Earth Observation Resources (GD-o6) Task Team, "In Situ Observations: Coordination Needs and Benefits" (no page), included in the [GEO 2016 Work Programme Progress Report](#).

Beijing 2010, Geneva 2014, Mexico City 2015). Reinforcing this message, the Canberra Declaration (November 2019) states that the Ministers:

- Recognise the critical role that data collected from the atmosphere, land, and water (in - situ data) plays in achieving GEO's mission;
- Note that sharing of such data is limited and there remain significant gaps in the global observing system;
- Call upon the GEO community to develop a strategy to address the challenges in this area and to demonstrate progress in implementation.

The GEO Mid-Term Evaluation completed in 2021 also called upon GEO to improve availability and integration of in situ data through the implementation of the GEOSS Data Sharing and Management Principles.

The Strategy must be based on a relevant, solid, and agreed foundation to ensure its uptake and implementation by the GEO community. Input from the GEO community, notably the Regional GEOs, is of paramount importance. It is therefore necessary and pertinent to engage all levels of the GEO community in developing the Strategy through a consultation phase.

The plan is to present and discuss an outline of the Strategy at the GEO Plenary, November 2021, with a view to having a final draft ready in mid-2022.

To facilitate the feedback process preliminary ideas and considerations have been organised in the sections. Accordingly, the subsequent sections present a first attempt at outlining key components of the strategy including:

- A preliminary definition of the term 'in situ data';
- Characteristics of the in situ data landscape;
- A first set of strategic objectives and an in situ mission statement;
- Links to real world challenges;
- Some thoughts about the potential role of GEO;
- Initial ideas concerning the implementation of the Strategy;
- Next steps.

The exact structure and content of the strategy will be based on the feedback received during the initial consultation phase.

3 IN SITU DATA: A PRELIMINARY DEFINITION

As a starting point, the Strategy will define the term “in situ data” to clarify and highlight which kinds of data are covered. It is important to make this definition as open as possible, thus making the strategy generic and flexible.

The SG-ISD is currently considering the following definition to be included in the Strategy:

In situ data represent measurements of quantities in specific locations and include records of parameters that are collected by sensors, e.g., ground stations, aircrafts and sondes, ships and buoys, or humans in every known environment. Like Earth observations recorded from remote sensing instruments, in situ data are used to study the Earth and its interior, offering opportunities for improving decision-making and research on Earth processes, the environment, and the relationship that humans have

with earth systems. In situ data also are used in conjunction with space-based observations for verification, comparison, and integration.²

4 CHARACTERISTICS OF THE IN SITU DATA LANDSCAPE

An overview of the characteristics of the current in situ data landscape provided through the GEOSS Portal will provide a basis for the Strategy. The intention is not to describe the landscape in detail but rather provide some high-level elements on which focus the development of the Strategy.

Key messages to be elaborated upon in this section are:

- The in situ data landscape is heterogeneous and complex – with many different stakeholders, data providers, objectives, types of funding, data policies, networks, dissemination mechanisms, management, and organisations;
- The spatial coverage of key observing networks is irregular and there are regions where data coverage is particularly sparse;
- Data interoperability and data sharing and management principles (including those defined by GEO) are not fully adopted nor implemented to a sufficient degree;
- Not all in situ data are discoverable, reusable, or accessible as called for by the GEOSS Data Sharing and Management Principles and other similar, for example, the FAIR principles;
- Lack of sustainability, reliability, and continuity of service negatively impact data collection, management, and sharing;
- There is no comprehensive coordination mechanism for certain, e.g., terrestrial, in situ observations and networks.

5 MISSION AND STRATEGIC OBJECTIVES

5.1 In Situ Mission Statement

The Strategy includes an in situ mission statement in the context of GEO. The following draft is partly based on the Key Finding #1 of the 2021 GEO Mid-Term Evaluation:

GEO is a world-leading organisation in coordinating availability, access, and use of in situ data in combination with other Earth observations to support sustainability goals and informed decision making.

5.2 Draft Objectives

A series of key objectives is fundamental to the Strategy as they will set the direction and frame for future actions, support GWP activities and steer the implementation of the Strategy. The list of draft objectives below is by no means exhaustive and is intended to give a first impression of the style and content we propose to include in the Strategy:

- GEO will improve in situ data use, management, and sharing by proactively supporting cross-cutting coordination of global and regional data provider and owner networks and organisations;

² The definition used in the document “In Situ Observations: Coordination Needs and Benefits” (see footnote 1) defined in situ data as “all land, water, and air-based observations, independent of the observing technology and methodology, excluding only space-based observations”.

- GEO will advocate the further adoption of open data policy as exemplified in the GEO Data Sharing Principles and Data Management Principles, thereby facilitating efficient reuse of essential in situ data;
- GEO will increase knowledge and awareness among its members and stakeholders regarding the use and importance of in situ data, and their integration with remotely-sensed data, as a basis for key global and regional applications and informed decision making;
- GEO will strive to improve the sustainability, reliability, and continuation of key in situ observing systems and networks, particularly in data sparse regions;
- GEO will encourage the use of relevant new and developing observation techniques and methods such as citizen science initiatives, and green sensors e.g., bioinspired-biodegradable sensors, to close prioritised in situ data gaps;
- GEO will underpin the formation and evolution of the ‘integrated observing system’ concept by facilitating cost-effective integration and combination of data from space-based and in situ observing platforms.

6 LINKING TO REAL WORLD CHALLENGES

The Strategy needs to be closely connected to real world applications that address global needs, coordination, and knowledge gaps to be engaging, relevant, and implementable. It would be impossible to measure the success of the strategy, efficiently engage the GEO community and other in situ data providers and owners, and make GEO’s actions concrete, explainable, and relevant unless it is clear what GEO would like to achieve through this Strategy.

As a starting point, the Strategy, and its derived actions will be directly linked to the four global priority engagement areas of GEO:

- The UN 2030 Agenda for Sustainable Development;
- The Paris Agreement;
- Sendai Framework for Disaster Risk Reduction; and
- Urban Resilience.

In addition, specific actions implementing the Strategy will be organised around GEO Work Programme activities, essential variables, or specific application areas such as health and security or geohazards.

A judicious choice of “real world challenges” will provide a targeted framework for activities such as the definition of requirements, gaps, and development of solutions.

7 THE ROLE OF GEO ACTORS

Considering resources, it is important to position GEO strategically within the in situ data landscape for greatest efficiency. Consequently, the Strategy should address and prioritise the primary role(s) of the GEO community as regards maintenance, promotion, and implementation of the Strategy.

The SG ISD is discussing different potential roles for GEO actors such as those listed below, noting that they are not mutually exclusive nor exhaustive:

- **Coordinator** – GEO will focus on leading and supporting coordination of relevant international, regional and in situ data coordination initiatives, and other activities;
- **Enabler** – GEO will lead by example through the definition and implementation of dedicated GWP actions;

- **Communicator** – GEO will focus on raising the awareness of, inter alia, the importance of in situ data availability and accessibility, data sharing, etc.;
- **Trainer** – GEO will improve data handling and sharing by providing or supporting training options for data providers and owners;
- **Data custodian** – GEO may host selected datasets by serving as a data repository;
- **Infrastructure solution provider** – GEO will provide infrastructure solutions and capacities to facilitate e.g., data management, discoverability, and sharing;
- **Producer and custodian of guidelines, principles, recommendations, and standards;**
- **Promoter** – GEO will help users identify opportunities for improving the usability of in situ data.

8 STEPS TOWARDS AN EFFICIENT STRATEGY IMPLEMENTATION

Meaningful implementation of the Strategy is obviously critical to its success. The Strategy or, rather, a Strategy implementation plan should provide clear guidance on how to divide the work and responsibilities between GEO actors. The SG-ISD presents below a few preliminary ideas to be discussed with the full GEO community:

- The Programme Board will oversee the implementation process with support from the Secretariat and the Data Working Group;
- The Data Working Group will own the In Situ Data Strategy;
- Relevant GWP activities should relate their work and goals to the Strategy when the activity is established and during its implementation;
- Relevant GWP activities should provide input to a GEO in situ data strategy implementation status report on an annual basis, following some monitoring process to be elaborated upon in the Strategy or its implementation plan. The individual reports will be collected and compiled into a full report by the Secretariat and the Data Working Group and presented to the Programme Board;
- Based on the full status report, the Secretariat and the Data Working Group will make recommendations to the Programme Board on future implementation actions.
- Based on the full status report, the in situ data provider will be advised for actions to align with the implementation action.

9 ACTION PLAN

9.1 SG-ISD Work Plan

The SG-ISD has developed a work plan with activities that will contribute to these objectives. They are the following:

- Review previous relevant documents including previous GEO Plenary and task group recommendations;
- Identify GEO initiatives and other relevant projects for application areas that may be used to highlight benefits of in-situ data sharing;
- Conduct an initial analysis of in situ data use, priorities, challenges, and requirements for selected key GEO Flagships and Initiatives;
- Identify/map GEOSS platform-brokered in situ data providers (also considering citizen science); and
- Identify and showcase specific use cases to illustrate benefits, challenges, and the wealth of in situ data use.

9.2 Future actions

These initial steps will set the stage for long term action with respect to in situ data sharing by GEO. The outcomes will help the IS-SG to precisely understand the needs of each GWP activity for implementing services, monitoring systems, and applications for which in situ data is critical.

Future actions of the IS-SG will, however, need support from the GEO governance bodies including the Programme Board, Executive Committee, and the Regional GEOs to ensure that the identified needs of GWP activities will be addressed by requests for open in situ data.

10 NEXT STEPS

The feedback from the Programme Board forms an essential part of the initial consultation phase, which will also include input from the Data Working Group (including its subgroups), the Secretariat, Regional GEOs, selected GEO Work Programme activities, and the Executive Committee.

The initial part of the consultation phase will be completed by end of October 2021. A draft outline of the In Situ Data Strategy will be presented at the GEO Plenary, November 2021.

The second iteration of the consultation phase will start January 2022 and will focus on engaging with the Regional GEOs and relevant GWP activities