

## **GEO CARBON AND GHG INITIATIVE**

### **Overview**

The budgets of carbon and other greenhouse gases (GHGs) have many uncertainties that make it difficult to evaluate the success of climate change mitigation strategies. Improvements in long-term, high quality observing systems within and across the atmospheric, oceanic, terrestrial, and human domains are required to quantify GHG sources and sinks, to understand changes in the carbon cycle and hence the climate system, and to assess the level of effort required in order to mitigate and adapt to climate change. Current observing efforts and initiatives are a mix of regional and global efforts, requiring a global coordinating mechanism that provides useful and comparable information to resource managers and policy makers.

The GEO Carbon and GHG Initiative is proposed in the framework of GEO to promote interoperability and provide integration across different parts of the system, particularly at domain interfaces. The intention is neither to write new strategies nor duplicate existing efforts, but instead to build on existing initiatives and networks, ensure their continuity and coherence, and to facilitate their cooperation, the interoperability of their data and efforts, including WMO's IG3IS effort and GCOS programme, to fill in the missing pieces to obtain a comprehensive, globally coordinated, carbon and GHGs observation and analysis system. The initiative shall address policy agendas and will operate as a common and open platform to plan and implement strategies and joint activities at the global level from science to policy.

The work of the GEO Carbon and GHG Initiative is motivated by the long-term vision of a data-driven system to provide comprehensive knowledge on changes in the global carbon cycle and GHG emissions as a result of human activities and global change, and to support decision makers with timely policy-relevant information. It is not intended to replace national reporting or serve as a MRV mechanism. GEO has already played an important role in the promotion of carbon emissions monitoring by describing the building blocks and coordinated implementation of an Integrated Global Carbon Observing System in the GEO Carbon Strategy (Ciais et al., 2010), and this Initiative builds on tasks of the former GEO 2012-2015 Work Plan (CL-09-03a and CL-02). Many efforts and initiatives suggested there are now in place to monitor and understand carbon cycle and GHGs, but still a globally coordinated and comprehensive initiative, ranging from science to policy, and addressing all the components of the needed Carbon and GHGs-observing system is missing.

### **Activities for the period**

The main aim of the GEO Carbon and GHG Initiative is therefore to facilitate cooperation to develop a coordinated system of domain overarching observations for monitoring and evaluating changes in the carbon and other cycles, and GHG emissions as they relate to human activities and global change, and to provide decision makers with timely and reliable policy-relevant information. Furthermore, the GEO Carbon and GHG Initiative will establish a common platform to plan joint strategies and implement joint activities. The activities of the Initiative are organized into Tasks, as follows:

Task 1 – User needs and policy interface: to engage with users and policy makers and ensure the consistency with their evolving needs, to drive the activities of the GEO Carbon and GHG Initiative and address the policy agenda.

Task 2 – Data access and availability: to provide long-term, high quality and open access near-real-time data and data products, complying with the GEOSS principles, from a domain-overarching carbon cycle and GHGs observing system. This task is building on the former GEO tasks (CL-09-03a and CL-02) and the GEO Carbon strategy document published in 2010. The GEO Carbon and GHG Initiative will support the implementation of that strategy that is done in many infrastructures that have been constructed since then. It is a logical step forward to move from the strategy to the implementing activities and GEO can support the data access very efficiently.

Task 3 – Optimization of observational networks: to develop and implement on an ongoing basis, a procedure for achieving observations of identified essential carbon cycle variables within user-defined specifications and at minimum total cost.

Task 4 – Budget calculations and breakdown across scales to inform policy implementation: to develop consistent budgets of GHGs (CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O) from local/urban to global scales using a combination of observations, inventories, models and data assimilation techniques.

### User engagement

Task 1 (above) is devoted in its entirety to user needs and policy interface. More specifically, it includes plans to:

- Strengthen linkages with policy makers and relevant organizations (e.g. UNFCCC);
- Involve end-users and stakeholders in the activities of the proposed GEO Carbon and GHG Initiative;
- Ensure consistency with user needs to drive the activities and address the policy agenda.

### Future plans

Ultimately, decision makers will be provided with policy-relevant data, information and products, of sufficient accuracy, coverage and timeliness that will support them in addressing climate policies and anthropogenic climate change. Thus, the intention is to start as a GEO Initiative and then move soon, depending on the level of maturity and available resources, to a GEO Carbon and GHG Flagship.

### Resources

The 1<sup>st</sup> year of activities is guaranteed by commitments in terms of financial and in-kind resources (including person months). During this period all the key partners are committed to work at national and international level, in collaboration with GEO Secretariat, for leverage funding from the GEO Member states and other institutions/organizations, in order to seek the budget specifically dedicated to the planned activities.

Furthermore, the presence of international institutions, organizations and programmes, such as the Integrated Carbon Observation System (ICOS), the Global Carbon Project (GCP), CEOS and many others, already committed to work on carbon and GHG observations and research is a guarantee of the continuation and success of this initiative. CEOS will periodically monitor progress against the actions set up in the CEOS Response to the GEO Carbon Strategy and that have to be implemented by this initiative. This constitutes a major contribution in-kind to the GEO Carbon Initiative with individual space agencies and CEOS collectively taking responsibility.

### Leadership

- Antonio Bombelli (Euro-Mediterranean Center on Climate Change Foundation / Italy), [antonio.bombelli@cmcc.it](mailto:antonio.bombelli@cmcc.it)
- Jost Lavric (ICOS), [jost.lavric@icos-ri.eu](mailto:jost.lavric@icos-ri.eu)

### Contributors

*Members:* Australia, Austria, China, Ethiopia, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, South Africa, Sweden, UK, USA.

*Participating Organizations:* CEOS, ESA, ICOS, IIASA.

### Linkages across the Work Programme

*Initiatives:* Oceans and Society: Blue Planet.