

The First Assessment Report on the State of Global Earth Observation (FAR-GEO)

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Earth observations are fundamental for informed decisions of the global community, national governments, and many other decision makers. At many levels, decision makers face increasingly complex choices ultimately impacting the sustainability of our civilization. Earth observations are critical for the scientific understanding of the Earth system, the assessment of the impact of human activities on this system, and the monitoring of the processes that cause global change. Without a deep understanding of these changes, sustainability at a high level of civilization will hardly be achievable. Increasingly, the anthropogenic impact on the Earth system is likely to lead to the emergence of unexpected environmental changes and a comprehensive observing system is needed in order to detect unexpected trends and phenomena in a timely manner.

The complexity of the Earth system with its multiple physical, chemical, and biological interactions between solid Earth, oceans, atmosphere, land surface, biosphere, and, not least, anthroposphere, turns the designing of a comprehensive Earth observation system into a formidable, multi-faceted challenge. Identifying the key variables that need to be observed requires an iterative process, which needs to be informed by increasingly more comprehensive observations. Likewise, quantifying the temporal and spatial resolution and the latency of the observations that are needed to capture the fingerprints of the relevant Earth system processes in a timely manner requires an iterative processes based on a combination of increasingly more complex models and more comprehensive observations. Finally, designing, implementing and operating the observation infrastructure together with the necessary processing, modeling, and interpretation that leads to useful products, services, and information again is an inherently iterative undertaking informed by the former two processes.

Currently, these iterative processes are mostly carried out within the silos of scientific disciplines or societal benefit areas. Assessments of the state of Earth observation systems and the adequacy of the information available on the state of and trends in the Earth systems most often take a view focused on a specific discipline or societal area. Examples are the Integrated Global Observing Strategy Partnership (IGOS-P) Theme reports, the assessments carried out by the Global Climate Observing System (GCOS) for the Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC), or the Community White Papers and Plenary papers presented at the OceanObs'09 Conference, which review the status and future developments of the ocean observing system. Many individual science plans, most often on national or regional levels, also address the required observation systems, and these plans are normally narrowly focused on specific scientific fields.

No comprehensive assessment of the state of Earth observation across all societal benefit areas of Earth observations, both in terms of science and applications, is available. The World Summit on Sustainable Development (WSSD) in 2002 emphasized the importance of comprehensive Earth observations. The foundation for identifying needs, gaps, redundancies, and priorities could be built in a first overall assessment of the state of global Earth observations. Until recently, no independent high-level international organization existed that could have organized such an assessment. In recognition of the importance of Earth observations, the Group on Earth Observations (GEO) was formed in response to a Call for Action of the WSSD. With GEO, for the first time, the global community has created an

organization well posed to assess the state of Earth observations.

It is proposed that GEO establishes a panel with the mission to organize the first assessment of Earth observations, and to produce a First Assessment Report on the State of Global Earth Observation (FAR-GEO). The panel, which we denote here preliminarily as Intergovernmental Panel on Earth Observations (IPEO), could be built in a similar way as the Intergovernmental Panel on Climate Change (IPCC), although some modifications of the IPCC-model and the processes used by the IPCC might be necessary. The mandate of the IPEO would be to produce the FAR-GEO based on published material, and to have the FAR-GEO reviewed and agreed-upon by a wide scientific, technological, and end-user community. In terms of scientific and societal fields, the FAR-GEO would have to cover at least the nine Societal Benefit Areas (SBAs) of Earth observations as defined by the Second Earth Observation Summit (EOS). In terms of observation infrastructure, ground-based, airborne, and spaceborne components would have to be considered. The assessment would also have to cover the availability and versatility of observations, products, services, and information to end-users.

Using an analogy, the FAR-GEO would describe to what extent the current observation systems satisfies the needs of the pilots who are in the cockpit of spaceship Earth. It would describe, to the best of our knowledge, what are the key parameters the pilots need to be informed about, and it would review to what extent these parameters are actually made available to the pilots in a timely manner to make the decisions that will help to keep Earth on a sustainable trajectory.

The proposed time schedule includes the formal establishment of the IPEO through the EOS in 2010, with the mandate to have the FAR-GEO available for the next subsequent EOS, most likely in 2013. A first draft of the report including an agreed-upon structure of the report should be available for the GEO Plenary in 2011. For the GEO Plenary 2012, the complete draft report should be made available after review by selected groups of reviewers, representing the GEO Member Countries and the Participating Organizations. The time between the 2012 Plenary and the EOS in 2013 should then be used for a wider review and for a final agreement procedure.

Within GEO, the main responsibility for overseeing the process itself could rest with the Science and Technology Committee (STC). Drafts of the FAR-GEO should be available for the GEO Plenary meetings in 2011 and 2012, and the IPEO should report to each of the STC meetings and the annual GEO Plenary meetings.