

GEO Ministerial Summit

Earth Observations for Sustainable Growth and Development

Draft GEO Report on Progress

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Objectives of the Report on Progress

- Remind Ministers of the political commitments to EO and origins of GEO and GEOSS.
- Restate that EO provides critical information to support a broad range of societal benefits for all nations and showing how EO/GEOSS supports the specific theme of this meeting – *‘EO for Sustainable Growth and Development’*.
- Inform Ministers about benefits to society that have already been realized through the early efforts of GEO - locally, regionally and world wide:
 - i. a very high-level summary of early achievements in the body of the text;
 - ii. a more detailed Annex highlighting examples of early achievements and vignettes submitted by Members and Participating Organizations.
- Provide a high-level statement on progress against the GEOSS 10-year Implementation Plan.
- Bring to the attention of Ministers the four emerging priorities: *impact of climate change on sustainable development; water security for society and the biosphere; changing land use and biodiversity; and, impacts of environment on health*. These respond to their call for sustainable growth and development through informed policies and decisions pertaining to human health, healthy and secure natural systems, as well as wise use of the Earth’s natural environmental resources.
- Use the example of the *coastal zone* as a complex cross-cutting area to illustrate how GEO can provide a comprehensive approach to reducing vulnerability from environmental change.
- Engage the commitment Ministers for continued support of GEO by providing a logical foundation for the Declaration.



Preamble

Environmental changes – natural and human induced – are having a significant, and increasingly destructive impact on our planet and our social well-being. The sustainable growth and development of nations and economies require well informed policies and effective decision making, fully supported by coordinated, comprehensive and sustained Earth observations, the precursor to sound scientific understanding. As a global collaborative initiative, the Group on Earth Observations (GEO), and its efforts to establish a Global Earth Observation System of Systems (GEOSS), is enabling developing and developed countries to leverage Earth observations to address the urgent challenges and opportunities that are faced by an increasingly vulnerable global society.

Executive Summary

[to be added at a later stage]

Section I: Introduction

In 2007, five years after the World Summit on Sustainable Development (WSSD), ministers are gathering once again in South Africa, this time in Cape Town, to take stock of the progress toward establishing the GEOSS.

The strong messages contained in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), the Stern Review, and numerous other relevant reports, contribute to the recognition that we are now in an era of significant environmental and climate change leading to major societal, economic and environmental consequences.

At the same time, sustainable growth and development are vital goals of all countries. Achieving these goals is fraught with numerous challenges ranging from growing

GEO/GEOSS Timeline

2003 – 1st Earth Observation Summit: Adopted a declaration establishing an ad-hoc Group on Earth Observations

2004 – 2nd Earth Observation Summit: Described the scope of a Global Earth Observation System of Systems.

2005 – 3rd Earth Observation Summit: Established the Group on Earth Observations and endorsed the GEOSS 10-Year Implementation Plan.

populations, expanding urbanization, and increasing energy and resource demands – to the effects of environmental and climate change including more frequent extreme weather events including droughts, floods, changing sea levels, and damaging storms.

Data, information and predictions derived from a coordinated, comprehensive and sustained approach to monitoring the Earth's systems is essential to support informed decision making on fundamental societal issues.

GEO and Other Initiatives

At WSSD in 2002, world leaders proclaimed the need “to promote the development and wider use of Earth observation technologies.” That vision built on the outcomes of landmark environmental summits, especially the 1972 Environment Summit, the 1992 Earth Summit, and the resulting Conventions on climate change and biodiversity. The WSSD and the many environmental treaties crafted over the past 30 years all have components that explicitly reference the requirement for Earth observations in fulfilling their commitments.

The GEOSS is substantially contributing to the United Nations Millennium Development Goals, including those dealing with reducing poverty, hunger, disease, biodiversity, ecosystems and environmental degradation. The need for coordinated Earth observations, and the concept of GEOSS itself, has also been consistently reinforced by G8 summits. The G8 nations made a clear commitment to strengthen international cooperation on global Earth observations in 2003 at Evian, and reinforced this commitment through the 2005 Gleneagles Plan of Action and at the 2007 G8 summit in Heiligendamm.

Aim of GEOSS

GEOSS is to achieve ***comprehensive, coordinated, and sustained*** observations of the Earth system, in order to improve monitoring of the changing state of the planet, increase understanding of complex Earth processes, and enhance prediction on the impacts of environmental change. GEOSS will meet the need for developing and developed countries to benefit from access to timely, quantitative, and high-quality long-term global data and information as a basis for sound decision making, and will enhance delivery of benefits to society in the following areas:

- ***Disasters*** - Reducing loss of life and property from natural and human-induced disasters;
- ***Human Health*** - Understanding environmental factors affecting human health and well-being;
- ***Energy Management*** - Improving management of energy resources;
- ***Climate Variability and Change*** - Understanding, assessing, predicting, mitigating, and adapting to climate variability and change;
- ***Water Cycle*** - Improving water resource management through better understanding of the water cycle;
- ***Weather*** - Improving weather information, forecasting, and warning;
- ***Protection of Ecosystems*** - Improving the management and protection of terrestrial, coastal, and marine resources;

- ***Agriculture*** - Supporting sustainable agriculture and combating desertification;
- ***Conserving Biodiversity*** - Understanding, monitoring, and conserving biodiversity.

A fully implemented GEOSS will be an enormous asset for achieving truly global sustainable growth and development to improve the lives of billions of people. Ultimately all citizens require their governments to make credible and effective evidence-based policy decisions which enable sustainable growth and development. These decisions will govern how countries and individuals prepare for, and respond to, the challenges presented by environmental change and the subsequent impacts on societies and the natural environment. Only through access to coordinated, comprehensive, and sustained Earth observations can leaders make effective decisions which will ensure protection of the environment and the sustainable growth and development of their countries, economies, and citizens.

By 2015, GEO will have built a system of systems that provides improved monitoring of the state of the Earth, increased understanding of complex Earth processes, and made predicting the behavior of Earth systems more accurate and reliable.

Section II: GEO Early Achievements

Already, since its establishment 2-years ago, GEO Member Nations and Participating Organizations have taken essential and significant steps toward realizing the 10-year goal of GEOSS implementation and have achieved early successes in many areas. These early achievements can be organized and summarized under five broad categories: development of an efficient *organizational and governance structure*; the *rapid mobilization* of the global Earth observation community; the establishment of key *cross-cutting initiatives*; the commencement of *capacity building* initiatives; and, the initiation of specific *results-based activities* within each societal benefit area.

In the context of this *GEO Report on Progress*, it is not possible to fully list or adequately describe the many early achievements of GEO. Instead, these achievements are presented in an ***Annex on Early Achievements***. This Annex details the specific achievements and contributions of Member Nations and Participating Organizations alike, and links their outputs to concrete societal benefits and their contribution to GEOSS implementation.

Organization and Governance

As a new international initiative, an efficient and effective organizational and governance structure for GEO was implemented to achieve the rapid progress required and expected for realizing the GEOSS. The institutional mechanisms include an elected 12-member Executive Committee to maintain momentum between GEO Plenary meetings, four technical committees to inform and aid global coordination of key aspects of GEOSS implementation, ad-hoc working groups to tackle specific issues, and a Secretariat to coordinate and support implementation activities.

Over the last 2 years, GEO has increased the participation and engagement of countries and participating organizations, which has grown from 20 initial governments to 70 Member

governments including the European Union. As well, the number of Participating Organizations has increased and now stands at 46.

Community Mobilization

GEO has achieved an unprecedented mobilization and coordination of the world's Earth observation and science communities, institutions, platforms, and activities within the framework of GEOSS. This has provided a common vision to focus previously uncoordinated efforts, and has provided an effective forum for coordination across international boundaries.

The success of GEO is demonstrated in the fact that many Earth observation activities and programs are converging around the objectives, requirements and standards of GEOSS, and the recognition that mutual benefits can be achieved between global, regional, and national programs. The GEO community is already benefiting from improved interoperability of systems, the exchange of data and information, the facilitation of access to world-wide Earth observation activities, and a better understanding of user needs. Further, some Organizations have redefined their objectives and structure around the GEO initiative by allocating significant additional resources.

GEO has also catalyzed the concept and creation of several interdisciplinary 'Communities of Practice' – these communities efficiently bring together technical expertise and thematic user groups. The GEO Science and Technology Committee has engaged the scientific and technology communities, in part through the use of Communities of Practice. Further, the GEO User Interface Committee has engaged users through this mechanism to ensure that user needs are reflected in the GEOSS development process.

Cross-Cutting Initiatives, Technologies and Systems

The backbone of GEOSS is the global coordination and collection of Earth observation data and its processing and dissemination as information and prediction products to experts, decision makers, and the general public. These cross-cutting activities have focused on: improved data access and data sharing; made advances in the development of interoperability between systems and related standards; developed mechanisms for the allocation, transfer and use of data and information products; and developed detailed specifications and conducted demonstrations of the underlying architecture and user interface components of the System of Systems.

The GEO Architecture and Data Committee supports GEO in all architecture and data management aspects of the design, coordination, and implementation of the GEOSS.

Capacity Building

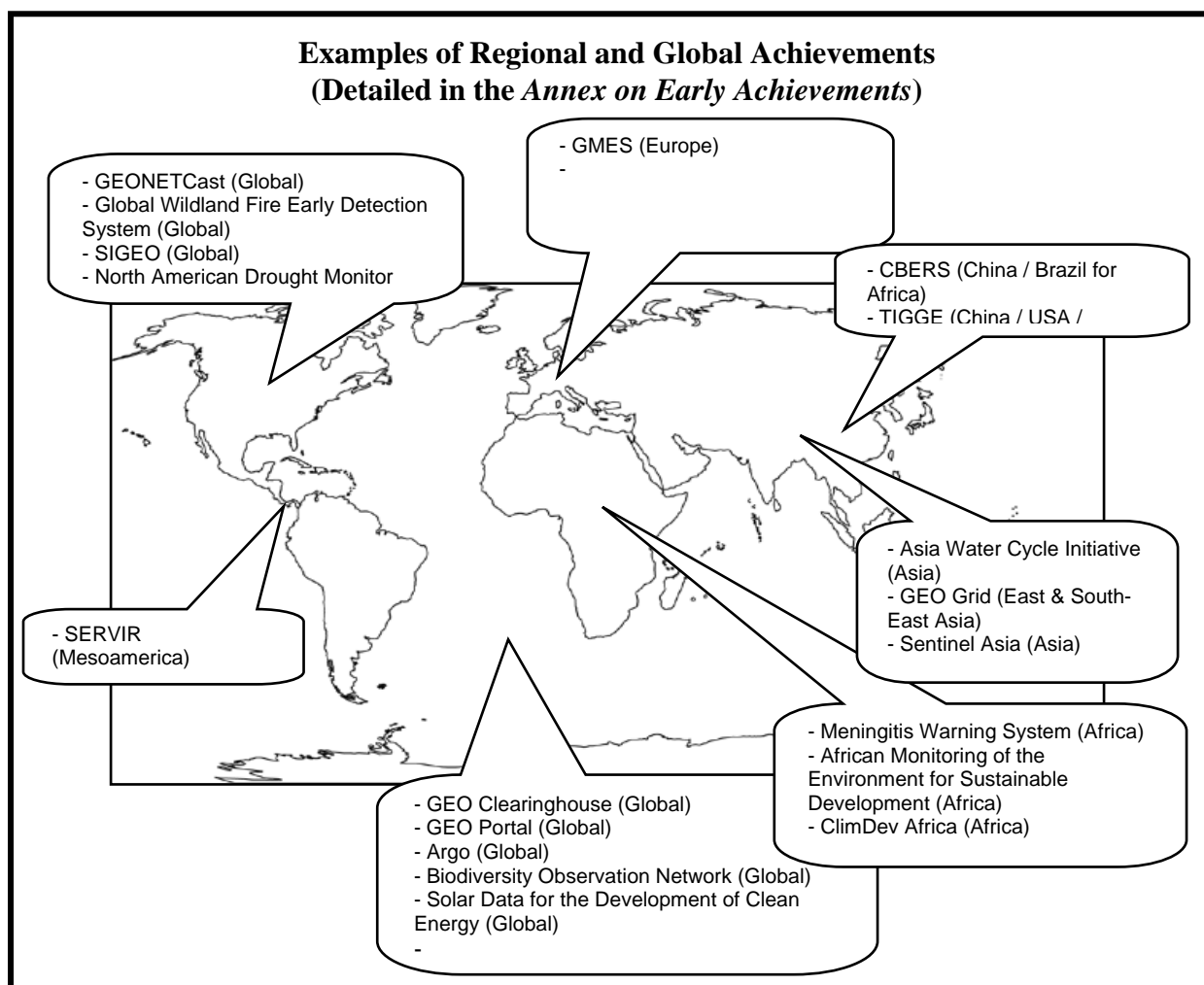
Capacity building, including the improvement of human, institutional and infrastructure capacity, is an integral element in the successful development and implementation of GEOSS. Member Nations and Participating Organizations have initiated capacity building activities, focused on building on existing efforts to address gaps and to achieve improved access and

better use of Earth observation data and products, especially in developing countries.

GEO has initiated a broad and ongoing dialogue between recipients, donors and facilitators of Earth observation capacity building efforts with an emphasis to understand user needs. This includes a guiding principal of GEO that developing countries should be engaged in effective participation and ownership of the various GEO initiatives and activities that are being implemented. Sustainable infrastructure, institution building, and education and training activities for GEOSS implementation are being developed and coordinated by the GEO Capacity Building Committee.

Key Initiatives for Societal Benefits

GEO has been a catalyst for the development and implementation of numerous Earth observation systems and programs over the last 2 years, ranging from relatively small local activities through to large and complex global initiatives. As many societal and environmental issues are trans-boundary in nature, the application of GEO principle values –convergence, harmonization, and cooperation – have been instrumental in the development of regional and global initiatives to adapt to both societal risks and opportunities posed by significant and often unprecedented environmental change.



These GEO inspired activities have led to early successes towards the creation of the System of Systems. Early global achievements include a program to monitor the health of forests, a global wildfire detection system, a system to observe and monitor the status of biodiversity, cooperative ventures to improve daily global weather forecasts, an application to provide access to solar radiation information for clean energy initiatives, and deployment of a world-wide network of ocean sensors for monitoring climate change.

To facilitate access to the System of Systems, emphasis was made at an early stage to develop the underlying architecture of GEOSS to enable users to locate, access, and share key data, information and applications through the clearinghouse and Internet portal components. A European-led initiative to provide information services to Europe initially, and later globally, is being implemented to address atmospheric, marine and terrestrial domains, as well as cross-cutting aspects pertaining to emergency response and climate change. The GEO process has also facilitated the development of a global satellite based dissemination system to broadcast real-time global environmental information to decision makers, researchers and individuals.

Additionally, GEO Members and Participating Organizations have developed regional results-based initiatives that have inspired partnerships, including the provision of remotely sensed satellite data to monitor Africa's diverse environmental challenges, implementation of an African Meningitis warning system, a drought monitoring program in North America, improved water resource monitoring and management in Asia, and the development of a visualization, monitoring, and forecasting system for ecological change and severe events in Central and South America.

With the inclusion of national and more localized GEO related initiatives, many of which are documented in the *Annex on Early Achievements*, GEO Member countries now have unprecedented access to data and information for decision makers and front line users. These developments will significantly assist countries to monitor their environment and to make timely science based decisions to forecast and plan mitigating actions. Countries are also better equipped to comply with key multilateral environment agreements, including those related to biodiversity, desertification, and climate change, and to accurately report on their status and ability to meet target achievements.

Section III: GEO as an Integrating Process – Reducing Vulnerability from Environmental Change

The GEO early achievements show that its Members and Participating Organizations are making significant progress towards the realization of the vision of GEOSS. Through progress, Earth observations do and will provide, with political will, the scientific underpinning to mitigate the risks and vulnerabilities from environmental change, including the impacts of natural and human-induced disasters and address many of the critical political challenges of today – climate change, water security and human health to name a just few. Adopting data sharing principles and improving access to *Earth Observations for Sustainable*

Growth and Development by all nations, especially the developing world, will go a long way to alleviate poverty and support fundamental elements of life.

Impact of Climate Change on Sustainable Development

Climate change is threatening the safety and security of human society and is becoming a top-priority political issue. For instance, coastal zones in all parts of the world are particularly vulnerable to the impacts of climate change such as sea level rise. Human activities on land – both in coastal areas and from further inland – impact the health, productivity, development and biodiversity of the marine environment and human society alike. Some 80% of the pollution load in the oceans originates from land-based activities. About 1.2 billion people live within 100 kilometres from the coastline, and their habitat is within 100 meters of mean sea level, thereby exposed to risk to life and property and impacting on the marine environment.

Observations and projections of climate change are fundamental to the development of adaptation measures and sustainable growth. GEO contributes to more comprehensive and precise monitoring data and model calculations of climate change and to significantly improve the reliability of impact and vulnerability assessments to understand risk caused by climate change at various spatial scales.

For instance, GEO has brought together projects for coordinated global greenhouse gas observation systems, improved detection of ongoing and expected changes, and improved access to observational data and derived information and products for policy makers, especially in coastal zones to address key physical, ecological, and socio-economic challenges. The complexity of these processes requires an integrated approach combining observations, analysis, and modeling. The audience for this information is wide, including coastal planners and engineers, emergency managers, insurers, and the public at large.

Water Security for Society and the Biosphere

Water is integral to virtually every human and natural system, and comprehensive knowledge and effective management of water is paramount to every nation's well being and economy. Issues surrounding water can be a significant determinant of the limits to sustainable growth and development. For example, GEO contributes to the provision of an adequate and safe water supply, understanding the changing water cycle and subsequent impacts and extreme weather events, and monitoring the state of the oceans and impacts of land-based sources of pollution.

GEO has demonstrated that operational monitoring systems provide effective tools to better understand the scope and potential impact of water-related events. Decision makers can use these tools to analyse and predict the impacts of having too little, too much or degraded water quality, and to then develop effective mitigation strategies. GEO efforts are targeted to developing regional and continental level systems for monitoring and managing crucial water resources.

Changing Land Use and Biodiversity

Effective use of land resources is a fundamental determinant of a nation's capacity for growth and development, and for protection of terrestrial biodiversity. A sound knowledge of current and evolving land cover and land use provides the foundation for managing the increasing competitive pressures on the societal benefits offered by terrestrial resources and to establish and monitor sustainable practices. Knowledge of these resources is also critical to establishing and managing a balance between the economically productive use of lands and the preservation of natural ecosystems and the conservation of biodiversity.

A role of GEO is to accelerate the knowledge of the transformations occurring on the Earth's surface, including through urban expansion, agricultural growth, forest reduction, soil exhaustion, and mining and oil extraction. The implementation of operational monitoring systems and making use of Communities of Practice helps officials to plan and take appropriate action for better management of the land and biodiversity resources.

Impacts of Environment on Health

The health and well being of a nation's population is a fundamental responsibility of all governments and a key determinant of sustainable growth and development. Engaging, educating, and alerting environmental managers, public health officials and the public is a key outcome of Earth observations. GEO can provide a suite of tools to monitor and mitigate the impacts of pollution and urban air quality, the spread of disease, and large scale environmental extremes such as heat waves, extreme cold, drought and floods.

By coupling Earth observations from different sources, such as those derived from remote sensing and others derived from *in situ* networks and socio-economic data, GEO provides health officials with a broader understanding of complex issues and interactions which, for example, triggers health alerts and the prediction of epidemics.

The Challenge

GEO has shown that drawing from the bank of resources in GEO, Ministers of Member countries have the opportunity to commit to specific, concrete efforts in areas that are fundamental to sustainable development in a significantly changing environment. Earth observations provide essential data and information that are necessary for making informed decisions – the challenge is to sustain the interest and commitment of Governments and to marshal sufficient resources to implement the vision of a *coordinated, comprehensive, and sustained* system of systems that protects our planet and its people.

Section IV: Conclusions / Way Forward

As we move toward a progressive and harmonized GEOSS, it is essential that we chart a course of action that embodies the principles of sustainable growth and development through a coordinated, comprehensive and sustained approach to Earth observations, as recognized in the Washington Declaration at the first Earth Observation Summit in 2003.

Evolving from concept to action and implementation, GEO continues to build the international framework to harness national investments in Earth observations, prediction, and information systems, in order to realize concrete results across the societal benefit areas. GEO also contributes to improved science, improved modelling and prediction systems, improved information uses, and the sustainability of all inputs. A wide range of user communities are partnering within GEO, and new products and applications are being developed. All these activities have benefited from the high visibility and global role of GEO.

Core GEO values – convergence and harmonisation, effective participation and ownership by developing countries, focus on user needs, free and open access to data and information – are essential pre-requisites for the success of GEO initiatives. Significant effort is required to ensure that developing countries master the technology they require for their development and that they can participate actively in modern scientific, environmental and technological developments such as those promoted under GEO, while allowing for their own capacities, knowledge base, institutions and infrastructure to grow without duplication.

GEO through its successes, has also highlighted a number of existing gaps and deficiencies that must be addressed, including gaps in the geographic areas covered by observing systems, and potential shortcomings that affect the current configuration of the global Earth observing system of systems, end-user community engagement, issues of data access and use, and underlying institutional aspects.

A Call to Action

Expressing the collective voice of the whole GEO community, an urgent call to action is required to emphasize the following elements which deserve particular attention and intervention at a political level for the coming years to implement a successful GEOSS:

- **All GEO partners must work together to ensure timely, global and open access to share data and products.** It is imperative to have a framework that will guide the principles and establish an end-to end, integrated and harmonized policy to govern the terms and conditions related to the access and sharing, collection, utilization, distribution and archiving of data. Data must be collected, analyzed and disseminated, in an effort to support various networks to respond to both domestic and international objectives in the context of public good. GEO will provide a “White Paper” that will address elements to take into consideration related to data policy.
- **Observations need to be complemented, improved, and sustained.**
 - ***In situ* networks and airborne systems.** The updating, expansion, and maintenance, of existing and new networks and systems are essential for the provision of essential data for GEOSS.
 - **The sustained component of space-based observing systems needs to be expanded.** Space agencies should be encouraged to actively pursue the coordinated deployment of satellite constellations and the development of

instruments aimed at fulfilling the observational needs of all Societal Benefit Areas in a sustained manner, while maintaining their efforts to improve observations through research and innovation.

- **Modeling and prediction capabilities need to be improved and expanded.** Mitigating socio-economic hazards requires major advances and commitments in the prediction of environmental change and the modeling of the Earth System. The GEO community needs to develop a new generation of models to ensure advancement in predicting high impact events and their complex interaction with society.
- **The path to sustainability for GEO requires a renewed commitment for capacity building, especially in developing countries.** GEO itself is a capacity building exercise to bridge the gap between developing and developed nations, and to engage all countries as partners in the GEO process. To achieve this, the perspectives of developing countries need to be better understood and their needs incorporated into GEO plans and activities. Resources for implementation of the GEO Capacity Building Strategy, adopted at GEO-III in Bonn in 2006, are required. This strategy emphasises the need for structuring and educating communities, facilitating coordination, and providing and maintaining infrastructures that will help to ensure better decision-making for sustainable growth and development.

Additional multi-discipline user agencies and organizations need to better engage in GEO. A number of initiatives already include stakeholder participation and involve key policymakers, development institutions, and the financial sector in evidence-based decision-making. An improved capacity to enhance user engagement, with an emphasis on product and application development, is essential to shift from an observation model to one of prediction.

It is important to underscore the significant early achievements of GEO in building GEOSS, and that many mechanisms have been successfully implemented to ensure that the targets set forth in the GEO Ten Year Implementation Plan will be achieved. The realization of success is therefore dependent on the continued support and cooperation of GEO member nations and participating organizations as the backbone of GEO.

As we continue to weave the fabric of GEO, to mobilize communities, change cultures, develop dialogue and facilitate integration, it is only fitting that we converge yet again in South Africa, to address the challenge of managing the Earth through the commitment of purpose and sufficient and sustainable resources.

In closing, we quote the plea for action on human-induced problems, as spoken by Thabo Mbeki, President of South Africa, at WSSD in September 2002: *“It is informed by the sense that the means and the knowledge exist within human society successfully to address all these challenges. The question arises as to why as human beings we do not act, when we have the capacity to overcome problems that are not god-given, but are the creation of human society and human decisions and actions”*.