



Federal Ministry
of Transport, Building
and Urban Affairs



Global Earth Observation System of Systems (GEOSS)

German GEOSS Implementation Plan D-GIP



Content

FOREWORD.....	3
INTRODUCTION.....	5
Background.....	5
Objectives.....	6
NATIONAL STRATEGY AND RECOMMENDATIONS.....	8
Use modern technologies.....	8
Enhance national coordination.....	9
Act across discipline boundaries.....	11
Seize opportunities for new applications.....	11
Safeguard information in the long term.....	11
Build capacity in partnership.....	13
Expand the national GDI to include remote sensing data.....	13
Implement international standards.....	13
Open data policy.....	13
Integrate national activities.....	14
NEXT STEPS IN THE IMPLEMENTATION PROCESS.....	14

Foreword

After the foundation of the transnational forum GEO for the development of GEOSS and the adoption of the GEOSS 10-Year Implementation Plan at the 3rd “Earth Observation Summit” in Brussels on 16 February 2005, the Federal Cabinet entrusted the Federal Ministry of Transport, Building and Urban Affairs (BMVBS) with taking the lead role and representing Germany in GEO. The Ministry has been commissioned to mastermind the implementation of GEOSS at national level and it pays the annual financial contribution of Germany to the GEO Secretariat.

For the national implementation, BMVBS has established the national interdisciplinary working group D-GEO. The bodies participating in D-GEO currently are the German Meteorological Service (DWD), the Federal Institute of Hydrology (BfG), the German Federal Agency for Cartography and Geodesy (BKG), the Federal Institute for Geoscience and Natural Resources (BGR), the Commission of Geo-Information Business (GIW), as well as the German Aerospace Center (DLR), which established the national GEO Secretariat for the coordination of the activities on behalf of BMVBS.

The D-GEO working group is developing a national GEOSS Implementation Plan (D-GIP) that is to become a national strategy for the German participation in GEOSS. It is based on a comprehensive literary research, the experience and activities of the participating bodies as well as a survey among users of geoinformation in Germany. This D-GIP will continue to be developed and adapted to changing needs during the implementation process.

The present version of the D-GIP links the strategic GEOSS objectives to national interests. It aims to make a contribution to integrate the national activities in the “Geoinformation services” policy area and is addressed to decision-makers involved in shaping the framework conditions in the Earth observation field in Germany. The objective is to help these decision-makers to identify the scope for actions in order to realize the benefits of GEOSS with regard to national issues.

Vision

Comprehensive and reliable information on the state and change of our environment make it possible to manage the impacts of human society on the Earth system successfully and in a targeted manner. The environmentally significant decisions are taken on the basis of an open information system, and are thus transparent and comprehensible. Decision-making processes in the public and private sectors, at different levels of government and within the international community are coordinated effectively based on common high-quality data. A policy of open access to comprehensive Earth observation data enables well-founded research findings for evaluating current and future changes of the environment and their causes.

GEOSS is the globally interlinked and coordinated system of high-performance Earth observations systems that pursues this vision.

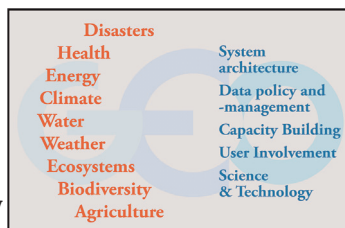
Introduction

Background

Based on the resolutions of the G8 Summit in Evian (2003) to strengthen international cooperation on Earth observation by

- improving the coordination of existing Earth observation strategies and systems and identifying opportunities to close information gaps with the overall objective of creating a comprehensive, coordinated and sustainable Global Earth Observation System of Systems (GEOSS),
- making a joint effort to involve developing countries,
- exchanging observations from in situ¹ and satellite-based systems in an open manner with minimum time delay and at minimum cost,

and with regard to the Action Plan of the World Summit on Sustainable Development in Johannesburg (WSSD, 2002), the transnational forum "Group on Earth Observations" (GEO) was founded by a resolution² at Brussels in February 2005 and a 10-Year Plan³ (2005-2015) to establish GEOSS was adopted.



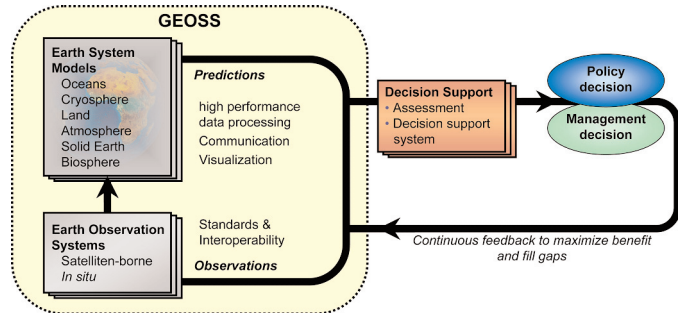
Societal Benefit Areas (red) and Cross-cutting themes of GEOSS

¹ In this context, "in situ" refers to all terrestrial measurement systems, i.e. ground stations, anchored and free-floating buoys, measurement balloons, airborne observation systems.

² <http://www.d-geo.de/basedocs/EOS-III%20Resolution.pdf>

³ http://www.d-geo.de/geoss-tyip_en.htm

Currently, 72 member countries, the European Commission, and 52 international organizations participate actively in GEO. The participating international organizations typically own or operate existing observation systems. Therefore, they play a key role within the framework of the objectives of GEOSS. A GEO Secretariat has been established and is hosted by the World Meteorological Organization in Geneva. An Executive Committee guides the GEO in between the annual plenary meetings.



The role of GEOSS

From the GEOSS 10-Year Implementation Plan a series of „Tasks“ with specific objectives are derived, which are set out in the GEOSS Work Plan. Experts of the GEO members and Participating Organizations work jointly in these tasks on a voluntary basis. The tasks are supervised by four GEO committees, supported administratively by the Secretariat and confirmed annually by the Plenary.

Germany has been holding a seat in the Executive Committee as elected member for Europe since 2005 and thereby assumes a leading role besides the USA, China, the European Commission, South Africa, Russia, Japan, Argentina, Norway, Panama, Australia and Uganda.

Building on existing structures

The membership and active participation of the European Commission in GEO creates links with the key activities for implementing the INSPIRE Directive⁴ and the "Global Monitoring for Environment and Security" initiative (GMES).

⁴ Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

INSPIRE is targeted at creating a European infrastructure for spatial information and services while GMES aims at developing an independent European Earth observation system to support Community and national policies and directives. Many goals of INSPIRE and GMES align with those of GEOSS and consequently contribute key elements to GEOSS. However, both systems can be substantially complemented and made more powerful by GEOSS.

Key Participating Organizations in GEO with German contributions:

- European Space Agency (ESA)
- European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT)
- World Meteorological Organization (WMO)
- Intergovernmental Oceanographic Commission (IOC)
- International Association of Geodesy (IAG) and a number of Programmes of the United Nations.

As a “System of Systems“, GEOSS takes into account that many European and international Earth observation systems and coordination structures have worked successfully for many years. These systems are represented in GEO by the responsible organisations (see examples in text box).

There is a close connection between the goals of GEO regarding the global coordination of Earth observation, the development and operation of a global Geodata Infrastructure (GDI), and the corresponding national efforts. The development of a national GDI (GDI-DE) as an integral part of E-Government in Germany is coordinated in a steering group (LG GDI-DE) across the different levels of government including federal, state and local authorities. The corresponding coordination of the federal administration takes place in the Interministerial Committee on Geoinformation Services (Interministerieller Ausschuss für das Geoinformationswesen, IMAGI).

Objectives

The implementation of D-GIP should enable Germany, as a member of GEO and a major location for science and technology in the field of earth observations as well as having in place comprehensive environmental and development policies, to both make contributions to the development of GEOSS and benefit from GEOSS. In this way, Germany can not only assume a global responsibility but also ensure that its citizens benefit from this global effort.

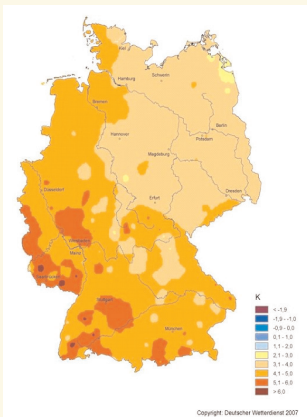
The global objectives of GEOSS – creating a user-oriented, comprehensive, coordinated and long-term global Earth observation system based on the numerous but independently established and operated existing observation systems along with developing and operating the corresponding geodata infrastructures – are of superior German interest:

- existing investments in the development and operation of national and international Earth observation networks and systems increase in value; more data and a simplified access to data lead to better results
- bringing together and standardizing global data records accelerates and improves the understanding of large-scale environmental processes and provides an impetus in the fields of environmental and especially climate policy
- bringing together data from different disciplines enables new scientific findings
- the simplified access to data opens up new potential for public and private services
- the international cooperation in the fields of Earth system science and adaptation to climate change is strengthened and facilitates the agreement of adequate strategies for action
- the global coordination of Earth observation strategies results in more consistent international data as a basis for advising policymakers on global environmental issues

Additional interests in connection with GEOSS result from political and social issues to whose solution a globally coordinated Earth observation system may contribute. In various documents of principles like the “National Strategy on the Protection of the Seas”, the “National Strategy on Biodiversity”, the “2nd Soil Conservation Report” or the “German Report on the Implementation of the WHO “Children’s Environment and Health Action Plan for Europe” and the action programme “iD 2010 - Information Society Germany 2010”, the Federal Government highlights the importance of geoinformation for a sustainable political and administrative decision-making process as well as for monitoring the implementation of political decisions.

In focus: Climate

From measurements and observation data, there is no doubt that the climate does change and, in fact, has already done so. This is one of the core statements of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), which goes to show the importance of climate measurements and observation. In order to better understand natural climate processes and the variability of our climate, and to better



Temperature deviation April 2007 from multi-annual mean 1961-1990
© Deutscher Wetterdienst.

evaluate the anthropogenous factors influencing global climate change, the continued long-term and comprehensive observation of climate-relevant parameters on the global, regional, and local levels will be indispensable. As a result of the foreseeable inevitable and sometimes dramatic effects of the predicted climate change to both humans and nature, the public and political discussions on necessary counter-measures have already gone a long way.

The issue has been a political priority and experienced a dynamic development since the United Nations Framework Convention on Climate Change (UNFCCC) went into force in 1994. The UNFCCC imposes upon Contracting Parties, inter alia, an obligation to support relevant research and make systematic observations. The presentation of scientific insight by IPCC in particular have advanced the political decision-making process.

The high political priority attributed to the development of a suitable strategy for dealing with global climate change in Germany has resulted in a strong German commitment to further develop international conventions on climate protection and their implementation at the European and national levels. Moreover, the research programme "klimazwei" ("ClimateTwo"), for example, has been designed to boost research into adaptation strategies.

Without global climate observations and the spread of the information obtained, no further progress in the understanding of the global climate and its variability nor the monitoring and evaluation of strategies for the mitigation of the climate change and for the adaptation to its effects seem reasonably conceivable. The global interconnection of observation systems and networks as well as long, homogeneous and comparable observational time-series are needed to detect and separate climate trends and variations. The development and improvement of global and – particularly – regional models to project climatic developments also requires long-term historical global observations

No single institution nor any single country are in a position to provide a global observation system or to make the historical data available for all required parameters. GEO and GEOSS take a unique position in this context and play a pivotal role in the development of knowledge-based strategies for responding to the climate change.

Strategic deliberations on how to position Germany in the political, scientific and economic field also play an important role. In the future, the global coordination of Earth observation systems resulting from GEOSS will also include fundamental programmatic and, as appropriate, legal agreements as well as setting technical standards, which also bear a close relation to relevant activities within the programmes for the development and operation of geodata infrastructures. These transverse areas of GEOSS are of particular importance especially in the current development phase. They require an active and coordinated participation of Germany.

Consequently, at the national level the following fundamental objectives are pursued with GEOSS:

- make a contribution to establishing a solid global data base for supporting political decisions
- make access to comprehensive global Earth observation information (data, metadata, products) as unrestricted, open and complete as possible
- promote public and private services in the field of Earth observation
- establish the European initiatives INSPIRE and GMES as European contribution to GEOSS and enhance and expand these initiatives by GEOSS
- participate actively in shaping GEOSS while safeguarding German and European interests in the fields of research, technology, standardization and data policy
- harmonise GEOSS with existing initiatives and systems in which Germany is involved
- harmonize GEOSS with the national geodata infrastructure (GDI-DE)

The cabinet decision of 29 November 2006 entrusts the Federal Ministry of Transport, Building and Urban Affairs with coordinating the implementation of GEOSS. The D-GEO working group established by the Ministry has elaborated recommendations for further action based on surveys and contributions especially by the specialized federal agencies. These recommendations are set out in the present German GEOSS Implementation Plan.

National strategy and recommendations

The German national strategy towards GEOSS aims at both, implementing the GEOSS Implementation Plan at national level and establishing the global coordination of the Earth observation systems. Thereby, Germany assumes its international responsibility in the fields addressed by GEOSS while also pursuing its own interests in such a system.

Use modern technologies

Only efficient public and private services using modern processes based on Earth observation information, can realize the benefits intended with the substantial public investments in Earth observation programmes. Important examples are the use of information products from ongoing in situ and satellite-based observation programmes for national reporting obligations like the National Forest Inventory or public tasks such as preventive and operational disaster management. Where there are concerns regarding the suitability of available earth observation information, it should be examined if these concerns can be overcome by formulating specific requirements to be met by the relevant systems.

In addition, opportunities arising from the improved availability of such information as a result of GEOSS in new areas should be developed and used consistently. Especially in areas where Earth observation information has not or hardly been used until now obstacles must be overcome in many cases. Conceptual developments for linking weather data with the spreading of infectious diseases, for example, are hardly known in the public sector. The systematic development of such service capacities in the public sector supports the “modern state” efforts and also fosters innovative developments in the private sector. An edge in modern geoinformation technology supported by demand from the public sector also opens perspectives for the German economy in international competition.

Recommendation 1: Use modern geoinformation technologies

The innovative use of modern geoinformation technology in the public sector is to be systematically called for and promoted. This includes

- a) providing personnel capacities in the relevant authorities
- b) regularly exchanging experiences regarding relevant scientific and systemic developments, e. g. within the GEO process

Enhance national coordination

In order to be able to politically support the professional participation of different institutions in individual tasks, introduce national priorities into the international coordination at the political level, and relate important developments to interested parties nationally, the overarching GEO activities should be coordinated at national level. This also applies particularly to the national activities and contributions to GMES. Moreover, the contents of the transverse areas system architecture, data policy and data management have to be introduced in the ongoing discussions of the development of the geodata infrastructures. This task is currently carried out by the national GEO Secretariat, which the German Aerospace Center operates on behalf of the Federal Ministry of Transport, Building and Urban Affairs. The Secretariat maintains contact with the national institutions and authorities working in the field of Earth observation. At the moment, however, the national coordination is suffering from scarce personnel capacities in the Federal Ministry of Transport, Building and Urban Affairs, as well as in the national GEO Secretariat. In order to make an appropriate coordination and information of the relevant bodies possible, the responsible ministry has to provide adequate staffing to address the issue.

Recommendation 2: Enhance national coordination
The responsible ministry, currently the Ministry of Transport, Building and Urban Affairs, should ensure adequate funding and personnel capacities for the issue at the ministry and for the national GEO Secretariat.

The D-GEO Secretariat's interlinking of the GEO activities with the closely related programmes GMES and the EUMETSAT satellite program has proven to be very sensible and should be continued. In the field of data infrastructure, the close coordination with the Interministerial Committee on Geoinformation Services (IMAGI) and the GDI-DE Secretariat has stood the test. All relevant ministries and authorities should have GEOSS contact persons in order to facilitate the national coordination and specifically to enable the recommended systematic evaluation of new potentials. Existing structures should be built on for this.

In those areas where Earth observation issues of authorities or federal ministries are coordinated by international organisations, consultations should be ensured at this level to provide for implementing a coherent strategy. Important examples for this are the national participation in the World Meteorological Organization (WMO) of the United Nations, in programmes of the European Space Agency (ESA) and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) as well as in the programmes of the European Union. Various Federal Ministries and their respective executive agencies are responsible for implementing and funding these activities.

Recommendation 3: Creating a network for coordination
All relevant ministries and federal agencies should name contact persons for the national coordination of GEOSS activities. Existing structures should be built on for this.

The national geodata infrastructure (GDI-DE) developed and operated as a result of national interest and the INSPIRE Directive provides access to a large fraction of the German in situ data for the monitoring of the environment. In order to make this infrastructure considerably more efficient and effective in the future and to be able to ensure a uniform quality of basic geodata nationwide, the Working Committee of the Surveying Authorities (Arbeitsgemeinschaft der Vermessungsverwaltungen, Adv) has decided on 13 September 2007 to identify and establish new sustainable cooperation structures on a solid legal basis for a core of subject-neutral official geodata. The related implementation issues are currently examined in a project group established by the Adv.

Recommendation 4: Promote the provision and use of basic geodata
The provision and use of subject-neutral official basic geodata as a basis for specialized applications is to be made more efficient and effective.

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	MA	BK/BK BKG	BG BSH	SEMA SMA	MHW	BGR DLR	FLI	BLE BfLFI BfAFH PAL	Ageo/BM RWI	BGR DWD BfLH BfEG	BfL UBA	BMBF BMZ		
Disasters	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Health	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Energy	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Weather	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Climate	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Water	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Ecosystems	█	█	█	█	█	█	█	█	█	█	█	█	█	█
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Agriculture	█	█	█	█	█	█	█	█	█	█	█	█	█	█
System architecture	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Data policy und -management	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Capacity Building	█	█	█	█	█	█	█	█	█	█	█	█	█	█
User involvement	█	█	█	█	█	█	█	█	█	█	█	█	█	█
Science and Technology	█	█	█	█	█	█	█	█	█	█	█	█	█	█

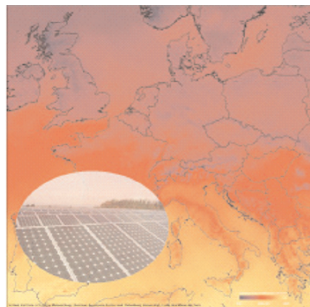
Relevance of the GEO Societal Benefit Areas for federal agencies and ministries. Incomplete due to lack of direct participation in the D-GEO process from some relevant departments.

In focus: Energy

The adequate and reliable supply of energy is one of most important foundations of our society and economic development and, therefore, takes high priority in Germany and elsewhere. Limited reserves of non-renewable energy sources as well as risks and environmental damages associated with their use (exploitation, transport, energy production, storage) have made the efficiency of energy production a key issue. The interest in regenerative sources of energy has increased enormously over the past few years in light of the environmental burden caused by the consumption of primary energy and by questions that have arisen out of the concern for a secure supply of energy from traditional sources.

Prospects for the use of globally-networked Earth observation data exist in efforts of gaining efficiency in the production and exploitation of energy, increasing energy supply security through demand prediction, in assistance to the exploration of non-renewable sources of energy, and in monitoring of environmental damages arising from the exploration of primary energy sources or from the production, transport, and consumption of energy.

Efficiency gains in the production and exploitation of energy through the integrated use of information gained from earth observation can be expected in two respects: First, as energy demand is often directly coupled to environmental conditions (e.g. the demand for heating energy depends on external ambient temperature) earth observations and model predictions based on these can improve demand predictions. Quantities of supply reserves may thus be reduced without jeopardizing supply security. The quantities no longer needed constitute a substantial saving potential. Second, measurable environmental parameters and models play a major role in managing the highly volatile regenerative energy sources wind, solar, and water.



Annual sum of global solar irradiance, 2004, derived from the SOLEMI data base, (DLR)

Not only can GEOSS assist in the siting, but also – at least to some extent – with operations. For example, a prerequisite for the efficient operation of a hydro-electric power station is a precise hydrological prediction based on snow-melt, precipitation data and rainfall-runoff models.

The exploitation of primary energy sources and energy production are of particular relevance with respect to detecting and controlling environmental damage. There is a high demand for global – and globally uniform – data on energy production and related emissions for developing both national legal instruments and international obligations, such as the Kyoto Protocol and any successor agreements, and for monitoring compliance with these. The trade in CO2 certificates, too, with its necessary accounting and control, will need to rely on data from a comprehensive Earth observation system.

Due to the close connection between economic development and energy supply, the subject of energy is also a central issue in economic co-operation with developing countries. Increasingly, the scope is broadening beyond energy supply as a prerequisite for economic growth to include also the endeavour to fill the growing demand for energy in developing countries from sustainable sources, where possible. Germany's initiatives in economic co-operation can make use of globally-networked Earth observation systems for planning purposes but also, where appropriate, complement such systems in dedicated projects in partner countries.

As a result of the economic importance of the energy issue, there is a substantial interest in developing business plans based on innovative value-adding and use of Earth observation information gained from GEOSS. First such plans are already pursued, for example in two projects ("Leitprojekte", entitled "Geothermics" and "Raw Materials") sponsored by the Commission for Geo-Information Business, which has been set up by the German Federal Government.

Act across discipline boundaries

Implementing GEOSS at national level also means creating interconnections between disciplines and responsibilities of different ministries and agencies in order to address the broad societal benefit areas of GEOSS (climate, energy, health, etc.). Germany will, without doubt, benefit from this linking-up not only in connection with GEOSS.

The situation in the area climate is exemplary: The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety is responsible for climate change mitigation measures and for reporting obligations e.g. according to the United Nations Framework Convention on Climate Change and the Kyoto Protocol. The executive agencies of the Federal Ministry of Transport, Building and Urban Affairs operate important national observational networks which are, however, complemented to a considerable extent by other measurements for which the Federal States are responsible. Relevant research is carried out mainly at universities and other research centers, often within projects funded by the Federal Ministry of Education and Research. Important points of contact also exist with divisions of the Federal Ministry of Economics and Technology (e.g. space-based observation systems, innovation), the Federal Ministry of the Interior (Geodata Infrastructure), the Federal Ministry for Economic Cooperation and Development (effects of climate change in developing countries) and the Ministry of Defence (climate change as a security risk). At international level Germany is a member of numerous relevant organizations including the WMO, the Intergovernmental Oceanographic Commission (IOC), the Food and Agriculture Organization of the United Nations (FAO), and participates in the United Nations Environment Programme (UNEP). Via programmes of ESA, EUMETSAT and the European Union Germany is involved in the development and operation of satellite systems, which also generate climate-relevant data.

An appropriate strategy to mitigate climate change and adapt to its direct consequences has to be formulated taking into account and in line with all these activities. Providing a reliable global data basis for future policy decisions has been and remains one of the main motivations for GEOSS.

Recommendation 5: Act across discipline boundaries

The requirements for national and international Earth observation systems should be aligned in working groups across disciplines, ministries and administrative bodies.

Seize opportunities for new applications

Utilization preparation activities in the fields of mature scientific and technological development foster new innovative applications. An important example for this is the area of disaster preparedness, mitigation, warning, response and rehabilitation. Here, it is essential to work towards linking information users and information providers more closely. Establishing relevant and reliable geodata bases and competencies in using these bases are other prerequisites for developments which can be completed in the near future. The high potential of the integrated use of Earth observation data in these fields has been recognized in principle by the responsible persons. In a few cases the transition from experimental application and demonstration to operational application has also already been advanced by project grants. A systematic dialogue with clear requirements and benefit analyses, however, could further accelerate this process and thereby not only allow for improved civil protection but also advance the maturity of corresponding information services.

Recommendation 6: Seize opportunities for new applications

Innovative applications of Earth observation information in particular in the field of disaster control should be developed and evaluated in close cooperation with information services providers and responsible officials.

Safeguard information in the long term

It is the key element of a national Earth observation strategy to ensure the operation of the required Earth observation systems within the national and European sphere of responsibility and influence in the long term. In the case of in situ instrumentation a considerable added value is generated by the coordination of these systems in GEOSS since a wider coverage is achieved at relatively low cost. The needed quality of the derived information requires continued and regular investments into the in situ observation systems by their owners. In the field of satellite-based Earth observation what is missing most today are reliable long-term funding prospects for the continuity of the satellite systems and the maintenance of the created data archives as well as, and not least, for the effective national use of the data. This is most urgent in the GMES programme.

In Focus: Natural disasters

Storms and storm surges, hard rain, heavy snowfall, floods, droughts, wildfires, volcanic eruptions, earthquakes, tsunamis, meteorite impacts, landslides, and avalanches put human lives and property at risk in all parts of the world. The effects of human activities frequently facilitate the occurrence of such events. In many cases anthropogenous changes to the natural environment have intensified such events or have weakened natural protective mechanisms and, thus, have enhanced their effects. Natural events typically become disasters only where humans or sensitive technical or social infrastructures are affected. The same applies to man-made disasters such as pollution in coastal or inland waters.

Benefiting from its climate, geology and geography, Germany affected by natural hazards such as earthquakes, floods, or tornadoes relatively infrequently – or with a low intensity. Nevertheless, natural events, particularly meteorological events such as storms and floods, continue to cause substantial damage in Germany. This is primarily due to Germany's high population density and concentration of property assets. The Munich Re re-insurance company estimates the economical damages in Germany caused by natural disasters during 1989-98 to some 10 billion Euro (at 1998 prices).

Furthermore, Germany is often affected indirectly by its many relations with regions that are more frequently, or more intensely, affected by natural disasters. Germany's economic co-operation activities with developing countries can thus benefit from an improved co-ordination of Earth observation information. This is also true in other contexts such as the protection of German citizens abroad. One example: More than 500 German citizens perished in the Indian Ocean tsunami on 26 December 2004, making it one of the most devastating "German" natural disasters. This demonstrates that German involvement in fighting the adverse effects of natural and other disasters elsewhere in the world is not merely about helping those affected as a token of moral responsibility, but often lies in our own immediate interest.

Suitable Earth observation systems can generally support all stages of the "circle of disaster management" and can, thus, reduce the cost (including lives and monetary assets) generated by disasters.

The necessary developments have already progressed substantially in Germany. Numerous German institutions and research centers are taking an active part in the relevant GEOSS and GMES activities, particularly in the preparation of the GMES "Emergency Response" service. The "Center for Satellite Based Crisis Information (ZKI), a service branch of the German Aerospace Center, has been showcasing potential applications far beyond Germany through its many activities and information products.



Floodmap supporting relief units during the Elbe flood in April 2006 (Source: Center for Satellite-Based Crisis Information of DLR)

On the German national level, operational routines relying on Earth observation systems in coping with natural disasters exist particularly in the framework of the Weather Warning Scheme maintained by the German Meteorological Service (DWD). The Service already bases its service on indispensable global Earth observation data made available through the co-ordination mechanisms of the WMO.

Additional operational procedures using Earth observation systems are in place in the flood warning centers and the federal and Länder civil protection services. Moreover, there is substantial potential for using globally co-ordinated Earth observation data in responding to major natural disasters abroad. These can provide a reliable and up-to-date information base to dispatched rescue workers, enabling targeted and effective help.

The topic of natural disasters also receives a lot of attention from private industry, particularly insurance companies and information providers deriving information products relating to natural disasters from Earth observation data. The Commission for Geo-Information Business is sponsoring a corresponding project on this topic, too ("Leitprojekt" entitled "Georisks").

Here, Germany has to use its influence to support the policy strategy also by financial obligations. The same applies to the continued support of the ARGO deep-sea drifter programme (Array for Realtime Geostrophic Oceanography) which contributes substantially to the objectives of the Global Ocean Observation System (GOOS).

Recommendation 7: Safeguard information in the long term
Germany has to emphatically advocate the stable operation of the required Earth observation systems. This includes, inter alia, the operation of the national in situ observational networks and the consistent implementation of the GMES space component.

Build capacity in partnership

With the capacity of global Earth observation systems being in the German interest, capacity building activities should be intensified in this field. Conceivable measures include further education projects in selected countries, e.g. within the framework of development cooperation projects. The sponsoring of measuring stations by German institutions has also proven to be effective in many cases. Small budgets in the relevant institutions for such purposes may already bring about big improvements.

Recommendation 8: Enable Capacity Building at all levels
National institutions operating in situ observation networks should be enabled to improve the capacity of global in situ observation networks for mutual benefit by direct cooperation with partner organizations in developing countries.

Expand the national GDI to include remote sensing data

The development of a high-performance and comprehensive geodata infrastructure and its integration into the corresponding European and international structures is currently one of the key priorities. With the GDI-DE secretariat an appropriate national coordination structure has been established for developing GDI-DE with the involvement of the federal states and the federal government. The issue of how to integrate appropriately the remote sensing data archived at the German Remote Sensing Data Center (DFD) of the German Aerospace Center, however, has not yet been settled due to the necessary clarification of the responsibilities for a sustainable integration. For this reason the institutional and, potentially, legal obstacles have to be cleared now. Simultaneously the agencies responsible for the development of the GDI-DE should continue to play an active part in the tasks related to the system architecture within GEO and the German Remote Sensing Data Center should be actively involved.

Recommendation 9: Expand the national GDI to include remote sensing data
The integration of the remote sensing data of the DFD into the GDI-DE should be vigorously pursued. The DFD should prepare a proposal on this for the GDI-DE steering group.

Implement international standards

An example of such a successful coordination of requirements is the formulation of Climate Monitoring Principles (GCOS-CMPs) by the Global Climate Observing System (GCOS), coordinated and funded to a great extent by the WMO, as well as the agreement of about 40 essential observation parameters for describing the climate system (Essential Climate Variables, ECVs). It is an important German contribution to GEOSS that these principles are applied to the design and operation of national observational networks.

Recommendation 10: Implement international standards nationally
The operators of national Earth observation systems should strictly implement agreed observational standards.

Open data policy

Data policy is a highly dynamic issue within GEO. A wide-ranging discussion on this issue at national level is essential in order to be able to play an active part in shaping pivotal developments in this field for the future. In this context, it should be borne in mind that the principle of an open and cost-efficient access to high-quality Earth observation data, which is also contained in the INSPIRE Directive of 14 March 2007, is an essential foundation for GEOSS and, therefore, must not be questioned. This is possible, in principle, at least with regard to the data governed by the German Environment Information Law (Umweltinformationsgesetz). Moreover, the social benefit of an open data policy has to be taken into account as well as its economic significance for innovative developments especially of small and medium-sized enterprises. This discussion on principles has to be broad and public and the decision has to be taken at high political level.

Recommendation 11: Create framework conditions for an open data policy
The Federal Government should create the framework conditions for an open and largely unrestricted public access to data in the field of Earth observation and geoinformation data.

In Focus: Water

Man interferes massively in the natural water cycle and has come to controlling the flow of terrestrial waters to a large extent. Without such intervention, many regions of the world would be inhabitable, or at least not arable. In order to achieve a sustainable use of the limited water resources an improved understanding water cycle is needed.

Even in Germany, which is not threatened by pronounced water scarcity, farmers and water managers, for example, can benefit from improved model predictions. In addition, the risk of drought and extreme flooding events is increasing as an effect of climate change. Consequently, developing appropriate and sustained measures of water management and flood protection is indispensable.

Water scarcity is a much more existence-threatening problem in many developing countries, of course. In the context of the German economic co-operation with these countries the issue also affects Germany indirectly. Hence, investments into expanding the globally co-ordinated Earth observation to improve our understanding of the global water cycle and its variability are an important contribution to assuming global responsibility.

Pre-emptive conflict prevention is a further, often neglected aspect of water management. Notably limited water resources have frequently led to conflicting interests in their use and allocation. Where several states share a water resource, a coordinated resource management is a crucial tool for preventing potential escalation, which might strongly affect German interests (e.g. in the middle east).

The German Advisory Council on Global Change (WBGU), in its report entitled "World in Transition – Climate Change as a Security Risk" and published in 2007, has warned of the potential conflicts that may arise, for example, from deteriorating freshwater resources and recommends setting up a global information and early-warning system.



Mean annual flow and flow variability
© German Federal Institute of Hydrology

Integrate national activities

Influence on the shaping of GEOSS is possible by participating actively in the technical Tasks of the GEO Work Plan and in the GEO Committees. Contributions to and participation in GEO are in general voluntary. It is expected of the stakeholders that they get involved out of their own interest and fund their activities themselves, if necessary. Up to now, German institutions have participated in individual tasks and committees due to own interest and often because of direct responsibilities. In order to ensure a sustainable commitment, adequate financial means should be provided at national level. This does not only enable individual persons and institutions to participate in GEOSS but also facilitates the national coordination of the participation in GEOSS. Thereby it is possible to attend to national interests consistently and derive the greatest possible benefit from the system.

Recommendation 12: Integrate national activities

In new projects at national level that are relevant to GEOSS, the necessary financial means for linking these projects with the international GEO activities should be budgeted for from the beginning.

Recommendation 13: Enable participation

At national level, financial means should be made available to German institutions to enable them to participate directly in GEO tasks and committees (travel allowances, appropriate personnel grants).

Next steps in the implementation process

Establishing the national GEO Secretariat with the German Aerospace Center and the D-GEO working group constitute important first steps in the national GEOSS implementation process. Both bodies also play a key role in the further implementation of GEOSS.

The national GEO Secretariat is to continue to perform the following functions:

- national point of contact and information on GEO/ GEOSS for interested parties at national level as well as for the GEO Secretariat, the EU Commission, etc.
- support of the German delegation in the preparation of the GEO Plenary as well as the meetings of the Executive Committee and the EU High Level Working Group on GEO
- coordination of the D-GEO working group
- coordination of GEO activities with IMAGI, LG GDI-DE and the national point of contact for INSPIRE
- Coordination of GEO activities and implementation with GMES and INSPIRE at national level

The D-GEO working group has to be extended to include all ministries affected by GEOSS. In this context, each of the relevant ministries (BMI, BMWi, BMELV, BMVBS, BMG, BMU, BMBF, BMZ, possibly BMVg) and the affected executive agencies should communicate at least one point of contact to the D-GEO Secretariat. The prerequisite for the continuation of these activities is that sufficient personnel capacities and equipment for fulfilling these tasks are allocated in the responsible Federal Ministry of Transport, Building and Urban Affairs and the D-GEO Secretariat.

After an initial potential analysis with regard to a participation in GEOSS (use and contributions) it should be examined if a specific budget for such participation is to be provided in the corresponding institutions and ministries. Typically, these institutions will invest limited personal resources to formulate their own interests with regard to GEOSS and to internally propagate sensible service capacities. Where applicable, this should include funds to provide targeted support to important capacity building measures in developing countries. As the responsible ministry, the Federal Ministry of Transport, Building and Urban Affairs should also examine whether the realization of national interest can be improved by providing travel allowances for national representatives in the GEO technical committees or important task meetings.

All national institutions that use or require Earth observation information to fulfil their tasks should clearly formulate their requirements to be met by national and international Earth observation systems and strongly advocate these requirements – either directly or via an appropriate coordination body – in the further development of relevant systems. The GCOS Climate Monitoring Principles are an example of such a formulation and should be strictly observed at national level.

The most fundamental task with regard to the observation infrastructure at national level is safeguarding the long-term availability of the observation systems. Given that the responsibilities are distributed across various ministries and levels of government (federal government, federal states, local authorities), this is a relatively complex feat. However, it is time to think about a national strategy taking into account the heterogeneous responsibilities – not only with regard to GEOSS. One option might be to establish a national Earth observation coordination body to coordinate the demand and the development of Earth observation systems in Germany.

Such a coordination body should work in close collaboration with the national GEO Secretariat, unless the tasks are consolidated in one single institution (e.g. by expanding the mandate of the D-GEO Secretariat). At European level, Germany has to bring its influence to bear with regard to the long-term development of the GMES programme and the EUMETSAT satellite programmes.

Regarding the development of the national geodata infrastructure GDI-DE, special attention should be paid to its completeness. In particular the technical and institutional obstacles to the integration of the remote satellite sensing data bases have to be cleared. Here, the German Remote Sensing Data Center should take the initiative and prepare a proposal to that effect to the GDI-DE Steering Committee.

In order to realize the largely unrestricted and open data access at national level, which is required not only for GEOSS, appropriate arrangements should be made when transposing the INSPIRE-Directive into national law. First, however, a broad discussion and consultation must be held. This discussion could be initiated by a position paper of the D-GEO working group.

The D-GEO Secretariat should document the development and progress of the implementation of GEOSS in Germany in annual progress reports. These reports should also be used to update the national GEOSS implementation plan in order to respond to the dynamically changing societal requirements and technical developments. In this way, Germany can make an effective contribution to the development of the international GEOSS and benefit from its investments in many areas of societal, economic, and political life.

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