| *Revisions* | |
|---|---|
| **Original Draft:** | 19 March 2013 |
| **First Revision:** | 29 May 2013 |
| **Second Revision:** | 19 August 2013 |
| **Third Revision:** | 28 October 2013 |
| **Fourth Revision:** | 13/18 November 2013 |
| **Fifth Revision:** | 24 November 2013 |
| **Sixth Revision:** | 13 February 2014 |
| **Seventh Revision:** | 9 March 2014 |
| **Eighth Revision:** | 1 April 2014 |

# Strategic Plan of the IAG Global Geodetic Observing System

***Adopted April 2014 in Vienna, Austria.***

## Dear Readers

**On behalf of the International Association of Geodesy (IAG), I am pleased to introduce the Strategic Plan of the Global Geodetic Observing System (GGOS).**

As the observing system of the IAG, GGOS serves a unique and critically important combination of roles centering upon advocacy, integration, and international relations. GGOS also promotes high-level outcomes such as the realization of the International Terrestrial Reference Frame through a variety of internal and external channels.

The IAG relies upon GGOS to advocate for improvements in the ground-based geodetic infrastructure of GNSS and DORIS reference stations, VLBI and SLR space geodetic stations, and gravity observatories; it also supports the development of new satellite missions for altimetry, gravity mapping and earth observation; and **promotes the importance of modern geodesy for addressing the needs of science and society** for stable spatial, time, and gravimetric reference frames. GGOS focuses attention on how international geodesy needs to evolve in order to deliver an order of magnitude improvement in the quality of its fundamental products – this includes identifying the critical elements of global physical infrastructure, efficient data management, and combined measurement analysis.

GGOS internally integrates the geometric and gravimetric aspects of geodesy – **driving continuous improvement in the quality of geodetic products through increased investment in different geodetic techniques.** It also provides a framework within which Services and other IAG components can integrate outputs and generate higher-level products. GGOS has a unique mission, and is unlike any IAG component in that it is not a service, but rather an observing system that integrates IAG services and commissions. GGOS cannot function without the facilities and products of each of the IAG services.

The first goal of this plan is to enable and empower GGOS to be the primary source of all global geodetic information and expertise, in order to best serve society and Earth systems science. As the observing system of the IAG, GGOS will be able to position itself as the primary source for geodetic information and expertise through optimally integrating multiple services. Furthermore, GGOS will also be enabled to function as a clearinghouse for geodetic information expertise – creating a central voice of consensus within the geodetic community. This technical streamlining and coordination ultimately advocates for the interests of both the scientific community and the general public that it serves.

In complement to these technical efforts, **GGOS serves as a vehicle of engagement with international governmental and non-governmental organizations, space agencies, and national mapping/geodetic institutions.** Developing and maintaining these relations ensures optimal use of resources for the greatest good – to the benefit of the technical community and society in general.

Key to realizing these GGOS goals is establishing a governance structure and drafting a strategic plan. Implementation of the 2014 GGOS Strategic Plan will be critical to delivering the proposed suite of high-quality geodetic products by 2020. Furthermore, this plan will provide a firm foundation for the dynamic development of GGOS, and the IAG Services in general, well into the future.

*Professor Chris Rizos*
*President of the International Association of Geodesy*

# Message from the Chair of the GGOS Coordinating Board

## Meeting the requirements of a global society on a changing planet in 2020.

The vision of GGOS – "*Advancing our understanding of the dynamic Earth system by quantifying our planet's changes in space and time"* - addresses the substantial task of quantifying our planet's changes in space and time due to Earth system dynamics. Successful execution of this vision is only possible if the international scientific community and its related governmental agencies are strongly committed, financially and organizationally, to the success of GGOS and its goals.

GGOS was founded over one decade ago as a scientific idea, and has grown to conceptual maturity as described in the seminal book, "*Global Geodetic Observing System: Meeting the Requirements of a Global Society on an Changing Planet in 2020*", edited by H.-P. Plag and M. Pearlman. The next critical step is to implement GGOS operationally in a way that acknowledges the dual aspects of GGOS: an observing system realized as an integrator of the IAG services and commissions, and an organization with a dedicated structure and workflow.

The systematic implementation, operation, maintenance, and further development of GGOS must account for the technical complexity as well as its societal importance. When these elements are developed and financially enabled, the social and economic benefits in areas such as the accurate monitoring and prediction of sea level change can be realized. Both technological and organizational skills are required at the highest level in order to ensure the success of GGOS services to society, and it is clear that a multitude of individual efforts are needed to reach the full operational capability of GGOS as a system and an organization.

I am happy to present the strategic plan as the systematic approach and guideline for the implementation and further development of GGOS. This plan was developed through the efforts of the GGOS Coordinating Board, and incorporates relevant content from previous GGOS directional documents while addressing pressing contemporary and future issues.

This strategic plan identifies four strategic focus areas that are immediately relevant to GGOS:

(1) **geodetic information and expertise** where GGOS is the primary source,
(2) **global geodetic infrastructure** as a requirement for science and benefit to society,
(3) **services, standards and support** focusing on coordinating and optimizing relationships with existing services, and
(4) **communication, education and outreach** regarding the benefits of GGOS to the world outside professional geodesy.

These areas are further developed and explained on the following pages naming goals, objectives, and expected measurable outcomes.

This strategic plan prescribes a demanding undertaking within the next few years in order to ensure the successful development and implementation of GGOS. It is a strict specification of tasks to be completed, but it is also a basis for inter-organizational interaction and thus a living document. The GGOS Coordinating Board welcomes comments and input from interested readers and will consider this feedback for future improvement and optimal adaptation to the needs of both the scientific community and society as a whole.

*Professor Hansjörg Kutterer*
*Chair of the Global Geodetic Observing System*

## Terminology

Throughout this document, terminology and definitions are adopted from "Creating your Strategic Plan," by Bryson and Alston, Jossie-Bass Publishing, 3rd Edition, 2011. Key terms are defined as follows:

**Strategic Plan[ing]:** *"A deliberate, disciplined effort to produce fundamental decisions and actions that shape and guide what an organization (or other entity) is, what it does, and why it does it. Strategic planning is an approach to dealing with the serious challenges that organizations, parts of organizations, collaborations, and communities face. The Strategic Plan documents the outcome of the exercise. "*

**Strategies:** *"The means by which an organization intends to accomplish a goal or objective. It summarizes a pattern across policies, programs, projects, decisions, and resource allocations."*

**Goals:** *"A long-term organizational target or direction of development. It states what the organization wants to accomplish or become over the next several years. Goals provide the basis for decisions about the nature, scope, and relative priorities of all projects and activities. Everything the organization does should help it move toward attainment of one or more goals."*

**Objectives:** "*A measurable target that must be met on the way to attaining a goal."*

**Outcomes:** *"The end results, consequences, and ideally benefits of outputs for stakeholders, and the larger meanings attached to those outputs."*

## The Case for GGOS

GGOS functions as a means for integration and optimization within geodetic observing services and techniques. The system leverages existing resources of its parent organization, IAG, in order to carry out its mission in the most efficient and effective means possible. In this, GGOS serves as one unified brand and one voice for global geodetic observation.

GGOS was systematically established by the International Association of Geodesy (IAG), and documented by the scientific community in 2009 in *The Global Geodetic Observing System: Meeting the requirements of a global society on a changing planet in 2020*[1]. "The Case for GGOS" is prepared in order to give contextual clarity to the Goals and Objectives set forth in this strategic plan.

### The Permanent Observing System of the IAG

The Global Geodetic Observing System (GGOS) was initially created as an IAG Project during the IUGG meeting in 2003 in Sapporo, Japan, in response to developments in geodesy, the increasing requirements of Earth observations, and growing societal needs. After a preliminary development phase, the Executive Committee of the IAG decided to continue the Project at its meetings in August 2005 in Cairns, Australia. From 2005 to 2007, the GGOS Steering Committee, Executive Committee, Science Panel, Working Groups, and web pages were established, and the Terms of Reference were revised. Finally, at the IUGG meeting in 2007 in Perugia, Italy, IAG elevated GGOS to the status of a full component of IAG — as *the permanent observing system of the IAG*.

### Integrating and Leveraging IAG Elements to Meet New User Requirements

GGOS as an organization is built upon the existing IAG services as a unifying umbrella, and will continue to be developed for this purpose. Under this "unifying umbrella," all the products provided by the different IAG services are considered GGOS products—as ratified at IAG General Assembly in 2009 in Buenos Aires, Argentina. Through this process, the International Terrestrial Reference Frame (ITRF), issued by the IAG International Earth Rotation and Reference Systems Service (IERS), is a fundamental contribution to integration of GGOS products, and a recognized global standard.

GGOS is chartered to realize new products and services to meet the needs of both scientific users and society in general – a need that is currently not met by individual IAG services, alone. In response to these needs, new products will require the combination of individual techniques beyond conventional geometric techniques. GGOS will act as the catalyst and integrator of these new products and services. In this pathfinder role, GGOS will leverage and optimize all existing IAG resources, including current working groups, under any of the IAG components. Only when the needs cannot be met by any of the existing IAG components will GGOS propose the creation of a new entity to the IAG.

[1] *The Global Geodetic Observing System: Meeting the requirements of a global society on a changing planet in 2020,* H. –P. Plag and M. Pearlman, Editors, Springer 2009.

## GGOS in Service to Society

There are numerous social benefits associated with an optimized observing system of IAG services. As stated in the Group on Earth Observations (GEO) Geneva Declaration of January 2014, *"The Rio+20 United Nations Conference on Sustainable Development recognized the importance of space-based and in situ observations for providing reliable geospatial information for sustainable development policymaking, programming, and project operations."* The declaration went on to note that *"the additional opportunities and potential provided by technological innovation that increases the utility and importance of Earth data allows for better decision-making at all levels."*

One such GGOS initiative that embodies service to society is a collective effort to understand and forecast sea-level rise and variability. The outputs of this ongoing effort will allow for better, more informed decision making with regard to infrastructure development and disaster preparedness.

GGOS also works in concert with the IAG commissions, which include commissions on reference frames, the Earth's gravity field, Earth rotation and geodynamics, and Earth positioning and applications. These commissions support the understanding of critical components of the Earth system, and advance geodetic knowledge as well as technology development. The societal benefit of the IAG commissions is wide reaching, including improved navigation systems, better understanding of climate and environmental change, and accurately determining changes in the length of each day.

# Vision and Mission

## Vision

Advancing our understanding of the dynamic Earth system by quantifying our planet's changes in space and time.

## Mission

We live on a dynamic planet in constant motion that requires long-term continuous quantification of its changes in a truly stable frame of reference. GGOS and its related research and services will address the relevant science issues related to geodesy and geodynamics in the 21st century, but also issues relevant to society (global risk management, geohazards, natural resources, climate change, severe storm forecasting, sea level estimations and ocean forecasting, space weather, and others). It is an ambitious program of a dimension that goes beyond IAG, requiring a strong cooperation within the geodetic, geodynamic and geophysical communities, and externally, to related endeavors and communities. GGOS will provide this integration at the highest level, in service to the technical community and society as a whole.

In summary, the mission of GGOS is:

1. To provide the observations needed to monitor, map, and understand changes in the Earth's shape, rotation, and mass distribution.
2. To provide the global geodetic frame of reference that is the fundamental backbone for measuring and consistently interpreting key global change processes and for many other scientific and societal applications.
3. To benefit science and society by providing the foundation upon which advances in Earth and planetary system science and applications are built.

## Overarching Strategies

In support of the aforementioned Vision and Mission, GGOS has formulated the following overarching strategic focus areas:

### Overarching Strategic Focus Areas of GGOS Goals and Objectives

The GGOS Goals, Objectives, and Outcomes presented in the next section are built around four strategic focus areas that are directly attributable to the established GGOS goals. These areas were established in the 2011 plan, and continue to be relevant to the activities and future efforts of GGOS. The strategies are related to each goal, but are overarching in nature – just as each goal acts in support of other goals, each strategy has a role in all of the goals.

1. **Geodetic Information and Expertise** ***(intangible assets)***
   GGOS outcomes will support the development and maintenance of organizational intangible assets, including geodetic information and expertise. This is the primary purpose of Goal 1, but the development of this strategic focus area will benefit all other goals and objectives.

2. **Global Geodetic Infrastructure** ***(advocacy for, and sustenance of, tangible assets)***
   Development of, advocacy for, and maintenance of existing global geodetic infrastructure is in direct support of each GGOS goal, and is the primary focus of Goal 2 and its objectives.

3. **Services, Standardization, and Support** ***(internal and external coordination)***
   Optimal coordination, support, and utilization of GGOS services, as well as leveraging existing IAG resources, are critical to the progress of all GGOS goals and objectives. Goal 3 addresses these needs specifically, and in support of all other goals.

4. **Communication, Education, and Outreach** ***(public relations, external education and outreach, internal continuing education and training)***
   Marketing, outreach, and engagement are critical elements for sustaining the organizational fabric of GGOS. Goal 4 directly addresses these needs, which then support and advocate for all other goals and objectives.


Geodetic Information and Expertise
Global Geodetic Infrastructure
Goal 1
GGOS will be the primary source for all global geodetic information and expertise serving society and Earth system science
Goal 2
GGOS will actively promote, sustain, improve, and evolve the integrated global geodetic infrastructure needed to meet Earth science and societal requirements
Goal 3
GGOS will coordinate the international geodetic services that are the main source of key parameters and products needed to realize a stable global frame of reference and to observe and study changes in the dynamic Earth system
Goal 4
GGOS will communicate and advocate its benefits to user communities, policy makers, funding organizations, and society
Services, Standardization, and Support
Communication, Education, and Outreach

## Strategic Goals, Objectives, and Outcomes

GGOS has formulated the following goals and objectives, as well as the expected outcomes. The four strategies described in the previous section inform all actions made by GGOS in order to realize the expected outcomes.


**Goal 1 – Geodetic Information and Expertise:** *GGOS will be the primary source for all global geodetic information and expertise serving society and Earth system science.*

> ***Objective 1-1 – Understand societal and scientific needs and deficiencies:*** GGOS will determine how to position itself as the primary source for geodetic information and expertise by first determining the greatest areas of need within the technical community and society.
>
> > ***Outcome 1-1A:*** A complete survey of all relevant areas benefitting from global geodetic information and expertise, highlighting areas in need of support, and recommending relevant GGOS components or services that may potentially be able to fill these needs or deficiencies.

***Outcome 1-1B:*** Knowledge of the greatest societal and scientific needs for geodetic products and services.

***Objective 1-2 – Position GGOS as the primary source for geodetic information and expertise:*** Informed by the outcomes of Objective 1-1, GGOS will determine the steps necessary to position itself as the primary source of geodetic information.

***Outcome 1-2A:*** GGOS facilitates the integration of pertinent existing IAG products and services with potential additional IAG products and services, specifically addressing areas of need.

***Outcome 1-2B:*** GGOS, as a clearinghouse for geodetic information and expertise, serves as the voice of consensus within the geodetic community.

***Outcome 1-2C:*** GGOS engages and integrates experts in all services within the organization.

***Objective 1-3 – Connect with the larger scientific community and integrate with other Earth observing systems:*** As the primary source for integrated geodetic information and expertise of the IAG, GGOS will reach out to the larger scientific community and integrate with other Earth observing systems as part of the Global Earth Observing System of Systems.

***Outcome 1-3A:*** GGOS conducts and/or supports meetings, workshops, and symposia in support of the multidisciplinary engagement and integration of individual experts as well as geodetic organizations and international services.

***Outcome 1-3B:*** GGOS, the IAG Earth observation system, is integrated with other Earth observing systems such as: the Global Ocean Observing System (GOOS) and the Global Sea Level Observing System (GLOSS), Global Climate Observing System (GCOS), Global Terrestrial Observing System (GTOS).

***Outcome 1-3C:*** GGOS continues to participate in groups such as the Group of Earth Observations (GEO), the GEO System of Systems (GEOSS), and the Committee on Earth Observation Satellites (CEOS).


**Goal 2 – Global Geodetic Infrastructure:** *GGOS will actively promote, sustain, improve, and evolve the integrated global geodetic infrastructure needed to meet Earth science and societal requirements.*

***Objective 2-1 – Support and advocacy for infrastructure and associated elements:*** GGOS will promote the development and implementation of new infrastructure, as well as support the use and maintenance of existing infrastructure.

***Outcome 2-1A:*** GGOS-led advocacy efforts yield a wide variety of benefits, from improved simple networking to building partnership sites in new affiliate countries.

***Outcome 2-1B:*** As the primary source for integrated geodetic information, GGOS leads advocacy efforts for new stations through political and financial avenues, including the GGOS Inter-Agency Committee (GIAC); as well as advocacy and support of navigation satellite missions, and the continuous identification of other advocacy needs within the organization, in support of Goal 1 objectives.

***Objective 2-2 – Lead efforts for the integration of various ground observation networks within the GGOS network:*** GGOS will promote and lead the integration of current and new ground observation networks using a system of systems approach.

> ***Outcome 2-2A:*** GGOS becomes a global observing system by systematically integrating individual systems across nations and across the globe.


**Goal 3 - Services, Standardization, and Support:** *GGOS will coordinate the international geodetic services that are the main source of key parameters and products needed to realize a stable global frame of reference and to observe and study changes in the dynamic Earth system.*

***Objective 3-1 – Standardization:*** GGOS will operate using a set of established standards within the system of systems, in order to optimize communication within GGOS, among the services, and externally.

***Outcome 3-1:*** GGOS organizational structure and operation includes standardized reports, processes, templates, support products, conventions, models, and reference frames.

***Objective 3-2 – Coordination and Development of IAG Services:*** GGOS will optimize the coordination of IAG services to promote an overall efficient use of resources.

***Outcome 3-2A:*** GGOS operates in concert with the IAG services, avoiding redundancies and ensuring integrated services development and optimal mutual benefits across services and systems.

***Outcome 3-2B:*** New products and services are aligned with the GGOS Themes, presently: Theme 1 - Unified Height System; Theme 2 - Natural Hazards; and Theme 3 - Understanding and Forecasting Sea-Level Rise and Variability

***Outcome 3-2C:*** GGOS develops forums, resource databases, and service interface matrices; GGOS component needs, linkages, and mutual benefits are identified through workshops; GGOS supports development and evolution of potential new IAG services, such as gravity, displacement, and earthquake services.


**Goal 4 - Communication, Education, and Outreach:** *GGOS will communicate and advocate its benefits to user communities, policy makers, funding organizations, and society.*

***Objective 4-1 – Establish a Strong Internet/Online Presence:*** As the primary source for geodetic information and expertise, GGOS will streamline and enhance its web presence.

> ***Outcome 4-1:*** The GGOS web presence is a consolidated and extensive resource – it is the primary point of engagement for the technical community, and a valuable tool for outreach to society. The GGOS website and portal are amalgamated into a single website and streamlined for both technical and general audiences. The website provides online databases of GGOS resources, including: technical resources, reports issued by (and related to) GGOS, general efforts advancing the organization, student opportunities and other educational resources.

***Objective 4-2 – Outreach to the Technical Community and General Society:*** Develop outreach efforts to engage relevant groups in the participation of GGOS efforts, as well as providing educational resources to the general population.

***Outcome 4-2A:*** GGOS engages the expert population within GGOS membership; engages in outreach to related and potentially complementary groups; supports geodetic satellite missions; advocates for new stations; and engages the general technical community through sessions at workshops and conferences.

***Outcome 4-2B:*** A component of the GGOS website is created for outreach to education and general interest audiences; educational materials are published for distribution to students of various age as well as the general public.

# Appendix

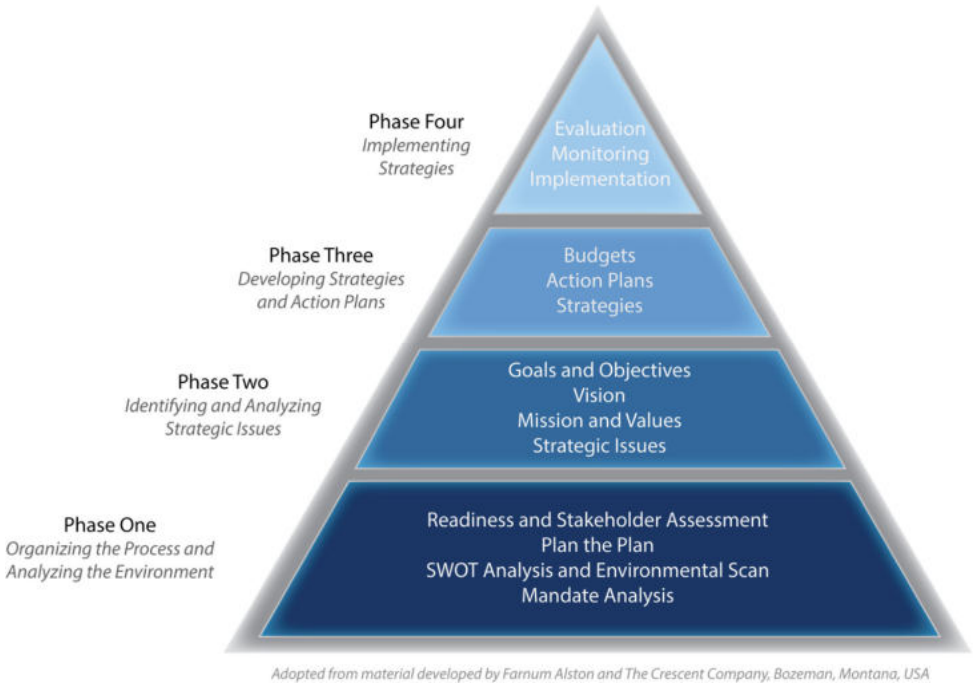
## Strategic Plan Development

### Background

In July 2011, the Global Geodetic Observing System established its vision, mission, and goals through the drafting of a Strategic Plan. The draft document was first discussed at the 20th Steering Committee Meeting in Vienna, Austria and distributed to the Steering Committee for comments in April 2011. The document was revised in response to comments received by the GGOS Vision Group throughout May and June 2011. The 2011 Strategic Plan was discussed at the 21st Steering Committee Meeting in Melbourne, Australia on July 2, 2011. Some minor edits were included and the Steering Committee unanimously adopted the document, which was then approved by the IAG Executive Committee.

After the Frankfurt Retreat in 2012, an extensive matrix proposing GGOS endeavors was created. Endeavors of a strategic nature—encompassing policy, international coordination, and advocacy in a long-term timeframe have been distilled as goals, objectives and strategies in this strategic plan. Endeavors that were of a project-based nature, contributing to the building of GGOS and establishment of long-lasting operational standards, will become initiatives in support of the objectives set forth in this plan. In addition to this, the Decade of the Reference Frame, *DecRef 2014-2024* is a linked initiative endorsed by the Committee on Earth Observation Satellites in 2013.

### Strategic Plan Formulation



The GGOS Coordinating Board (CB) will appoint the GGOS Strategic Planning Committee (SPC) at the beginning of the formulation period. The SPC will be co-chaired by the GGOS Chair and Vice Chair and an IAG designated representative. This committee is tasked, with the support of the GGOS Coordination Office, to formulate the strategic plan for the next period of performance. This period of performance shall be dictated by GGOS Coordinating Board and will typically be four to five years.

### Strategic Plan Approval

The GGOS Coordinating Board will review the proposed goals and objectives, along with their associated targets, formulated by the planning working group during its year-end working meeting. Any changes agreed upon by CB consensus will be included in the strategic plan prior to its final approval.

The SPC will identify the most effective initiatives based on the approved objectives and associated targets, and past performance analyses. The strategic plan may also incorporate an appendix detailing the initial list of activities and their anticipated impact on objectives. The final strategic plan will be presented to the CB for final approval.

### Strategic Plan Implementation

The strategic plan contains goals and supportive objectives. These objectives and associated performance targets are further decomposed in a number of activities. The core of the strategic plan implementation is to identify, assign, execute, and monitor the progress of these activities, which can be multi-year efforts depending on their nature. The GGOS Coordinating Board will create a yearly working plan containing all proposed activities and their scheduled periods of performance.