

CEOS SELF STUDY

Part 1:

SYNTHESIS REPORT

PLENARY DRAFT

27 October 2011

PART I: Synthesis Report

PART II: Annexes

CEOS SELF STUDY - PLENARY DRAFT

Executive Summary

In order to help facilitate the work of the Committee on Earth Observation Satellites as it tackles the challenges and opportunities ahead in providing coordination of civilian space-borne observations of Earth, in February 2011 the incoming SIT Chair (Dr. Michael Freilich, NASA) requested that CEOS undertake a self-study to identify past successes, strengths, opportunities, and areas of challenge. The strategic goal of the study was to inform CEOS as it goes forward, through an analysis of lessons learned, input from CEOS members, and assessment of current CEOS structure, achievements and challenges, and to provide recommendations for potential changes and potential new initiatives for the next 3-5 years.

The document presented here is the Plenary Draft, which includes the main output of the study along with supporting documentation. This document was prepared by the Steering Committee, and is a synthesis of the input from three Study Teams, interviews of past leaders, and written records, representing input from nearly 80 individuals with a substantial history of involvement in CEOS. This report is a synthesis, not a compendium of material submitted by individuals.

There was remarkable consistency among the findings and recommendations derived from multiple sources. At the highest level, key recommendations are summarized as follows:

- **CEOS Strategic Objectives**

Key Recommendation: Develop a 5-year CEOS Strategic Plan highlighting goals and objectives of the organization. The Strategic Plan should be accompanied by appropriate Work Plans to ensure progress toward established goals, and should not only consider GEO Work Plan goals, but overall CEOS goals.

- **Decision-making and New Initiatives**

Key Recommendation: Develop a process for reviewing and selecting new activities with consideration for CEOS objectives and available resources. The CSS results suggest that an increased focus on hazards and disaster monitoring and response could serve as the first proposed initiative to be evaluated for consideration under the new process.

- **Organizational Functions**

Key Recommendation: Articulate the organizational functions and relationships that CEOS needs in order to perform and sustain its work, and consider whether modification of the leadership structure and organizational elements is needed to support these functions. Clarify roles and responsibilities for CEOS Leadership at all levels.

- **Membership and Participation**

Key Recommendation: Develop a process for review and acceptance of new CEOS members or associates. Consider ways to encourage new member engagement at all levels and develop a plan to follow up with and address concerns regarding inactive members.

- **Objectives of Meetings**

Key Recommendation: Develop coordinated objectives and formats for the CEOS Plenary meeting, SIT meeting(s), and SEC telecons to encourage discussion and decision-making. Balance reporting with strategic discussions that engage and utilize participation from all CEOS functional groups

These five Key Recommendations encapsulate the major themes. Specific findings and individual recommendations in the report provide additional detail and suggested implementation actions.

I. Introduction

In order to help the Committee on Earth Observation Satellites tackle the challenges and opportunities ahead in providing coordination of civilian space-borne observations of the Earth, in February 2011 the incoming SIT Chair (Dr. Michael Freilich, NASA) requested that CEOS undertake a self study to identify past successes, strengths, opportunities, and areas of challenge. The strategic goal of the study was to inform CEOS as it goes forward, through an analysis of lessons learned, input from CEOS members, assessment of current CEOS structure, achievements and challenges, and to provide recommendations for potential changes and potential new initiatives for the next 3-5 years. The tactical objective of the Self Study was to produce a report for presentation at the 2011 CEOS Plenary meeting.

To conduct the work of the Self Study, a Steering Committee and three Study Teams were convened (see Annex I). The Steering Committee provided the overall guidance and synthesis of results and recommendations for the CEOS Self Study (CSS). The three Study Teams each evaluated a specific functional area of CEOS and reported on their findings. The areas evaluated by the Study Teams included CEOS Executive Functions, Working Groups and Societal Benefit Area Teams (SBAs), and Virtual Constellations, respectively. The analytic approach was to review and assess CEOS products and documents, and to broadly canvass the CEOS community, CEOS stakeholders, and past CEOS leaders for their valuable perspectives, ideas, and input.

The document presented here is the Plenary Draft, which includes the main output of the study along with supporting documentation. This document was prepared by the Steering Committee, and provides a synthesis of the input from the Study Teams, interviews of past leaders, and existing CEOS documentation. To develop the report, the Steering Committee drew on the full range of sources described above to extract common themes and to highlight emerging issues and opportunities. The report includes a series of findings and recommendations for consideration by CEOS leadership, and provides as Annexes the source material from which the synthesis proceeded. Subsequent to the 2011 Plenary, the Steering Committee will prepare a final report that includes the material found here, together with additional background and supporting materials.

It is important to note that this report is a synthesis, not a compendium of material submitted by individuals. The report identifies and incorporates the major issues and themes that were identified by Study Teams, past CEOS leaders, and Steering Committee analysis. Since the report provides a fusion of information derived from multiple sources, where needed, information is provided regarding the level of consensus or diversity of opinion on major concerns and recommendations, and those concerns and recommendations are not attributed to specific individuals. Findings and recommendations contained in the report are the product of the Steering Committee.

This report is intended for internal distribution only, and the Steering Committee understands that it will not be distributed or published outside of the CEOS membership. However, the intent is that the Executive Summary of the Self Study, which summarizes key points and recommendations for potential changes and new initiatives, may be published for distribution outside CEOS at the Secretariat's and SIT's discretion.

II. Background

CEOS was established in September 1984 in response to a recommendation from a Panel of Experts on Remote Sensing from Space that was set up under the aegis of the G7 Economic Summit of Industrial Nations Working Group on Growth, Technology and Employment. Participating in the first meeting were representatives of eight space agencies: CCRS, CNES, ESA, INPE, ISRO, NASA, NASDA and NOAA. Its initial scope was technical coordination and harmonization of Earth observations to make it easier for the user community to access and utilize data. As such, it focused on such work as interoperability, common data formats, intercalibration of instruments, and common validation and intercomparison of products. The three original, primary objectives of CEOS were:

- 1) To optimize benefits of space-borne Earth observations through cooperation of its Members in mission planning and in development of compatible data products, formats, services, applications and policies;
- 2) To serve as a focal point for international coordination of space-related Earth observation activities; and
- 3) To exchange policy and technical information to encourage complementarity and compatibility of observation and data exchange systems.

Over the past 25 years, CEOS has actively pursued these objectives, although the balance and focus has changed as the range, diversity and scope of Earth observations have matured and multiplied. The number of satellites operating today and the number of participating CEOS members are legion when compared to the numbers at CEOS's inception. Similarly, the user community has grown by vast numbers, and users have grown in sophistication, complexity, and diversity of Earth science and application groups, in response to new instruments being available for their use. The user community has also become better organized internationally, and they now coordinate and deliver their requirements through many coordinating bodies: GEO, GCOS, UNFCCC and others have work plans and tasks in which CEOS is deeply involved.

Correspondingly, CEOS has matured and expanded as an organization. CEOS's expansion, maturation and need to respond to requirements arising in other organizations have driven significant accomplishments as well as the organizational challenges that go with increased size, scope, and complexity. CEOS now finds itself a "go-to" organization internationally for numerous tasks related to the coordination of satellite-based Earth observations.

A comment that the Steering Committee heard many times over the course of the CEOS Self Study is that there will always be more good and worthy ideas than there are resources to support them, that the projects that CEOS takes on must be balanced with available resources, and that CEOS needs a reliable process for decision-making. While these things are undoubtedly true and comprise some of the key findings of this report, it is equally true that CEOS is fundamentally a forward-looking organization, and that its

mission still includes both the technical exchange of information and international coordination of satellite-based Earth observations.

Accordingly, new initiatives are exceedingly important to ensure that CEOS remains responsive and relevant, and the Steering Committee heard several suggestions of candidates for evaluation as new activities of CEOS. The Steering Committee is cognizant that since a key recommendation of this report is that CEOS needs a reliable process for decision-making, the approval of new initiatives should be done not by fiat of this report, but through a fair and strategic process that is yet to be defined. That said, the new initiative that was mentioned most frequently by respondents over the course of the Self Study is to create an enhanced focus on the area of hazards and disaster monitoring and response. Respondents highlighted the societal importance of this topic, the great need for predictive tools and coordination with the UN framework, and the extremely high value that space-based Earth observations bring to this area. The Steering Committee feels that this topic is deserving of evaluation as a potential new CEOS initiative through the process that CEOS will design and implement.

The remainder of this report consists of the synthesis of findings and recommendations of the CEOS Self Study conducted over eight months in 2011. These findings distill inputs from the three Study Teams, interviews with 19 past leaders of CEOS, review of CEOS documentation, and the deliberations of the Steering Committee. Appended to this report are several Annexes that contain the full Study Team reports and other supporting and source material. The purpose of these Annexes is to ensure that the reader may look deeper to see the full range of thoughts and expertise brought to bear during this Self Study, as well as the rationales for specific recommendations.

The Self Study Report is presented hereby to CEOS, as an opportunity to acknowledge and evaluate what has worked and is working, to highlight the need for improvements where necessary, and to identify realistic potential initiatives for the next 3-5 years.

IV: CEOS Self Study: Findings and Recommendations

Overview

Four major sources of material were developed over the course of the CEOS Self Study. These include three Study Team Reports (on Executive Functions; Working Groups and SBAs; and Virtual Constellations) together with the report compiled through interviews with past CEOS leaders. Taken together, these reports compiled by the CSS Steering Committee and Study Teams represent the collective and individual opinions of nearly 80 individuals with a substantial history of involvement and leadership in CEOS.

Once this material was gathered, the major findings and recommendations from the three Study Team reports and the interviews of past CEOS Leaders were collated and synthesized into one set of findings and recommendations. The resulting synthesis is presented here; the source material, including full reports from Study Teams and a summary of the findings from interviews, is included in Annexes 3 and 4.

There was remarkable consonance among the findings and recommendations derived from study team reports and leadership interviews. In broad terms, five themes dominate the results, and the highest-level recommendations can be characterized in terms of these five themes:

- **CEOS Strategic Objectives**

Key Recommendation: Develop a 5-year CEOS Strategic Plan highlighting goals and objectives of the organization. The Strategic Plan should be accompanied by appropriate Work Plans to ensure progress toward established goals, and should not only consider GEO Work Plan goals, but overall CEOS goals as well.

- **Decision-making and New Initiatives**

Key Recommendation: Develop a process for reviewing and selecting new activities with consideration for CEOS objectives and available resources. The CSS results suggest that an increased focus on hazards and disaster monitoring and response could serve as the first proposed initiative to be evaluated for consideration under the new process.

- **Organizational Functions**

Key Recommendation: Explicitly articulate the organizational functions and relationships that CEOS needs in order to perform and sustain its work, and consider whether modification of the leadership structure, organizational elements, and connections are needed to support these functions. Terms of Reference for the CEOS Chair, SIT Chair, CEO, DCEO, SEO, Secretariat (SEC), Working Groups, Virtual Constellations and SBA Coordinators should be created/updated and made accessible, so that CEOS participants have a common understanding of these roles and responsibilities and the interfaces among them.

- **Membership and Participation**

Key Recommendation: Develop a process for review, acceptance of new CEOS members or associates. Consider ways to encourage new member engagement at all levels and develop a plan to follow up with and address concerns regarding inactive members.

- **Objectives of Meetings**

Key Recommendation: Develop coordinated objectives and formats for the CEOS Plenary meeting, SIT meeting(s), and SEC telecons to encourage discussion and decision-making. Balance reporting with strategic discussions that engage and utilize participation from all CEOS functional groups.

These five Key Recommendations encapsulate the major themes of findings and individual recommendations in the body of the report. What follows is a discussion and synthesis of the CSS findings and recommendations for each theme.

CEOS Strategic Objectives

There is a generalized perception that CEOS's objectives have evolved substantially since its beginning. It began as an internally-focused group, with early successes as a venue for technical coordination and cooperation among space agencies. In recent years it has required a more external focus, toward coordination with and provision of services for external bodies such as GEO/GEOSS, GCOS, UNFCCC and others. The increased attention to global issues like observing strategies and gap analysis has helped CEOS focus its efforts, but it has not been without a price. CEOS's activities are now dominated by dialogue with and tasks identified by these outside organizations, and CEOS's successes are largely being measured through its ability to respond to these external forces. As a result, at the organizational level there is substantially less focus on internal coordination among space agencies.

However, the need for coordination on technical matters (e.g. cal/val, interoperability, coordination of missions, the needs of user communities, etc.) has not ceased, as evidenced by the prominence of these issues in highly active CEOS working groups. So in fact, CEOS's objectives have not strictly evolved: they have grown, and now encompass both internal and external relationships, tasks, and coordination issues.

Internally, CEOS's successes include the development of the Virtual Constellations, the creation of the EO Handbook, the Data Democracy initiative, and the technical coordination achievements of the Working Groups. The Forest Carbon Initiative is widely viewed as an emerging success, as is the focus on climate, culminating in the recent creation of the Working Group on Climate.

The CEOS Working Groups have clearly-defined and well-understood roles on behalf of CEOS. They are supported by highly-motivated and highly-qualified technical experts from CEOS Agencies, and they have a proven track record of accomplishments that range from the establishment of the CEOS International Directory Network (IDN), to development of new tools to support a single user interface to multiple data catalogues, to maintenance of a worldwide network of calibration/validation test sites, quality assurance practices for EO data, and coordinated climate information product development.

Similarly, the CEOS Constellations, though diverse in scope, have shared a variety of common outcomes and achievements. These include common requirements and guidelines, focused projects and assessments and improved data distribution and sharing. One outcome common to all Constellations is the recognition that these groups are an effective forum for improved international coordination and advocacy. Although the results sometimes vary in practice, both the SBA Teams and the Constellation framework are inherently supportive of focused community involvement, which is critical for maintaining momentum well into the future.

Looking to the outside world, the initiation of IGOS and the side benefits of organizing the customers, including the formal recognition of the role of Affiliates and Associates with the creation of IGOS-P, are recognized as successes, as is the response of CEOS to GCOS and CEOS's involvement in and support of GEO.

All of these achievements have one thing in common: they are responsive to the original CEOS goals. These successes are a testament to the diligence and hard work of CEOS members, but they also point toward a key vulnerability: in expanding its scope to include both internally- and externally-derived objectives, CEOS is stretched thin. While continuing its inherent focus on technical coordination, it has also become a recognized organization among political entities (e.g. G8, G20, UN) and GEO and other external groups (e.g. UNFCCC, IPCC, CGMS). These relationships are critical to continued CEOS success and CEOS must carefully consider how to balance and stabilize its internal and external objectives and engagements.

FINDING: *Contrary to perception, CEOS's objectives have not evolved in the sense that the early needs were met and then replaced by new needs. Rather, CEOS has continued to address its original objectives, while accreting substantial new ones and investing substantial resources in both old and new. CEOS's scope has grown, not evolved, and its current portfolio of goals is much more ambitious than it was in the past.*

FINDING: *CEOS has had significant successes both internally and externally, including its role in coordination among space agencies, the creation of IGOS and GEO, its response to GCOS, and in the Virtual Constellations, high-performing Working Groups, and recent initiatives in forest carbon and data democracy; sustaining these relationships and activities may present challenges.*

RECOMMENDATION #1: CEOS's original strategic objectives should be reviewed and re-articulated as a tool to help CEOS make informed decisions, to match activities and scope to resources, and to ensure that the right items are receiving the most attention.

Decision-making and New Initiatives

One of the questions asked of past CEOS Leaders was "What new initiatives should CEOS consider for the next 3-5 years?" It is striking that, when asked what new things CEOS should do, the nearly unanimous response was one of caution. In response to this question, the overwhelming consensus was that CEOS must do two things: 1) meet the commitments that have already been made; and 2) decide upon the means by which new initiatives are selected.

There is clear concern that CEOS has made many commitments, including some that are established and others that are fairly new but already regarded already as successes. New ideas included a proposed increase in focus on hazards and disaster monitoring and response, but overall, the

message is clear that important existing activities like forest carbon, data democracy, climate change and climate architecture must not be compromised by a CEOS that is stretched too thin by competing demands.

This is a crucial flaw since there are and always will be far more good ideas and genuine needs than there are resources to support them. Without a selection process, CEOS continues to find it difficult to address problems that might arise, and it has no mechanism to manage the stresses posed by ambitious goals during times of economic downturns, or when members are unable or unwilling to fully participate in activities. Similarly, since decisions are taken by general acclamation, activities that do not receive unanimous support are sometimes left in an uncertain status.

A corollary that is implicit in the points above is that without a clear process for choosing its activities, CEOS also has no clear, fair mechanism by which to identify those activities that are within its scope, as opposed to those that would better be done by other coordinating bodies. Leveraging the scope and competencies of other coordination bodies would be another way for CEOS to focus on its strengths and resist “scope creep.”

A reliable process would allow CEOS to select rationally and wisely from among the many good ideas and externally-derived tasks and requirements that it is being asked to handle. CEOS needs to be strategic and thoughtful in its choices, and the message is quite clear that an *ad hoc* approach no longer suffices for an organization of 25 years’ maturity. CEOS is at a turning point in this regard, and the most important new activity that it should undertake is the development of a long-term Strategic Plan that includes updated statements of strategic goals, and which is accompanied by development of a process for proposing, evaluating, and selecting new initiatives, and which includes provisions for how decisions are made, and by whom. The Strategic Plan should also be accompanied by appropriate Work Plans to ensure progress toward established goals.

The need for a process for selecting new activities is crucial, and it one of the key findings of this report. It is equally true, however, that CEOS is fundamentally a forward-looking organization, and that its mission includes the technical exchange of information, international coordination of satellite-based Earth observations, and to optimize the benefits of space-borne Earth observations through cooperation among members. Accordingly, substantive new initiatives are exceedingly important to ensure that CEOS remains responsive and relevant.

Since a key recommendation of this report is that CEOS needs a reliable process for decision-making, the approval of new initiatives should be done not by fiat of this report, but through a fair and strategic process that is yet to be defined. That said, the potential new initiative that was mentioned most frequently by respondents over the course of the Self Study would be an increased CEOS focus in the area of hazards and disaster monitoring and response. Respondents repeatedly highlighted the societal importance of this topic, the great need for predictive tools and coordination with the UN framework, and the extremely high value that space-based Earth observations bring to this area. The Steering Committee feels that this topic is deserving of evaluation as a potential new CEOS initiative through the process that CEOS will design and implement.

FINDING: *CEOS has many ongoing activities at the current time, and no clear process for selecting or approving new activities or tasks. As a result, each new proposal is handled ad hoc, and the reliance on approval by acclamation can leave proposals in an uncertain status.*

RECOMMENDATION #2: CEOS must meet the commitments that have already been made and ensure that current activities have both sufficient guidance and sufficient autonomy to succeed.

RECOMMENDATION #3: CEOS should develop and implement a process for selecting new activities and tasks. The process should be cognizant of potential scope creep, and should include an assessment of whether a proposed activity is supportive of CEOS objectives, whether there are appropriate resources for the activity, how CEOS will adjudicate among multiple good proposed activities, and how decisions on new activities will be taken.

RECOMMENDATION #4: CEOS should develop a concise, yet complete, 5-year Strategic Plan and a schedule for review and update of future Strategic Plans. The Strategic Plan should be accompanied by appropriate Work Plans to ensure progress toward established goals. The plan should not only consider GEO Work Plan goals, but should address primary CEOS goals, and it should contain inputs from the CEOS Constellations, Working Groups, and SBA Teams.

***FINDING:** Respondents repeatedly highlighted hazards and disaster monitoring and response as a topic of great societal importance for consideration as a new CEOS initiative, and they emphasized both the great need for predictive tools and coordination with the UN framework, and the extremely high value that space-based Earth observations bring to this area.*

RECOMMENDATION #5: CEOS should consider the topic of hazards and disaster monitoring and response as a potential new CEOS initiative or area for increased focus, through the decision-making process that CEOS will develop and implement.

Organizational Functions

All areas of response for the CSS emphasized the innate value of CEOS as a coordinating body. There is general consensus that CEOS is good at defining and meeting short-term objectives and handling specific tasks with concrete deliverables (especially true for short-term tasks and requirements provided by external organizations), but that it is substantially less effective at meeting its longer-term and/or strategic level objectives. Most CSS respondents felt strongly that the current voluntary nature of CEOS participation and contribution is the best and only mode of operation for CEOS. There was consensus that expectations need to be matched to realistic timeframes and resources.

It is recognized by all those interviewed that the CEOS Executive functions are critical to the success of CEOS. The outstanding accomplishments of the organization are a direct result of this leadership at all levels. However, there is consensus that CEOS's structure and organizational functioning need improvement. The most common issues articulated included confusion regarding leadership structure and responsibilities, and the sense that the overall structure of CEOS has become extremely complicated and difficult to navigate. CEOS has grown as its scope has grown, and it now finds itself with two governing bodies, multiple working groups, virtual constellations, and societal benefit areas, the lateral and vertical connections among which are not clearly defined or managed.

There is general confusion regarding lines of authority, leadership and divisions of responsibilities among the CEOS Chair, the SIT Chair, the CEO, DCEO, and Secretariat. There is a sense that the leadership structure of CEOS has become more complex as the organization has become more

complex, in response to the need to manage external requirements while maintaining its internal goals. This is not uncommon as organizations grow, but it is cumbersome, and leads to confusion regarding decision-making and prioritization. It would be appropriate, as part of a strategic planning effort, for CEOS to explicitly identify the organizational functions that it now needs, and to consider what structural elements would be required to support those functions.

There is consensus that real technical coordination remains highly valuable. This function occurs predominantly through the Working Groups, Virtual Constellations, and SBAs, and the data strongly suggest that these need to be better utilized and empowered by the CEOS SEC and SIT. Multiple respondents suggested that better use be made of these groups, and that CEOS would benefit from delegating responsibilities and authority to them, giving them both better guidance and more authority over their areas of expertise. This is a two-way street: Working Groups, Virtual Constellations, and SBA Teams need to consider and develop their own strategic objectives and priorities in concert with the CEOS SEC and SIT, these need to fit with overall CEOS goals, and the SEC and SIT need to provide sufficient guidance and feedback to facilitate this process. Another point raised is that the Virtual Constellation concept has been broadening, and now includes not only satellite constellations that need coordination, but also broad communities of practice. This represents a broadening of the original virtual constellation concept and it is not clear that the overall size or shape of the set has been considered. A less common weakness, thought very relevant to some Constellations, is the lack of response from CEOS leadership to presented Constellation issues.

In addition to these concerns, potential threats for the future exist for Constellations. While outside the scope of the CSS to address, the most common future threat is regarded to be fragile funding and the lack of new or sustained missions.

The structure and complementary nature of the four Working Groups and the SBA teams provides them the opportunity to enhance CEOS Agencies' service to stakeholders across their entire spectrum of needs: responsiveness to user requirements, data quality, data availability, and capacity-building for data and information products. Furthermore, the Working Groups' technical expertise and the SBA teams' topical orientation mean that they are placed to effectively carry out the highest priority assignments from GEO and CEOS leadership, providing they are given the appropriate direction, coordination, and resources.

Recently, reorientation of the WGEdu toward the broader implementation of the GEO/CEOS Data Democracy initiative should help CEOS enhance user capacity through full and open provision of EO data and the related tools for its effective application and use.

However, the work of the CEOS Working Groups and SBA teams suffers from the lack of a coherent list of priorities from GEO and CEOS leadership. With so many prospective tasks and the flawed perception that Working Groups and SBA teams can do anything for anyone, it is extremely easy for these groups to get overwhelmed. This situation is coupled with the fact that the CEOS SIT and Plenary meeting agendas have not been conducive to the necessary dialogue on Working Group / SBA priorities and activities. Working Groups and SBA Teams have often formulated their own priorities, with little executive guidance on their annual work, and with minimal Agency resource allocation for their initiatives.

Horizontal coordination among Working Groups, SBA Teams, and especially the CEOS Virtual Constellations (VCs) is often lacking, resulting in sub-optimized work plans and priorities among

all three groups. Additionally, although much effective work takes place in certain SBA Teams, there is a general lack of awareness in CEOS about their activities (with climate, and perhaps disasters, being exceptions).

The data strongly suggest that there is a lack of common understanding regarding the roles, activities, and performance of the Societal Benefit Area teams as distinct from other structural components of the organization, to the extent that different individuals shared with the CSS very different perceptions regarding the number of SBAs, as well as their size, status (active, moribund, or never created), and leadership, and whether they should be continued. CEOS SBA Coordinators are closely aligned with current and future GEO Work Plan tasks, though, and many have been very active in working with the GEO Secretariat and related Communities of Practice, to identify the appropriate role for CEOS Agencies in providing data and technical expertise in support of GEO objectives. While activities in support of GEO are good and necessary, it is important that all CEOS activities be concordant with and supportive of CEOS strategic objectives, priorities, and relationships.

Part of the problem may be the lack of written record for some of these subgroups. While searching for documentation regarding the various subgroups within CEOS for use by the CSS, it was observed that some key CEOS structural components do not have defining terms of reference, or that the terms of reference are out of date and do not reflect the changes that have occurred in response to the organizational demands placed upon CEOS by external organizations like GEO. This is not a surprising finding, since as a best-efforts organization CEOS (and the CEOS Secretariat) do not have any designated administrative focal point for such record-keeping, other than what might be performed on an *ad hoc* basis by the staff of any given CEOS Chair.

***FINDING:** The current organizational structure, responsibilities and term durations are acceptable to the majority and there is also agreement that the current voluntary approach is acceptable. The addition of the funded CEO and SEO roles are viewed as positive recent contributions to CEOS. In the case of the CEO, there is a need to readdress the roles and responsibilities to increase the focus on strategic issues and maintain continuity of support, and to ensure that their substantial burden of ad hoc administrative work does not overburden these individuals at the expense of more strategic issues.*

RECOMMENDATION #6: Update the roles and responsibilities (or Terms of Reference) for the CEO and other leadership positions to increase the focus on strategic initiatives rather than administrative functions. In addition, the term of the CEO should be 2 or 3 years to help maintain continuity of operations.

***FINDING:** There is confusion within CEOS regarding the complex leadership structure, and a lack of clarity regarding the respective roles, responsibilities and authorities of the CEOS Chair, SIT Chair, CEO, DCEO, SEO, and Executive Secretariat. The overall structure of CEOS has become cumbersome and difficult to navigate, with two governing bodies, working groups, virtual constellations, and societal benefit areas, the connections among which are not clearly defined or managed.*

RECOMMENDATION #7: CEOS should explicitly articulate the organizational functions and relationships that it needs in order to perform and sustain its work, and modify the leadership structure, organizational elements, and connections as needed to support these functions. Terms of Reference should be created and/or updated and made accessible, so that CEOS participants have a common understanding of these roles and responsibilities and the interfaces among them.

***FINDING:** CEOS does not always adequately record or update its Terms of Reference, decisions and accomplishments, and does not have an explicit administrative focal point for such tasks other than the rotating best-efforts of CEOS Chair staff.*

RECOMMENDATION #8: CEOS should evaluate what documentation of decisions, actions, and progress it genuinely needs and that is commensurate with resources, and it should establish internal processes and designate responsible parties to sustain that documentation effort.

***FINDING:** Working Groups, SBAs and Virtual Constellations are not laterally well-coordinated, though they carry on important CEOS work. Additionally their current task loads are not commensurate with existing agency provision of personnel and other resources.*

RECOMMENDATION #9: Strengthen working relationships among Working Groups, SBA Coordinators, and VCs to support common CEOS objectives around high-level CEOS initiatives and their cross-WG/SBA synergies, rather than on a project-by-project (or even SBA-by-SBA) basis. Encourage the CEO and DCEO and other leadership as appropriate to attend WG meetings to help communicate CEOS priorities on a cross-WG and cross-SBA basis. Utilize the CEOS website more effectively for lateral CEOS communications and initiative/task coordination across Working Groups, SBAs, and VCs. Rebalance the task load to more effectively utilize and leverage existing resources.

RECOMMENDATION #10: Develop clearly-articulated and published goals and objectives for SBA Coordinators. SBA Coordinators' roles, responsibilities, and terms should be formalized through development of Terms of Reference or position descriptions that are developed by the SIT and reviewed and endorsed by the CEOS Plenary. Routine outreach to GEO Secretariat staff and routine reporting to CEOS Secretariat members should be part of the SBA Coordinators' responsibilities. Consider greater emphasis on the physical results of coordination, such as data products.

Membership and Participation

Concerns surfaced in the CSS regarding the level of member participation in CEOS. It is widely commented by participants in both the CSS and in other CEOS venues that many Associate and Affiliate members who formerly were active no longer attend CEOS meetings. It is often stated anecdotally that this is because these organizations are now within GEO and GEO comes to the table for all, but this appears to be an assertion that has not yet been validated through discussion or correspondence with formerly-active associates or affiliates. Even if the assertion were found to be valid, it is unlikely that participation in GEO would be viewed as a sufficient substitute for direct participation in CEOS activities and meetings.

Respondents to the CSS also expressed the need for CEOS to turn more attention to other partners beside GEO. Both GCOS and UNFCCC were mentioned multiple times as partner organizations with high mutual value and visibility for CEOS. Some respondents also expressed a desire to evaluate the balance of R&D versus operational agencies, and to reinvigorate the CEOS goal of space agency coordination, in order to encourage active participation by more members and to explore how to give smaller agencies more of a role. It should be noted that there is an abundance of roles to go around (including CEOS tasks, CEOS/GEO tasks, Working Groups, Virtual Constellations, and/or SBA Team participation), and that many of these roles are currently unfilled or filled disproportionately by a relatively few members.

The CSS had hoped to interview a wide range of representatives of Associates, Affiliates, and other external bodies, but time and resource constraints precluded inclusion of this component in the current study scope. From the selected interviews that were conducted in this category, we believe that it would be of strong benefit to CEOS to conduct a follow-on activity to engage these outside organizations to ensure that CEOS has full benefit of their perspectives.

Similar weaknesses in participation are noted at the Virtual Constellation, Working Group, and SBA levels of CEOS. Currently, a small minority of CEOS Agencies (~20% of the membership) supports the majority of the workload taken on by the CEOS Working Groups and SBA Coordinators. Leadership succession remains uncertain for both WGCV and WGISS, with neither group having a prospective Vice Chair identified for 2012-2013.

Similar concerns are strongly expressed for the Virtual Constellations. The primary weakness, common to all of the Constellations, is the lack of universal participation. Of the 29 CEOS space agencies, only 8 are represented in 3 or more Constellations. Representation of all relevant CEOS agencies and participating members is critical to the success of Constellations. Such participation will benefit international coordination of missions and projects and establish clear support and advocacy for those missions and projects.

***FINDING:** Participation in CEOS meetings by affiliate and associate members has declined, and while there is anecdotal evidence that attributes this to participation in GEO, there is a paucity of evidence to confirm this assertion.*

RECOMMENDATION #11: As a follow-on to this Self Study, CEOS should reach out to non-active full members as well as affiliate and associate members and survey them to understand their reasons for no longer participating in CEOS.

***FINDING:** Active participation of the CEOS members and associates is critical to the success of CEOS. There are currently 29 space agency members and 21 associates with a potential for more in the future. In order to ensure active participation of those members and associates, there must be a clear method for accepting new members and monitoring the participation of current members and associates, and for ensuring that all members are empowered to participate in some manner. As a volunteer organization, it is critical that CEOS maintain an active membership to achieve its planned goals.*

RECOMMENDATION #12: New CEOS members and associates should be accepted as "temporary" for a two-year trial period prior to acceptance as full members, associates or affiliates of CEOS, during which time every effort should be made to engage them in CEOS activities. This period should be used to encourage and evaluate the engagement and contributions of those members to the CEOS organization, including participation in some measure in Working Groups, Constellations, major meetings, and/or other CEOS functions. "Permanent" membership should only be considered following the successful completion of the initial trial period. CEOS should also maintain awareness of the attendance of members and associates at CEOS meetings, including Plenary, SIT, and Working Groups, Virtual Constellations and SBA Teams as appropriate.

***FINDING:** Insufficient participation by members and the resultant inability to do succession planning hampers the ability of Working Groups, Virtual Constellations, and SBAs to accomplish their tasks, and places an excessive burden upon agencies and individuals who do participate.*

RECOMMENDATION #13: CEOS Working Groups, Constellations and SBA Teams should address the lack of participation by providing a list of strongly desired space agencies and associates to the CEOS SIT. CEOS Principals can be made aware of their desired participation in Constellation efforts and the anticipated gain from such participation. If participation continues to be too low to sustain necessary Constellation activities, CEOS leadership should work with the WG, VC, or SBA Co-chairs to identify and address the reasons.

Objectives of Meetings

While perhaps not at the same level as the need for a process for selecting new initiatives, a common theme running through responses to the CSS is frustration with the format and content of CEOS major meetings. The chief concern expressed is that the meetings are dominated by reporting and review of small tasks at the expense of the big picture, i.e. discussion, coordination, and decision-making. Respondents also expressed that the major in-person meetings contain repetitive material and fail to leverage the opportunity represented by having multiple space agencies in the same room.

Respondents noted that Working Groups and Virtual Constellations contribute a substantial share of the overall progress attributable to CEOS, and that the established venues for reporting progress are the annual Plenary meeting and the major SIT meetings. However, although these meetings are widely acknowledged to be well-run and important, there is a clear sense of missed opportunities due to the focus on GEO-related task reporting. Respondents expressed a strong desire to see CEOS actions receive an investment of time, tracking and measurement of progress that is in balance with the investment given to CEOS-GEO actions, and to provide better opportunities for guidance and feedback to and from Working Groups, Virtual Constellations, and SBAs. Implicit in this desire is a need for external stakeholders to provide clearer prioritization of the activities that they would like CEOS to undertake, so that they can be more effectively balanced against other CEOS business.

***FINDING:** There is frustration that CEOS meetings are repetitive and dominated by reporting and review of routine task progress at the expense of discussion, coordination, and decision-making. The outcomes of these meetings are critical to the success of CEOS, and the use of them for routine reporting represents a missed opportunity to make progress on issues of strategic relevance.*

RECOMMENDATION #14: Consider developing a unified meeting plan, in which the scope, format, and purpose of the CEOS Plenary and SIT meetings for the entire year are developed. Better define what needs to be addressed at SIT & Plenary meetings to create a complementary rather than repetitive structure, and revise the format of major meetings and telecons to reduce repetition and reporting, to ensure engaged participation, and to facilitate discussion and decision-making. Routine reporting should be included as part of the written read-ahead material of telecons and meetings, and should not be the focus of the meeting agendas.

***FINDING:** Much CEOS progress is due to the outstanding accomplishments of the CEOS Working Groups and Constellations. External agencies recognize that these CEOS groups are the primary forum to address Earth observation needs, and often request CEOS group support. These requests result in a large number of potential tasks within each Working Group or Constellation with no process to evaluate relevance and priority.*

RECOMMENDATION #15: The CEOS Plenary and/or SIT meetings should provide sufficient time for consideration of Working Group, Virtual Constellation, and SBA Team priorities and

recommendations together with strategic discussion and direction to these groups on their annual work. Working Groups, Virtual Constellations and SBA teams should be encouraged to more specifically measure and document their progress in relation to CEOS's highest priorities. In turn, CEOS leadership should actively participate in establishing priorities for the Working Groups, Constellations, and SBA Teams by reviewing these initiatives and gathering feedback from the SEC and SIT to reach decisions.

This completes Part 1 of the CSS Report. Please look for full Study Team reports, interview summary and supplementary material in
CEOS SELF-STUDY Part 2: Annexes
(separate pdf)