# AMERIGEOSS: A GEO INITIATIVE

# NOVEMBER 6, 2015

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# 1. Executive summary

The Americas Caucus members (Argentina, Bahamas, Belize, Brazil, Canada, Chile, Colombia, Costa Rica, Ecuador, Honduras, Mexico, Panama, Paraguay, Peru, and the United States) have recognized the value of working together as one region to meet GEO objectives. In October 2014, the AmeriGEOSS initiative was born as a way to continue the progress made at that meeting in identifying regional needs GEO can address. Priority thematic areas identified form the technical basis of this initiative. The management arrangements that create organized thematic and coordination-working groups provide the sustained coordination framework to ensure the success of this initiative over the next decade.

With this initiative, the American Caucus assumes greater responsibility in short- and long-term planning for the development of activities through regional cooperation that reflect the local, national, and regional interest; this responsibility will be entrenched in the technical capabilities of its country members and in the resources of other global initiatives that may be available for the benefit of the region.

# 2. Introduction

The Americas Caucus members have recognized the value of working together as one region to meet GEO objectives: improve and coordinate observation systems; advance broad open data policies/practices; foster increased use of Earth Observation (EO) data and information; and build capacity across the GEO societal benefit areas (SBA's). Great progress and great relationships have been formed between Caucus principals and their staff during Caucus teleconferences and meetings. Three GEOSS in the Americas Symposia in Brazil in 2007, Panama in 2008, and Chile in 2011 have encouraged dialogue across thematic areas of importance to the region. While these Symposia provided valuable interchange, the ability to continue interactions have been hampered by lack of consistent regional coordination and communication other than preparation for and at Caucus-level meetings each year in association with GEO Plenary and Ministerial meetings.

Efforts to encourage further engagement have included offering general GEO overview webinars to GEO member countries in Fall 2013, reaching out to Americas Embassy representatives in Washington DC in August 2014, and the first ever GEO Americas Caucus 2-day workshop hosted by Americas Caucus Chair Colombia in October 2014.

On October 2014, delegates from Argentina, Canada, Chile, Colombia, Costa Rica, Honduras, Mexico, Panama, and United States, met in Bogotá, Colombia with the objective of sharing the experiences and activities of members of the Caucus of the Americas in the framework of the Group of Earth Observation (GEO). The members also explored how the regional perspective could be included within the GEO implementation Plan 2016-2025. Presentations from Argentina, Canada, Costa Rica, Brazil, USA and Colombia among others, were included as well as discussions on the Regional initiative to be proposed in the future of the GEO Implementation Plan for the 2016-2025 GEO

decade. The discussions led to the identification of four areas of common interest to the countries of the Americas Caucus, along with a continued emphasis on capacity building:

1. *Agriculture, associated with climate variability, climate change, and food security*
2. *Disaster risk reduction, particularly for data exchange associated with early warnings, and for the generation of regional products of early warnings*
3. *Water, associated with the management approach of water resources and data management*
4. *Biodiversity and Ecosystem Monitoring, in the context of capacity building for better monitoring, management, and maintenance of ecosystems and biodiversity they support; and to predict future changes*

The resulting Declaration from the October 2014 meeting was presented at the GEO-XI Plenary. This Declaration was discussed, and it was emphasized that these four areas of emphasis are in addition to those activities that are already working well, e.g. GFOI and SilvaCarbon.

Since the GEO XI Plenary, a small writing team from the GEO Co-chairs Colombia and Mexico, as well as members of the USGEO, have been developing this initiative. Following the path forged by the AfriGEOSS initiative, the AmeriGEOSS seeks to regionalize participation in the areas of Water, Agriculture, Disaster, Biodiversity and Ecosystems. This participation seeks to increase the efficiency and interoperability of Earth observations for better decision-making and to foster regional cooperation and capacity building among GEO members under the GEO principles.

## 3. Need for action

The Group on Earth Observations (GEO) was established as a voluntary partnership in February 2005 and in response to calls for action by the 2002 World Summit on Sustainable Development and the Group of Eight (G8) leading industrialized countries. These high-level meetings recognized that international collaboration is essential for exploiting the growing potential of Earth observations to support decision making in an increasingly complex and environmentally stressed world.

As of November of 2015, 15 countries in the American continent have joined this partnership to pursue the vision of GEO: “a future wherein decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and sustained Earth observations and information.” Efforts on GEO’s SBAs have been taking place in the region and are in various stages of development; however, progress and engagement has not been uniform due to challenges of different nature, in particular the lack of a framework to harness opportunities for regional progress.

GEO’s regional caucus structures play an important role in the overall governance of GEO. Additional engagement across SBAs focused on regional, national or local level requirements has been shown to be beneficial by efforts such as SERVIR (https://www.servirglobal.net/), the EGIDA project (http://www.egida-project.eu/), the Asia-Pacific Symposia (http://www.earthobservations.org/afrigeoss.php) and AfriGEOSS

(http://www.earthobservations.org/afrigeoss.php). This initiative defines regional coordination mechanisms to strengthen consistent engagement in the Americas, with the hopes to engage all countries in the Americas in the next decade.

## 4. User engagement

a. *How established user communities link to the initiative*
b. *How the activity would benefit stakeholders (in particular developing countries)*
c. *How it feeds into decision-making processes*

Some GEO flagships are already addressing the AmeriGEOSS priority areas. The first step will be to engage with the GEO flagships and their end user communities from Americas member countries. From there, we will strengthen the engagement of other Americas countries, and work with the flagships to tailor their work to address regional needs. Regional needs will be brought to this initiative through coordination in the AmeriGEOSS initiative. In particular, unaddressed needs from developing countries will be prioritized. In each case, the data, information or tools being developed by the flagships will be tailored to meet the needs of the decision-makers in each of the Americas nations.

## 5. Previous development and results

America's-member countries have been working to contribute to the development of GEO. For example, within the Water SBA Information System Development and Capacity Building Task (WA-01-C5), led by Angelica Gutierrez from the United States, an excellent technical network has been established through the Centre of Hydrologic and Spatial Information for Latin America and the Caribbean (CIEHLYC). This group of water and remote sensing experts from governments and academia has created an international non-profit network that coordinates the activities of GEO for capacity building and development of water-related projects in Latin America and the Caribbean.

The United States, co-directs the network's activities of capacity building and project development with Mexico, Chile, and Argentina. These countries have initially taken the lead in their areas of expertise, but welcome others to participate and lead with activities related to water. Specific expertise includes:

- Mexico leads in oceanographic activities, with the management of the Antares marine monitoring network with stations in 10 countries in Latin America (http://www.antares.ws). The objective of this network of marine monitoring data is to generate high quality in situ data that enables the ability to discern between natural and anthropogenic variability. This network is a pioneer in this type of monitoring and currently represents the Latin American branch of the global network Chloro-GIN. http://www.antares.ws.
- Chile is leading capacity building for high school students, with its pilot program "GEO for the millennial generation," and promoting the use of the GEONETCast

system not only for training, but also for decision making in the areas of agriculture and disasters.

- Colombia leads the campaign for the implementation of CNG-A system at national and local level, operating the first pilot project of mercury contamination in the region.
- Argentina leads the training in operational oceanography, including in numerical modeling of water quality, ecological, sediments, etc.
- The United States has the overall coordination of the group and leads activities in the area of hydrology and marine biodiversity. The U.S. has initiated a Marine Biodiversity Observation Network (MarineBON) demonstration project, with stations in Florida (Florida Keys coral reefs), California (Monterey Bay and Santa Barbara Channel), and Alaska (Chukchi Sea, oil exploration areas). These pilots are funded under a partnership of U.S. Federal agencies that include National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), Bureau of Ocean Energy Management (BOEM) and private industry (Shell Oil). The Smithsonian Institute has also initiated a large international marine biodiversity experimental effort, the Tennenbaum Observatory. This larger MarineBON is a contribution by the U.S. to GEO BON.

AmeriGEOSS proposes to link some of these efforts to form groups of networks, and to provide pathfinder activities to foster regional collaboration. For example, there is significant potential benefit in collaborations between the agencies and scientists working on the Antares Network, the U.S. MarineBON pilot projects, and the Smithsonian Tennenbaum Observatory. They could be linked through AmeriGEOSS to both GEOBON and GEO Blue Planet to form a cross-cutting activity that links ecological observations to the socio-economic well-being of communities that depend on marine and coastal resources.

# 6. Partners

In addition to member countries, there are many participating organizations from the Americas countries. There are non-Americas countries contributing to the development in the Americas that also can serve as partners.

For example, the OAS Pan-American Institute of Geography and History (PAIGH) has members from 20 countries in the region, but limited participation in GEO, under the GSDI Specialized Organization entities. The Institute of Electrical and Electronics Engineers (IEEE) Geoscience & Remote Sensing Society (GRSS) has chapters in the Americas and while IEEE is a participating member of GEO, IEEE GRSS could be more engaged. Also, in many Americas countries, there are embassy representatives that are active in bilateral and regional relationships and activities. We will continue to engage the embassies as a way to increase communication, identify representatives in countries, which are already members of GEO, and as a means of inviting new countries to join GEO. They also may be able to provide additional services during project execution, e.g. translation services.

# 7. Activities description

The specific goals of the AmeriGEOSS initiative are to address coverage gaps, develop actionable tools and services, build capacity in GEO-member countries by leveraging existing expertise, technology, and efforts in-country and across the region, and apply the knowledge and capabilities of partner members to address gaps and challenges. Over the next ten years, the partnership will:

- Enable countries to benefit from improved environmental understanding, to better address societal needs in the following areas: Agriculture, Disaster risk reduction, Water, and Ecosystems including Biodiversity monitoring.
- Leverage technical resources, and scale up existing capabilities throughout the region.
- Strengthen institutional and personal capacity, through sustained and targeted training in the use of EO.
- Promote open community-developed data standards and data sharing. The term "data" refers not only to the observations obtained through in situ or satellite monitoring, but also to information obtained through modeling.
- Promote the integration of data products that bring together in situ and satellite observations in the relevant areas of cooperation
- Promote the implementation and strengthening of regional Earth observing systems

To accomplish these ambitious goals AmeriGEOSS will:

- Assist in the coordination of pilot projects,
- Facilitate interoperability of data resources for reuse at global, regional and/or national scales
- Promote learning and mentoring of water data tools, standards, conventions and best practices for improved environmental understanding at the local level
- Engage stakeholders to address global and regional challenges
- Foster regional cooperation to build institutional and personal capacity
- Assist in activities that will lead to the strengthening of regional observing GEO networks.
- Use and promote, where appropriate, foundational activities of GEO

AmeriGEOSS also seeks to increase institutional and personal capacity through the acquisition and sharing of technology and training, and engage experts, stakeholders, and decision makers in the process of decision making through cooperation.

## 7.1. Areas relevant for coordinated projects that focus on societal benefits

Proposed areas are:

- Agriculture, associated with climate variability, climate change, and food security;
- Disaster risk reduction, particularly for data exchange associated with early warnings and for the generation of regional products of early warnings.
- Water, associated with the management approach of water resources and data management.
- Biodiversity and Ecosystem Monitoring in marine, freshwater, and land habitats, in the context of capacity building for better monitoring, management, and maintenance of ecosystems and biodiversity they support; also to predict future changes.
- Several thematic areas have longstanding engagement in the Americas, and will continue to engage and be strengthened, e.g. in the areas of biodiversity and forest management.
- Specific activities that will help to improve information systems and the exchange of experiences, e.g. communities of practice; strengthening national capacities through a comprehensive program with vision, resources, and its own life; and webinars and technical seminars.

### 7.1.1. Agriculture and Food Security Activities

Agriculture, associated with climate variability, climate change, and food security, is another focus of this initiative The socio-economic and environmental characteristics of the region call for a unique vision when implementing agricultural monitoring initiatives. Food security is integrally linked with water availability for natural systems, for agriculture, and for the built environment (cities, towns, industrial parks, ports, etc.). Food security is also intimately linked with land use, land cover, and coastal management practices that sustain optimal biodiversity states and ecosystem productivity for healthy ecosystem services. Contrasts in the level of development of agricultural productivity, as well as the climatic and topographic diversity among regions and countries of the Caucus demand new approaches to the application of Earth observations for the collection and processing of information from the agricultural sector. While the GEOGLAM initiative has advanced information for the global monitoring of crops and markets, its application in countries of tropical agriculture with more complex dynamics requires new methodological and conceptual approaches. The concept of implementing AmeriGEOSS in agriculture and in coastal and marine biodiversity monitoring is a valuable opportunity to strengthen the actions of GEO globally by responding to the needs of the regional level in the Americas. The decisions in agriculture, aquaculture, and coastal resource use by AmeriGEOSS countries will collectively spur further actions for capacity building and information exchange among countries of the Caucus.

The world's population has increased by 130% during the last 50 years, from an estimated 3.0 billion in 1960 to 6.9 billion in 2010. The United Nations projects a population of 9.2 billion by the year 2050. Food demand is driven by population size and

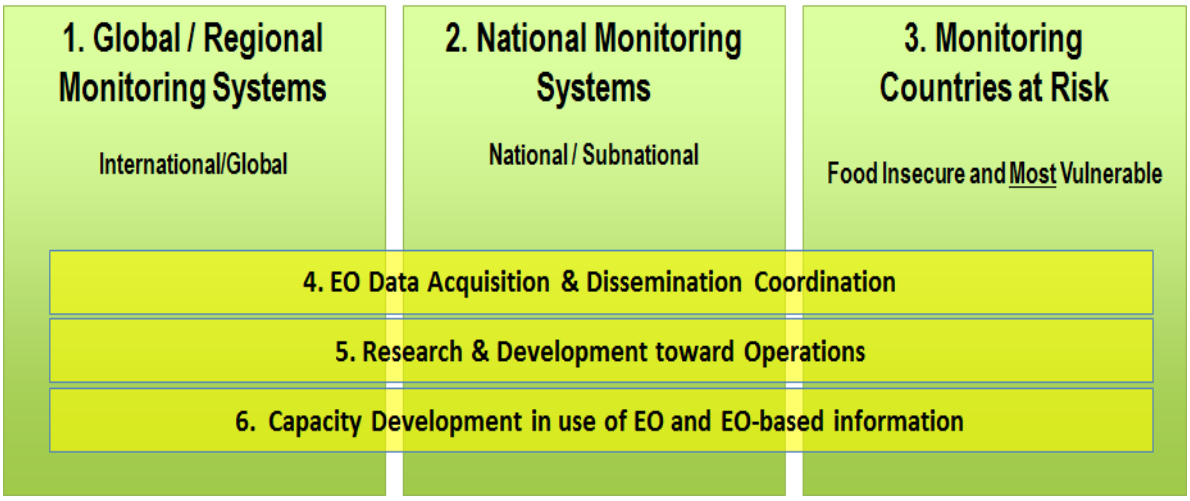
consumption habits, which in turn are influenced by culture and standards of living, with average food consumption varying greatly across the globe. In addition to providing food and feed (animal), agriculture, aquaculture and fisheries also generates products for the energy (biofuels), materials (wood, fibers, textiles) and chemicals industries, with an increasing competition among these sectors (4F: Food, Feed, Fuel, and Fiber). Properly managed ecosystems with a desired biodiversity offer significant economic opportunity beyond food security, including tourism and recreation, adequate clean water supply, and emerging opportunities in other chemical harvesting, such as for pharmaceuticals.

The agriculture, aquaculture, and fisheries sectors faces new and emerging challenges to meet the demands of growing populations for an ever-broader spectrum of agricultural products, fish migrations, and invasive species. One of the challenges is particularly in the context of a changing climate. At the global levels, agricultural and fisheries production are marked by high temporal and geographical variability. Furthermore, over the past decade, agricultural markets have become increasingly volatile, threatening food security and human livelihoods. Fisheries and coastal living marine resources have been stressed everywhere around the globe for many years. The diverse socio-economic and environmental characteristics of the Americas call for creative approaches in implementing agricultural and marine living resource monitoring initiatives. Contrasts in the level of development of agricultural productivity and marine industries, as well as the climatic and topographic diversity, among regions and countries of the Americas Caucus demand new approaches to the application of EO for the collection and processing of information about the agricultural and marine living resources use sectors.

#### 7.1.1.1. GEOGLAM

To this end, in 2011 the G20 Agricultural Ministers mandated the creation of a GEO Global Agricultural Monitoring Initiative (GEOGLAM), toward improving the use of EO-based information about crop condition and production at earlier periods in the agricultural growing season. GEOGLAM also provides an opportunity to develop management paradigms that consider linkages between water quality, land use, coastal and marine resource health, and sustainable use. GEOGLAM's primary objective is to reinforce the international community's capacity to produce and disseminate timely and accurate information on agricultural production at national, regional, and global levels through the use of satellite and in situ EO. The tools underpinning remote sensing-based agricultural monitoring have developed or multiplied, but the adoption of these tools, as well as the access to the space-based data required for monitoring, remain heterogeneous across the globe, including the Americas. Similar tools are being developed for marine resource observation. Through the coordination of satellite and *in situ* observations, and through the transparent sharing of methods and information, GEOGLAM aims to improve regional-to-global scale agricultural information.

GEOGLAM has 6 components, including 3 core components and 3 cross-cutting components:




Component 1 deals with the creation of global and regional monitoring systems, and has been quite active with the creation of its Crop Monitor for AMIS (Agricultural Market Information System; www.amis-outlook.org; www.geoglam-crop-monitor.org) and in Asia through the Asia-RiCE (www.asia-rice.org) activity. However, there is a strong need to create more regional networks around the world, including in the Americas. The current Crop Monitor for AMIS focuses only on maize, soybean, wheat, and rice, and focuses only on the G20+7 countries responsible for 80% of their global production,, leaving important subsistence areas and crops outside of the formal reporting procedure. To this end, GEOGLAM is developing an Early Warning Crop Monitor, targeting areas vulnerable to food insecurity, with special attention to the relevant crops and threats to crop production not accounted for in the current Crop Monitor for AMIS. Also, acknowledging that rangelands and pasture lands are a crucial component of food security and markets both in the Americas and beyond, GEOGLAM is also developing its Rangeland and Pasture Productivity (RAPP; www.geo-rapp.org) monitoring activity, which has its own efforts to develop national capacity, build a network of test sites for best-practices development, and is in the process of prototyping a RAPP Monitor as well.

Supporting the growth national monitoring systems, which utilize EO data for analyses and the production of national statistics, is a crucial component of GEOGLAM (Components 2 & 6). In the Americas, several investments have been made in the strengthening of national capacity to utilize remote sensing-based methodologies in Mexico, Brazil, and Argentina. These efforts include training workshops, sharing of best practices, and the transfer and installation of various EO-based monitoring systems to national monitoring agencies. The University of Maryland and NASA have partnered with SAGARPA (Mexico), CONAB (Brazil), and INTA (Argentina) to customize and install the Global Agricultural Monitoring [GLAM] system (e.g. http://pekko.geog.umd.edu/glam/brazil/zoom2.php). The GLAM system utilizes time series of MODIS data and ancillary information to aid near-real time monitoring of crop conditions and decision support. Meanwhile, research activities have been undertaken in the Americas to refine methodologies and develop best practices via the Joint Experiment

on Crop Assessment and Monitoring (www.jecam.org), a network of agricultural test sites distributed across diverse agricultural landscapes, and led by Agriculture and Agrifood Canada.

At present, there are generally poor statistics on regional marine biodiversity and living marine resource exploitation. GEOGLAM provides an opportunity for countries to better manage these national resources.

Crucially, there remain many opportunities to engage additional Central and South American countries in the GEOGLAM initiative, but institutional and financial support are needed in order to progress in this domain. This would be greatly facilitated by the creation of an Americas GEOGLAM with a strong coordination body, to maximize knowledge, experience, and data transfer north, south, east, and west. The concept of implementing AmeriGEOSS in agriculture and living marine resource use is a valuable opportunity to strengthen the actions of GEO globally by responding to the needs of the regional level in the Americas. The decisions in agriculture and marine resource by AmeriGEOSS countries will collectively germinate further actions for capacity development and information exchange among countries of the Caucus.

**Contributors:**

- AAFC (Agriculture & Agri-Food) Canada
- INTA (Instituto Nacional de Tecnologia Agropecuaria) – Argentina
- SAGARPA (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación Secretary of Agriculture) - Mexico
- CONAB (Companhia Nacional de Abastecimento) -Brazil
- INEGI (Instituto Nacional de Estadistica y Geografia) – Mexico
- USDA (U.S. Department of Agriculture) - USA
- USGS (U.S. Geological Survey) – USA
- NASA (National Aeronautics and Space Administration) – USA
- University of Maryland – USA

#### 7.1.1.2. Agriculture and Food Security Capacity Building

CEOS Working Group for Capacity Building and Data Democracy (WGCapD) will work with GEOGLAM and with GEO Capacity Building activities to support trainings and workshops. The needs for these trainings will be identified in 2016.

### 7.1.2. Disaster Activities

The vulnerability of members of the Americas Caucus to the effects of climate change and increasing variability requires the adoption of appropriate approaches for the region to enable integrated management of the disaster cycle, particularly with the implementation of mechanisms for exchanging information that will generate national and regional early warning products. It is necessary for the region to develop a plan for capacity building on the use of geospatial information and to work towards disaster risk reduction, particularly for data exchange associated with early warnings and for the

generation of regional products of early warnings. Current initiatives and projects, such as different architectures and platforms, can help fill the gaps between countries for effective risk management of disasters at the regional level, which in turn can contribute to overall risk management in the framework of GEO.

#### 7.1.2.1. Data broadcast through GEONETCast-Americas (GNC-A)

GEONETCast Americas is a service that is well suited to disaster preparedness and response. GNC-A receive stations can, in many if not most cases, operate with a 1.8-meter or smaller antenna in emergency situations. They do not rely on the Internet or a utility provided power source. Since the receiver powers the antenna, a mobile power source, such as a generator, is all that is needed to power the station. These factors allow GNC-A stations to be portable. The International Charter on Space and Major Disasters recognizes GEONETCast Americas as an alternative dissemination system. GNC-A users have sent a petition letter to the Disaster Charter so that once the Charter is activated, the information (including high-resolution imagery related to the disaster area) be transmitted through the GNC-A system.

#### 7.1.2.2. DEWETRA

DEWETRA is an open source platform capable of ingesting multiple data formats, combining dynamic and static layers to build disaster risk scenarios in near real time,. It is an excellent prospect platform for integration, visualization, and data management of the early warning systems. DEWETRA is the Italian Government's contribution to the Group of Earth Observations (GEOSS)

DEWETRA has been implemented by the hydro-met services in Ecuador (INAMHI) and Bolivia (SENAMHI). In Bolivia the DEWETRA platform was installed a few years ago, as part of a project on early warning with a meteorological approach. A new phase is about to start to strengthen flood forecasting. Various ministries and institutions such as the hydrometeorological National Service (SENAMHI) and the Vice Ministry of Civil Defense (VIDECI) use the DEWETRA platform.

Dr. Lauro Rossi (lauro.rossi@cimafoundation.org), DEWETRA coordinator in Italy, provided information to the Hydro-met services in Colombia (IDEAM). IDEAM in association with the Climate Change Adaptation Fund and the Spaniard Meteorological Agency (AEMET), is developing an Early Warning System for Colombia which includes four weather radars, the integration of the four existing radars in the country, and the integration of 410 semiautomatic hydrometeorological stations within the system. Such infrastructure must be articulated through a software architecture that allows modeling risk scenarios in near-real time as well as an interface for alert products, reports, etc.

DEWETRA is an excellent prospect platform for integration, visualization, and data management of the early warning system of Colombia. The implementation of the platform will be sought within the framework of GEO actions, to strengthen the prognosis, monitoring, and risk prevention in the areas of hydrometeorology and forestry wildfires.

#### 7.1.2.3. GEO Disasters Task Regional End-to-End Systems

There are numerous disaster activities focused on the Americas that are organized under the GEO Disasters Task DI-01 Informing Risk Management and Disaster Reduction. The task coordinator for DI-01 is Kerry Sawyer representing the Committee on Earth Observation Satellites (CEOS). Because of the integration of satellite data for modeling and monitoring disasters, many activities under this Task are global in nature, but involve regional and national participants as practitioners and end users, such as within the Regional End-to-End systems component DI-01-C3. In addition to CEOS space agencies, participating regional/national agencies in this work component include the Caribbean Institute for Meteorology and Hydrology (CIMH), the Caribbean Disaster and Emergency Management Agency (CDEMA), and the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC). Satellite data products and maps are combined under this component with ground sensor data in an architecture that is compatible with the Global Earth Observation System of Systems (GEOSS) interoperability specifications. The data offerings under the DI-01 Task are multi-hazard and integrate risk information across all individual risk areas so decision makers have the best information at their fingertips for handling alerts, response, recovery, and on-going mitigation for reducing risks and increasing resiliency.

As an outgrowth of the Kyogo Framework for Action update that was issued in March 2015 at the UN International Strategy for Disaster Risk Reduction (DRR) conference in Sendai Japan, an Initiative for DRR named GEO-DARMA. The disasters working group within the AmeriGEOSS Initiative will coordinate with GEO-DARMA to ensure that data products and services developed in the Americas are cooperative and interoperate with other components developed within the GEO-DARMA structure.

#### 7.1.2.4. CEOS Disasters Working Group

CEOS is a forum for coordinating civilian satellite agency activities and the Disasters Working Group (DisWG) within CEOS has been conducting disaster pilots for flooding, volcanoes, and earthquakes since early 2014. In addition, a new multi-hazard pilot for landslides that would span these disaster areas is being proposed and will be considered for approval at the November 2015 CEOS plenary. Work under these pilots is being conducted on regional scales where the events have their highest impact. For example, there is a regional component within the flood pilot for the Caribbean and Central America. The volcano pilot region of interest is the Central and South America including Mexico. CEOS agencies are contributing hundreds of satellite images for these regional disaster pilots annually. Satellite data are being developed into improved maps to characterize the evolution of disaster events and develop risk reduction information delivered as actionable products that are widely available. End users for the CEOS DisWG pilot data products include numerous regional and national agencies in the Americas in addition to international groups such as the World Bank, World Food Program, and Red Cross/Red Crescent.

#### 7.1.2.5. Country Contributions to Disaster Risk Management

**COSTA RICA**

Another activity that is underway within the Central American Integration System (SICA) umbrella and in particular CEPREDENAC is to support implementation of disaster components and services under the control of DAI in Costa Rica. DAI is part of a consortium responsible for building the Climatic Information Platform for Central America and the Dominican Republic as part of the Regional Climate Change Program (RCCP). The U.S. Agency for International Development (USAID) and the NASA SERVIR program are supporting the establishment of the open source software, satellite data products, and models that are being installed that will perform the platform disaster risk management role.

**PERU**

NASA and the U.S. Army in Peru are conducting another activity involving landslide susceptibility mapping and landslide modeling at the request of the Peru Ambassador to the U.S.

**BRAZIL**

A new activity involving NASA is about to start in Brazil to assist in preparing for disaster modeling and monitoring using satellite data in advance of the 2016 summer Olympics to be held in Rio de Janeiro.

**CHILE**

The main objective of the Chile Disaster Risk Management contribution is to align with other regional and global initiatives within GEO in order to develop and implement prototype services according to national priorities, to develop interoperable connections within and outside the continent using GEO data sharing principles, spatial standards, open source data and software, in order to reduce the vulnerability of the population to disasters.

- Within Chile, the goal is to strengthen both the commitment of the agencies involved at the present time, and to enroll other agencies that can contribute to reduce disaster risk.
- Outside Chile, the goal is to link with additional contributions and activities, such as within AmeriGEOSS and GEO-DARMA.

The establishment of criteria and policies related to the management of disasters will be applied with the goal of hazard assessment and disaster mitigation, harmonizing the excellent work carried out by the emergency management agencies while fostering innovation.

**Contributors:**

- CIMA (Centro Internazionale in Monitoraggio Ambientale) – Italy
- USGS (United States Geological Survey) – United States
- NOAA (National Oceanic and Atmospheric Administration) – United States

#### 7.1.2.6. Disasters Capacity Building

##### 7.1.2.6.1. GEOSS Architecture Implementation Pilot Capacity Building

The GEOSS Architecture Implementation Pilot (AIP) is a set of progressive activities that organize technical disasters-related work and is a testbed for demonstrating progress towards achieving GEO goals of implementing GEOSS and improving the utility of Earth Observation (EO) data. Extensive work with an array of Chilean agencies to increase interoperability across data offerings has been undertaken under AIP-7 and AIP-8 during 2014 and 2015 culminating in a GEOSS session at the 7-10 September 2015 Spatial Data Infrastructure workshop in Santiago Chile focusing on the accomplishments and plans for upcoming AIP activities. These accomplishments are especially important in light of the potential for upcoming (2016) El Nino impacts on Central and South American countries. Chilean agencies involved in the AIP Capacity Building Working Group activities include the Ministry of Foreign Affairs, Chile's Meteorological Office, the National Agency for Geospatial Information, National Emergency Management Office, Chile Department of Natural Resources, Hydrographic and Oceanographic Service, Universities of La Serena and Santa Maria, and the Aerophotogrametric Service (the Chilean Satellite Agency).

Future efforts of this body within the Chile GEO-AIP include establishment of a distributed network of data publishers serving products collected mostly through sensors. This distributed architecture is at the foundation of the GEOSS Common Infrastructure. Sensors will cover both the ground, air and water-based sensors such as the ones monitoring earthquakes, tsunamis and volcanic activities, and will include the ones on satellites, such as NASA's EO-1 and Chile's FASat Charlie. Other sensors, such as webcams and cameras on mobile devices may be also incorporated. The AIP-GEO work in Chile may become part of the GI-16 also called "Data Access for Risk Management (implementation of the Sendai framework 2016-2030)". The main website for the AIP-GEO effort within Chile is http://www.ide.cl/. Questions should be forwarded to Luciano Parodi (lparodi@minrel.gov.cl) or Lucia Lovison (lovison@afriterra.org ).

##### 7.1.2.6.2. CEOS WGCapD Capacity Building

CEOS Working Group for Capacity Building and Data Democracy (WGCapD) will work with the Disasters Working Group and with GEO Capacity Building activities to support trainings and workshops. The needs for these trainings will be identified in 2016.

### 7.1.3. Water activities

The growing impact of weather phenomena and land use changes (e.g., loss of forest) in the region significantly influences the variability of the hydrological cycle, which leads to greater difficulty in determining not only the amount of available water, but the amount of resources required to manage and mitigate water-related disasters creating economic

and social instability in the region. Activities in inland areas can have large impacts on coastal zones and the living marine resources and human communities living in these areas. Caucus member countries of the Americas must evolve in the area of water-resources data management in order to have the necessary tools and observations for better management decisions. This management focused on water resources needs a Water Strategic Framework that provides a well-supported "regional" water implementing mechanism to leverage regional and local resources and that allows for the implementation of programs that address regional development of observing systems, interoperable data infrastructure, capacity building and institutional strengthening. The philosophy to design and implement these systems needs to consider the geography of the region from mountaintops to the ocean.

#### 7.1.3.1. GEOGLoWS

This framework is provided by the **GEO Global Water Sustainability (GEOGLoWS)** initiative, **a user driven initiative** with a "community centric dynamic implementation" plan, which provides a common context and community of practice to support implementation of different projects, programs, and activities as they move at their own pace. This initiative is intimately linked with GEO BON efforts to establish a scientifically robust framework for observations to detect biodiversity change (e.g. in to migratory, endemic, invasive or other species). Together these efforts provide information to characterize and understand regional ecosystems and to develop improved and sustainable resource use practices.

Acting within the framework of the GEOGLoWS, AmeriGEOSS will facilitate the interaction mechanisms within the member countries of the Americas Caucus that includes a national, regional, and local perspective to support the development of sustainable EO-based terrestrial water information systems. As the adoption of EO-based methodologies will be heterogeneous across different administrative, political, and hydrologic divisions, implementation of GEOGLOWS will need to be user-driven and user-defined.

The GEOGLoWS initiative provides a framework for effectively mobilizing EO assets to contribute to mitigating water challenges on various scales and across different climates and landscapes. GEOGLoWS seeks to use EO and associated tools and assets to decrease regional tensions and the risk of instability and state failure by ensuring that water is available to all, even as the proportion of people living in high water stress is increasing due to climate change, population growth and economic growth; and inequities exist in nations' access to data for decision making.

GEO, through its unique value proposition of convening communities and through its broad membership, provides the right environment for a regional collaboration. Under the GEO principles, we will pursue the implementation of coordinated actions that will assist in developing water initiatives that recognize the services that ecosystems provide to freshwater and coastal and marine systems. With this broad perspective, we recognize the need and importance to develop a strategy for collaboration that is inclusive in nature and

that reinforces the role that national and regional government organizations play in the success of this regional effort. AmeriGEOSS will assist in the evaluation of existing observation frameworks that in many cases need to be shored up and in some cases rescued, and will assist in the evaluation of innovative and low-cost technology within new observation frameworks needed to fill critical gaps. The goal of this initiative is to work towards improved quality, timeliness, range, availability, interoperability, and use of EO through data-sharing principles and mechanisms of cooperation.

Freshwater, marine, and land systems are linked. They are affected by the quality of water that runs off the land surface and meteorological conditions that link them through the hydrologic cycle. Local ecosystem services are affected by phenomena that operate at regional to global scales. Observations are needed to fully understand the linkages and feedbacks between water availability and quality and biodiversity, ecosystem productivity, and ecosystem services. GEOGLoWS supports the GEO BON goals of supporting marine and freshwater resource management tools for conserving existing biodiversity and enhancing biosecurity against threats such as invasive species and infectious agents. To achieve this goal, marine biodiversity, the biodiversity of freshwater aquatic systems, and the biodiversity of land ecosystems, including the various uses given to these by people, must be monitored at scales ranging from microbes to whales and from the benthos to treetops in different environments.

Many major and critical water observing systems have been declining in recent years. Water-related observations (i.e. not just observations of water specifically, but of myriad Earth parameters that are relevant to hydrologic processes) are equally important and have similar issues. In many cases, observation data important to water prediction are declining, difficult to discover and access, use legacy formats, and have not improved significantly in many years. Moreover, there are very significant data gaps where innovation would be welcome. Technologies such as *sensor webs* and others could be part of the next generation of water monitoring to form massive observation networks that could be readily consumed by water prediction and related services.

The activities proposed for the water area and within the AmeriGEOSS initiative,will aim to provide a regional response to the challenging issue of water services as well as the management perspective of the resource. We will seek the support of development partners in the region.

The following activities are identified as relevant for coordinated infrastructure projects:

Linkages between land use characterization and management coordination efforts and biodiversity monitoring efforts to improve ecosystem-based management.
Develop the MarineBON Pole to Pole activity (7.1.4.1 below) in a manner that establishes linkages with watershed, water availability and coastal and estuarine water quality initiatives.

#### 7.1.3.2. GEOSS Water Services

The interactions between human communities and the natural environment should be managed to enhance the availability of water, optimum biodiversity and production of food, while sustaining other uses of relevant terrestrial and marine ecosystems to stimulate economic and social health. The primary goal of the GEOSS Water Services is to encourage and help government data providers and research centers to publish water resource time series data, including observed and modeled variables such as stream flow, stream depth, precipitation, soil moisture, runoff, water quality, and others. These data are important to our understanding of the frequency, variability, and consequences of extreme weather events (storms, floods, drought), as well as for supporting consistent, on-demand pictures of regional and national water availability. An important aspect is to understand the value of biodiversity and other ecosystem services in maintaining water resources. For the past three years, the GEOSS Water Services team has worked with participants from developed and developing countries to help them publish water resource data, using the GEOSS Architecture Implementation Pilot (AIP) as a convening venue. GEO-CIEHLYC, a working group of GEOSS in the Americas is participating in the outreach activities of the GEOSS Water Services by promoting the benefits of this application to the regional and local communities, and water management organizations, and by providing capacity building activities that foster the use of the application.

#### 7.1.3.3. HydroServer

HydroServer Lite developed by The Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) provides an open source solution to water observation data management that can fulfill the needs of a variety of organizations charged with the collection, management, and dissemination of this vital information to the larger public, private, and academic scientific community. It is built on accepted standards such as the CUAHSI Object Data Model (ODM) and the WaterML web services. As part of previous AIP's we have made contributions to these tools such as translations to Spanish and other languages, and conducted pilot implementations in local and national hydrometeorological agencies. We will continue to make the HydroServer tool available and provide training as well as work towards the development of a regional catalog where individual entities that stand up and operate data sharing tools like HydroServer can register their data and services and make them more easily discoverable. Part of this registration will include connectivity to GEOSS. The primary purpose of the development of the HydroServer water information management and dissemination tools along with the ECMWF-RAPID stream forecasting model is to lower the barrier for national hydro meteorological services and other academic, government and non-government institutions charged with collecting, managing, and providing water information to end-users to be able to stand on their own technologically. The open source platform on which the tools have been developed allows adopting organizations to become participants in the process and stand shoulder to shoulder with other users and the developers according to their current capacity, even while elevating what they know through adaptation and customization to their specific needs. The idea that we are developing local and international networks of support is fundamental to the objectives of this and the overarching GEO capacity building effort.

#### 7.1.3.4. ECMWF-RAPID Stream Flow Prediction

As part of an ongoing effort to transform the US National capacity for streamflow prediction a National Flood Interoperability Experiment (NFIE) was undertaken. In conjunction with the AIP work a new cloud-based streamflow prediction application based on the global meteorological and land surface runoff forecasts produced by the European Center for Medium-Range Weather Forecasts (ECMWF). This system forms the basis of the Global Flood Awareness System or GloFAS (http://www.globalfloods.eu/) and provides a valuable resource for monitoring severe events over large basins globally. In order to be useful to regional and local water data managers it is important to provide this information on smaller watersheds as it currently only works for watersheds on the order of 10,000 sq. km and larger. As part of the NFIE/AIP work, a methodology to downscale the ECWMF forecasts has been developed to stand up watersheds of any size and provide valuable streamflow prediction using a cloud-based computational and data discovery tools. This work, as demonstrated in the NFIE where the nearly three million river reaches of the National Hydrography Dataset (NHD-Plus), have been made operational, can be extended to any other region of the world. In developing areas where information and tools are limited, this represents a major step forward in developing the capacity to have critical forecasted flows for river networks. Using this tool it is possible to extend NFIE to a global scale, or Global Flood Interoperability Experiment (GFIE).

#### 7.1.3.5. Meteorological Products through GEONETCast

Water activities from a regional perspective include water products from the hydro-met services nations in America, which are users of the GNC-A system. These products add new capabilities for activities related to resources management and to other objectives of GEO. The main contributions in terms of regional products come from the following nations:

· El Salvador and Costa Rica, contributes with WRF model output and the .5 KM NCEP model data broken out for Central America, the Caribbean, and South America, this contribution continues in 2016.

· Brazil will implement 23 new GNC-A receiving stations in each of their regional hydrometeorological services.

· Colombia's hydro-met service (IDEAM) has offered to contribute with hydro-met and GEOBON products in 2016.

**Contributors:**

- IMN (Instituto Meteorológico Nacional) – Costa Rica
- IDEAM (Instituto de Desarollo del Ambiente) – Colombia
- MARN (Ministerio de Medio Ambiente y Recursos Naturales) – El Salvador
- JRC (Directorate-General Joint Research Centre) - European Commission
- INPE (Instituto Nacional de Pesquisas Espaciais) - Brasil
- UBY (University of Brigham Young) – USA
- NASA (National Aeronautics and Space Administration) – USA
- USGS (United States Geological Survey) – USA
- NOAA (National Oceanic and Atmospheric Administration) – USA

#### 7.1.3.6. Water Capacity Building

##### 7.1.3.6.1. CIEHLYC – Comunidad para la Informacion Espacial e Hidrografica en Latin America y el Caribe.

The Integrated Global Water Cycle Observations (IGWCO) Community of Practice (CoP), which has been in existence since 2004, has had a number of workshops in South America beginning in Buenos Aires and including one in Lima, which led to the formation of CIEHLYC in 2009. In 2011 the chair of the Americas Caucus and GEO principal for Canada, Dr. David Grimes, recognized CIEHLYC as a regional partner to work under the auspices of the Americas Caucus. Since its formation, CIEHLYC has provided an important link to data providers and users and has led GEO-Water activities in the region. Through the many hands-on training courses organized by CIEHLYC, many individuals now have increased capacity to access, understand and use Earth observations, particularly in the water and marine management sectors. CIEHLYC has been instrumental in building capacity among various institutions throughout Latin America and the Caribbean, enlisting support and fostering a shift in approaches towards policy-making. In addition to Capacity Building, we have promoted the GEONETCast (GNC-A) GEO-foundational activity since 2011 and since then, great progress has been achieved in the implementation of the system in Latin America.

##### 7.1.3.6.2. CEOS WGCapD Capacity Building

CEOS Working Group for Capacity Building and Data Democracy (WGCapD) will work with the Water Working Group and with GEO Capacity Building activities to support trainings and workshops. The needs for these trainings will be identified in 2016.

### 7.1.4. Ecosystem and Biodiversity monitoring activities

The Americas region is one of the most biodiverse regions in the world, containing 6 of the world's 17 megadiverse countries. While current GEO initiatives like GEO BON (GEO's Biodiversity Observation Network) and the GEO Ecosystem Mapping effort have a global focus, their implementation in member countries of the Americas Caucus is in a relatively early stage. Monitoring programs that provide information to establish the impact of changing ecosystems and ecosystem services on the economic and social development of the region are almost non-existent.

There are very few terrestrial, freshwater, and marine biodiversity and ecosystems programs in the Americas, which promote the development and use of science for the sustainable management of these resources. Those that exist are hindered by a general lack of finances to sustain program activities. There is also a lack of coordinated networks of collaborating institutions seeking to understand regional shifts in the status

and trends of ecosystems at a time when terrestrial and marine ecosystems are under increasing natural and human-generated pressures.

The AmeriGEOSS initiative will promote the development of biodiversity and ecosystems monitoring (including ecosystem services) networks, with the aim to develop a regional system for monitoring changes to biodiversity and ecosystems in the region. These monitoring systems will promote GEO BON's (see Section 7.1.4.3 below for more information on GEO BON) conceptual framework for standardized biodiversity observations (i.e. the Essential Biodiversity Variables, or EBVs – Section 7.1.4.6), allowing for scaling of ecosystem and biodiversity observations from national to regional to global levels.

#### 7.1.4.1. Regional Ecosystem and Biodiversity Information Networks

AmeriGEOSS will endorse and where possible support the development of regional ecosystem and biodiversity information development and networks. A pole-to-pole Marine Biodiversity and Ecosystems Observation Network for the Americas is currently in discussion as a foundational element of MBON (Marine Biodiversity Observation Network), a thematic BON associated with GEO BON. This pole-to-pole distribution of monitoring sites could provide for the collection of information from a variety of different marine ecosystem types. The Marine Working Group of GEO BON is actively developing the MBON concept, and is planning its initial deployment in the Americas as an AmeriGEOSS priority. In a related activity, the U.S. Geological Survey, in collaboration with Esri, is implementing a standardized, data-derived, 3D mapping of global marine ecosystems. The Americas subset of these global marine ecosystems could be incorporated as a stratification mechanism for selecting monitoring sites, thereby addressing the representativeness criteria in the site selection process. Once mapped, these marine ecosystems of the Americas could be assessed for vulnerability and the provisioning of ecosystem services. One of the objectives of the Pole to Pole MBON (Section **7.1.4.4 )** is to provide the dynamic, ongoing observations needed to update the state of these initial ecosystem maps.

Other regional ecosystem information networks exist or are in development and could be integrated under AmeriGEOSS. For example, a marine environmental observation network using satellite remote sensing has been developed by the Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO) for Mexico. This network, the Automatic Ocean Monitoring Satellite System (SATMO), has been developed to provide near real time, continuous monitoring of the daytime sea surface temperature (SST) nighttime sea surface temperature (NSST and SST4) and other biophysical parameters such as ocean color, the concentration of chlorophyll a (Chl_OC3 or CHLO), chlorophyll fluorescence (FLH), the diffuse attenuation coefficient (K_490 or K490) the concentration of total suspended material (TSM_Clark or TSM), and the remotely sensed reflectance (Rrs_ λ). This system collects marine environmental data as important contextual information for understanding biodiversity distributions in Mexican waters and adjacent ocean regions. These georeferenced products are obtained daily from 1 km

MODIS (Moderate Resolution Imaging Spectroradiometer ) satellite imagery received at CONABIO's ground receiving station after each pass of the Aqua and Terra satellites. The system automatically provides composite images for several weekly and monthly ocean products as well as weekly and monthly compound anomalies in the concentration of chlorophyll a and the sea surface temperature based on weather compounds 9 year (July 2002 - June 2011) generated from MODIS-Aqua. Similar satellite products are needed to cover the rest of the Exclusive Economic Zones of countries of the Americas.

Groups presently engaged in the U.S. MBON projects are developing a series of satellite-based products that represent dynamic 'seascapes'. These use the satellite products mentioned above to derive a 'thematic classification' based on historical and current ocean conditions that informs users on changes in marine ecosystems and how these may be affecting the functional biodiversity of an ecosystem. AmeriGEOSS will work with these groups to make such products widely available.

#### 7.1.4.2. Ecosystem Services

Terrestrial, freshwater, and marine ecosystems provide many goods and services which benefit humankind. These ecosystem goods and services are generally thought of as provisioning services (food, water, fiber, etc.) regulating services (climate, water quality, flood control, etc.), supporting services (nutrient cycling, pollination, etc.) and cultural services (spiritual benefits, recreation, etc.). Under AmeriGEOSS, ecosystem services valuation and accounting will be promoted. Best practice approaches for national ecosystem accounting (e.g. the United Nations System of Economic and Environmental Accounting (SEEA), and the World Bank's Wealth Accounting and the valuation of Ecosystem Services (WAVES) program) will be investigated for application in national ecosystem accounting efforts.

Ecosystem services are an important part of many important economic activities in the region: industry, tourism/recreation, transportation, water supply and purification, coastal protection, carbon sequestration, and resource extraction by fisheries and aquaculture. Certain ecosystems provide many ecosystem services at the same time, as "bundled" benefits from nature. Coral reefs are an example of such complex ecosystems, providing ecosystem services related to fisheries management, tourism, and construction materials. In general, costal and continental margins account for over 90% of world fish production. In coastal areas of developing countries, more than 20% of the protein is derived from fishing activities. In Latin America, many of the national gross domestic products (GDPs) are strongly related to ecosystem services associated with the coastal areas. However the indirect benefits from these ecosystems are rarely accounted for in a manner proportional to their importance. An AmeriGEOSS focus on promotion of best practice approaches to incorporate ecosystem services values, both economic and non-economic, will address the current lack of attention in this area.

#### 7.1.4.3. GEO BON in AmeriGEOSS

GEO's Biodiversity Observation Network (GEO BON), is a flagship program of GEOSS with a global scope. GEO BON's mission is to improve the provision, coordination, and delivery of biodiversity information and services to users, particularly decision-makers. AmeriGEOSS envisions a regional implementation of GEO BON activities to support ecosystems and biodiversity conservation and management in the Americas. The 2025 vision for GEO BON under AmeriGEOSS is the existence of a robust, extensive and interoperable biodiversity and ecosystems observation network covering the major biomes of the Americas. AmeriGEOSS will promote the development of a regional monitoring capacity for biodiversity and ecosystems through the establishment of interoperable national and regional observation networks that can be integrated with global biodiversity and ecosystem monitoring systems. Regional observation networks will focus on the collection, management, sharing and analysis of ecosystems and biodiversity observations. In turn, that information should facilitate decision-making in support of sustainable management of natural resources. This information should contribute to effective and timely conservation, sustainable use, and mitigation and adaptation decisions regarding the America's ecosystems, the biodiversity they support, and the services provided.

##### 7.1.4.3.1. Essential Biodiversity Variables

One of the global priorities of GEO BON is the adoption and implementation of the Essential Biodiversity Variables (EBVs) as an over-arching framework for biodiversity observation systems. GEO BON under AmeriGEOSS will promote the use of EBVs as a consistent and rigorous set of concepts that frame a comprehensive biodiversity and ecosystems observation strategy. The EBVs will be presented to scientists, natural resource managers, and policy makers in an Americas-wide education and capacity building effort. This outreach will include guidance on the development of biodiversity observation networks, and provision of modeling and analysis tools, and interoperable data management systems. GEO BON has initiated targeted capacity building and technology transfer efforts at the national and regional level (e.g. development of a "BON in a Box" toolkit) focusing on enhanced observations to facilitate improved policy and decision-making. These approaches reflect the need to provide a top-down design for a global observation system (e.g. EBV's, monitoring guidelines, interoperable data systems) with the pragmatism of a bottom-up construction process (e.g. through national and regional capacity building). In addition to promoting the uptake and use of EBVs in the region, a consolidation of information on EBVs could be used as the basis for assessing the status and trends of biodiversity and ecosystems in the Americas. Specific EBV objectives include 1) further definition of EBVs and assessment process for determining biodiversity status and trends, 2) management of technical and administrative mechanisms for the generation and collection of EBV information, 3) management of mechanisms for strengthening capacity building related to EBVs, 4) integration and analysis of information across national and regional biodiversity and ecosystem monitoring initiatives, 5) product generation for EBV information synthesis, and 6) promotion of efficiency emphasizing synergies and collaborations among and between regional biodiversity observation programs.

#### 7.1.4.4. Marine Biodiversity Observation Network (MBON)

GEO BON recognizes two different kinds of biodiversity observation networks, regional BONs and thematic BONs. A new thematic BON called the Marine Biodiversity Observation Network (MBON, mentioned above in Section 7.1.4.2), is emerging for the purpose of dedicating attention and resources to marine ecosystems and biodiversity. The MBON will be piloted in Latin America and the Caribbean, in essence creating both a regional and a topical BON in one key AmeriGEOSS activity. The MBON will prioritize the development of an Americas-wide marine ecosystems and biodiversity observation network. In addition to national priorities, a pole-to-pole marine ecosystems map under development between USGS and Esri will inform site selection decisions for the construction of the MBON. A variety of information is planned to be collected at the MBON network locations. Program development and information collection priorities at MBON sites will reflect national marine biodiversity and ecosystem priorities as well as the EBV framework. MBON site selection and program development will be a key focus in the initial MBON implementation phase. Sites like Parque Nacional Natural Corales de Profundidad in Colombia (see below), the Antares network (http://antares.ws/), and the SARCE network (http://sarce.cbm.usb.ve/) which are already contributing significantly to the documentation of marine biodiversity change, will be identified as model examples of candidate MBON sites.

##### 7.1.4.4.1. Parque Nacional Natural (PNN) Corales de Profundidad (Colombia)

MBON will seek to identify changes occurring to the coastal and marine biodiversity and ecosystems of the Americas. In Colombia, the research and monitoring efforts at the Deep Corals Natural National Park, are already documenting change in biodiversity variables in this deep-sea corals ecosystem. These coral reefs, especially the mesophytic reefs (30 – 15 m deep) and cold-water corals (> 200 m deep), are known to be closely interrelated to shallow coral reefs (<30m depth). Colombia has made great efforts to protect these resilient marine ecosystems which contain 60% of the deep-sea ecosystems in the Colombian part of the Caribbean. However, the study of biodiversity associated with these deep systems is difficult due to high monitoring costs, poor technological infrastructure, lack of trained personnel, and other reasons. As a contribution to MBON and AmeriGEOSS, a biodiversity monitoring program, particularly for planktonic communities (phytoplankton and zooplankton) is proposed, as changes in these communities could be useful indicators of potentially harmful environmental change like continental runoff, global warming, and ocean acidification.

In 2016, the PNN Corales de Profundidad deep coral group expects to have full biological characterization of deep coral formations, which will provide the baseline for the study of the biodiversity of these cold waters located between 150 and 400

m deep. This type of rigorous characterization of these formations could be useful for contemplation elsewhere in the MBON network. The current monitoring at the site could also be potentially expanded to include other biological and environmental variables, consistent with the Essential Biodiversity Variables (EBV) framework described as follows below.

#### 7.1.4.5. Established Biodiversity Activities

##### 7.1.4.5.1. BON in a Box: Latin America

BON in a Box (Biodiversity Observation Network in a Box) is a regionally customizable and continually updated online toolkit for lowering the threshold for the start-up or enhancement of biodiversity observation systems. With a particular focus on national and regional systems, BON in a Box will facilitate discovery and access to state-of-the-art tools. Tool classification and filtering will allow for guidance on the appropriate use of the tool. It is through this process that we will see greater harmonization of observation design and data collection, management, analysis and reporting amongst and between nations.

The development of BON in a Box is being piloted in Latin America led by the Alexander von Humboldt Institute of Colombia on behalf of GEO BON. To date, a survey has been sent to over 1000 people in the Latin American region (15% response rate) in an effort to better understand needs regarding the generation and use of biodiversity data and a workshop in Colombia with over 50 participants from 8 Latin American countries (Mexico, Costa Rica, Panama, Colombia, Ecuador, Peru, Bolivia and Brazil) was held in April 2015. The workshop was focused on specifically designing the structure, content and functionality of the Latin American pilot (see Figure 2 as an example of the potential look and feel). The first version (beta version) of BON in a Box: Latin America will be released this fall (launched at the CBD SBSTTA19 and GEO Plenary meetings in November) and will be in Spanish, Portuguese and English. The full version will be ready in late 2016. The toolkit is comprised of two major elements – a web-based, searchable and customizable user interface and a database of tools that are characterized based on a series of tags (e.g. EBV class, observation component, scale of use, etc.). To date, the look and feel has been partially designed, the database of tools is in development with close to 100 tools identified and a number of partnerships have been established or are being negotiated for specific tool development (e.g. EarthWatch Institute to develop citizen science tools; iNaturalist to produce a template for national versions; Map of Life to produce a national and regionally customizable version for tropical Latin America). The toolkit will be continually updated to ensure that the information contained within remains relevant and allows access to the newest tools available.

##### 7.1.4.5.2. Global Forest Observation Initiative (GFOI) and SilvaCarbon in the Americas

GEO's Global Forest Observation Initiative (GFOI), like GEO BON, is another flagship program of GEOSS. GFOI seeks to build global capacity in inventory, monitoring, and

evaluation of global forest resources, and includes a forest carbon accounting dimension as well. The fundamental objective of GFOI is to help nations develop a capacity to utilize earth observation data in a credible national forest monitoring system that can provide input to national monitoring, reporting, and validation systems for greenhouse gas emissions and removals. From the beginning, GFOI has had a strong regional focus in Latin America, with foundational support from three Americas Caucus member nations: Colombia, Mexico, and the United States. Many of the GFOI concepts and documents have originated from GFOI program implementation in the Americas. GFOI seeks to further institutionalize and increase the regional implementation of its program in the Americas region through incorporation in the AmeriGEOSS agenda as a high priority. SilvaCarbon, the capacity building arm of GFOI, has had several workshops in the Americas, and seeks to develop new workshops and other capacity building activities for future implementation in the region.

**Contributors**

- IDEAM (Instituto de Desarollo del Ambiente) – Colombia
- CONABIO (Comision Nacional de Biodiversidad) – Mexico
- USGS (United States Geological Survey) – United States
- NOAA (National Oceanic and Atmospheric Administration) – United States
- U.S. MBON projects
- Smithsonian Tennenbaum Observatory
- Parques Nacionales (Colombia)

#### 7.1.4.6. Biodiversity and Ecosystem Capacity Building

##### 7.1.4.6.1. Silva Carbon

As described above, SilvaCarbon is the capacity building arm of GFOI. SilvaCarbon has had several workshops in the Americas, and seeks to develop new workshops and other capacity building activities for future implementation in the region.

##### 7.1.4.6.2. CEOS WGCapD Capacity Building

CEOS Working Group for Capacity Building and Data Democracy (WGCapD) will work with the Biodiversity and Ecosystem Capacity Building Working Group and with GEO Capacity Building activities to support trainings and workshops. Needs for these trainings will be identified in 2016.

## 7.2. Relevant areas for coordinated foundational projects, e.g. in infrastructure, data, and capacity building.

The October 2014 meeting in Bogota identified the need to include specific activities that will help to improve information systems and the exchange of experiences: e.g.

communities of practice; strengthening national capacities through a comprehensive program with vision, resources, and its own life; and webinars and technical seminars. Many of these activities will be included in each thematic area above, with overall coordination by the AmeriGEOSS foundational activities working group. Specific regional activities that cut across the thematic priorities are identified below.

### 7.2.1. GEONETCast-Americas (GNC-A)

GEONETCast Americas (GNC-A) is the Western Hemisphere component of GEONETCast, a near real time, global network of satellite-based data dissemination systems designed to distribute space-based, airborne and *in situ* data, metadata and products to diverse communities. GEONETCast Americas is the United States Government contribution to GEOSS. The primary goals for GEONETCast Americas in the short term are to 1) develop a user-friendly interface to facilitate the visualization of product, 2) continue collaboration with WMO Virtual Laboratory for Training and Education in Satellite Meteorology (VLab), INPE and other partners and providers to develop tutorial and tools, 3) increase outreach to better determine user needs, continue outreach to Partners and Users to participate as providers and in governance via the GEONETCast Americas Coordination Group, 4) increase the ability to use GNC-A in disaster response including carrying relevant Disaster Charter products, 5) work to add WMO Region III/IV Requirements while leaving room to support other SBAs, 6) and work toward at least one installation in each country (e.g. Hydro/Met, Disaster Response, Universities, Utilities, Other agencies serving SBAs).

GNC-A's goal is to enable enhanced dissemination, application, and exploitation of environmental data and products for the diverse societal benefits defined by GEO, including agriculture, energy, health, climate, weather, disaster mitigation, biodiversity, water resources, and ecosystems. Accessing and sharing such a range of vital data will yield societal benefits through improved human health, well-being environment management, and economic growth. GEONETCast receiving technology is based on using widespread and off-the-shelf components allowing for widespread adoption of the service at low cost. NOAA and the Instituto Nacional de Pesquisas Espaciais (INPE - Brazil) are collaborating to expand the broadband capacity of the system, to develop a user-friendly platform for data access, and to include INPES' information into the list of transmitted products in the Americas.
NOAA has used two sizes of antennas for GNC-A; a 2.4 and a 1.8 meter dish. The 2.4 m dish will work almost anywhere while the 1.8 requires some investigation and is somewhat more difficult to point correctly.
The software used to access the information is Kencast FAZZT Professional Client and it comes with a mandatory 1-year of support. Further support is available but optional. There is no yearly license fee. The broadcast specification is:
PID 4201 **
Satellite IS-21
Transponder 7C
Polarity Vertical
Frequency 3840 MHz

Symbol Rate 27.69 Msym
FEC 7/8

**Contributors**

- NOAA (National Oceanic and Atmospheric Administration) – United States
- INPE (Instituto Nacional de Pesquisas Espaciais) - Brasil

#### 7.2.1.1. Capacity Building to Thematic Working Groups

Within the foundational activities working group, members of the capacity building community from CEOS WGCapD and GEO will support thematic working group needs. Standard methodologies, e.g. webinars, e-learnings, workshops, will be identified and shared as good practices. The needs assessments driven by the thematic working groups will also be supported.

# 8. Planning, milestones and deliverables

Each working group described below in section 10 will manage their own planning, milestones, and deliverables. Expected planning includes monthly working group teleconferences, participation in relevant GEO meetings, and at least annual meetings of the AmeriGEOSS community. Deliverables includes teleconference notes to be shared with the other working groups and periodic status briefings. Deliverables specific to each thematic area will be defined and coordinated with the related global GEO activities.

# 9. Data policy (sharing and management)

*(use of GCI, data sharing & data mgmt for the initiative/flagship)*

The AmeriGEOSS initiative will strive to advocate that all participants follow GEO's data principles. Nations without needed infrastructure and/or data policies will be provided examples of what is working in other Americas member nations.

# 10. Management arrangements

AmeriGEOSS has developed a proposed management arrangement based on a review of the approaches being used by UNGGIM-Americas, GEO BON, and AfriGEOSS. This proposed arrangement will be piloted in 2016, and adjusted as needed to achieve the best regional coordination with the least resources. The management arrangements that create organized thematic and coordination-working groups provide the sustained coordination framework to ensure the success of this initiative over the next decade.

The proposed arrangement includes several working groups, each with a Chair and Vice Chair and at least one participant from each country, and preferably two, to ensure that one member can always be present at working group teleconferences and meetings. Regional participating organizations are welcome to participate as well. The following AmeriGEOSS working groups are proposed:

1. Regional coordination working group responsible for the overall regional coordination between Americas Caucus nations, coordination with resource contributors, political coordination including engagement with other potential member nations, and coordination and reporting to Americas Caucus principles. This single coordination group will bring together the individual thematic working group contributions to form a comprehensive "view" and work to ensure/facilitate any necessary cross-communication and coordination among the individual working groups.

   The regional coordinating group will report to the Americas Caucus in two ways. First, each national member(s) will report through their nation's GEO leadership and reporting structure to keep them apprised of AmeriGEOSS activities. Second, the regional coordinating group's chair, vice-chair, and/or their designated representatives will provide an overall summary of AmeriGEOSS activities to the Americas Caucus. At a minimum, this report will be provided to the Americas Caucus prior to Caucus meetings held in conjunction with GEO Plenaries and Ministerial meetings. Other reports can be made as needed, e.g. in advance of Executive Committee meetings.

2. Agriculture and food security working group responsible for the coordination with, and participation in, GEOGLAM from a regional perspective, engagement and contribution from Americas nations that add new capabilities to the overall GEOGLAM system and objectives, and linking existing nations' agricultural initiatives that are of benefit to or could benefit from GEO EO assets.

3. Disasters working group responsible for the coordination with, and participation in, other GEO disasters activities, e.g. hazards supersites and flood monitoring systems from a regional perspective, engagement and contribution from Americas nations that add new capabilities to other GEO disasters activities and objectives, and linking existing nations' disasters initiatives that are of benefit to, or could benefit from, GEO Earth observation assets.

4. Water working group – the functions of this group include coordination with, and participation in, other GEO water activities, e.g. global water cycle activities, from a regional perspective, engagement and contribution from Americas nations that add new capabilities to other GEO water activities and objectives, and linking existing nations' water initiatives that are of benefit to, or could benefit, from GEO EO assets.

5. Ecosystems and biodiversity working group responsible for the coordination with, and participation in, other GEO ecosystems and biodiversity activities, e.g. GEO BON from a regional perspective, engagement and contribution from Americas nations that add new capabilities to other GEO ecosystems activities and objectives, and linking in existing nations' ecosystems and biodiversity initiatives that are of benefit to, or could benefit from, GEO EO assets.

6. Foundational activities working group responsible for the coordination with and participation in other GEO foundational activities, e.g. infrastructure and capacity building activities from a regional perspective, engagement and contribution from Americas nations that add new capabilities to other GEO foundational activities and objectives, and linking existing nations' foundational initiatives that are of benefit to or could benefit from GEO Earth observation assets.

With this initiative, the Americas Caucus assumes greater responsibility for short- and long-term planning for the development of activities through regional cooperation that reflects the local, national, and regional interest. This responsibility will be entrenched in the technical capabilities of its country members and in the resources of other global initiatives that may be available for the benefit of the region.

**2016 Activities**

In 2016, the regional coordination framework will be piloted and improved. Each working group will manage their own planning, milestones, and deliverables. Coordination activities include monthly working group teleconferences, participation in relevant GEO meetings, and at least annual meetings of the AmeriGEOSS community. Deliverables includes teleconference notes to be shared with the other working groups and periodic status briefings.

In 2016, deliverables specific to each thematic area will be defined and coordinated with the related global GEO activities.

In 2016, the national and regional needs will be assessed in each of thematic working group areas. The GEO global initiatives needs, e.g. GEO BON's needs for greater regional engagement, will also be assessed. These combined sets of needs will form the basis of longer-term AmeriGEOSS plans.

# 11. Monitoring and evaluation approach and reporting

AmeriGEOSS is an initiative to improve the coordination and participation in GEO from a regional perspective. The basic theory of change is that if each nation in the Americas is engaged thematically and through regional coordination, Americas participation in GEO will be strengthened. If participation is strengthened, then additional use of GEO's EO assets will occur, open data policies will be promulgated, and capacity will be strengthened in decision-makers to use EO across the GEO SBAs.

AmeriGEOSS is open and interested in tracking GEO's global indicators at the regional level. Members of the regional coordination-working group will coordinate with GEO's monitoring and evaluation group to determine the approaches being taken that could be adapted and used by AmeriGEOSS at the regional level.

# 12. Committed Resources and annual budget(s)

Resource commitments include the national human resources needed to participate in the management arrangements described above. Additional resources to participate more fully in each of the thematic areas will be coordinated as the specific activity is proposed by that nation and included.

**2016 Resources**

Contributions from the national governments of the Americas Caucus nations have included human resources from Caucus co-chairs Colombia and Mexico, as well as other Americas member countries. These contributions will continue through 2016 to establish the working groups and to assess national, regional, and GEO global initiatives' needs. In 2016, additional resources will be targeted to support a sustained coordination framework.

**Additional Activities for 2016**

If additional resources are made available, the AmeriGEOSS working group members will participate more deeply in GEO global initiative meetings and activities. GEO foundational activities will be more fully engaged to address infrastructure and data access gaps, e.g. in nations' spatial data infrastructure.