

Annex 1

GEO Work Programme 2017-2019 Application

Asia-Oceania GEOSS Initiative(AOGEOSS)

September 5, 2016

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ANNEXES 33

GEO Work Programme 2017-2019 Application

Asia-Oceania GEOSS Initiative

Executive Summary

Please note this is a living document, the contents of which are being updated in line with the official consultations among the relevant countries and organizations.

The Asia-Oceania region has two-thirds of the world's population, numerous and fast environmental changes and frequent disaster pose a big challenge to the AO society. Earthquakes and tsunamis, floods and droughts, environments deterioration and pollution, global warming and island losing, mountain ecosystem degradation endanger the security of water, food, energy, health and ecosystem services. As the world is closely inter-connected, the impact of an event immediately leads to a cascade of consequences, even in geographically remote countries within in AO region. Sustainable development must therefore be based on a comprehensive assessment of disaster and environmental risks, along with their potential ramifications for environmental security and human well-being.

Recognizing that Earth observation data, information and derived knowledge are critical for identifying vulnerabilities, monitoring and assessing impacts and informing the decision-makers, and the uneven development of AO region and complexity of the geographic scope, there is an urgent demand to develop an integrated, shareable, and sustained observation system and to foster its application capacity.

Based on our continuous efforts for enhancing the ability of Earth Observations, the Asia Oceania Caucus members (China, Australia, Japan, Korea, etc.) have realized the value of establishing a regional initiative to work together and it is necessary to promote a regional cooperation with broad user and stakeholder's involvement to meet GEO strategic overall objectives. i.e. "Asia-Oceania GEOSS"(hereinafter to be referred as AOGEOSS). Through establishing an effective cooperation framework at national and regional levels, and reefing the Asia-Oceania regional organizational network, the AOGEOSS initiative intends to promote the ability of AO countries to confront those challenges which pose a risk to the attainment of social sustainable development goals.

The AOGEOSS initiative will engage participants and stakeholders in Asia-Oceania region, and coordinate the observation infrastructure, leveraging the existing cooperation base and conducting joint projects under the AO Caucus mechanism of intergovernmental GEO. Based on the several priorities in the AO regions, the dedicated AOGEOSS is specified into two categories: (1) The foundational tasks, including AO-Data Sharing Platform, Develop AO GEOSS Dataset, User engagement and communication. (2) The regional applications and services, including Disaster Monitoring and Mitigation, Environmental Monitoring and Protection, Ocean and Island monitoring, and Himalayan GEOSS.

The implementation and organization mechanism of AOGEOSS are divided into tasks and their next level of actions, which are lead and implemented by the task leader and team. The initiative relies on the resources from both in-kind, and committed from national and international projects, and platforms. This initiative will further cultivate scientific research and technology development community to provide regional earth observation information service and promote the earth observation application in accordance with user requirements at different levels, and promote key application ability of each country in the field of social economy development.

1. SYNOPSIS OF OBJECTIVES AND BENEFITS:

1.1 Objectives and Planned Way of Attaining Them

To extend the benefits of earth observation to social-economic development of Asia-Oceania region, the following objectives will guide AOGEOSS activities to 2019:

- Engage with coordinate as appropriate all stakeholders, partners and sponsors working together in Earth observation activities in Asia Oceania region;
- Utilize infrastructure, resources and capacity to develop integrated and sustained observations;
- Investigate user needs and address gaps on implementation of GEOSS and develop technological approaches;
- Provide a platform for regional countries to advance data sharing and services;
- Cultivate regional collaboration network by providing technical support and knowledge sharing;
- Support decision-making and regional sustainable development with earth observation information.

The core value of GEOSS is to support the sustainable development of Asia-Oceania countries. The actions shall be conducted to achieve the goal of delivering data, information and knowledge to inform decision-making. The actions will be conducted in regional applications and foundational tasks.

- **Regional application activities**
The initiative will propose new regional applications including Monitoring and evaluation of drought in Asia-Oceania region, Environmental Monitoring and Protection, Ocean and Island monitoring, and Himalayan GEOSS. At the same time, it will also foster the existing activities such as Asia-Pacific Biodiversity Observation Network (AP-BON), Asian Rice Crop Estimation and monitoring (Asia-RICE), Asian Water Cycle Initiative (AWCI), Ocean and Society, GEO Carbon and GHG Initiative.
- **Foundational tasks**
The initiative will implement data sharing, AO-DataCube and users' engagement and communication.

1.2 Expected Outcomes, Impacts and User/Societal Benefits

AOGEOSS initiative will implement prototype information services, build the regional data sharing platform, and deliver report on Remote Sensing Monitoring of Ecosystem and Environment over Asia-Oceania. AOGEOSS Initiative will also demonstrate technical feasibilities through pilot projects and operational application services.

As an integral part of implementing GEOSS, AOGEOSS will coordinate various resources including observations, technologies and applications, to deliver information services for end-users and facilitate the development of society and economy of Asia and Oceania.

A key goal of AOGEOSS, it is to promote further cooperation among countries of Asia-Oceania region. It will promote deeper understanding for international communities on earth observation system and a wide range of applications on some important topics.

1.3 Relevance to GEO’s Strategic Objectives

The “GEO Strategic Plan 2016-2025: Implementing GEOSS” has identified three Strategic Objectives, “Advocate”, “Engage” and “Deliver” to realize the GEO’s vision and maximizes the benefits that GEO can bring to users through 2025. The Strategic Plan has also identified the 8 Societal Benefit Areas (SBAs) and their cross-cutting issue; climate change.

The objective of AOGEOSS is to support the GEO Members and Participating Organizations in Asia-Oceania regions to build sustainable and resilient societies through maximum use of the Earth observations by advocating the merits of GEO and GEOSS, engaging researchers, engineers, practitioners, policy makers, civil societies and private sectors, and delivering data and products obtained by Earth observations. To achieve the three Strategic Objectives of GEO, the AOGEOSS will rely on the two key functions of the previously established and very successful GEOSS Asia Pacific Symposium as a forum that provides a regional communication and exchange platform, suitable for promoting discussion and information exchange on (i) cooperation on specific initiatives and (ii) as a scientific and technical workshop on each thematic area related to the Societal Benefit Areas.

Based on the activities and communities established within the Asia-Oceania Regions, the AOGEOSS initiative will foster regional activities connecting to global GEO Initiatives such as Asia-Pacific Biodiversity Observation Network (AP-BON) component for GEO Biodiversity Observation Network (GEO BON), Asian Rice Crop Estimation and monitoring (Asia-RiCE) component for GEO Global Agricultural Monitoring (GEOGLAM), Asian Water Cycle Initiative (AWCI) component for GEO Water Cycle Integrator and regional activities for Global Forest Observation Initiatives (GFOI), GEO Carbon and GHG Initiative, Blue Planet.

AOGEOSS plays an important role in support of sustainable economic development in Asia-Oceania region, and its goals highly accord with the GEO’s strategic objectives. This Initiative will take full advantage of remote sensing technology, strengthen the data sharing of earth observation, and enhance application capacity, through integrating and innovation of related scientific and technological achievements, and the established international coordination mechanism (GEOSS).

2. RELATIONSHIP TO PREVIOUS DEVELOPMENTS AND RESULTS:

AOGEOSS provide flexible framework to integrate the existing activities and coordinate the new actions and contributions of Members and Participating Organizations towards a common objective with joint efforts, which more focuses the comprehensive applications on region level. In past years, the members and participating organizations of GEO in Asia-Oceania region have been engaged in improving Earth Observations and data applications with joint efforts, like China, Japan, Australia, Korea, India, associating with CEOS, UNESCAP, CODATA, ISPRS and so on. Coordination mechanism, influential activities, integrated resources and expertise of the GEO community and external partners will contribute greatly to the implementation of AOGEOSS. The implementation of AOGEOSS will enable the diverse relevant stakeholders, institutions and agencies within and outside GEO community to work together to increase their capacity to acquire and utilize Earth observation data and information.

GEOSS Asia Pacific Symposium, which was held annually since 2007 with the presence of hundreds of

participants from diverse countries, has strongly demonstrated the importance of fostering system for regional activities. Through them, regional challenges such as biodiversity, water resource management, agriculture and food security, global carbon monitoring, and ocean observation were addressed and collaborative efforts across the developed countries and developing countries were carried out to contribute to the global initiatives such as GEOBON, GEOGLAM, GEO Water Cycle Integrator, GFOI, GEO Carbon and GHG Initiative and Blue-Planet. The Symposia have published Statements addressing regional challenges to be tackled. GEOSS Asia Pacific Symposium will be inherited and act as a core platform for communication and exchange of the activities, and broad engagement of observation and user communities.

The reports and datasets on “Annual Report of Remote Sensing Monitoring of Global Ecological Environment” have been openly and successfully released worldwide in the past three years, which has received a highly evaluated and recognized as one of the important remote sensing data products in the long-term global ecological environment monitoring. The annual report of remote sensing monitoring of global ecological environment was achieved in the cooperation with more than 20 institutions in China. Promoting remote sensing monitoring of AO ecological environment is a supplement to the existing remote sensing monitoring report of global ecological environment. Those existing systems and the experiences/knowledge will be part of and also beneficial for AOGEOSS.

3. PARTICIPANTS/CONTRIBUTORS:

No.	Members and POs	Officials		Experts			
		Name of Organizations	Name of participants	Name of Organizations /Organization Type	Roles of Organization	Name of participants	Roles in the initiative
Countries in AO regions							
1	China	National Remote Sensing Center of China	Li Jiahong (Point of contact)	Institute of Remote Sensing and Digital Earth, CAS/Institution	Contributor	Xingfa GU (Point of contact)	co-Lead
						Qinhua LIU Guoqing LI Xiang ZHOU Yubao QIU Bingfang WU	Contributor
				Satellite Surveying and Mapping Application Center/ Institution	Contributor	Xingming TANG Fanghong YE	
				China Center for Resources Satellite Data and Application/Institution		Zhigang WANG	
				National Satellite Meteorological Center/ Institution	Contributor	Jinlong FAN	
				Institute of Geographic Sciences and Natural Resources Research/ Institution	Contributor	Chuang LIU	
				ChinaRS Geoinformatics Co., Ltd/Private sector	Contributor	Zhifeng GUO	
				Satellite Environment Center, Ministry of Environmental Protection	User	Qiao WANG	

				The state forestry administration	User	Zhihai GAO	
2	Australia	Geoscience Australia	Stuart Minchin (PoC)	Geoscience Australia	Contributor	David Hudson	Co-lead
				CSIRO/POGO/ Blue Planet	Contributor	Andy Steven	
				Geoscience Australia/CEOS [TBC]	Contributor	Jonathon Ross	
				GRSS and University of NSW	Contributor	Tony Milne	
3	Japan	Ministry of Education, Culture, Sports, Sciences and Technology (MEXT)	Shinichi HIGUCHI Izumi MORI Mariko HARADA (Point of Contact)	The University of Tokyo	Contributor	Toshio KOIKE	co-lead
				Gifu University	Contributor	Hiroyuki MURAOKA	co-lead alternative
4	Korea, Republic of	Climate Science Bureau, Korea Meteorological Administration (KMA)	Seong-Kyoun Kim [TBC]	Korea Aerospace Research Institute(KARI)	Contributor	Catharina Hyun-Ok Kim [TBC]	
				National Institute of Meteorological Sciences/Institution	Contributor	Sang-Ok Han [TBC]	

5	Myanmar			Head Mandalay Technological University	Contributor	MYINT MYINT KHAING	
				Myanmar, Geospatial Center	User/Observer	Kyaw Sann Oo	
6	Pakistan	Pakistan Meteorolo gical Departmen t	Muhammad Imran,		User		
7	Nepal	Survey Departmen t of Nepal	Krishna Raj B.C. Ganesh Prasad Bhatta(PoC)		User		
8	Laos			ASEAN SCOSA- National Focal Point Ministry of Science and Technology	User	SilapBoupha	
9	Mongolia			MonMap Engineering Service Co.	User	M. Saandar	
10	Bangladesh		Kazi Habibul Awal	Bangladesh Meteorological Department (BMD)	User	Shamsuddin Ahmed (PoC)	
11	India		Rajeev Jaiswal (PoC) (TBC)	Indian Society of Remote Sensing (ISRS)	User/Observer	Dewayany Sutrisno	
International Organizations							
12	UNEP-IEMP		Jian LIU		Contributor /User		
13	UNESCO-HIST		Tianhua HONG		Contributor /User		
14	WMO		Wenjian ZHANG		User		

15	UNESCAP		WANG Keran		Contributor /User		
16	ICSU/Future Earth		Mario Hernandez		Contributor /User		
17	ICSU/IRDR		Fang CHEN		Contributor /User		
18	ICIMOD		Basanta Shrestha		Contributor /User		
19	POGO		Andy Steven		Contributor /User		
20	ISDE		Changlin WANG		Contributor		
21	ISPRS		Jun CHEN		Contributor		
22	GRSS		Tony Milne		Contributor		
23	CEOS		Alex Held [TBC]		Contributor(Inviting)		

*Please noted that for those who have not reply us till now are not listed here, but all new participants are welcomed.

4. DESCRIPTION OF ACTIVITIES:

AOGEOSS serves as the core engine of activities, to: (1) meet regional SBA-related challenges such as disaster mitigation, environmental monitoring and protection, ocean and islands observation, and (2) strengthen collaborative exchange across the developed countries and developing countries to contribute to the global initiatives such as GEOBON, GEOGLAM, GEO Water Cycle Integrator, GFOI, GEO Carbon and GHG Initiative and Blue-Planet. The AOGEOSS will enhance observing capacity of Asia-Oceania region, and develop earth observation information processing technology and earth observation applications to support social and economy development of Asia-Oceania region.

The AOGEOSS activities are grouped into two categories (Fig. 1). **Foundational tasks** include data sharing, AO-DataCube and users' engagement and communication. **Regional applications and services**, include the disaster mitigation, environmental monitoring and protection, ocean and islands observation, and Himalayan GEOSS.

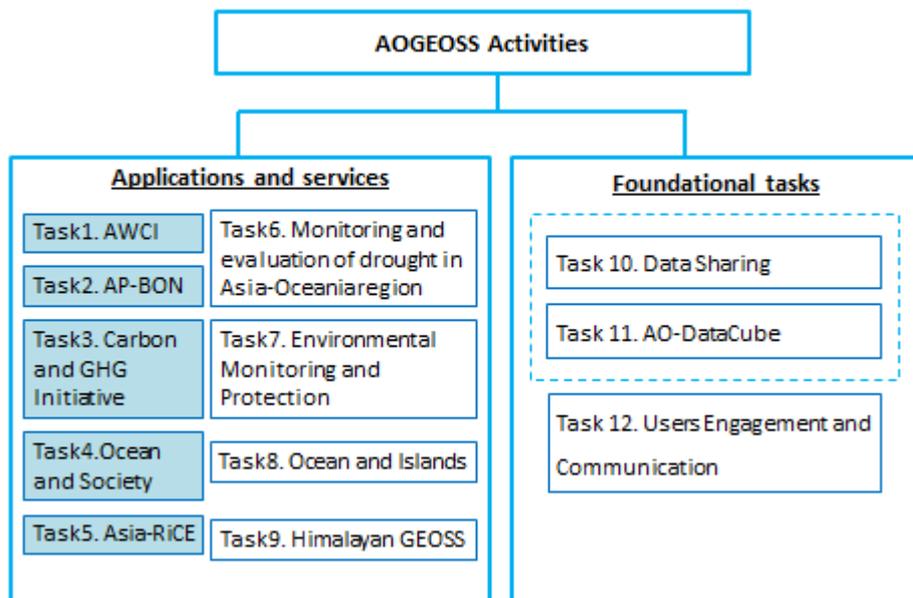


Fig.1 The AOGEOSS Activities
(Boxes with blue background represent existing AP activities; other boxes represent newly proposed ones)

4.1 Applications and Services

The AOGEOSS will foster the existing AP regional applications and services such as Asia-Pacific Biodiversity Observation Network (AP-BON), Asian Rice Crop Estimation and monitoring (Asia-RICE), Asian Water Cycle Initiative (AWCI), Ocean and Society, and Carbon and GHG Initiative.

Task 1. GEOSS Asian Water Cycle Initiative (AWCI)

More than 60 percent of the world population lives in Asia. The Asian monsoon brings a rich-water environment. However, the Asian monsoon often causes serious floods, landslides, droughts, water scarcity, and water pollution problems. Climate change is now a fundamental threat in Asia. To address the Asian water-related issues, the GEOSS Asian Water Cycle Initiative (AWCI) was established in 2005. Responding to the data needs, GEOSS/AWCI member countries collected and archived hydrological data under the open data policy of the GEOSS. The Data Integration and Analysis System (DIAS) contributes to this data integration. GEOSS/AWCI supports capacity building through a wide range of training courses for practitioners and policy makers.

In 2015, the international community agreed on three major accords: the Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework), the Sustainable Development Goals (SDGs), and the Paris Agreement on Climate Change (Paris Agreement). These agreements collectively present an urgent need and opportunity for action in 2016 and beyond. There are important connections among these agreements. For example, the SDGs and Paris Agreement identify actions that can build resilience against both hydro-climate hazards, floods and droughts.

Responding to these directions, GEOSS/AWCI has stepped into the second phase based on the discussions at the Asia Water Cycle Symposium (AWCS2016) held in Tokyo in March 2016. The Symposium focused on flood and drought issues in the Asia-Oceanic region. It is the time for us to provide a stepping-stone for addressing existing gaps in implementing a holistic approach to water-related disaster risk reduction towards sustainable development in the Asia-Oceanic region.

Task 2. AP-BON(Asia-Pacific Biodiversity Observation Network)

Leaders: Tetsukazu Yahara (Kyushu University, Japan), Eun-Shik Kim (Kookmin University, Korea), Sheila Vergara (ASEAN Center for Biodiversity, Philippines)

Since its foundation in 2009, AP-BON has been developed as a coordinated network contributing to CBD and IPBES through observations of the states and trends of biodiversity and ecosystems in the Asia-Pacific region. AP-BON is promoting not only observations but also data sharing and published data papers and three volumes of books in which various data have been compiled. Based on those achievements and considering contribution to the achievements of CBD Aichi targets, AP-BON will develop a new work plan towards 2020. One of the challenges of AP BON towards 2020 is to promote multi-scale observations of spatial and temporal changes in biodiversity and ecosystem structure and functions (e.g., primary production) by combining *in situ* field surveys, sensor networks, satellite observations and various models. AP-BON will facilitate (i) *in depth* observations at some “super-sites” placed along the environmental gradients, to find essential biodiversity variables (EBVs) and key biophysical characteristics that can be measured by satellites, (ii) multi-point observations at “a network of inventory sites” to monitor spatially variable changes of biodiversity and ecosystems under various pressures including land use changes and also various efforts of conservation and restoration, and (iii) integrated analyses of the changes in biodiversity, ecosystems, and human-nature interactions.

More specifically, AP-BON will work on the following subtasks.

Subtask 2.1 Promoting data sharing, increasing access to data and filling gaps in data availability

Subtask 2.2 Networking observation sites in collaboration with ILTER, GBIF, and IUCN

Subtask 2.3 Monitoring states and changes in biodiversity, ecosystems and human-nature interactions

Subtask 2.4 Contributing to Global Platforms including IPBES and CBD

Subtask 2.5 Publishing AP-BON books

Task 3. Carbon and GHG Initiative

Leaders: Pep Canadell (GCP-CSIRO, Australia), Yi Liu (CAM-CMA, China), Nobuko Saigusa (NIES, Japan)

The budgets of carbon and other greenhouse gases (GHGs) have many uncertainties that make it difficult to evaluate the success of climate change mitigation strategies.

Improvements in long-term, high quality observing systems within and across the atmospheric, oceanic, terrestrial, and human domains are required to quantify GHG sources and sinks, to understand changes in the carbon cycle and hence the climate system, and to assess the level of effort required in order to mitigate and adapt to climate change.

The work of the GEO Carbon and GHG Initiative is motivated by the long-term vision of an independent system for monitoring and evaluating changes in the carbon cycle and GHG emissions as a result of human activities and climate change, and to provide decision makers with timely policy-relevant information, recommendations, and services.

Subtask 3.1 Data access and availability: to provide long-term, high quality and open access near-real-time data and data products, complying with the GEOSS principles, from a domain-overarching carbon cycle and GHGs monitoring system.

Subtask 3.2 Optimization of observational networks: to develop and implement on an ongoing basis, a procedure for achieving observations of identified essential carbon cycle variables within user-defined specifications and at minimum total cost.

Subtask 3.3 Budget calculations and breakdown across scales to support policy implementation: to develop consistent budgets of GHGs (CO₂, CH₄, and N₂O) from local/urban to regional scales in order to contribute to the global one using a combination of observations, inventories, models and data assimilation techniques.

Task 4. Ocean and Society

Leaders: Kentaro Ando, Takeshi Kawano (JAMSTEC, Japan)

The task of “Ocean and Society” was established in the 5th GEOSS-AP symposium by the leaderships of Drs Masao Fukasawa and Keisuke Mizuno (originally named “Ocean Observation and Society”), and has been targeted development of strategy to synthesis of in-situ open and coastal observational data towards societal uses such as fishery management, weather and seasonal predictions, and ocean predictions. As the outcome of the 7th GEOSS-AP symposium, the task determined the development of “GEOSS-AP Ocean Data Networking System (AP-ONS: <http://www.jamstec.go.jp/geossap/>)” by the support of Blue Planet Initiative and contributions of IOC/WESTPAC. The function of the AP-ONS is to provide the list of observation inventory and the linkages to the data providers in the AP region, so to provide solid route to uses who look for in-situ ocean observational data in the AP region. The future task shall be to expand and enhance the function of inventory to

access more and various in-situ data in the AP region, as well as stronger linkage with one of global initiative, Blue Planet Initiative.

Task 5. Asia-RiCE(Asian Rice Crop Estimation and monitoring)

Leaders: Shin-ichi Sobue, Kei Oyoshi (JAXA, Japan), Thuy Le Toan (CESIBO, France)

The Asia-RiCE initiative (<http://www.asia-rice.org>) has been organized to enhance rice production estimates through the use of Earth observation satellites data, and seeks to ensure that Asian rice crops are appropriately represented within GEO Global Agriculture Monitoring (GEO-GLAM) to support FAO Agriculture Market Information System (FAO-AMIS). Asia-RiCE is composed of national teams that are actively contributing to the Crop Monitor for AMIS and developing technical demonstrations of rice crop monitoring activities using both Synthetic Aperture Radar (SAR) data (Radarsat-2 from 2013; Sentinel-1 and ALOS-2 from 2015; TerraSAR-X, Cosmo-SkyMed, RISAT, and others) and optical imagery (such as from MODIS, SPOT-5, Landsat, and Sentinel-2) for 100x100km Technical Demonstration Sites (TDS) as a phase 1 (2013-2015) in Asia with satellite –based cultivated area and growing stage map in cooperation with ground based observation and field survey activities in the countries.

The Asia-RiCE teams are also developing satellite-based agro-met information for rice growth outlook, crop calendars and damage assessment such as drought, flood and high temperature, in cooperation with ASEAN food security information system (AFSIS) for selected countries (currently Cambodia, Indonesia, Lao, Myanmar, Thailand, Vietnam, Philippine, and Japan; <http://www.afsisnc.org/blog>), using JAXA's Satellite-based Monitoring Network system (JASMIN including precipitation, drought index, temperature, soil moisture, NDVI, etc.) as a contribution to the FAO AMIS outlook with the University of Tokyo (http://suzaku.eorc.jaxa.jp/cgi-bin/gcomw/jasm/jasm_top.cgi).

From 2016 as a phase 2 (2016-2017), Asia-RiCE initiative deploys up-scaling activity from a TDS (100x100km) to major crop areas or entire country to implement operational use for rice crop production information in the Mekong Delta, Vietnam and top-10 rice producing provinces in Indonesia using EO data in cooperation with VAST, VNSC, CESBIO, MOA/Indonesia, LAPAN and JAXA with TDSs in other countries and rice crop outlook.

The AOGEOSS will propose a series of new regional applications such as Monitoring and evaluation of drought in Asia-Oceania region, Environment Monitoring and Protection, Ocean and Islands, and Himalayan GEOSS. AOGEOSS will implement new applications by step by step approach, beginning with case study after careful consultations among members. The newly proposed application activities and the foundational tasks are described in details as the following.

Task 6. Monitoring and Evaluation of Drought in Asia-Oceania region

Leaders: Sanjay Kumar Srivastava (UNESCAP), JIA Li (RADI, China),

Asia-Oceania is the largest and most densely populated and drought-prone region in the world. Due to climate change, the frequency, severity and duration of droughts, drought will likely increase in the future. The task described here aims at applying Earth Observations and other Space-based technologies to provide timely and free access to space-based data/products and services for effective drought monitoring, evaluation, and management.

Subtask 6.1 Create and maintain a drought monitoring cooperative mechanism to

- provide satellite products for general drought monitoring and higher resolution products for identified high drought risk areas;
- provide timely, on-demand high resolution data products for areas affected by drought anomalies to support deployment of remedial and impact – mitigation interventions;
- assist its members in developing localized products and services for relevant decision making. The monitoring cooperative mechanism will be established in December 2017.

Subtask 6.2 Establish a framework to integrate multiple EO data acquired by different satellites and by different Countries to monitor and evaluate drought in Asia-Oceania region using EO data resources. This framework will be established in June 2018.

Subtask 6.3 Develop a comprehensive, inclusive and robust information system, which is also considered as a decision support system, for disaster management to combine disaster data with socio-economic data for evidence-based policymaking and effective disaster management. This information system will be operational in December 2018.

Subtask 6.4 Generate policy-relevant advices to support governments to make evidence-based decisions on how and when to prepare for drought. The advices for decision-making will be released in December 2019.

Task 7. Environmental Monitoring and Protection

Leaders: LIU Qinhua (RADI, CAS), Alfredo Huete (UTS, Australia), LIU Jian (UNEP-IEMP), Mario Hernandez (Future Earth).

Environmental deterioration is a significant challenge in the AO region. From 2012, the

National Remote Sensing Center of China (NRSCC), Ministry of Science and Technology of China has continually carried out and released Annual Report on Remote Sensing Monitoring of Global Ecosystem and Environment (GEO ARC), integrating a series of products from National High-tech Research and Development Program. The task proposed here will mainly focus on the monitoring of the regional land use/cover change, ecological environmental conditions, and atmospheric environmental conditions. Accordingly, there are three sub-tasks included, which are closely connected with the Task 10 and Task 11.

Subtask 7.1 Land Use/Cover Change Monitoring for Asia-Oceania Region

Subtask Team: CHEN Jun (ISPRS), Peng Gong(Tsinghua University), Zhihai Gao (CAF), Zhenguo Niu(RADI, CAS)

Monitor the regional Land use/cover by using the long time series of satellite data such as Landsat TM, MSS, and the new satellite data such as the European Sentinel series and Chinese ZY, HJ and GF series satellites. The Land use/cover change, such as urban expansion, desertification, etc., have significant influence to and get obvious feedback from the climate change.

A7.1.1 Construct the AO regional land use/cover remote sensing product validation network, and evaluate the existing global and regional land use/cover product's accuracy and quality.

A7.1.2 Algorithm development for the Classification or change detection based on the DATA CUBE. Produce new time series of 30m AO regional land use/cover product.

A7.1.3 Annual report on the land use/cover change to evaluate the urban expansion and desertification of the AO region.

Subtask 7.2 Ecological Environment Monitoring for Asia-Oceania Region

Subtask Team: LIU Qinhuo (RADI, China), Alfredo Huete (UTS, Australia), Zheng Niu(RADI, China), Shunlin Liang(UMD, USA), LIU Liangyun (RADI, China), FAN Jinglong (NSMC, China) and other participants.

Unprecedented ecosystem, environmental and climate change in the AO region including are a consequence of rapid development of human society and with further anticipated growth there are key technical and social capacity solutions that at will be require to measure, adapt and where possible mitigate these effects on important forestry, agricultural and grass ecosystems in AO region.

A7.2.1 Construct the AO regional ecosystem parameter remote sensing product validation network, and evaluate the existing global ecosystem product's accuracy and quality.

A7.2.2 Develop the ecosystem parameter retrieval algorithm (NDVI, EVI, LAI, FVC, FPAR, NPP, BIOMASS, and Phenology et al.,) for AO regional scale, based on the DATA CUBE.

A7.2.3 Building the ecosystem monitoring System for Asia-Oceania region and produce the 30m to 1km ecosystem environmental product based on the multi-source remote sensing data, integrating the USA, Chinese, Japanese and European satellites.

A7.2.4 Annual report on the ecosystem environmental condition and the ecosystem evaluation related with climate change for the AO region.

Subtask 7.3 Atmospheric Environment Monitoring for Asia-Oceania Region

Subtask Team: GU Xingfa (RADI, China), QIN Yi (CSIRO, Australia), CHENG Tianhai (RADI, China) and other participants.

Monitor the Asia-Oceania Atmospheric environment quality, including studying the temporal and spatial variation of aerosol optical properties, particulate matter, greenhouse gases and trace gases, evaluating the control of major air pollution events and the impact on the regional atmospheric environment, providing technology and data for the regional air quality monitoring and regional coordinated control over Asia-Oceania, improving the prediction of the reliability of future air quality change over Asia-Oceania.

A7.3.1 Construct the AO regional atmospheric parameter remote sensing product validation network, and evaluate the existing global atmospheric product's accuracy and quality.

A7.3.2 Develop the atmospheric parameter (aerosol optical properties, particulate matter, greenhouse gases and trace gases et al.,) remote sensing retrieval model.

A7.3.3 Building the Atmospheric environmental monitoring System for Asia-Oceania region and produce the Atmospheric environmental product based on the multi-source remote sensing data.

A7.3.4 Annual report on the atmospheric environmental condition and the major air pollution event evaluation for the AO region.

Task 8. Ocean and Islands Observations for Asia-Oceania Region

Leaders: Andy Steven (CSIRO, Australia), Simon Albert (University of Queensland, Australia), TANG Danling (SCSIO, China), POGO, IOC, CZCP, Blue Planet.

An informed society that recognizes the oceans' crucial role in Earth's life support system and is committed to stewardship of the oceans for a healthy, safe and prosperous future for all . Blue Planet is the integrating coastal and oceans GEO initiative seek to address these issues and AO GEOSS will provide an important regional mechanism to address a number of significant issues including rapid coastal ecosystem (mangroves, seagrass, coral reefs) loss, as well as unprecedented climate change (e.g. regional climate perturbations, sea level rise, Tsunamis) that risk coastal nations and particularly the many small island developing nations of Oceania which are subject to rapid sea level rise. Thus the purpose is to advance and

exploit synergies among the many observational programmes devoted to island, coastal and ocean, to improve engagement with a variety of users for enhancing the timeliness, quality and range of services delivered; and to raise awareness of the societal benefits of ocean observations at the public and policy levels.

Subtask 8.1 Identify and articulate user needs and gaps in meeting the needs. Produce new marine and coastal observation network across the ocean observing and broader user communities by supporting and linking partners.

Subtask 8.2 Improve the Coastal Applications of the Data Cube and Modelling the Hydrodynamics and Biogeochemistry of the ocean environment.

Subtask 8.3 Extract the small island information and evaluate the sea level rise risk due to the global climate change for the developing states in the western and eastern Pacific.

Task 9. Himalayan GEOSS

Leaders: Basanta Shrestha (ICIMOD), Jiancheng Shi (RADI, China), Massimo Menenti (Netherland), QIU Yubao (RADI, China).

Under the AOGEOSS infrastructure, the ICIMOD a proposed regional Himalayan GEOSS, that aims to maximize the benefits of the Earth Observations and Geospatial Information for sustainable mountain development in the Hindu Kush Himalayan Region. The mountain region is already a strong user for the Asia Pacific regions, and will benefit further from the successful coordinated resource of AOGEOSS, including the satellite, in-situ data and assimilation data, infrastructure, and communication platform. The scope of Himalayan GEOSS includes Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan, with the efforts from all over the world. The ICIMOD mainly fosters the Himalayan GEOSS based on the commitment of its eight member countries, the main tasks and deliverables are,

Subtask 9.1 Develop and implement innovative EO and geospatial solutions and services for mountain specific situations aligning with regional priorities and GEO societal benefits areas that related to the low land areas, like Nepal, Pakistan, India; **Actions:** data products of the glacier and snow inventory from a long time at a history perspective (RADI, ICIMOD, before 2018); and water cycle parameters products related to the Himalaya region (ICIMOD, RADI, ~2018); New Earth Observation satellite for the water cycle mission (WCOM) (RADI, ~2019/2020);

Subtask 9.2 Develop capacities of the regional countries in using the EO data and information into developmental decision-making; **Actions:** Education activities with ICIMOD, and its member countries (China, ICIMOD); Dissemination of data products and utilities in Himalaya Regions (ICIMOD, Nepal, 2018~2019);

Subtask 9.3 Foster regional cooperation among the HKH countries and providing a regional platform on EO and geospatial information for mutual learning and sharing; **Actions:** Sustained Data Infrastructure building for the Himalaya mountain regions (ICIMOD, RADI, link with Task 10 and Task 11, 2018~2019); Setting up its regional data sharing mechanism within the low land area within the AO regions and its influence (ICIMOD, China, and etc. 2018~2019);

Subtask 9.4 Promote a Himalayan Spatial Data Infrastructure (H-SDI) through its established networks of institutions in the region and strategic alliances and partnerships with international agencies/initiatives. **Actions:** contribute to the data infrastructure (task 11) and global GEOSS(ICIMOD, ~2019)

4.2 Foundational Tasks

Task 10. AO-GEOSS Data Sharing Infrastructure

Leaders: Li Guoqing (RADI, China), David Hudson (CSIRO, Australia), TBD(Japan), Stefano Nativi (CNR, Italy).

Infrastructure and data services have been regarded as the core of GEOSS. To support regional sustainability and development of regional observing capacity, a data producing and sharing platform should be highlighted by AOGEOSS to improve regional EO data cooperation and ensure the Earth Observation data both generated in this region or by GEO Members and Participating Organizations in the other part of the world.

Subtask 10.1 Develop National GEOSS Data Facilities

The data rich countries in this area include Australia, China, Japan, Korea and Thailand etc. The National GEOSS data facilities are encouraged to be developed based on GCI tools and standards. Data CUBE in Australia and China-GEOSS DSNNet in China will be adjusted and published in middle of 2017(M1-1, D1-1). It is expected other national GEOSS data facilities will be online at end of 2018 (D1-2).

Subtask 10.2 Develop Regional GEOSS Data Facilities

The Regional Data Sharing Platform includes AOGEOSS Knowledge Portal (M1-2, D1-3, by May of 2018), Regional Data Sharing Nodes (D1-4, linking to Subtask 1-1), Data Publication Services (D1-5, by July of 2017), and Community Portals (D1-6, linking to Task 4/5/6/7). It is the collection hub for the national GEOSS data facilities, will benefit to the data poor countries in this regional with its free and open data policy. The data brokers outside AO Region are also welcomed to connect AOGEOSS regional data facility and make contribution to the regional applications.

Subtask 10.3 Connect AOGEOSS Data Sharing Infrastructure to GEO Portal

As part of GEO GCI, AOGEOSS Data Sharing Infrastructure will work with GCI team to

make communication with GEO portal through DAB protocol. The training and test connection will be taken as the first step (M1-3, by May of 2017), and regular data exchange will be in operation by Sept of 2018 (D1-7, linking to subtask 1-2).

Task 11. Develop Regional GEOSS Data Set

Leaders: David Hudson (GA, Australia), YU Tao (RADI, China).

Subtask 2.1 Create dialogue to assess data format requirement among data-rich countries including Australia, China, Japan, Korea and Thailand. Datasets are encouraged to be developed based on GCI tools and DAB protocols, and new requirement will be defined and conformed in 2017.

Subtask 2.2 Consolidating operational users' needs and dynamic features of large volumes EO data to support development of AO Data Cube (AODC) data set format, which will be released in 2018. The Australia Geoscience Data Cube (AGDC) and Chinese Geoscience Data Tile DEM (CNGDT) are good examples, where the remote sensing products will be produced by integrating multi-satellite data with technologies like the normalization of remote sensing data from different sources, the algorithms for automatically producing by using multi-source remote sensing data, and data processing system including software and hardware supporting automatic and efficient generation of earth observation information.

Subtask 2.3 Advocate and support incorporation of pilot researches using standardized AODC format, with the help of activities in task 1 to task 9. The final assessment report will be released around the middle of 2019.

Subtask 2.4 Advocate and support incorporation of data catalogues among member countries and contributes to task 1 in the end of 2019.

Task 12. User Engagement and Communication

Leaders: TBD(Japan), ZHOU Xiang(RADI, China), LIU Jiuliang(RADI, China), TBD(Australia).

The User engagement and Communications task serve several functions: users and partnership engagement, communication platform building, and synergy with the international communities and capacity building. The overall task is to establish a collaboration framework and platform for Members and Participating Organizations from both developed and developing regions in AO regions, which provide a core interface with other GEOSS communities. The AP Symposium is the explicit platform that serves as the lead position for the AOGEOSS user engagement and communication. The activities and actions include:

Subtask 12.1 Involvement of End Users: Conduct communication with the communities through the user's groups in different conference, event, this is one of the task for the

flag-shipped GEOSS Asia Pacific Symposium. Actions: The AP Symposium is now operationally led by Japan, and it plays a critical role for the user's engagement every year. (Annually to 2019)

Subtask 12.2 Capacity Building: conduct multilateral training courses and technical communication meetings on a regular basis, every year. **Actions:** promote the training activities related to the disaster mitigation (UNESCAP); AP Symposium services as a platform for the capacity building (for a long run, ~2019).

Subtask 12.3 Dissemination and Outreach: Tackling SBAs in the region by utilizing the existing earth observation infrastructure and integrating observation and information services by linking the resources and applications of national scale and cultivating expansion of global applications. **Actions:** synergize the applications into the global applications for the sustainable development ability (AP Symposium platform, China, Japan, Australia and etc., ~2019); Establishment of AOGEOSS flagship website, building internet mobile platform for outreach (China, Australia, Japan and etc., ~2018).

Subtask 12.4 Partnership and Synergy, The effective partners are critical to the success of AOGEOSS in the complex area for its diversity of local and national mechanisms. Synergy with the international organizations will help a lot to improve the work for both AOGEOSS and the organizations. **Actions:** Cooperate with the International Organizations and Programmes in the field of Earth Observations, such as World Meteorological Organization (WMO), Committee on Earth Observation Satellites (CEOS), International Society for Photogrammetry and Remote Sensing (ISPRS), United Nations Educational, Scientific, and Cultural Organization (UNESCO), U.N. Economic and Social Commission for Asia and the Pacific (UNESCAP), the Partnership for Observation of the Global Oceans (POGO), and etc. (Australia, China, Japan, ICIMOD, UNESCAP, etc., ~2019)

P.S. The context in Task 12 maybe modified after the consideration recently.

5. INVOLVEMENT OF END-USERS:

Involvement strategy is mainly relying on the communication activities at different platform, such as conference, side events, and related activities conducted by different consortiums. The GEOSS Asia Pacific Symposium is one of the explicit platforms, which could provide a flexible and inclusive convening platform for end-users at different level, also playing a critical role for the user's engagement and capacity building. AOGEOSS also focus on its capacity building to foster the user's engagement through the existing activities that can be with the participants, for example, UNESCAP, UNEP, WMO regional user's conference, and national platforms.

The potential AOGEOSS end-users include different national public divisions of regional agencies under UN, such as UNESCAP, UNEP, and regional activities of WMO, scientific communities, like Future Earth, ASEAN, GRSS, ISDE, CEOS, ICIMOD, and even the regional GEOSS (Himalaya GEOSS). Except the regional UN agencies and regional platform, a more technique engagement and involvement is open to all the users, including decision makers, citizens and related research communities from the developing and developed countries.

Many of these user's engagement will be strongly supported for the users from public division of AO countries, e.g. academia, governments, private sector, like Madaly Technical University (MTU) /Myanmar, Ministry of Science and Technology (MOST) /China, Technology Innovation Department/Laos, and related agencies in developing countries, such as Pakistan, Nepal, Mongolia and Bangladesh. More timely and accurate data will certainly speed up the development of countries-specific applications.

6. PLANNING, INCLUDING SPECIFIC MILESTONES AND DELIVERABLES:

6.1 The Implementation Plan

In 2016, the AOGESS initiative is proposed. From 2017, the planned tasks and related activities will be implemented by the Task Teams according to the timetable provided in the following Gantt chart. The team of co-leads will coordinate the overall progress in the implementation as well as provide support to the Task Teams where needed.

Table 1. Milestones

Task Activities	2017				2018				2019			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Task1. AWCI(GEOSS Asian Water Cycle Initiative)												
Subtask 1.1 Promote International Flood Initiative in the Asia-Oceanic region												
Subtask 1.2 Promote International Drought Initiative in the Asia-Oceanic region												
Task2. AP-BON(Asia-Pacific Biodiversity Observation Network)												
Subtask 2.1 Promoting data sharing, increasing access to data and filling gaps in data availability												
Subtask 2.2 Networking observation sites in collaboration with ILTER, GBIF, and IUCN												
Subtask 2.3 Monitoring states and changes in biodiversity, ecosystems and human-nature interactions												
Subtask 2.4 Publishing AP BON books												
Task3. GEO Carbon and GHG Initiative												
Subtask 3.1 Data access and availability												
Subtask 3.2 Optimization of observational networks												
Subtask 3.3 Budget calculations and breakdown across scales to support policy implementation												
Task4. Ocean and Society												
Subtask 4.1 Expand AP-ONS into GEO countries												
Subtask 4.2 Expand AP-ONS into non GEO countries												
Subtask 4.3 Enhance the functions of AP-ONS												
Task5. Asia-RiCE(Asian Rice Crop Estimation and monitoring)												
Subtask 5.1 Rice crop planting and growth monitoring												
Subtask 5.2 Rice crop outlook												
Subtask 5.3 Rice yield estimation, damage assessment and forecasting												
Subtask 5.4 Outreach and promotion to operational and administrative use of Asia Rice crop team results in the countries and other regions in cooperation with partners												
Task 6. Monitoring and evaluation of drought in Asia-Oceania region												
Subtask 6.1 Create and maintain a drought monitoring cooperative mechanism												
Subtask 6.2 Establish a framework to integrate multiple EO data												
Subtask 6.3 Develop a comprehensive, inclusive and robust information system												
Subtask 6.4 Generate policy-relevant advices												
Task 7. Environmental Monitoring and Protection												
Subtask 7.1 Land use/cover change monitoring for AO region												
Subtask 7.2 Ecological Environment Monitoring for AO region												
Subtask 7.3 Atmospheric Environment Monitoring for AO region												

Task 8. Ocean and Islands Observations for AO region												
Subtask 8.1 Identify and articulate user needs												
Subtask 8.2 Coastal Applications												
Subtask 8.3 Island Applications												
Task 9. Himalayan GEOSS												
Subtask 9.1 Data products of the glacier and snow inventory												
Subtask 9.2 Education activities with ICIMOD												
Subtask 9.3 Sustained Data Infrastructure building												
Subtask 9.4 Promote a Himalayan Spatial Data Infrastructure												
Task 10												
Subtask10.1 Develop National GEOSS data facilities												
Subtask10.2 Develop Regional GEOSS data facilities												
Subtask10.3 Connect AOGEOSS data sharing infrastructure to GEO portal												
Task 11. Develop Regional GEOSS Data set												
Subtask11.1 Assess data format requirement												
Subtask11.2 Development of AO Data Cube												
Subtask11.3 Pilot researches												
Subtask11.4 Advocate and support incorporation of data catalogues												
Task 12. User engagement and communication												
Subtask 12.1 Involvement of end users												
Subtask 12.2 Capacity Building												
Subtask 12.3 Dissemination and Outreach												
Subtask 12.4 Partnership and Synergy												

The milestone and annual deliverables are as follows.

- **Deliverables in 2016**

- Hold the WebEx meeting and AOGEOSS Meeting at ExCOM;
- Attending GEO Plenary
- According to organization structure, set up preliminary working group, and explore to implement the activities with proposed communication mechanism.
- Initiative proposal concurrence/acceptance

- **Deliverables in 2017:**

- AOGEOSS Data Sharing Infrastructure connected with GEO portal through DAB protocol in the middle of 2017.
- Data CUBE in Australia and China-GEOSS DSNet in China will be adjusted and published in middle of 2017.

- Developed models and software based on the satellite network observation data for demonstration;
- Annual Ecological and environmental monitoring report for AO region will be release on June 2017
- AO Ecological and environmental key parameter product data set (2014-2015) will be released on the end of 2017

- **Deliverables in 2018:**
 - The national GEOSS data facilities will be online in the middle of 2018
 - The Regional Data Sharing Platform includes AOGEOSS Knowledge Portal will be operational in serve from the middle of 2018.
 - Validation report of the typical AO remote sensing products will be completed in the middle of 2018.
 - Developed operational systems for AOGEOSS demonstration applications and services;
 - Annual Ecological and environmental monitoring report for AO region will be release on June 2018
 - AO Ecological and environmental key parameter product data set (2010-2016) will be released on the end of 2018

- **Deliverables in 2019:**
 - Annual Ecological and environmental monitoring report for AO region will be release on June 2019
 - AO Ecological and environmental key parameter product data set (2000-2017) will be released on the end of 2019
 - Demonstration application and service report for AOGEOSS will be released on the end of 2019.

6.2 Monitoring and Evaluation Approach & Reporting Mechanism

- **Regular Supervision**

As wide-accepted and general methodology to monitor and evaluate the implementation of AOGEOSS, there will be regular project supervision conducted by management team with annual progress report and providing the feedback and recommendation to the task group and participators.

- **Mid-Term Review**

After the investigation and additional data collection of project implementation, a mid-term project review will be conducted, this would produce intensive feedback and suggestions for improvement; Mid-term review report will be circulated to participants to help the improvement on implementation. Also, the Mid-term review report will be delivered to GEO PB/Secretariat for identifying potential problems and providing constant feedback on the extent to which the tasks are achieving their goals.

- **Completion Evaluation**

The objectives of task and initiative will be inspected according to output indicators. Depending on the final report, the evaluation will provide important reference for Continuance or termination of task

6.3 Communicating and Exchanging Mechanism

Based on the full of experience to organize the Asia Pacific Symposium, the implementation plan and deliverables for the years from 2017-2019 is shown as follows:

- **Implementation and Deliverables in 2017:**

- Organize the 9th Asia Pacific Symposium in Tokyo, composed with Working Groups focusing on applications;
- Publish Statement at the occasion of the 9th Asia Pacific Symposium in Tokyo;
- Report the results of the 9th Asia-Pacific symposium at the GEO Plenary and GEO Executive Committee;

- **Implementation and Deliverables in 2018:**

- Organize the 10th Asia Pacific Symposium in an Asia Pacific country, composed with Working Groups focusing on applications;
- Publish Statement at the occasion of the 10th Asia Pacific Symposium in an Asia Pacific country;
- Report the results of the 10th Asia-Pacific symposium at the GEO Plenary and GEO Executive Committee;

- **Implementation and Deliverables in 2019:**

- Organize the 11th Asia Pacific Symposium in Tokyo, composed with Working Groups focusing on applications;
- Publish Statement at the occasion of the 11th Asia Pacific Symposium in Tokyo;
- Report the results of the 11th Asia-Pacific symposium at the GEO Plenary and GEO Executive Committee;

To ensure appropriate implementation, teleconferences amongst co-organizers including GEO Secretariat and co-chairs of the Task Groups of the Symposium will be held timely.

7. DATA MANAGEMENT & DATA POLICY:

7.1 Description of the Key Datasets Used or Created by the Activity

In AOGEOSS activity, a wide-range of international and regional datasets will be connected, collected, processed and finally used to support the building of some regional information datasets.

Besides some important international GEO data resources, such as GEONetCast, Landsat, and Sentinel, the key support datasets will also rely on regional capability. China, Japan, India, Korea and Thailand can provide EO data services. For example, there are six Chinese EO data centers can provide international data services with standard products of FY, HY, CBERS,

ZY, HJ and GF satellites. Japan opened several Japanese satellite dataset online for public use, such as Himawari can provide real-time observations over AO region.

Lots of new datasets will be built up from this activity and contribute to GEOSS, for instance.

- Remote sensing products including vegetation, radiation, and hydrology;
- Daily and monthly atmospheric remote sensing products and validation on Kilometer level will be provided through synergic aerosol retrieval model;
- Experimental data collected from ground, drone, and aircraft.

7.2 Data Sharing and Data Management Principles

GEOSS Data Sharing Principles have already been adopted by most of the regional countries. These principles have not been technically applied completely in their data service at this moment. Cultural traditions and lack of legal mechanisms are regarded as the main reasons limiting the adoption of these principles. A typical limitation for many countries is that is not a clear policy for overseas distribution with regional neighbours. Data Management Principles are much fresh than Data Sharing Principles in term of the publish date, so no large scale of adoption has been taken by regional countries. Not all the components listed in DMP have been applied in the main data centers in Asian countries, even in China, Japan and India; this should be enhanced and adapted through the AOGEOSS group.

In AOGEOSS, the training of GEOSS Data Sharing and Data Management Principles will be very important for the arrangement. They are the key approach to transferring the regional data systems to be GEOSS data facilities, and contributing to the GEOSS Data CORE. There are already lots of regional data resources listed in GEOSS Data CORE. The Data Resource Catalogue and AOPub (Data Publication Services) in AOKP (AOGEOSS Knowledge Portal) will be the exchange brokers of GEOSS Data CORE, which can provide continue update from Asia-Oceania regional.

Besides the regional GEOSS platform of AODP (AOGEOSS Data Platform), National GEOSS platforms will be encouraged in some countries. China GEOSS is a national GEOSS technical facility supported by Chinese government. China as example will collect Chinese datasets information in China-GEOSS and automatic update them into GEOSS Data CORE. Interoperability with the GCI (GEOSS Common Infrastructure).

GCI is the fundamental technical components to build and support GEOSS. AOGEOSS will apply the standards of GCI and deploy GCI tools in its implementation of facilities. China will cooperate with GCI team, to develop China-GEOSS and enable its DAB interfaces. China will also lead a subtask to test GCI tools in GEO work plan of 2016 and expect to be extended to 2017-2019.

8. RISK ASSESSMENT:

Anticipated risks relating to AO GEOSS implementation include follow issues:

a) Data policy

The difficulties of data sharing caused by data policy are main risk of implementation. Possible limitations on the data acquisition of ground experiments also increases the uncertainty on performance of AOGEOSS and practical applications. The initiative has to develop a win-win mechanism to encourage stakeholders/institutions from members and participating organizations under the GEO Data sharing framework to share data.

b) Environment for International cooperation

The construction of regional earth observation system needs effective multilateral cooperation. There is an inevitable risk for different countries with different cultural backgrounds, different social systems to work together for a complex system involved in diverse activities. To establish a cooperation mechanism to prevent and mitigate international risks and to reduce the risk to be controllable is very important.

c) Communication Mechanism

The participants of AOGEOSS will engaged in the initiative activities on a voluntary basis. Besides the difference on countries background and social systems, the diverse participants from different sectors, like academia, civil society, industry and international organization, will play varied roles in AOGEOSS. So an effective communication mechanism for governance and Multi-stakeholder processes should be introduced to ensure appropriate implementation of initiative activities.

d) Technical basis

- The developing countries in Asia-Oceania region mainly adopt independent innovation to narrow the gap with the developed countries when the gap of developing countries and developed countries are growing. To avoid the halt risk during AOGEOSS implementation, developing countries should introduce technology from abroad to form their own technological solution and application system. Risk management procedures
- Assign accountability of activity
To ensure AOGEOSS activities have clear process, task ownership and accountability.
- Assess strengths and potential risk of each activity
To analyze each activity's strengths and weaknesses on an annual basis and assess the measure to improve the situation. The risk management team should focus on the most important component that will drive the success of the task and build an annual roadmap for improvement.
- Track progress, amending effort, and assess the improvement

To keep track of task group's efforts, measure the time and resources dedicated to implementation and process improvement.

9. MANAGEMENT AND GOVERNANCE:

A. Principles

A well-defined Governance Structure is critical to the success of the AOGEOSS Initiative. While responsibilities of each body within the structure are clearly defined, the governance is still expected to be simple, light and flexible to ensure efficient decision-making and prompt actions to achieve the agreed objectives of this Initiative.

Here are some principles to be considered when designing the Governance Structure.

a) Inclusiveness

All GEO Members and Participating Organization in the Asia-Oceania Region are encouraged to play certain roles in the structure. Non-Member countries are extremely welcome to participate.

b) Voluntary Contribution

All involvement of AOGEOSS activities are conducted on a voluntary basis. All members and partners could take advantage of its strength to achieve the initiative objectives with joint efforts under the agreement on implementation plan of AOGEOSS.

c) Balance

Balance between political and technical bodies, developed and developing countries, as well as provider community and user community, should be considered in the composition of the Governance Structure.

d) Best Efforts

The Initiative should leverage the existing coordination mechanisms to the largest extent to achieve Pareto optimality, i.e., no one individual country is made worse off in the proposed structure.

B. The Governance Structure

Considering above Principles, based on early versions of Governance Structure and discussion among Co-lead countries, the Governance Structure is modified as below:

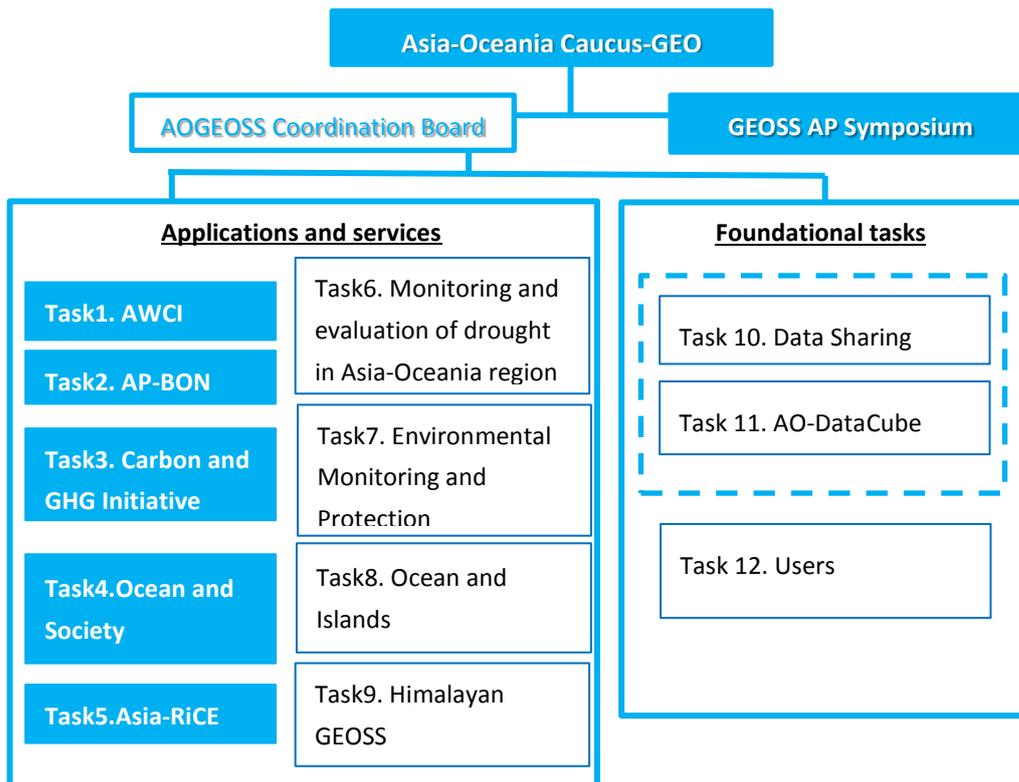


Fig.2 Governance Structure of Asia-Oceania GEOSS Initiative
(Boxes with blue background represent existing AP activities; other boxes represent newly proposed ones)

- **Asia-Oceania Caucus - GEO Principals**

The Asia-Oceania Caucus is the decision-making body consisting of GEO Principals in the Asia-Oceania Region. It provides high-level political support and ensures necessary resources to implement the AOGEOSS Initiative.

The Asia-Oceania Caucus meets annually to review reports from the Coordination Board, endorse updates on the Initiative and provide guidance to the AOGEOSS implementation. The GEO Principals may choose to hold their annual meeting at either the GEO Plenary or at the AP Symposium. Teleconferences are held as needed.

- **AOGEOSS Coordination Board**

The AOGEOSS Coordination Board is the executive management body, consists of main contributors, representatives of users, supporters and observers. The board will be composed of around 20 members, including four co-leads of the Initiative and representatives from the Task Groups. Each task group can nominate candidates for the board member and no less than 1/4 members will be rotated every two years to ensure the wider participation in initiative activities. The selection of observers in the board shall give priority to non-member countries, especially small island countries, or developing countries with relatively low capacities to engage in GEO.

The Coordination board bridges political and technical guidance and connects AOGEOSS objectives to implementation by determining mission, goals, long-term plans and high level policies of AO GEOSS and its action plan, ensuring the sustainability of the initiative by defining a number of resources, and communicating about the direction and the activities of the AO GEOSS to the GEO community.

The Coordination Board reports to the Caucus and observes the Initiative implementation between Caucus Meetings. It assembles the AOGEOSS Annual Report based on progress updates from Task Groups.

The Coordination Board may make recommendations on new tasks of the Initiative to the Asia-Oceania Caucus based on the wide consultation among experts at the GEOSS Asia-Pacific Symposium.

The Coordination Board meets at least once a year and has teleconferences on a necessary basis. It may establish subsidiary bodies to support the administrative affairs or specific activities. At the very least, the member of Coordination Board will be present (and meet) during the AP Symposium.

- **GEOSS Asia-Pacific Symposium**

GEOSS Asia-Pacific Symposium is a regional forum to exchange broad scientific and technical views on Earth observations and their applications as well as to report progress of tasks in the AOGEOSS Initiative and to recommend new tasks as necessary.

The GEOSS Asia-Pacific Symposium is held annually by Japan, a host country and GEO Secretariat.

- **Task Groups**

Task groups are task groups that implement tasks agreed by countries in the Asia-Oceania region or GEO Participating Organizations. Each Task group should have two to four co-chairs and representatives from at least three Asia-Oceania countries.

Task groups will conduct much of their work over teleconferences and emails. They meet annually at the GEOSS Asia-Pacific Symposium or GEO Plenaries. Participation in GEO Work Programme Symposiums and GEO Plenaries is greatly encouraged.

Task groups will provide progress update to the Coordination Board who assembles the AOGEOSS Annual Report.

Three categories of Task Groups are designed to meet the objectives of AOGEOSS:

- a) **Application Task Groups**

The Application Task groups implement activities related to GEO Societal Benefit Areas downscaled to Asia-Oceania region. It may also implement tasks targeting challenges specific for the region.

Working Groups within the GEOSS Asia-Pacific Symposium, namely AP-BON, Asia-RICE, AWCI, Ocean and Carbon Monitoring, will continue and be fully

inherited as AOGEOSS Working Groups.

Based on the existing efforts, four new Task groups will be established on regional priority areas including Monitoring and evaluation of drought in Asia-Oceania region, Environmental Monitoring and Protection, Ocean and Island monitoring, and Himalayan GEOSS.

b) Data Sharing Infrastructure and AO-Data Cube Task Groups

The Data Sharing Infrastructure and AO-Data Cube Task groups works to ensure the Earth Observation data both generated in this region or by GEO Members and Participating Organizations in the other part of the world, is made openly available and easily accessible to the largest extent. Existing efforts including GCI, Data Cube and national data platforms should be leveraged to avoid duplication.

As an enabling team in the Initiative, the Infrastructure and Data Task group shall facilitate the Application tasks in implementing the GEOSS Data Sharing Principles and Data Management Principles.

c) User Engagement and Communication Task Group

The user engagement and communication task group aims to transfer knowledge and technologies of Earth Observations to decision makers, scientific communities, and even civilian user (citizens), which could enhance the capacity building, synergy of partnership with the international and national communities. These aims are realized and leaded through the convening power of the AP Symposium, and other dedicated conference and side events; another important mechanism is to utility the existing regional and international platform, like events that links with the international partners: WMO, CEOS, ISPRS, UNESCO, UNESCAP, and POGO.

10. SUMMARY OF COMMITTED RESOURCES AND ANNUAL BUDGET(S):

The implementation of AOGEOSS needs active resource (financial and in-kind) contributions and social capital input from member countries and participating organizations. As AOGEOSS aims to provide an integrated information service of earth observation, it needs the resources from multi-stakeholders, including government (national, provincial, territorial and municipal governments) and private sectors, institution and organizations, not-for-profit organizations and community organizations, professional associations, GEO trust funds and individuals.

AOGEOSS's resources are in-kind and in cash as well. **In-kind resource**, such as the satellite data and its services, hosting the training programme, will be provided by member countries through their space agency and institute. For example, China, Japan, India, Korea and Thailand have successfully launched a series of satellites. China only has operated 5 data center with more than 10 services for 11 mid-high resolution land surface observing satellites,

8 meteorological satellites, 3 ocean satellite series and some scientific satellites. **Millions dollars has been spent to guarantee data for AOGEOSS every year.** The annual GEOSS Asia Pacific Symposium will be voluntarily borne in an in-kind manner by Japan as before.

Specified in-cash resources are very important for a successful AOGEOSS. Although most of member countries have expressed to invest special and/or in-kind resource on a voluntary basis for the task and subtask they are involved, some of initial funding have been fixed for some countries. Such funded projects are playing very fundamental role for the start of AOGEOSS. Such as:

1. Project funded by China MOST with USD 500,000 annually for Global Ecosystem Monitoring Report.
2. China RADI invested USD 350,000 for China GEOSS Data Sharing Platform maintaining every year.

Funding and projects for each task will be allocated by member countries after the approval of this proposal.

ANNEXES

- A. List of references
- B. Full addresses of all participants

ANNEXES

A. List of References

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B. Full Addresses of All Participants (to be added)

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