

# Implementation Plan for a GEO Community Activity Construction and Services of Chinese High-resolution Satellite Data Resources (CSDR)

## 1. Executive Summary

Since the implementation of the UN Global Mapping Project(<http://www.iscgm.org/>), Member States, including China, have been actively supporting and conducting related work benefitting the sustainable development of society and economy at domestic, regional and global levels. In recent years, the Chinese government proposed the Belt and Road (B&R) Initiative and started the co-construction with B&R countries to promote global commerce, investment and technical cooperation. The Ministry of Natural Resources of P.R.China (MNR, the former NASG) has launched the programme to serve the B&R region with the acquiring, processing, application of geoinformation to ally the geospatial industry, institutions, commercial sectors for the global co-construction and sharing of surveying, mapping and geoinformation, where it has accumulated the sufficient international EO achievements of products, resources and experience.

The Cloud Service Platform of Natural Resources Satellite Images (SatCloud) initiated by Land Satellite Remote Sensing Application Center, MNR (LASAC) is capable to meet the demands of remote sensing data for natural resources management. SatCloud has a client management system and an instant push system as well, providing management services, distribution services and real-time push services for latest acquired images of China domestic high-resolution satellites. SatCloud with high-resolution Satellite Image has been applied to government agencies and other relevant organizations during the last 2 years. It provides data query, data purchase, data instant push, and other related services. At present, LASAC has the partners of 15 countries (Austria, Norway, UK, Kenya, Uganda, Ghana, Venezuela, Jordan, Laos, Mongolia, Sri Lanka, Bangladesh, Thailand, Nepal, Cambodia) which have co-constructed 15 nodes in 4 continents of the network by bi-literal cooperation, while some of them are also the members of GEO. This network and mechanism are desired to take leveraging of GEO framework to strengthen and expand the network construction with more substantial outcomes. For the GEO Community Activity Chinese High-resolution Satellite Data Resources (CSDR), on one hand, partners of SatCloud will be in this CSDR programme continually to make joint efforts to promote the applications, research and engineering of Earth Observation remote sensing satellites images for natural resources management. On the other hand, the construction of data sharing, data exchange, and other forms of cooperation of sharing satellite resources are implemented in CSDR network.

Through the service model and mechanism of CSDR, Chinese high-resolution satellite image data, mapping products and data processing technologies can be contributed to the GEO members to support the applications in developing countries, small islands and south-south cooperation for the sustainable and harmonious developments.

To accelerate the data applications, planned activities include construction and updates of the SatCloud and the multi-satellites radiation and geometric calibration will be conducted under the collaboration Turkey, Jordan, Germany, Austria and France, etc. to guarantee the data precision and the status of the satellites. The CSDR high-resolution satellite image network architecture and application regulations will be established, in situ data cooperation and field investigation for geoinformation will also be conducted in associated countries, such as in Zimbabwe, Lao PDR, etc.

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## 2. Purpose

CSDR aims to firstly engage more partners using the EO satellite remote sensing data and establish the effective international cooperation mechanism for the remote sensing application of the natural resources and the related satellites based on the service of SatCloud. Secondly CSDR partnership is formulated to develop the cooperation on Satellite Earth Observation System, including the plan of global cross-radiation calibration and geometric calibration of resources satellites. Thirdly, endorsements are made to co-construct the global geoinformation and resources for the high accuracy integrated international geoinformation services.

- a. Coordinate positively based on the current data platform and celebrative mechanism to fascinate the data acquiring and receiving globally on remote sensing satellites, in order to provide convenient and high-efficient conditions for the satellite operation, maintenance, TT&C, validation and calibration.
- b. Enhance the international cooperation network to facilitate the processing and sharing services of geoinformation products such as satellite remote sensing data, DOM, DEM, DSM, etc.
- c. Promote and evaluate the applications using the high-resolution satellite image data in the associated countries on supporting the government decisions in various fields of the domain of natural resources management, especially focusing on the three priorities of GEO's Engagement Strategy, including 2030 Agenda for Sustainable Development (SDGs), Paris Climate Agreement within the UNFCCC (Paris Agreement), and Sendai Framework for Disaster Risk Reduction (Sendai Framework).
- d. Explore the research, training and technical exchange of theories on natural resources satellite, development of satellite data processing, sharing of infrastructure of natural resources satellites, which compose various fields of satellite remote sensing and Earth observation.

The planned outputs are

- a. The Cloud Service Platform of Natural Resources Satellites Image ([www.sasclouds.com](http://www.sasclouds.com)) for distributing high-resolution satellite image products with overall management, on-line push and distribution services. Its main responsibilities are real-time data push, management and distribution of Chinese remote sensing satellites images to realize automatic "T+1 day" and 24/7 continuous data push and data distribution of satellite images.
- b. The global mechanism and network on high-resolution satellite operators and service provider, satellite data users, and the users of downstream applications etc.
- c. The alliance of global satellite validation and calibration.
- d. Applications, demonstrations, workshop, trains, joint projects like activities or events conducted each year based on Chinese natural resources satellites resources and images, especially for contributing to the developing countries.

The actual users are the government and public sectors, research institute and universities, international organizations, and even private sectors who are the satellite data users, operator, or service providers, etc. CSDR will engage the partners from all over the world with various forms of cooperation related to the high-resolution satellite data and resources.

## 3. Background and Previous Achievements

Since last decade, Chinese series of natural resources satellites and their products have played important roles in the Global Mapping project of the UN. During this period, several demonstrations have been the proofs for the necessity of the satellite remote sensing data and the start of the CSDR programme.

Moreover, the current 15 countries of SatCloud, which are Thailand, Laos, Mongolia, Sri Lanka, Bengal, Nepal, Cambodia, Jordan, Venezuela, Kenya, Uganda, Ghana, UK, Austria and Norway, have been making good use of the Chinese high-resolution satellite image to support the national mapping tasks or drive the growth of the local economic and social sustainable development.

In the SatCloud, partners have already started to exchange visits, staff, data and technologies. For instance, As an extension of Digital Mekong River Project led by LASAC, the project of high precision composite mapping technology based on China's aerospace remote sensing images and its application based on SatCloud lead by LASAC participated by related universities, government and private sectors in China, Laos, and Austria has accomplished on its half-way of the project implementation plan with fruitful achievements, such as sharing the in situ data and exchange for the field trips, co-producing the DOM of Laos and exchange staff for training and project cooperation tasks. The project group also helped in the relief of dam break disasters of Laos in July, 2018 and won the recognition from Laos government. Furthermore, the previous research collaborated with CSIRO also innovated an interdisciplinary method to integrate the high-resolution satellite image, GIS together with SPH method for the simulation of dam break and flood disaster modelling. The 3D dynamic visualization system for disaster evaluation based on the project has been designed to be mature software and put to the market for several demonstrations. The China-Australia satellite calibration and validation, China-UK Surveying and mapping technology, and China-Germany EO data processing research are implemented each year via the pervious cooperation activities. On September 2019 the Southeast Asian Satellite Application Workshop was held in China by LASAC and GISTDA under the framework of GEO and the guidance of GEO China Secretariat, which representatives from 10 countries has participated in .In 2018 and 2019, 8 technical staff from Laos and 2 from Ghana have completed their training and joint work in China for the satellite data processing and applications.

#### 4. Key Activities

In general, the activities have been and will be conducted by the forms of joint research, technical projects and activities; organization of seminars, workshops and training courses; development of regional cooperation mechanism and infrastructure network; data sharing and results publishing of scientific studies and cooperative projects in the cooperation areas, which are listed as but not limited to the following,



- a. Construction of Cloud Service Platform of Natural Resources Satellite Images(SatCloud) to provide satellite data and services to the partner countries. Please refer to the Portal of SatCloud <http://www.Sasclouds.com/english/home/>
- b. Node construction of SatCloud in associated country and the expansion of the mechanism network;
- b. High-resolution remote sensing data processing, joint calibration and products verification;
- c. Generation and update of 1:25,000 and 1:50,000 geospatial information products based on natural resources satellites on ZY-3 satellite images mainly;
- d. Geospatial information extraction and change detection based on remote sensing technology;
- e. Remote sensing and GIS applications in agriculture, forestry, water conservancy, land resource management, urban planning, ecological environment, disaster prevention and alleviation, and other areas.

In the year 2020, key activities are as below,

- a. Establish the CSDR administrative body, joint research center and secretariat;

- b. Provide non-charge Chinese natural resources satellites data for co-constructing the technical experiment and testing, while strength the service model and cooperation mechanism.
- c. Build more international nodes for partners in the on-going CSDR programme;
- d. Discuss the long-term development goals and short-time action plans;
- e. Conduct the exchange visits and technical collaborations, co-host the workshops and training courses based on SatCloud network.

## 5. Relationship to GEO Engagement Priorities and to other Work Programme Activities

Although LASAC is also a data provider of ZY-3 data sets to GEOSS and ChinaGEOSS portal, CSDR will be a supplement to fill the blank of the construction of GEOSS regarding the sharing and construction of high-resolution satellite resources, such as image data, products and technologies, which will be considered as the valuable contributions from LASAC of China.

By implementing CSDR programe, more countries, organizations and private sectors will be engaged in the network and mostly work under and inspired by the GEO framework. This mechanism has been proved to be successful sharing the high-resolution satellite data and resources by avoiding international disputes.

The satellites image and remote sensing data can support all SDGs related applications listed in the appendix 1-the SDG Targets and Indicators Relevant to Earth Observations as a fundamental globally. Under the CSDR, depending on the applications of the partners of SatCloud and users of high-resolution satellite image data, image data with different level of products will be collected and models with methods will be invented to support the SDGs. Besides, the achievements would be exchanged with other flagships, initiatives or community activities in GEO Work Programme.

Case studies and the advantages of GIS and remote sensing technologies have been given to support the disaster relief and loss/damage estimations, which will be further developed benefitting from the sufficient satellite image data sources to support the 2<sup>nd</sup> and 3<sup>rd</sup> pillars in Appendix 2-Five Pillars of Earth Observations Support to the Paris Agreement, as well as be the support from the geospatial domain to Appendix 3-Global Targets of the Sendai Framework for Disaster Risk Reduction. Under the CSDR, depending on the applications of the partners of SatCloud and users of high-resolution satellite image data, the outcomes may contribute to the GEO Engagement Priorities.

## 6. Governance

At present CSDR governance structure will be based on the SatCloud lead by LASAC and contributed by the government sectors, organizations, enterprises in the associated countries, as well as the nodes of the CSP network or is willing to join in the network. That means LASAC act as the main node and it radiate to other partners as the sub-nodes over the world in different regions

For the next step work, along with the implementation, the administration board, advisory committees, joint research center and secretariat is planning to be established by the consensus of all the participants. Depending on the needs of the practical status, the location of office and working staff for the joint secretariat might be funded and deployed in the future.

Approaches like teleconference, visiting exchanges and face-face meeting, etc. will be held to strengthen the CSDR network to ensure the implementation and participation of CSDR programme.

## 7. Data Policy

CSDR will operate and not be against GEOSS data sharing principles or GEOSS Data management principles and be a supplement of the high-resolution satellite image data to fill the blank of GEO based on agreements of the parties, while activities are undertaken under MOU or agreements framework signed on consensus of the participants of CSDR for non-commercial usages.

Annual or seasonal reports of application will be set up as measures for the updating and concluding the joint achievements. The related co-construction progress is planning to be publish on the following URI:[www.sasclouds.com](http://www.sasclouds.com)

### Tables

#### A. Individual Participants

##### a. Lead:

Dr. TANG Xinming, LASAC, China

##### b. Contributor(include but not listed here all):

1. Dr. Wolfgang Kainz, University of Vienna, Austria

2. Dr. Peter Caccetta, CISRO, Australia

3. Dr. Paul Cleary, CISRO, Australia

4. Dr. Peter Reinartz, DLR, Germany

5. Dr. MENG Xiaolin, University of Nottingham, UK

6. Dr. Amos T. Kabo-bah, University of Energy and Natural Resources, Sunyani,

Ghana

7. Dr. Mariano Imbert, ABAE, Venezuela

8. Mr. Susheel Dangol, Survey Department, Nepal

9. Ms. Ye Fanghong, LASAC, China (Point of Contact)

Information of the participants not listed in this version of text will be updated soon.

#### B. Confirmed Contributions

##### LASAC:

a. Territorial image data and products provides to the partner countries of the through SatCloud based on the agreement<sup>9</sup> natural resources remote sensing satellites

b. B&D information acquiring and processing project: 5 million RMB per year;

c. Construction and demonstration in B&R countries international cooperation 50 million RMB per year

##### Contributors:

Contributions to conduct the joint research or activities.

##### 15 SatCloud nodes in 15 countries:

Hard and software environments, such as computers, data storages;

Work group assigned to use and applicant with the cloud platform.

Please refer the tables of the excel format attached for more details.

### Annexes

#### I. Acronyms and abbreviations

ASEAN: Association of Southeast Asian Nations

B&R: One belt and one road  
TT&C: Tracking Telemetry and Command  
CSP: Cloud Service Platform of Natural Resources Satellites Image  
DOM: Digital Orthophoto Map  
DEM: Digital Elevation Model  
DSM: Digital Surface Model  
GIS: Geographical Information System  
MNR: Ministry of Natural Resources of P.R.China  
MOU: Memorandum of Understanding  
NASG: National Administration of Surveying, Mapping and Geoinformation of China  
LASAC: Land Satellite Remote Sensing Application Center, Ministry of Natural Resources  
of P.R.China

## II. Brief CV of Project Leader(s)

Dr. Tang Xinming works as the Chief Engineer of Land Satellite Remote Sensing Application Center, Ministry of Natural Resources of P.R.China. He is designated as the chief designers of ZY-3 and GF-7 satellites application systems. He was the president of Commission I Working Group V of the International Society for Photogrammetry and Remote Sensing (ISPRS) and the Deputy Director-General of Satellite Surveying and Mapping Application Center (SASMAC), National Administration of Surveying, Mapping and Geoinformation of China. He is now the Deputy Director-General of GEO China Secretariat and the member of GEO Programme Board.

He earned an MSc Degree in Land Administration from Faculty of Geo-Information Science and Earth Observation (ITC) in the Netherlands in 1998. He earned a PhD Degree on Geo-Information Science and Computer Application from University of Twente in the Netherlands in 2004. His scientific expertise is in the fields of spatial information science and technology including remote sensing, GIS and their integration. He has been the leads of about 10 national key science and technology projects and has published more than a hundred scientific papers and 8 books during his work career.