



[DRAFT]

ASEAN Regional Training Course on Geospatial Big Data Applications for Sustainable Development

5th – 9th August 2019

ASEAN Research and Training Center for Space Technology and Applications (ARTSA)
Sirindhorn Center for Geo-Informatics (SCGI),
Space Krenovation Park, Chonburi Province, Thailand

In Collaboration with Hydro Informatics Institute (HII), Chulalongkorn University, King Mongkut's Institute of Technology Ladkrabang, Thailand, Chinese University of Hong Kong (CUHK), United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), The Regional Committee of United Nations Global Geospatial Information Management for Asia and the Pacific (UNGGIM-AP)

I. Background

The volume of data in the world is increasing exponentially. By some estimates, 90% of the data currently existing worldwide has been created in the last two years, and it is projected to increase by 40% annually¹. The data revolution encompassing the application of earth observation data, the open data movement, the rise of crowdsourcing, new information and communication technologies (ICTs) for data collection, and the explosion in the availability of big data, together with the emergence of artificial intelligence and the Internet of Things – is already transforming society. Multi-temporal earth observation data and crowdsourced geospatial data can help us identify depleting natural resources, diagnose underlying causes and can help us devise informed planning for sustainable development. According to the UN global pulse to use big data for development we need to turn imperfect, complex, often unstructured data into actionable information. Often the tools and technologies for analysing massive amounts of data are rapidly evolving and no single standard exists for generating actionable information. This poses a huge challenge to the practitioners and decision maker for effectively utilizing geospatial big-data for decision making.

As expressed in its Vision 2025, ASEAN highlights the need to promote and ensure balanced social and sustainable environment that meets the needs of the peoples at all times and to work towards a resilient community with enhanced capacity and capability to adapt and respond to social and economic vulnerabilities, disasters, climate change as well as emerging threats and challenges. The Asia-Pacific Plan of Action on Space Applications for Sustainable Development (2018–2030), which was adopted by ESCAP in 2018, is a regionally-coordinated, inclusive and country-needs driven blueprint that harnesses space and geospatial applications, as well as digital innovations to support ASEAN members and other countries in the region, particularly those with special needs, to address regional challenges towards achievement of the Sustainable Development Goals.

To meet this challenge, GISTDA, ARTSA, UNOSAT and UNESCAP is offering an introductory course in the use of Geo-Spatial Information Technology applications for big data relevant to different domains such as disaster risk management, environmental monitoring, hazard mapping and disaster risk reduction for achieving Sustainable Development Goals (SDGs).

II. Learning Objectives

At the end of the course, participants should be able to:

- Define and describe basic concepts and terminology related to Geospatial Big Data Analytics
- Explain the advantages and limitations of using Geospatial Big Data Analytics
- Detect flood using RADAR satellite image and damage estimation using Google Earth Engine
- Monitor disaster situation using web-scraped geodata
- Utilise big data techniques for monitoring carbon emission, smog and forest fire using Google Earth Engine
- Undertake the process to prepare actionable information through visual communication

¹<https://www.un.org/en/sections/issues-depth/big-data-sustainable-development/index.html>

III. Course Content

The course will provide participants with a theoretical understanding of geospatial big data and within the context of geospatial data analysis, its application for problem identification, assessment, and decision support. Participants will also be challenged to solve a problem of their choice by developing a simple decision support application.

IV. Duration and Instructional Methodology

This is a full-time, face-to-face course with lectures and lab exercises using geospatial big datasets and real case scenarios (60% lab exercises, 40% lectures and discussions). This course is divided into 5 modules. Each module is structured into 4 sessions of 1.5 hour each. The average workload per week is likely to be around 25-30 hours.

The course is designed in a way to have a balanced approach between theoretical and practical teaching methods consisting in Power Point presentations, live demos, videos, interactive sessions and geospatial big data analytic exercises. At the end of the course. GISTDA, ARTSA, UNOSAT and UNESCAP will set up a community of practice platform to maximize the learning experience of participants and to provide all required technical backstopping and assistance to training participants during and after the training.

V. Course Content



Module A1: Introduction to geospatial big data analytics for sustainable development

- Increased understanding of the regional action plan on using geospatial technology
- New trend in geospatial big data and technology for big data analytic



Module A2: Geospatial big data application for disaster risk reduction

- Flood monitoring and damage assessment from time series satellite image using Google Earth Engine
- Disaster monitoring and situational analysis using web-scraped big data



Module A3: Geospatial big data for environmental management

- Geospatial big data analysis for forest fire management and carbon emission



Module A4: Group project on big data application

- Hands-on exercise on using big data analytics for actionable information for social benefit



Module A5: Data visualisation

- Use of infographic for representing maps and geospatial big data analysis

Description of the modules

Module A1: Introduction to geospatial big data analytics for sustainable development

- **Asia-Pacific Plan of Action on Space Applications for Sustainable Development (2018 – 2030) - UNESCAP**

The Plan of Action is a regionally coordinated, inclusive and country-needs driven blueprint that harnesses space and geospatial applications, to achieve the 2030 Agenda for Sustainable Development. The Plan of Action is fully aligned with ESCAP's Regional Roadmap for Implementing the 2030 Agenda for Sustainable Development in Asia and the Pacific. It maps the sectoral needs and resources at national and regional levels.

This topic will increase understanding of the regional action plan on using space and geospatial applications in ASEAN member countries and able to apply to the project and work in the participant's agency.

- **Roles of geospatial big data in geoinformatics application for sustainable development –KING MONGKUT'S INSTITUTE OF TECHNOLOGY LADKRABANG**

Achieving sustainable development presents all countries and the global policy community with a set of significant development challenges that are almost entirely geographic in nature. Many of the issues impacting sustainable development can be analyzed, modelled, and mapped within a geographic context, which in turn can provide the integrative framework necessary for global collaboration, consensus and evidence-based decision-making.

This topic aims to explore a new trend technology of geospatial big data, which can be used to address scientific and societal issues and to develop a potential methodology on how to improve more precise and timely results through big data analytic approaches.

Module A2: Geospatial big data application for disaster risk management

- **Flood monitoring and damage assessment from time-series satellite image using Google Earth Engine - UNOSAT**

Between July and September, 2018 much of Lao PDR was under water. To understand the flood dynamics for the whole country for a duration of two months requires a staggering amount 237 RADAR satellite images to be analysed. Using the a traditional technique of image by imager flood extraction would require at least several months to come up with the statistics.

In this scenario Google Earth Engine platform will be used to extract flooding duration and extent and a massive scale.

- **Disaster monitoring using web-scraped big data –CHULALONGKORN UNIVERSITY**

The combined application of location identification in mobile phones, social network and computers with cloud computing can help faster detection of natural disaster location. By combining information related to disaster situation from Twitter and satellite observations, a scientist can build a real-time map of the location, timing, and impact of disaster assessment.

This topic aims to train the participant to practise writing programming language to extract disaster information and location from Twitter for assessing and monitoring the situation efficiently and timely.

Module A3: Geospatial big data for environmental management

- **Wildland fires, smoke and haze – HYDRO-INFORMATICS INSTITUTE (HII)**

Wildland fires, smoke and haze consider as a regional problem. Active fires can be detected and utilized in wildfires control. They emitted carbon, carbon dioxide and other greenhouse gases which will continue to warm the planet well into the future. They damage forests that would otherwise remove CO₂ from the air. Moreover, they inject soot and other aerosols into the atmosphere, with complex effects on warming and cooling. To timely cope with this growing problem, a combination of satellite image processing with near real-time data supplied by multi-sensors is needed.

This topic will aim to improve the understanding of big data application for forest fire detection and management where is the source of carbon emissions using Google Earth Engine, Sentinel Hub, NASA FIRMS, NASA WorldView, etc.

▪ **Big data application for social development – CHINESE UNIVERSITY OF HONG-KONG (CUHK)**

Big Data refers to data sets of much larger size, higher frequency, and often more personalized information. It ensures will be the next frontier for innovation, competition and productivity. Using machine learning technology, a field of data science known as predictive analytics shows the value in large amounts of data. This advantage can be adapted for social development by understanding society and social interaction in ways we never could before.

With the group project participants will apply big data analytics for preparing actionable information for social benefits.

Module A4: Group project on big data application

▪ **Technical visiting at Space Krenovation Park - GISTDA**

Space Krenovation Park (SKP) was established in 2012 by Geo-Informatics and Space Technology Development Agency (GISTDA). SKP offers a new focus for development on the challenges of meeting global demands in geo-informatics and space technology. SKP comprise of GISTDA's operation centre to control the THAICHOTE satellite and also to receive the images from various other satellites, Space Inspirium - first Thailand's space museum. It also will serve as an incubator for young entrepreneurs in the country to set up their business.

In this session, all participants will have a chance to visit all facilities in SKP under the guideline of GISTDA's experts and satellite engineer to understand the role space technology support to country development.

Module A5: Data visualization

▪ **Prepare actionable information through visualization - UNOSAT**

Infographics - a clipped compound of "information" and "graphics" - are graphic visual representations of information, data or knowledge intended to present information quickly and clearly. Infographics have been around for many years and recently the increase of a number of easy-to-use, free tools have made the creation of infographics available to a large segment of the population.

This topic aims to let everyone understand the concept of infographic and demonstrate infographic application for mapping representing the result of geospatial big data analysis.

VI. Organizers

- ASEAN Research and Training Center for Space Technology and Applications :(ARTSA)
- Ministry of Higher Education, Science, Research and Innovation:
Geo-Informatics and Space Technology Development Agency(Public Organization)(GISTDA)
- United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)
- UNITAR's Operational Satellite Applications :(UNOSAT)

VII. Collaborator

- HydroInformatics Institute (HII), Thailand
- Chulalongkorn University, Thailand
- King Mongkut's Institute of Technology Ladkrabang, Thailand
- Chinese University of HongKong (CUHK), China
- United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA)
- The Regional Committee of United Nations Global Geospatial Information Management for Asia and the Pacific (UNGGIM-AP)

VIII. Date & Place

Date	:Monday5 th –Friday 9 th August 2019 (5 days)
Place	:ARTSA, Sirindhorn Center for Geo-Informatics Building, Space Krenovation Park (SKP), SriRacha, Chonburi, Thailand.
Location	: 13.102001 N,100.928833 E

IX. Expected Participants from ASEAN countries

The course is designed to accommodate ASEAN participants, who work in government sector as a public officer, from geoinformatics backgrounds and professional experiences. Previous experience in basic programming and algorithm development is recommended. Participation is limited to a maximum of 20 participants.

X. Language

The language of the training course will be conducted in English.

XI. Lecturers

The lecturers will be conducted by experts on geospatial big data from Thailand, UNESCAP, UNOSAT and prominent organizations.

XII. Software

Lab exercises will be based on free to use and opensource tool like QGIS, Orange, R (programming language) and Google Earth Engine.

XIII. Class Size

The number of participants is limited to 15-20 (max.) to ensure quality support provided by the instructors.

XIV. Certificates

Students will be given a certificate issued by GISTDA, UNESCAP and UNITAR upon successful completion of the course.

XV. Financial Support

There are two groups of participants, self support participants and funded participants, available for this course. Both groups are supported with local expenses by local host (ARTSA and GISTDA, Thailand) **excluded** the life and health insurance.

UNESCAP and UNOSAT-UNITAR also offering the airfare grant for limited number of funded participants on competitive bases. A panel of judges from the local organiser and co-organiser in its sole discretion will review all application and decide on the fund recipient.

	Self support participant	Funded participant
Local Expenses		
Registration fee	Supported by Local Host	Supported by Local Host
Lecture materials		
Meals and break refreshment		
Local transportation and airport transfer		
Accommodation (IN 4 Aug / OUT 10 Aug)		
One Round Trip Ticket	Self funded	Supported by UNESCAP and UNOSAT-UNITAR
Life and health insurance	Self funded	Self funded

The applicant for funded participant must be a government officer in ASEAN country or official of ASEAN agencies.

Please indicate in the online course registration form if you would like to apply for the airfare grant as funded participant and self funded of airfare as self support participant. (See at How to apply and required document)

Applicants of both groups will go through the theselection process by the Committee.

XVI. How to apply and requied document

All applicants are requested to submit the application through **ONLINE APPLICATION FORM** with required documents as below detail list.

(1) Online Application form can be accessed at <http://artsa.gistda.or.th/geobigdata2019>

(2)One Copy of Passport*

(3)Curriculum vitae(Maximum 2 pages)*

(4)One letter of recommendation: e.g. from your supervisor, head of the department or head of organizationwho knows well your work ([the recommendation formis available on training course website](#)).

* Note: (2) and (3) should be prepatated in PDF format and shouldbe attached in the online application form

XVII. Important Dates

Call for course application	01 June 2019
Course application deadline for ASEAN Participants	30 June 2019
Course application deadline for Local Participants (Thai)	5 July 2019
Announcement of selected participantsfor ASEAN Participants	5 July 2019
Announcement of selected participantsfor Local Participants (Thai)	10 July 2019
Sending invitation letter and attendance forms to all selected participants (for VISA purpose)	1 – 10 July 2019
Deadline for attendance form submission	20 July 2019
Travel to SKP, Thailand	4 Aug 2019
Geospatial Big Data Course	5 – 9 Aug 2019

Remarks:

- Only complete applications, with all the requested information, will be considered.
- The invitation letter will be sent to only the selected applicants for visa formalities at the same time.

XVIII. Institutions

Geo-informatics and Space Technology Development Agency (GISTDA)

GISTDA has developed space technology and geo-informatics applications to be beneficial to the general public and satellite database for derived natural resources information centre. GISTDA has also provided data services relating to space technology and geo-informatics and technical services to develop human resources in satellite remote sensing and geo-informatics. GISTDA also conducts researches and development as well as implements other activities related to space technology, including the development of small satellites for natural resources survey. The headquarter is located at The Government Complex, Rattaprasasanabhakti Building, Bangkok, Thailand.

ASEAN Research and Training Center for Space Technology and Applications (ARTSA)

ARTSA Center increases the capability of personnel knowledge and research development in the region as well as establishes and expands the networks of academic knowledge and research collaboration among ASEAN countries that will benefit to natural resource, environmental management, and emergency response of the region. The operational concept of the center is to increase ASEAN personnel capacity on the area of space

technology and geo-informatics applications and raise awareness for all levels as well as strengthen the network of academic knowledge and research collaboration through conventional classroom training, on the job training, research projects and academic network.

United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)

The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) is the regional development arm of the United Nations for the Asia-Pacific region. ESCAP promotes rigorous analysis and peer learning in our core areas of work; translates these findings into policy dialogues and recommendations; and provides good development practices, knowledge sharing and technical assistance to member States in the implementation of these recommendations.

UNITAR'S Operational Satellite Applications Programme (UNOSAT)

UNOSAT is a technology intensive programme active in all aspects of applied research relating to satellite solutions, from earth observations to telecommunication, positioning and navigation. UNOSAT delivers satellite solutions, geographic information to organizations within and outside the UN system to make a difference in the lives of communities exposed to poverty, hazards, and conflict, or affected by humanitarian and other crises. The main office of UNOSAT is located on the CERN site in Meyrin, Geneva, on the border between Switzerland and France and regional offices at Bangkok, Nairobi and N'djamena.

The Regional Committee of United Nations Global Geospatial Information Management for Asia and the Pacific (UNGGIM-AP)

The Regional Committee of UN-GGIM-AP is one of the five regional committees of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM). It was initially established in 1995 as the Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP) in accordance with the resolution adopted at the Thirteenth UN Regional Cartographic Conference for Asia and the Pacific in 1994, and rebranded as UN-GGIM-AP in 2012, subsequent to the establishment of UN-GGIM in 2011. As the representing body of the National Geospatial Information Authority of 56 countries in Asia and the Pacific region, the UN-GGIM-AP aims to promote the use of geospatial information for identifying problems and finding solutions, so that the economic, social and environmental benefits of geospatial information will be maximized in Asia and the Pacific region. The Economic and Social Council adopted the resolution "Strengthening institutional arrangements on geospatial information management" at its 48th plenary meeting on 27 July 2016. The resolution requests, the regional commissions of the United Nations shall provide relevant support to the work of the regional bodies of the UN-GGIM and the outcomes and benefits of the activities of those bodies shall be equally disseminated to all member States in each region. To implement this resolution, ESCAP has taken over the secretariat of UN-GGIM-AP since November 2018, in order to strengthen the capacity of the member States in geospatial information management and to facilitate the dissemination of the outcomes and benefits of the activities of the Committee to the member States in the region.

Chinese University of Hong Kong

Founded in 1963, The Chinese University of Hong Kong (CUHK) is a forward-looking comprehensive research university with a global vision and a mission to combine tradition with modernity, and to bring together China and the West. CUHK teachers and students hail from all around the world. CUHK graduates are connected worldwide through an extensive alumni network. CUHK undertakes a wide range of research programmes in many subject areas, and strives to provide scope for all academic staff to undertake consultancy and collaborative projects with industry.

Hydro-Informatics Institute (HII)

HII is a public organization under the Ministry of Higher Education, Science, Research and Innovation, was originally established by the initiative of His Majesty the King Bhumibol Adulyadej, aiming to develop a coherent plan to improve water resource management in Thailand. With agriculture as the backbone of Thailand's economy, HII's researches on water resource management and agricultural practices have been increasingly notable. Since 2010, HII has maintained the High Performance Computing facilities that enable researches

branching from intelligent monitoring systems, weather and flood modeling, simulation, information processing, and information dissemination that support the policy makers in coping with flood and drought management.

Chulalongkorn University

A World-class National University with 102 years of education and knowledge to serve the nation with dignity and integrity. The university was originally founded during King Chulalongkorn's reign as a school for training royal pages and civil servants in 1899 (B.E. 2442) at the Grand Palace of Thailand. It was later established as a national university in 1917, making it the oldest institute of higher education in Thailand. Chulalongkorn University is one of the National Research Universities and supported by the Office of National Education Standards and Quality Assessment of Thailand. Moreover, CU is the only Thai university which is a member of Association of Pacific Rim Universities (APRU)

King Mongkut's Institute of Technology Ladkrabang

King Mongkut's Institute of Technology Ladkrabang (KMITL or KMIT Ladkrabang for short) is a research and educational institution in Thailand. KMITL consists of seven faculties and four colleges with a total enrollment of more than 29,729 undergraduate and graduate students: Faculty of Engineering, Architecture, Industrial Education, Science, Agricultural Technology, Information Technology and Agroindustry together with College of Nano technology, Data storage technology and applications, Administration and Management and International College.

XIX. Course Coordination:

Ms. Manpreet Sachasiri, GISTDA (manpreet@gistda.or.th)

Ms. Patricia Budiyo, UNESCAP (budiyo@un.org)

Mr. Jakrapong Tawala, UNOSAT-UNITAR (jakrapong.tawala@unitar.org)

XX. Course Schedule (DRAFT)

	Module 1 5 Aug 2019	Module 2 6 Aug 2019	Module 3 7 Aug 2019	Module 4 8 Aug 2019	Module 5 9 Aug 2019
S1 09:00- 10:15	Opening Session [PPT] Course Introduction, ARTSA [PPT]	Case Study 1 LaoPDR Flood Monitoring Simulation, UNOSAT [LAB_EX]	Case Study 3 Wildland Fires, Smoke and Haze, HII [LAB_EX]	Technical visiting SKP, GISTDA [RT]	Group Project [ASN]
S2 10:30- 12:00	Plan of Action, UNESCAP [PPT]	Case Study 1 (Continued) [LAB_EX]	Case Study 3 (Continued) [LAB_EX]	Data Visualization UNOSAT [PPT+IA]	Group Presentation [ASN]
12:00- 13:30	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
S3 13:30- 15:00	Roles of Geospatial Big Data, KMITL [PPT]	Case Study 2 Disaster Monitoring using Web-scraped Big Data, Chulalongkorn University [LAB_EX]	Case Study 4 Big Data Application for Social Development, CUHK [LAB_EX]	Group Project [ASN]	Case Studies by Various Experts [RT]
S4 15:15- 16:30	Group Discussion On country needs on Big Data Application [RT]	Case Study 2 (Continued) [LAB_EX]	Case Study 4 (Continued.) [LAB_EX]	Group Project [ASN]	Training Evaluation Training Certificate Closing Ceremony
16:30- 17:00	Wrap-up & Self-Study	Exercise Continuation – Q&A	Exercise Continuation – Q&A	Exercise Continuation – Q&A	

[PPT]: Power Point Presentation
[PPT+IA]: Power Point Presentation with Interactive exercise
[LAB_EX]: Lab Exercise
[RT]: Round Table and Group Discussions
[ASN]: Assignment

[END]