GIC joined a UNEP Discovery Session to promote its role in the CounterMEASURE Program

GEOINFORMATICS CENTER

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In This Issue

UNEP Discovery Session - CounterMEASURE Project

GIC presented its ongoing work to fight plastic pollution using geospatial technology at the United Nations Environment Program's (UNEP) 13th Digital Discovery Session on September 14, 2021.

Digital Discovery Sessions are two-hour long webinars designed to serve as a platform for joint learning where those in the environmental field can learn about the latest environmental applications of digital technology. The sessions skew towards topics involving climate action, biodiversity conservation, and pollution control. UNEP's CounterMEASURE project, a concerted region-wide effort to reduce plastic waste in waterways, was the focus of the latest Digital Discovery Session.

Dr. Kavinda Gunasekara shared GIC's latest work for the CounterMEASURE Project, including plastic waste data collection efforts in the Lower Mekong River Basin, a plastic litter hotspot map for Ubon Ratchathani province created using a deep learning model with roadside images, and GIS analysis of plastic leakage hotspots in the region. Dr. Gunasekara also highlighted upcoming GIC research efforts using unmanned aerial vehicles and CCTV cameras to monitor plastic waste in greater Bangkok waterways.

Additional technology-related sessions focused on CounterMEASURE partners who are operating around the region, including a microplastic survey in Vietnam, development of a CounterMEASURE knowledge management platform, and other AI applications for plastic pollution detection.

Provincial Capital City-Scale Heatmap Development

GIC has completed data collection and analysis in Ubon Ratchathani province to support its efforts in mapping plastic waste pathways in the Lower Mekong River Basin.

GIC partnered with Ubon Ratchathani Rajabhat University to handle local data collection efforts. The methodology used was developed by GIC and involves capturing high resolution roadside video with a camera attached to a passenger vehicle.

Camera preparation for roadside data collection

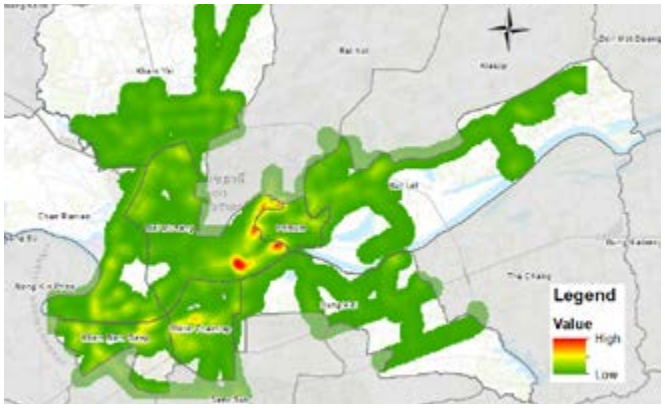
The Ubon Team collected data in June and July 2021. In total, 558 km were covered in Ubon Ratchathani's Muang and Warin Chamrap districts. These areas were selected based on GIC's spatial analysis for plastic leakage pathways completed the previous year during Phase 1 of the UNEP CounterMEASURE project. Weather conditions played a critical role in data collection progress as testing demonstrated that precipitation negatively affected data quality. Data collection was frequently postponed due to inclement weather conditions as this period coincided with Thailand's rainy season. Despite these delays, Ubon Ratchathani data collection was completed in nine days for 5-6 hours each day.

Littered areas in Ubon like the one pictured above will benefit from GIC's plastic waste analysis

Quality control was established at the onset of the data collection campaign by staging test runs with the Ubon Ratchathani field team. GIC staff evaluated the test data and provided recommendations for improvement to achieve optimal data quality. The final data volume was nearly 900 GB.

Following data cleaning, several university students from around Southeast Asia were recruited as volunteers to annotate instances of plastic waste in the Ubon Ratchathani dataset. Annotations were performed using ***pLitter***, an online plastic waste annotation platform developed by GIC. The annotated data was used to train a Neural Network to identify plastic waste in roadside images. A partnership with Google led the GIC team to use Google's Auto ML platform for deep learning analysis. An advantage of using AutoML is that it subjects datasets to numerous deep learning models to find the one with the best output, reducing some of the effort for the analyst.

After training, the deep learning model can detect roadside plastic waste from the Ubon Ratchathani roadside images. GIC then used the locations of plastic waste to create a heat map depicting areas in Ubon Ratchathani with the most plastic litter that poses a risk to enter local waterways. These hotspots are being shared with UNEP and Ubon Ratchathani municipality to design a plan of action to work towards reducing the plastic problem in the Lower Mekong River Basin.



Plastic Litter heatmap for Ubon Ratchathani study area

The next step for GIC in CounterMEASURE Phase 2 is to reproduce this work in Chiang Rai province. Data collection in Chiang Rai ran from September 26 through October 3, 2021 for approximately 600 km of roads in the Chiang Saen District. Analysis will soon be underway and a plastic waste heat map will be developed for the Chiang Rai province study area.

Plastic Waste Outreach at *National University of Lao*

GIC partnered with the National University of Laos (NUOL) to spread awareness for Southeast Asia's riverine plastic waste issue with an online workshop on August 27, 2021.

Seventy students from the NUOL attended the three-hour webinar.

GIC staff introduced NUOL students to UNEP's CounterMEASURE project and gave an overview of efforts going on in the region, including identification of potential problem areas for plastic waste and a deep learning-based approach to plastic waste hotspot identification.

Part of the deep learning process involves training the deep learning model to identify plastic waste. The process of annotation requires users to select instances of plastic waste in images, which are then used to train the deep learning model. GIC developed an online platform called ***pLitter*** to carry out these annotation tasks. With ***pLitter***, anyone can access GIC's roadside image dataset to annotate plastic waste that appears in the environment. These annotations are then used to train deep learning models to identify plastic litter. When the model encounters other roadside images it will be able to automatically identify plastic waste in them.

Land Stability Monitoring Training Course

GIC teamed up with the Remote Sensing Technology Center of Japan (RESTEC) to hold an online five-day training course to strengthen Indonesia's capacity for reconstruction monitoring with geospatial technology from July 12 – 16, 2021.

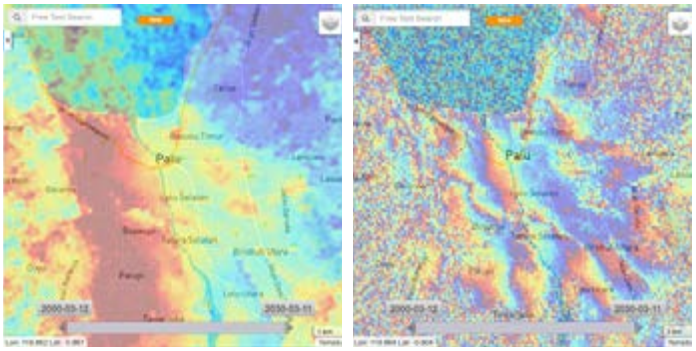
This training course was the second module in a series of six training courses that were prescribed by the Asian Development Bank (ADB) to assist with Indonesia's rebuilding effort in the wake of the devastating 2018 Sulawesi earthquake.

Training Module 2 focused on building participants' capacity for land stability monitoring with time series analysis of synthetic aperture RADAR (SAR) data. Participants also gained valuable experience in processing open source SAR data in the Geohazard Exploitation Platform, a cloud based solution for on-demand processing of large scale data. Technical sessions were handled by representatives from GIC, Diponegoro University - Indonesia (Ind: UNDIP), RESTEC, and National Institute of Aeronautics and Space – Indonesia (Ind: LAPAN).

The thirty participants who took part in the training course represented a number of Indonesian government institutions, including: LAPAN, the Geospatial Information Agency - Indonesia (Ind: BIG), the Meteorology, Climatology, and Geophysical Agency (Ind: BMKG), Bappeda Sigi, and the National Geology Department.

Module 3 is scheduled for 4th Quarter 2021 and will continue land stability monitoring by honing on building-level stability through spatial modeling techniques.

Group photo of the second training



Sample of deliverables of Unwrapped Phase (left) and Interferometry Phase (right) for InSAR processing using DIAPASON service of GEP over Palu city

Climate Modeling Capacity Building in Lao

GIC completed an online capacity development program to aid Lao PDR in its effort to prepare for the effects of climate change to the country's agriculture sector.

The final two training courses were conducted from July 19 – Aug 03 and from September 16 – 17, 2021, respectively.

Nine participants from the Lao PDR Department of Climate Change - Ministry of Natural Resources and Environment (MoNRE) took part in the training courses.

Training Course 2 built on the foundation laid in the first training course by reinforcing dynamical downscaling concepts while introducing participants to the procedure to perform statistical downscaling. In addition, participants learned how to select and perform projections on a global climate model.

Training Course 3 comprised of a refresher course to ensure that the participants had a good grasp of requisite Python scripting skills for processing and display of Weather Research and Forecasting Model output data.

Python & Google Earth Engine Training Course

GIC conducted an online training course titled ***Python for Geospatial Analysis and Google Earth Engine (GEE)*** in collaboration with The Food and Agriculture Organization of the United Nations (FAO), Afghanistan.

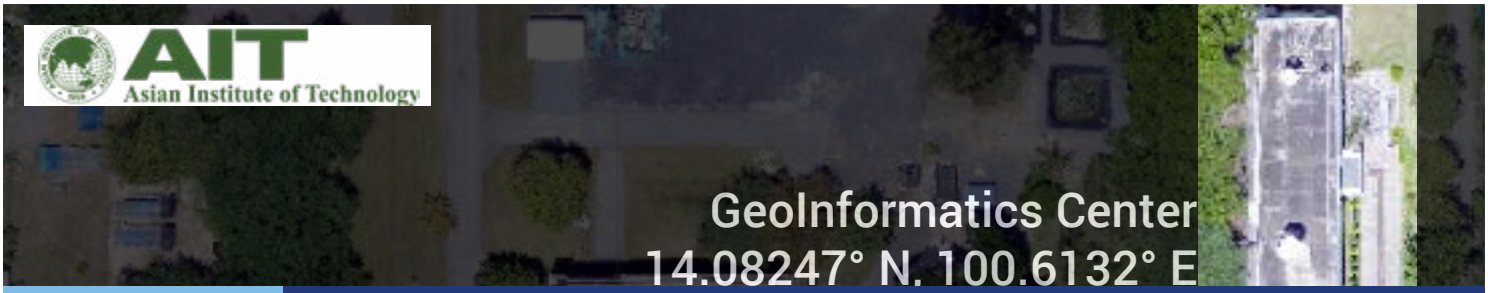
Twenty-four participants from the Afghanistan Ministry of Agriculture, Irrigation and Livestock (MAIL) and FAO Afghanistan took part in the 10-day training course which was held from July 25 to August 05, 2021.

This training was organized to enhance the national-level capacity for collection, monitoring, analysis, and dissemination of agriculture information based on integration of remotely sensed data and technology for decision-making to support agricultural policies and food security in the country.

The Python programing language was used within the Google Colab environment throughout the training program. The first week of the training program focused on Python for Geospatial Data Analysis; Google Earth Engine (GEE) concepts and applications in various domains were covered during the second week.

Python has made its way into the data science realm in the last few years. Currently, Python is considered as the most widely used programing language in geospatial data analysis as well. Similarly, Google Earth Engine (GEE) has revolutionized the way we utilize satellite imagery. It is a cloud-based platform that facilitates satellite image analysis, map creation, data visualization, and data dissemination. This course was designed for participants to get started with programing concepts and applications in Python and GEE. Participants were guided through several hands-on exercises to become familiar with concepts and applications of Python in Geospatial Data Analysis and GEE.

Participants exhibited positive reactions to the training course with many suggesting additional training courses from GIC in the future.



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