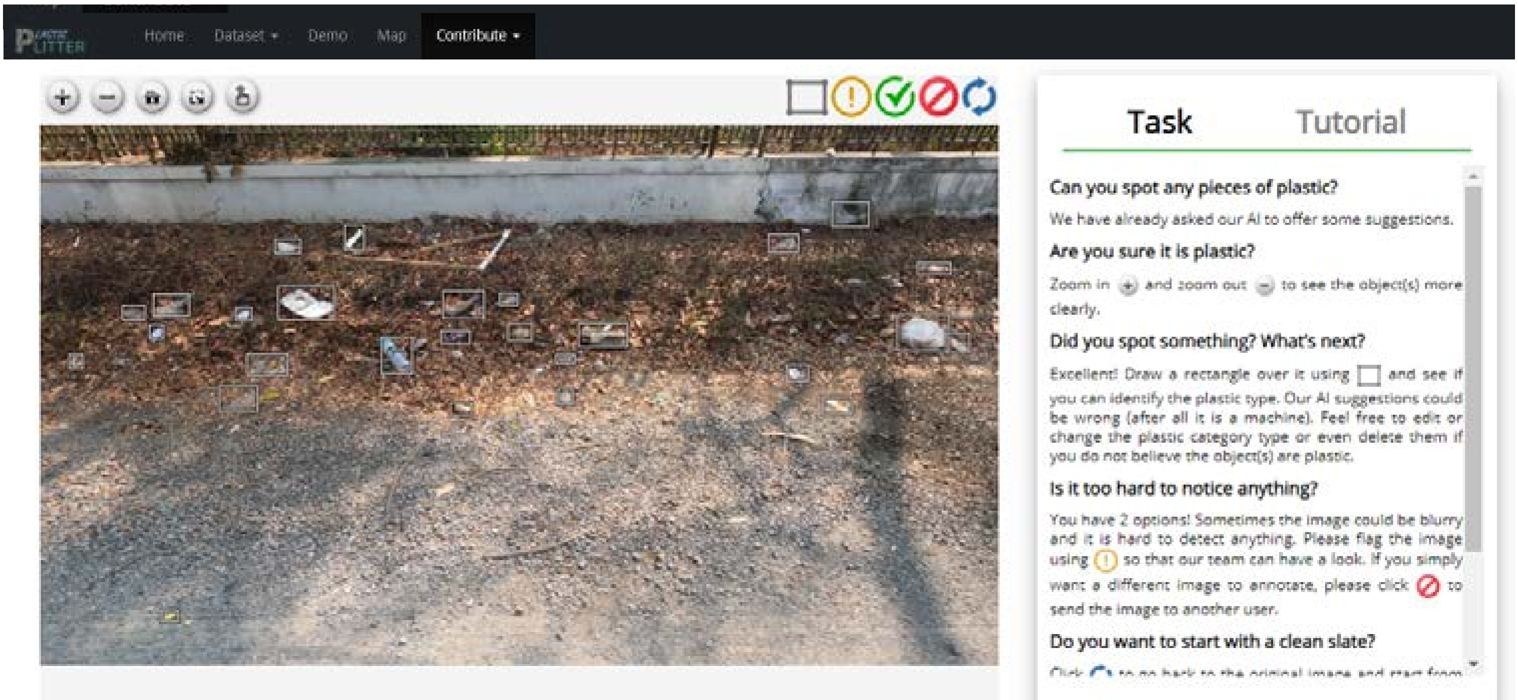
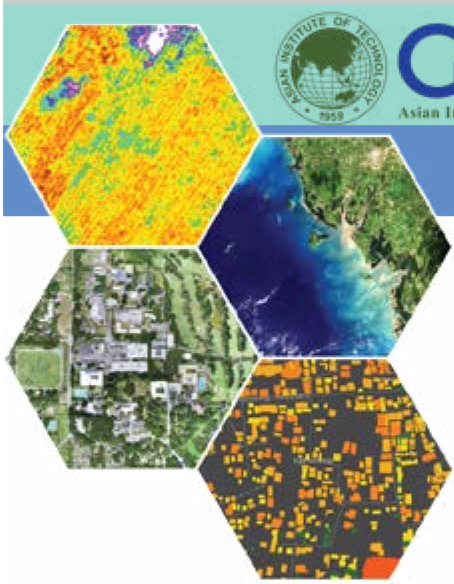


Identifying plastic litter with the pLitter Image Annotation Platform



GEOINFORMATICS CENTER

July 2021 NEWSLETTER

In This Issue

pLitter Image Annotation Platform Launch Event

GIC continued its efforts to fight plastic litter in Southeast Asia with the launch of a new citizen science tool called ***pLitter*** (plasticLitter) on World Environment Day, Saturday June 05, 2021.

What is *pLitter*?

pLitter is an online image annotation platform developed by GIC through a partnership with the United Nations Environment Program (UNEP) and Google to support UNEP's CounterMEASURE project. ***pLitter*** gives citizen scientists the power to improve their communities' environmental health by training a machine learning model to automatically identify plastic litter. The model is still in its early stages, similar to a toddler, so it's counting on citizen scientists to teach it what plastic litter looks like.

The Power of Citizen Science

Machine learning algorithms require comprehensive, representative training datasets to make accurate predictions. Providing such a dataset could be a daunting task if left to a small team. Citizen Scientist involvement can reduce annotation times from weeks to mere days. By engaging environmentally conscious citizen scientists from around Southeast Asia, we aim to create a thorough training dataset to strengthen GIC's plastic litter identification model.

Students in action

GIC is also in the process of engaging graduate students from around the region to raise plastic litter awareness and promote the use of (continued on page 2)

pLitter Launch Event (cont.)

(cont. from page 1) the ***pLitter*** annotation platform. GIC has already held workshops for the AIT Marine Plastics Abatement masters program and the University of Peradeniya (Sri Lanka) GIS & Remote Sensing masters program on June 11, 2021 and June 27, 2021, respectively. Students from both programs annotated plastic waste items from roadside images including plastic bottles, bags, takeaway containers, and Covid-19 facemasks, among others. In total, the students annotated more than 600 images which will be used to further improve the plastic litter identification model.

How to use *pLitter*

Users who access ***pLitter*** online will mark and classify, or annotate, plastic litter that appears in roadside scenes taken by vehicle-mounted cameras. In a typical annotation, users will draw a bounding box around plastic litter in the image, then assign a class to it. There are numerous plastic classes available in the platform including bottles, bags, and food containers to name a few, as well as piles of plastic litter, facemasks, and rubbish bins. The ***pLitter*** interface was designed to be simple, yet intuitive so that new users can quickly perform plastic litter annotations.

Equally as important to this process is teaching the model what is not plastic litter. Occasionally users will encounter errant bounding boxes from the model's plastic predictions that are not plastic litter. These boxes should be flagged or deleted by users to improve the model.

The Way Forward

After sufficient training from citizen scientists with ***pLitter,*** the machine learning model will be able to automatically identify plastic litter with a high degree of accuracy. The GIC team will then use the output from the machine learning model to create plastic litter hotspot maps that will be shared with UNEP and relevant policymakers to forge a more sustainable future for the region.

Click here to access the ***pLitter*** online platform and start training the plastic litter identification model.

Following the launch on June 05, the ***pLitter*** image annotation campaign is set to run through March 2022.

Reconstruction Monitoring Training Course

GIC, Remote Sensing Technology of Japan (RESTEC), and Indonesia's National Institute of Aeronautics and Space (LAPAN) jointly organized an online training course for applying remote sensing to reconstruction monitoring which was held from May 24-28, 2021.

Forty participants from numerous Indonesian governmental agencies were in attendance, including LAPAN, the Ministry of Public Works and Housing (MPWH), the Geospatial Information Agency (Ind: BIG), the National Agency for Disaster Management (Ind: BNPB), the Meteorology, Climatology, and Geophysical Agency (Ind: BMKG), and the National Geology Department.

The training course module focused on familiarizing participants with concepts and applications of remote sensing for reconstruction monitoring. Sessions during Module 1 explored remote sensing for disaster management, landslide detection, and applications of InSAR for disaster monitoring. Participants also gained practical experience using the Geohazard Exploitation Platform (GEP), a cloud-based solution for large scale processing of Earth Observation data for disaster-related work in Indonesia. GIC also introduced the Project Geoportal, which serves as an online visualization tool for data coming from the GEP to monitor pertinent infrastructure.

This marked the first training course module in a series with further modules to continue through mid-2022. The next training course module is scheduled for 12-16 July 2021.

UNEP CounterMeasure Phase 2 Webinar

GIC shared its latest approaches to combat Southeast Asia's plastic pollution problem at the United Nations Environment Program's (UNEP) Webinar: ***Discovering Plastic Leakage Hotspots.***

The three-hour webinar was held on June 02, 2021 from 10:00 – 13:00 (Bangkok Time).

GIC delivered its new three-pronged approach to plastic leakage hotspot identification, which includes: a mobile app for citizen-science based plastic waste data collection, a deep learning model which identifies plastic waste from roadside images (developed in partnership with Google), and a web-based annotation platform called ***pLitter***.

Discovering Plastic Leakage Hotspots brought together international experts from UNEP, Google, the University of Georgia, the Mekong River Commission, the Wilson Center, Wageningen University, and GIC to discuss how the latest technology and citizen science can be used to fight plastic pollution in Southeast Asia.

The webinar and GIC's research fall under Phase 2 of UNEP's CounterMEASURE project. CounterMEASURE aims to identify plastic pollution pathways into Asian river systems. During Phase 1 of the project, GIC created a region-based model to monitor and assess macroplastic leakage in the Mekong and Ganges River Basins.

Click here to learn more about how CounterMEASURE is fighting

Land Resources Information Management System Training Course

GIC held the final online training course for the Afghanistan Land Resources Information Management System (LRIMS) from June 28-29, 2021.

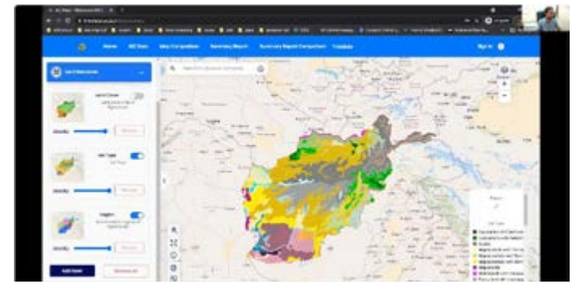
Twenty participants from the Afghanistan Ministry of Agriculture, Irrigation, and Livestock (MAIL) were given a complete overview of the LRIMS online data visualization platform.

GIC staff guided the participants through practical sessions which explored available data types for different locales and scenarios as well as automated report creation. Practical sessions featured an introduction to the LRIMS user interface, hands-on LRIMS exercises, as well as an outline of LRIMS technical and design specifications.

Project partners from FAO led classroom sessions on relevant background information including an introduction to Agro-ecological Zonation (AEZ), a review of Afghanistan's national AEZ efforts, and AEZ national scenario development.

LRIMS was created as part of a collaboration to strengthen Afghanistan's institutional capacity for monitoring and analyzing agricultural production systems. Previous FAO efforts used the Global AEZ (GAEZ) software package to develop a national AEZ dataset for Afghanistan. LRIMS serves as a data visualization platform for the results of the Afghanistan's national AEZ project. It is capable of querying case-specific data types under user-specified conditions to create maps and associated reports.

To learn more about the LRIMS platform please visit https://lrimsfaoaf.ait.ac.th/.



The LRIMS Online Platform is capable of displaying various data layers relevant to Agro-ecological Zonation

Afghanistan country partners

GAEZ v4 Platform Launch

GIC's ongoing regional collaborations were recognized during the online launch of FAO's Global Agro-ecological Zones (GAEZ) platform version 4 on June 17, 2021.

The webinar demonstrated the functionality of the GAEZ platform regarding applications for sustainable development. In addition to presentations detailing model documentation and the user manual, the webinar featured user cases including two ongoing GIC collaborations: 1) PyAEZ – a local level application of the GAEZ platform written in Python scripting language; 2) LRMIS – an online visualization and report creation platform for Afghanistan's national AEZ data.

The webinar featured opening remarks from notable individuals involved with AEZ including Maria Helena Semedo, Deputy Director-General, FAO; Albert van Jaarsveld, Director General, International Institute for Applied Systems Analysis (IIASA); and Jack Dangermond, President, Environmental System Research Institute (ESRI).

Agro-ecological zonation uses established land evaluation principles find land most suitable for agriculture. Environmental inputs and climate conditions are used to understand the most suitable crop types based on productivity and resilience to changing climate scenarios.

Although FAO just launched GAEZ version 4 platform, version 5 is also currently underway with contributions from various international collaborators including GIC.

Click here to access the GAEZ version 4 promotional launch video.

Climate Downscaling Training Course - Module 1

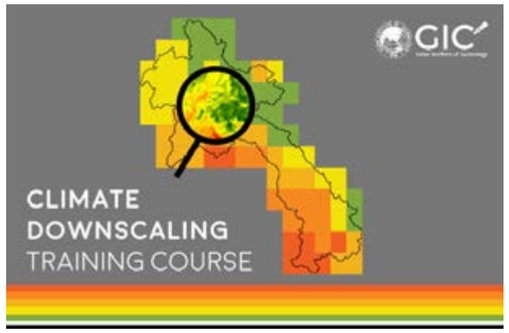
GIC and the University of Peradeniya (Sri Lanka) held a virtual climate modeling training course from June 14-18, 2021.

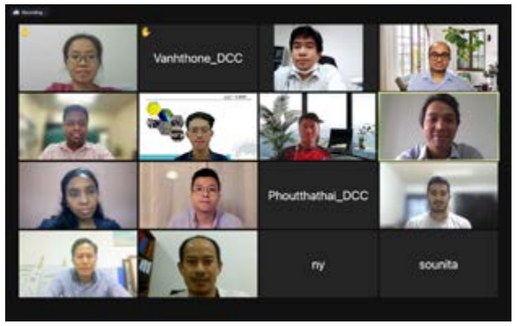
The training course is the first in a series aimed at building climate modeling and downscaling capacities for a core team of officers from the Lao PDR Department of Climate Change (DCC) in order to support climate policy implementation in Lao PDR.

Nine participants from the Lao PDR DCC took part in the training course, as well as a representative from Global Green Growth Institute (GGGI), the training course sponsor.

Course material addressed dynamical downscaling of climate data using the Weather Research and Forecasting (WRF) model for Lao PDR. Training sessions included a Linux operating system overview, an introduction to downscaling, a review of WRF libraries, WRF/WPS setup, and a tutorial on how to visualize output.

The second training course in this series is scheduled for July 08, 2021. If your workplace is interested in scheduling your own climate downscaling training course with GIC please contact us at geoinfo@ait.ac.th.





Dumpsite Volume Estimation at Klong 3 - Pathum Thani

GIC staff and AIT Marine Plastics Abatement Program students worked together using geospatial technology to estimate waste volume at a nearby dumpsite in Pathum Thani, Thailand on April 01, 2021.

The collaboration supported the thesis of an AIT-MPA student who is working under the supervision of thesis committee member Dr. Kavinda Gunasekara, GIC Associate Director.

GIC elected to use aerial photogrammetry to collect images of the dumpsite combined with computer vision techniques to digitally reconstruct the dump piles within a known coordinate system. The approach was appropriate with consideration given to the safety of the field team. Other conventional survey methods of volume estimation like on-pile measurements were avoided given the nature of the dumpsite environment.

A multirotor unmanned aerial vehicle (UAV) was selected to capture high resolution imagery of the dumpsite. The area of interest at the dumpsite was a waste collection/sorting area approximately 3 ha in size, small enough to complete an aerial survey within half an hour. The multirotor configuration made it convenient to launch and land the UAV from the basecamp located across the road from the dumpsite.

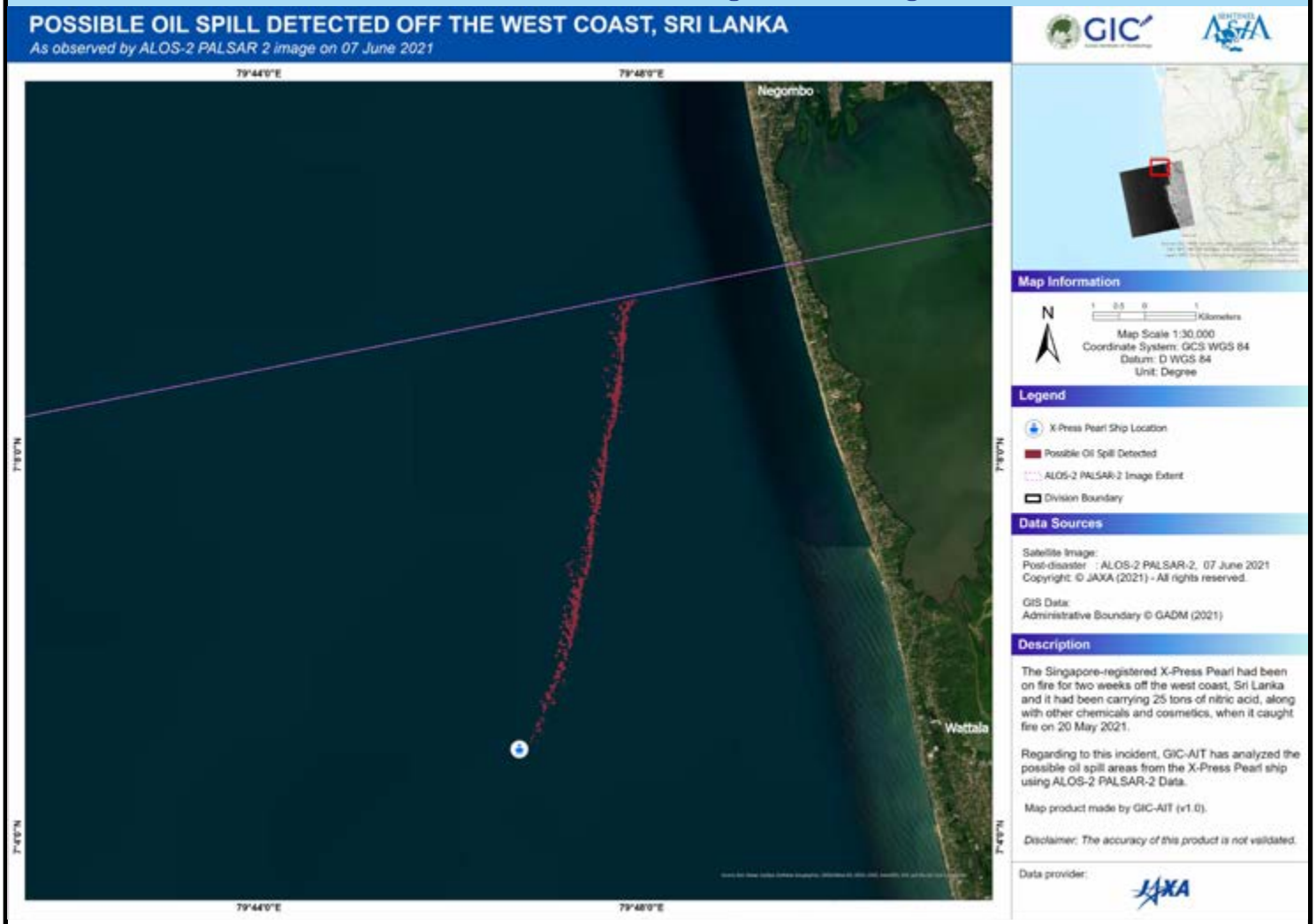
Being that achieving accurate measurements of dumpsite volume was a priority for this project, it was imperative to take steps reduce geometric error in the UAV deliverables. The team opted to use phototargets as photogrammetric control which were strategically placed around the area of interest. Other phototargets were reserved as check points to understand the accuracy of the UAV deliverables. Positions of all phototargets were determined with a real-time kinematic survey using a low-cost GNSS receiver assembled by the GIC GNSS team. The receiver is capable of making centimeter-level measurements at a fraction of the cost of commercially available units.

Phototarget placement was especially challenging at the dumpsite. Although the team used reconnaissance data from a previous visit to plan the phototarget layout, changes had to be made on the fly as the dumpsite is a dynamic environment. Placement in the waste collection area became restricted due to changes in pile layout, limiting the possibility of any phototargets appearing at the center of the area of interest. Therefore, phototarget placement was limited to the periphery.

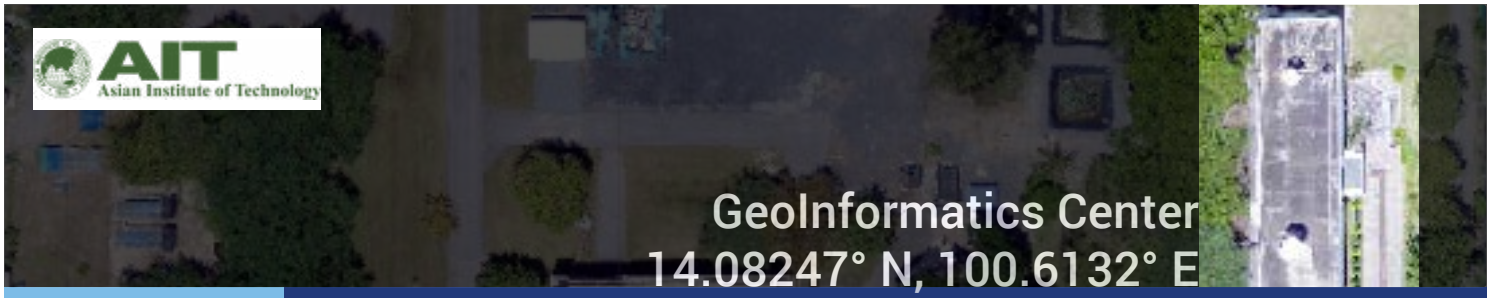
Following data collection, a commercial photogrammetry software was used to process the UAV images. The process is highly automated apart from manually selecting the centers of phototargets for control/check points. Care was put into cleaning up the dense point cloud as errant points arose from poor reconstruction in problem areas. Furthermore, vehicles and waste sorting stations were removed from the dense point cloud so that they would not affect the final volume estimation.

The dumpsite proved to be a challenging environment but the techniques and equipment employed were sufficient to achieve a volume estimation for the area of interest.

Featured Sentinel Asia Value Added Product: Sri Lanka Chemical Spill - May 2021



The above image is a valued added product (VAP) created by GIC depicting a chemical spill originating from a Singaporean cargo ship anchored along Sri Lanka's western coast. An onboard explosion on May 20 set fire to the ship and sent some its chemical cargo, which includes nitric acid and sodium hydroxide among others, into the surrounding coastal waters. Remote sensing analysis revealed a trail of what may be the chemical cargo or the ship's 350 tons of fuel (depicted in red in the VAP). The environmental impact from this incident is expected to be severe. GIC operates as the Principal Data Analysis Node (P-DAN) for the Sentinel Asia Program, a collective managed by the Asia-Pacific Regional Space Agency Forum to aid in disaster management with space technology. Maps like the one above are disseminated to national governments and line agencies during disasters to improve response activities.



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