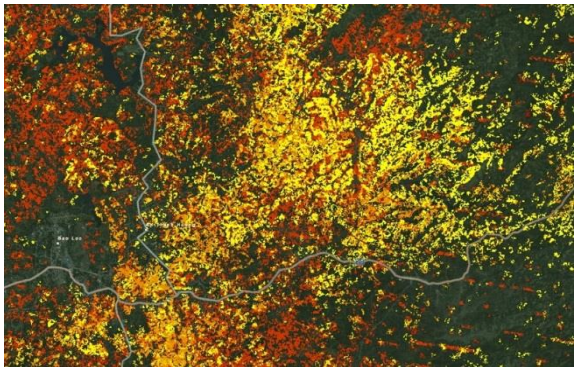
PROGRAM UPDATE

USAID LEAF Demonstrates Google Earth Engine for Rapid Detection of Forest Degradation



A screenshot of a landscape in Lam Dong, Vietnam, combining Google Earth Engine images and CLASlite analysis showing forest cover change.

"(This technology is) cost effective and it's consistently right or wrong, so therefore, it's highly repeatable. The error structure is consistent."

Ian Housman
USFS Remote Sensing Application Center

Use of common remote sensing imagery to study the impact of forest degradation in the tropics has long been a challenge. Persistent cloud cover in tropical zones means that techniques that work in arid and temperate landscapes are not as successful at capturing cloud-free images, which are necessary to measure and monitor forest change. At a recent workshop sponsored by the United States Agency for International Development Lowering Emissions in Asia's Forests (USAID LEAF) program, a new system demonstrated an approach using Google Earth Engine (GEE) and CLASlite software to measure historical degradation rates in four of USAID LEAF's landscapes.

Participants at the training gained understanding, knowledge and access to GEE's image database and learned how to use basic scripts to prepare cloud-free images that can be used to address forest change using CLASlite software to provide estimates of historical deforestation and degradation rates, trends and patterns.

Until recently, using Landsat images was the only way to view potential changes in forest cover. The Landsat program is the longest running satellite program for acquiring images of the earth, developed by the US government in the 1970s, and has captured millions of images from around the globe. Each image pixel is a roughly 30 by 30 meter footprint of an area, about 1/10th of a football field. The resolution is not high enough to see individual trees, but as the Landsat satellites collect images every 16 days, those looking at the images can track an individual "pixel" and therefore detect trends.

The power to manipulate these images through 'scripts' developed by the United States Forest Service Remote Sensing Application Center (RSAC) provides a very powerful historical data set. The Carnegie Landsat Analysis System – Lite (CLASlite) software, developed by the Carnegie Institution for Science, analyzes the cloud-free Landsat imagery and assesses change within a pixel to estimate changes in canopy cover over time. This is a hugely powerful tool allowing researchers and field staff to quickly determine deforestation and forest degradation patterns, trends and rates.

The free Landsat imagery and CLASLite software can now process historical data for millions of hectares in a matter of days, when it once took months and was prohibitively expensive. Prior to 2009, each image cost USD$600 and analysis required several images to create a cloud-free composite image of a location. In one of the greatest recent advances in monitoring global forest cover change, the Landsat satellite team proposed that the images they were collecting should be free and their request was granted. As part of Google's philanthropic activities, Google Earth Engine provides this historical archive of Landsat images to help people better understand earth's dynamics and is currently the only place where the entire collection of Landsat images is available for public use.

How does all this technology help to monitor forest degradation? Paul Maus, the resource mapping, inventory and monitoring (RMIM) contract leader at the RSAC in Salt Lake City, Utah, explains, "You can line up the pixels and track vegetation over time. The satellite sensors are well engineered and well calibrated. You can look at similar vegetation from 30 years ago and compare it to today and see if it is the same. If they're not the same, you can find out why it changed by comparing it to field data on the ground." Ian Housman, a remote sensing specialist at the RSAC, added, "It's cost effective and it's consistently right or wrong, so therefore, it's highly repeatable. The error structure is consistent."

This technology brings big benefits for rapidly monitoring forest degradation and deforestation. When paired with accurate field data from the ground, it provides a much improved means of remotely measuring changes in the forest, particularly in the tropics.

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