FORESTS 2020
CASE STUDY

APRIL 2019

Forests 2020 is a major investment by the UK Space Agency, as part of the International Partnerships Programme (IPP), to help protect and restore up to 300 million hectares of tropical forests by improving forest monitoring in six partner countries through advanced uses of satellite data.

Forests 2020 is a £14.2 million investment by the UK Space Agency over 3.5 years as part of the International Partnerships Programme (IPP). IPP is a five-year, £152 million programme designed to partner UK space expertise with overseas governments and organisations.

It is funded from the Department for Business, Energy and Industrial Strategy's Global Challenges Research Fund (GCRF).

The Global Challenges Research Fund (GCRF) is a £1.5 billion fund which forms part of the UK Government's Official Development Assistance (ODA) commitment and is overseen by the Department for Business, Energy and Industrial Strategy (BEIS), and delivered through 17 delivery partners including the Research Councils, the UK Academies, the UK Space Agency and funding bodies. It harnesses the expertise of the UK's world-leading researchers, focusing on: funding challenge-led disciplinary and interdisciplinary research; strengthening capability for research, innovation and knowledge exchange; and providing an agile response to emergencies where there is an urgent research or on-the-ground need.

Forests 2020 aims to protect and restore up to 300 million hectares of tropical forests using advanced applications of satellite data in 6 partner countries. Forest resources are being lost at an unprecedented rate with catastrophic implications for ecosystem health, animal habitats and climate change. Alarmingly, if forest loss is allowed to continue, we risk forests converting from a carbon sink that mitigates climate change, to a carbon source that contributes to it (Mitchard, 2018).

In response to these problems, Forests 2020 has partnered with UK Earth Observation experts from the Universities of Leicester (UoL) and Edinburgh (UoE), with an international consortium of organisations based in Kenya, Ghana, Mexico, Colombia, Indonesia and Brazil to address gaps and challenges in their forest monitoring systems to tackle loss of forests and improve governance.

Why Use Satellittes?
Earth Observation is widely recognised as the only practical way to monitor the condition and use of forests at regional, national and international scales. The recent influx of freely available data, especially since the launch of the European Copernicus programme, offers an opportunity to improve the accuracy and speed of national forest monitoring at a cost that is accessible and sustainable for developing and emerging economies.

Although we have large streams of new satellite data, there are technical challenges to overcome before many countries can use the data effectively to help protect and restore their forests.

“By partnering UK expertise and international institutions responsible for forest monitoring, Forests 2020 advocates co-development, learning and collaboration to address these technical challenges and produce monitoring tools that help understand how forests are changing, where forests are at risk and communicate the results effectively.”

Sarah Middlemiss
Space Programme Manager
Ecometrica

Ecometrica leads the project and designed its structure with impact and sustainability in mind.

Our approach has resulted in some outstanding examples of collaboration and impact that use space technologies to monitor the health of forests, contribute towards their protection and support their case for restoration across the world.

Project Timeline

Stage 1 - Nov 2016 - Mar 2017
Project setup and planning

Stage 2 - Apr 2017 - Dec 2017
Defining test sites and developing methods for forest monitoring products

Stage 3 - Jan 2018 - Mar 2019
Product testing phase

Stage 4 - April 2019 - March 2020
Scaling test methods up to national systems

Section 1: Colombia

"In Colombia, Forests 2020 is working with IDEAM - the Institute of Hydrology, Meteorology and Environmental Studies - who are responsible for national forest monitoring. Our priority was to understand IDEAM's challenges from the outset, and co-develop solutions that can help increase the processing speed, improve scale and accuracy of the products of the forest and carbon monitoring system that is used by the national and regional governments, as well as NGOs to understand and tackle deforestation in a cost-effective way."

Felicia Line
Forests 2020 Coordinator for Latin America
Ecometrica

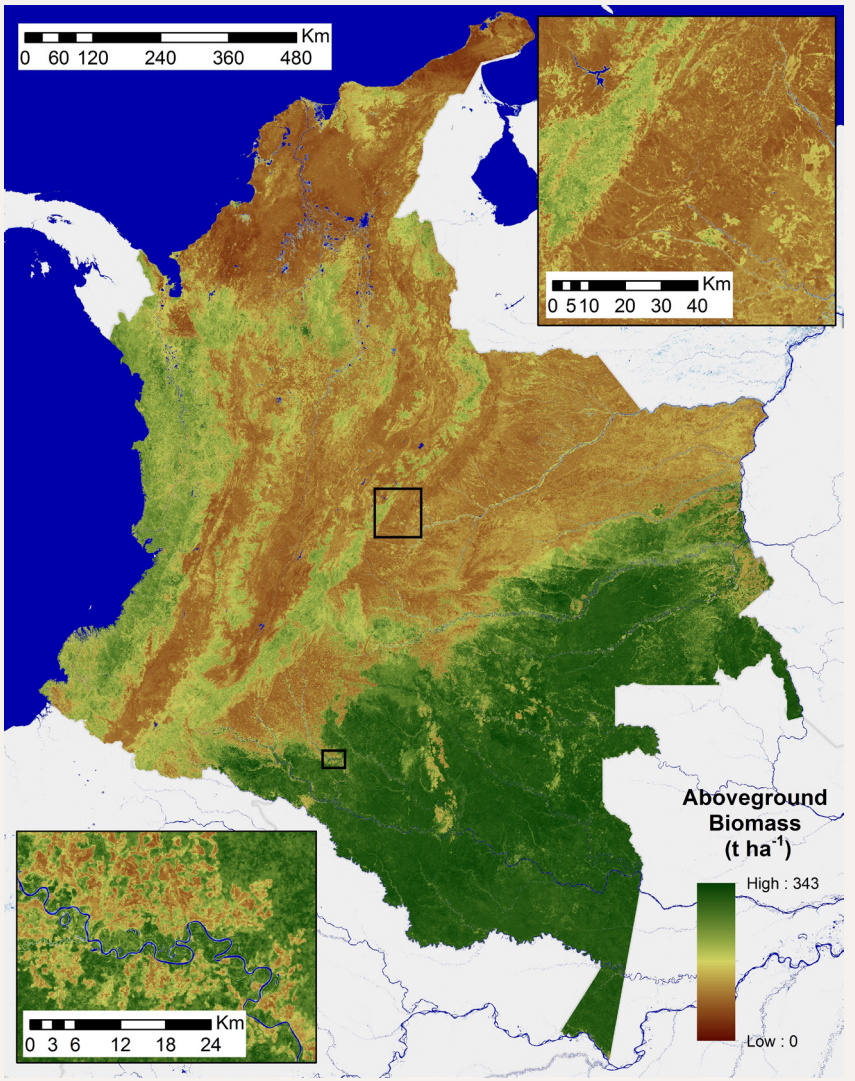
Forests 2020 has supported the following innovations in Colombia through collaboration between IDEAM, the University of Andes, Ecometrica and the UoL.

Biomass Mapping

Forests are an integral part of the global carbon cycle, and monitoring biomass is of key importance to understand levels of carbon being emitted into the atmosphere through forest loss. Estimating biomass is a challenging task, especially in areas with complex forest stand structures and environmental conditions.

An aboveground biomass map had only been been generated once in Colombia. Through Forests 2020, the UoL have supported IDEAM in the generation of a biomass map using multispectral Landsat 8, synthetic aperture radar (SAR) ALOS-2 PALSAR-2 satellite imagery. SAR satellites are better suited to monitoring biomass, because the sensors transmit long wavelengths through the atmosphere that can understand the geometric structure of forests day-and-night, and in all weather conditions. The biomass map will be used for reporting carbon stocks to donors, and eventually reporting greenhouse gas emissions from the land use change sector to the UNFCCC and World Bank.

Forests 2020 supports countries with international reporting to donors and declarations because it can unlock results based payments for further investment in the forest monitoring systems, incentivise countries to take action to reduce deforestation and provide support to monitoring global commitments to forest protection, such as the Paris Agreement.



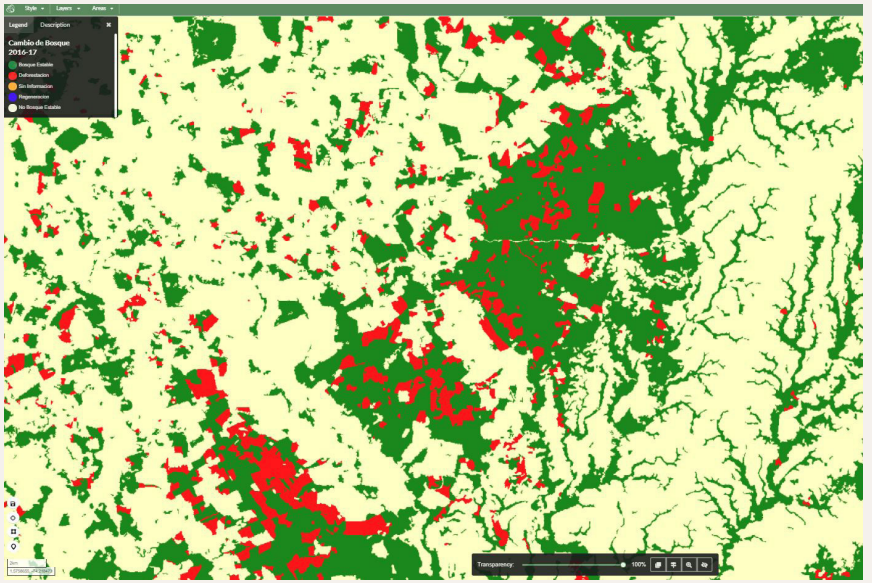
Early Warning Deforestation Reports

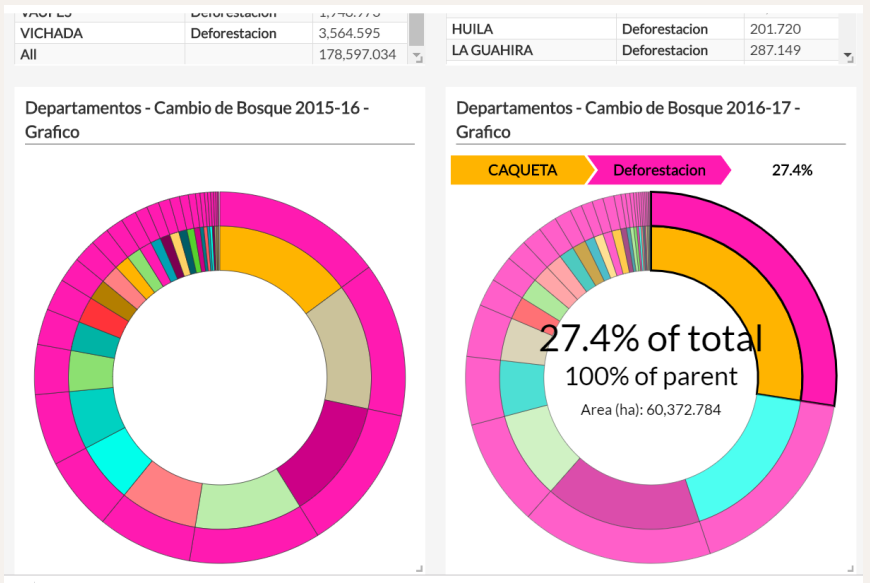
Prior to the Peace Deal, Colombia's forest areas were implicated in the longest running domestic conflict of the Americas. In 2016, the Peace Deal was struck between the government and the Colombian Revolutionary Army (FARC) where the FARC were disarmed and converted into a political party. Whilst a step forward for reducing conflict in Colombia, an unintended effect was that much of the FARC land territory is now being exploited by criminal mafias, land grabbers, and other groups. With no forest protection, these areas became "free" to whoever claimed them first, initiating a race to seize available lands. As a result, it is estimated that deforestation in Colombia has increased by 27% since the peace process began.

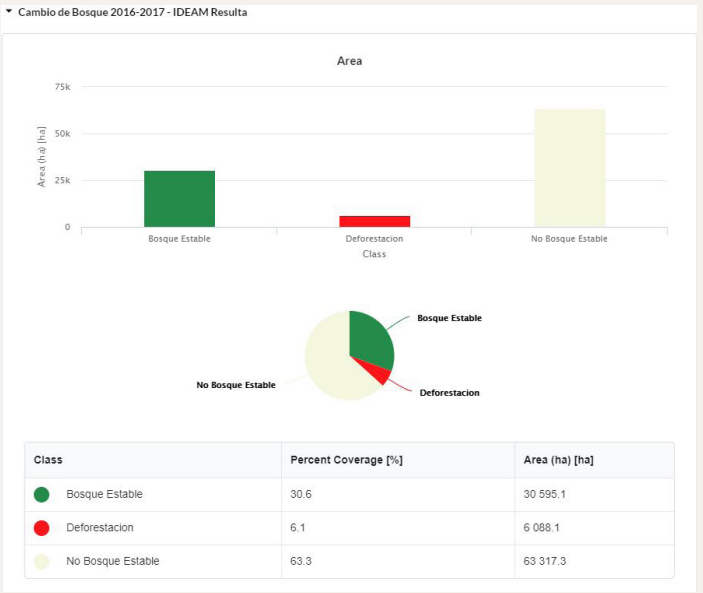
In the midst of these changes, UOL have provided training to IDEAM on the ingestion of Sentinel 1 (in design would like INFO BOX on sentinel 1-see comment) satellite imagery into the Colombian Datacube to produce quarterly early warning deforestation reports. These reports are provided to regional forest monitoring authorities, enabling targeted and efficient intervention. In deforestation hotspots, the reports can be produced weekly or monthly in some areas to assist authorities to respond rapidly to deforestation events almost in real time. Through improvement of this product, using the new Sentinel 1 and 2 images, Forests 2020 has supported improving the accuracy and timeliness of these early deforestation warning alerts for the national and regional governments to respond and protect the remaining forest cover in Colombia.

Use of the Business Intelligence Platform

The national forest change maps for 2015 - 2016 and 2016 - 2017 created by IDEAM can be found on Ecometrica Mapping provided through Forests 2020. Due to the high volume of data, the Business Intelligence platform is able to extract forest change information by department or natural region, in order of highest to lowest rates of change, or areas of forest and compare trends across different years.







“Ecometrica’s Business Intelligence platform has helped IDEAM to move from a manual to a more automated process for reporting land use change in specific regions, and saves time for staff in IDEAM.”

Lewis Rattray
GIS Analyst
Ecometrica

Section 2: Mexico

“In Mexico, Forests 2020 is working with five organisations who work at the local, state and national level to integrate forest monitoring and improve information flows at these different levels. We have tested forest monitoring innovations in window areas and then scaled these up to the state and national level. We have engaged a wide variety of stakeholders, from communities, scientists, campaigners and state and national level government officials to respond to different forest monitoring needs.”

Felicia Line
Forests 2020 Coordinator for Latin America
Ecometrica

Forests 2020 has focused on improving land use classification and land use change maps at the state and national level, improving deforestation and fire risk mapping, and improving the alignment and information flows from the national to the state level.

For example, the research institution ECOSUR has been collaborating with local NGOs Pronatura Sur and AMBIO to collect ground information to improve state-level land use mapping, and with national research institution CIGA-UNAM, and public trust fund FIPRODEFO to improve forest change mapping in the state of Jalisco.

In parallel, the National Forestry Commission has been collaborating with the UoL to improve change detection processing chains, and with Pronatura Sur to improve information transfer and alignment of methodologies with the state governments.

FIPRODEFO and AMBIO have been collaborating with the UoE and CONAFOR to improve degradation and fire risk mapping in the window areas states of Jalisco and Chiapas.

Degradation Mapping

Measuring forest degradation is a challenge in all Forests 2020 countries for many reasons:

- Activities causing degradation such as fire, forest pests, coffee plantations, selective logging, mining and charcoal production produce loss of forests that vary across the area/intensity interface, making it very difficult to quantify. As a result, some estimate degradation to be a 3-10 times larger source of greenhouse gas emissions than deforestation itself.
- Scientists have not yet defined whether degradation is considered a 'process' that forests experience, or a 'state' in which a forest lives.
- There are discrepancies between natural (caused by wildlife) and unnatural (caused by selective logging) degradation.
- Even the newest earth observation satellites, like Sentinel 1 and 2, are not suited to detecting degradation.
- (Bowers, 2018)

When Forests 2020 began in Mexico, there was no accurate estimate of forest degradation resulting in uncertainty around its impact on carbon emissions from forest loss.

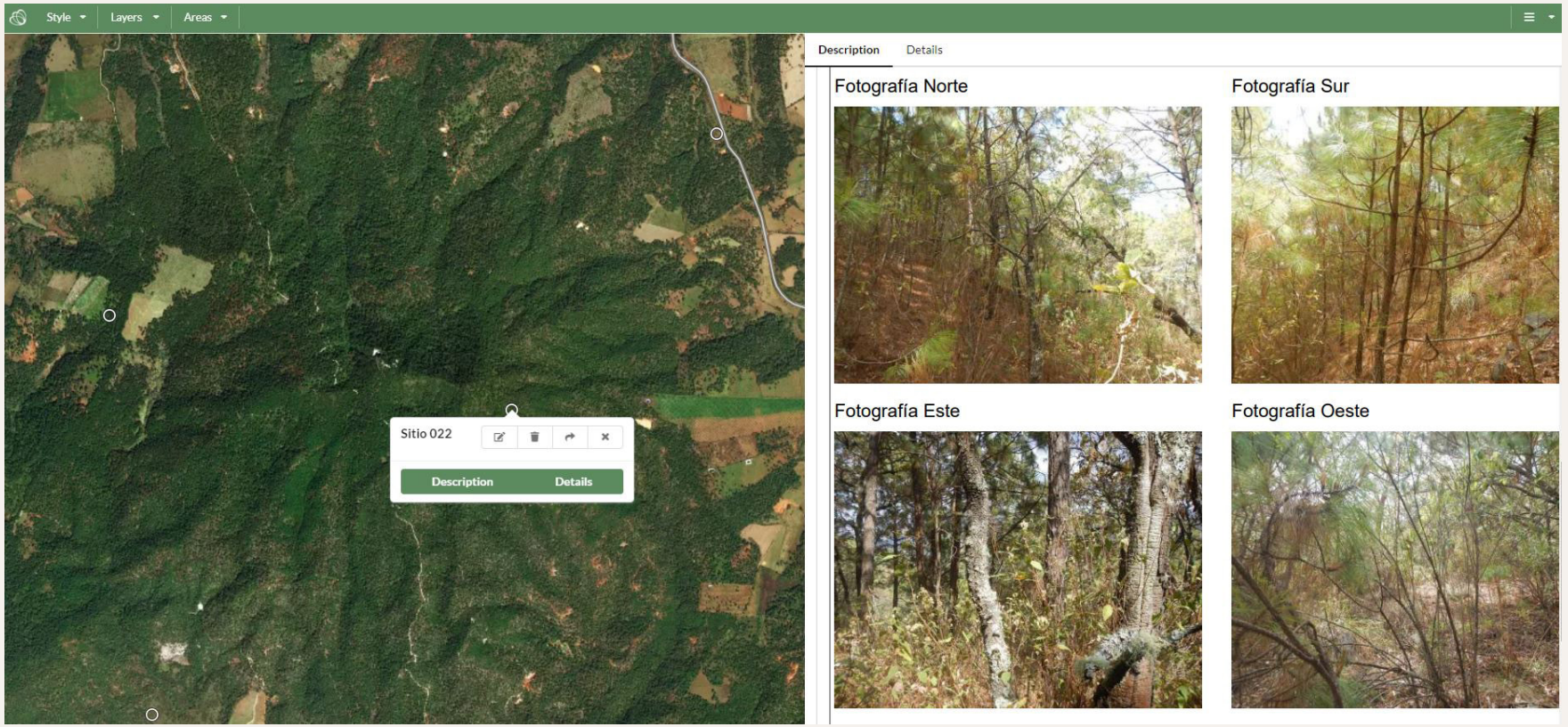
Since then, the UoE has supported the states of Chiapas and Jalisco to measure forest degradation by establishing 19 large forest measurement plots, and calibrating ALOS Palsar radar images to create biomass maps.

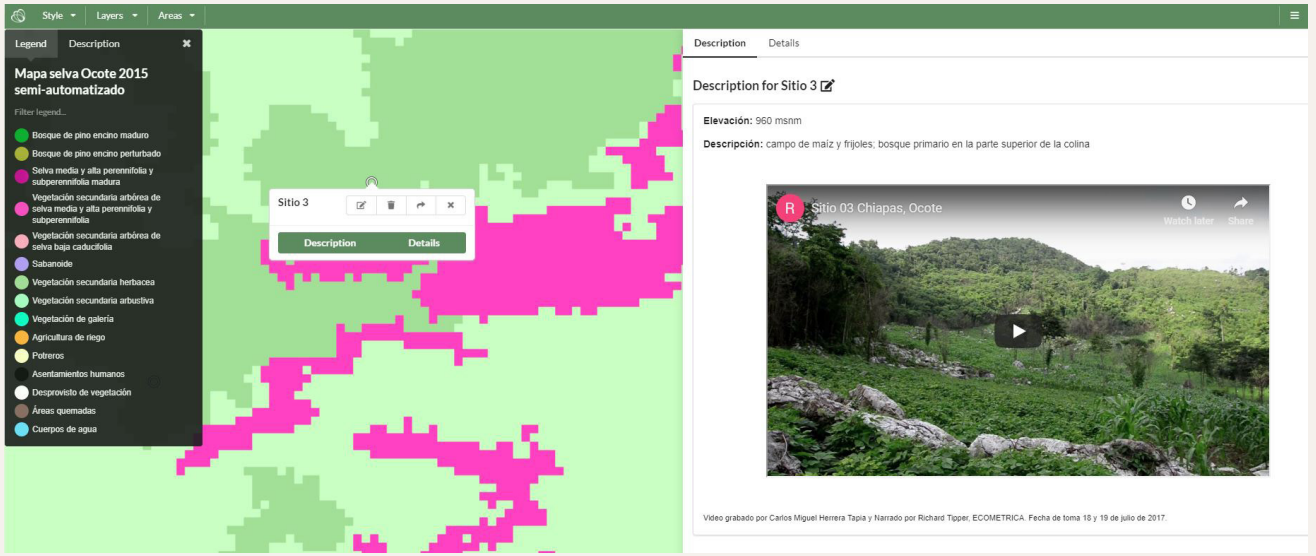
"I developed a rapid field inventory data collection protocol, which involved creating field manuals and travelling to Mexico to deliver a training session for AMBIO and FIPRODEFO. My research has found that using larger permanent sample plots is more suitable for measuring biomass change as a proxy for degradation, and can be used to calibrate ALOS PALSAR radar satellite imagery."

Dr Charlotte Wheeler
University of Edinburgh

Following the training, Mexican partners FIPRODEFO and AMBIO are remeasuring the plots to estimate biomass change on the ground, and using this data to calibrate biomass maps, which are used to an estimate of forest degradation. CONAFOR is exploring the extrapolation of this method using National Forest and Soils Inventory data, in order to generate an estimation for degradation at the national level. Using Ecometrica Mapping, FIPRODEFO have uploaded photographs from each of the plots for North, East, South and West to help them ascertain whether forest degradation has occurred at re-measurement. Here are some photographs from the Sierra del Tigre region in Mexico.

The degradation estimation maps will assist Mexican partners to estimate greenhouse gas emissions stemming from forest degradation, which could be included in future reports by Mexico to the UNFCCC and the World Bank, as forest degradation is currently not accounted for in Mexico's emission reference levels. The combination of Dr Wheeler's training and the data sharing functionality of Ecometrica Mapping platform, has helped develop an online repository for monitoring field plots and assisting with degradation measurement in Mexico.





El Colegio de la Frontera Sur (ECOSUR), a research institute that is based in South Mexico, are the first organisation to renew their mapping platform license from the UKSA's International Partnership Space Programme (IPSP), a forerunner to the current IPP programme. ECOSUR have worked together with field partners Pronatura Sur and AMBIO to upload photos and videos of field plots to validate the land use and land use change maps for the window areas, which you can view here: http://areasventanamexico.forest2020-mx.ourecosystem.com.

By developing useful forest monitoring applications for the South of Mexico, state level government organisations and municipalities can use these outputs such as forest change detection and risk mapping to plan and evaluate the impact of public policies in the region on the forests. The applications can be found on ECOSUR's blog: https://www.ecosur.mx/laboratorio-de-observacion-de-la-tierra/

"Our EO lab applications have had more than 1,000 views, which is the second highest globally after the UK. In 2018 we renewed our ECOSUR EO lab license as we see the value of the platform for disseminating geographical information in the state to municipalities, government agencies, academic institutions and NGOs for decision-making."

Dr. Miguel Castillo
Head of the Geographical and Statistical Information Laboratory
ECOSUR

Section 3: Ghana

“Forests 2020 has made significant progress with the development of forest monitoring products for the cocoa producing regions of Ghana that will assist the government, private sector and deforestation free chocolate initiatives to monitor cocoa supply chains.”

Dr Ruth Malleson
Forests 2020 Coordinator for Kenya and Ghana
Ecometrica

"The growing demand for cocoa is driving deforestation in West Africa and other forest-rich areas. Ambitious trade policies and governance reform can help to support more sustainable production practices, and so alleviate some of the pressures on land and forests while transforming the lives of the 5 million smallholders who feed chocolate-lovers worldwide."

Chatham House, (2019)

Ghana

In Ghana, we are working with the Resource Management Support Centre (RMSC) who are the technical wing of the Ghanaian Forestry Commission, and the Faculty of Renewable Resources of the Kwame Nkrumah University of Science and Technology (KNUST).

Monitoring 'dirty' cocoa

One of the biggest impacts has been in Ghana where 15% of high forest zone deforestation can be attributed to cocoa production. Cocoa is an important agricultural commodity in Ghana; 25% of the world's cocoa supply originates there and cocoa exports contributes to around 7% of GDP as well as one quarter of national exports (Reuters, 2016). However, increased cocoa production is also a key driver of forest loss, and shade loving varieties of the crop, which are prominent in Ghana, are extremely challenging to detect from satellites. One of the biggest challenges Forests 2020 partners faced was the ability to to disaggregate cocoa tree crops from natural forest.

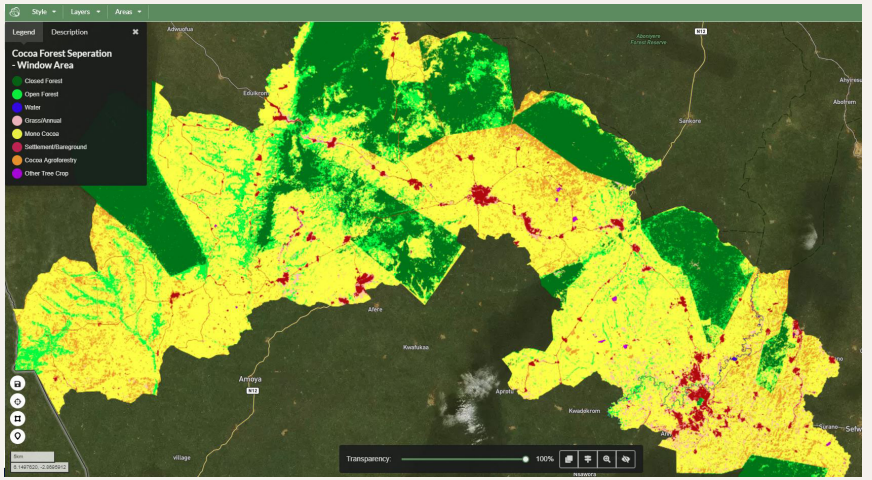
As the consumer demand for sustainable products has grown, many chocolate companies have committed to deforestation free supply chains. In 2018, the government of Ghana and chocolate producing companies signed up to the Cocoa and Forests Initiative (CFI), headed by the World Cocoa Foundation. This has spurred urgent action to address the above challenge as the Ghanaian government, NGOs and the cocoa sector require detailed information about where cocoa is grown and sourced from, in order to meet their deforestation free chocolate commitment.

Experts at the UoL have worked together with RMSC to develop a processing chain which uses Sentinel 2 satellite imagery to segregate monocrop cocoa plantations, agroforestry cocoa plantations and natural forests.

The UOL team travelled to Ghana in late 2018 and gained local knowledge from RMSC about identifying the differences between monocrop and agroforestry cocoa plantations. By co-developing a flexible system that automates a raw satellite image to user required products, RMSC have produced a draft cocoa segregation map that has been uploaded to Ecometrica Mapping. The map has been evaluated by stakeholders 2019 will see this map scaled up to national land use classification for cocoa and provide more detailed forest structure information using long range LiDAR.

Cocoa segregation maps are useful to initiatives like the CFI and the government of Ghana because they can be layered with commercial companies farm data to show encroachment onto protected areas and show if the crops are agroforestry or monocrop. The Ghanaian government strongly encourages agroforestry cocoa in the growing regions to preserve tropical forest habitat.

To provide more detailed forest structure information, Ecometrica, Carbomap Ltd and RMSC have been exploring the potential of using LiDAR and Structure from Motion surveys to detect cocoa being grown under the forest canopy. LiDAR data can provide fine scale detail for multiple uses: invasive species, vegetation mapping, biomass mapping, detailed terrain mapping, flood risk and digital infrastructure, but is often expensive to obtain. To reduce costs Ecometrica and Carbomap Ltd are testing a cost sharing model for broad scale LiDAR survey.
Cocoa segregation mapping is one of many forest monitoring innovations being developed in Ghana by Forests 2020, to see more of our work in Ghana on Ecometrica Mapping, follow the link: https://forests2020.knust.ourecosystem.com/interface/



“Through Forests 2020, staff at RMSC now have capacity in the use of radar satellite imagery to address forest monitoring challenges. The draft cocoa forest segregation map showed serious infractions in the Krokosua Forest Reserve and triggered nationwide action which involved policy makers, land owners and community members to clamp down on illegal chainsaw activities within the reserve.”

Yakubu Mohammed
Head of Forest Monitoring
RMSC

Section 4: Kenya

“Our focus has been on developing tools in partnerships with other stakeholders to: improve the efficiency of forest monitoring in Kenya, including real time forest alerts to detect forest change, including illegal forest-related activities; map changes in the condition of mangroves; and identify areas with the greatest potential for forest restoration.”

Dr Ruth Malleson
Forests 2020 Coordinator for Ghana and Kenya
Ecometrica

“We have developed a risk and opportunities toolkit combing Earth Observation within a modelling framework that can estimate potential carbon stocks and growth rates, helping to inform decision making about where to plant new forests based on different climatic and disturbance conditions.”

Dr Luke Smallman
UoE and NCEO

“The initial DALEC runs (where Biomass data for 2012 was used) have shown that the carbon pools (and by extension, biomass) in the two forest areas is increasing steadily.”

Charles Kuria
Kenya Forest Service

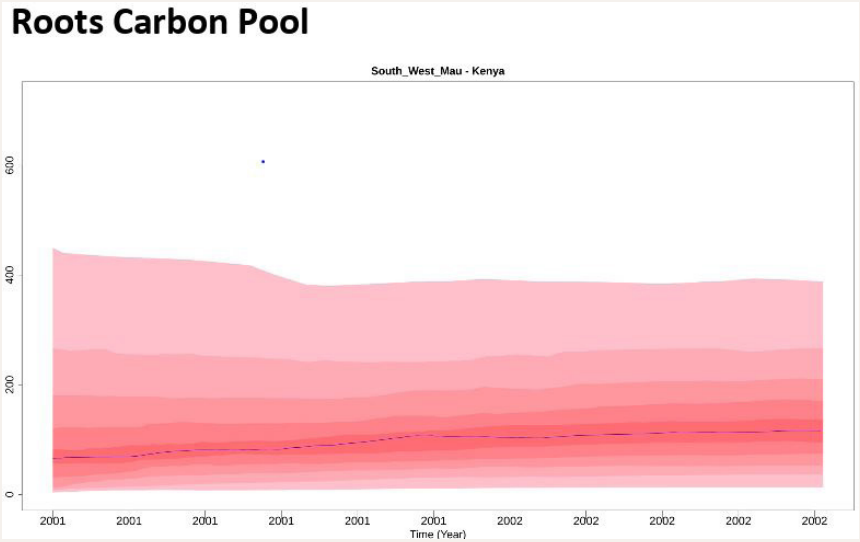
Over the last 50 years, Kenya’s forest cover has almost halved from around 12% to 7.4%. This is a result of numerous deforesting activities including tea production, charcoal production, tourism and energy sectors. Reduction in forest cover has contributed to severe droughts leading to strains on the agricultural systems and creating conflicts between pastoralists and land owners.

To address these challenges, Kenya committed to increase it’s forest cover by 5.1 million hectares as part of the Bonn Challenge and pledged to protect the remaining forest cover through REDD+. These commitments have informed Forests 2020 activities in Kenya, and resulted in co-development of a restoration modelling system and a deforestation alert system.

In 2018, Kenyan partners travelled to the Edinburgh to take part in DALEC training at the UoE to learn about the system and modelling restoration potential. Following the visit, KFS have customized the DALEC system using local Kenyan forest ecosystem data for the South West Mau and and Mount Loundani forest.

“We are building a near real time deforestation alert system based on our open-source Sentinel 2 processing chain, PYEO. The system detects potential changes in forest cover and sends an alert to forest rangers, enabling rapid deforestation intervention.”

John Roberts
UoL



The next steps are to input additional local data into the system such as time series biomass data and soil characteristics for forest sites where such information is available in order to improve the predictive power of the model.

KFS intend to use the model to estimate the present biomass in our forests and determine the Forest Reference Level (FRL) and supporting a critical part of REDD+ reporting. The FRL will also be used for accounting and reporting Greenhouse Gas Emissions to the Intergovernmental Panel on Climate Change (IPCCC).

DALEC can also predict of future levels of biomass (especially in degraded forests) and the time it will take for these forests to reach their full biomass potential under different climatic and managerial scenarios. The information will improve efficiency and planning for forest restoration work, contributing towards Kenya’s commitment to restore 1.5million hectares of degraded forests and landscapes as part of its Nationally Determined Contributions.

Developing a Deforestation Alert System

To protect the remaining forest cover, KFS expressed keen interest in developing a deforestation alert system that will enable forest rangers to make targeted interventions and develop a wider understanding of deforestation practices in Kenya.

The system works by collecting satellite images from the Copernicus Sentinel

“Through our Forests 2020 work with the UoL, KFS have began testing a deforestation alert system using images from Sentinel 2. Once implemented, KFS intend to use the system to detect changes in forest cover in real time and intervene before mass deforestation occurs, protecting the remaining forest cover in Kenya. By improving efficiency in use of rangers time, the solution will reduce costs and increase intervention impact. “

Jamleck Ndambiri
Kenya Forest Service

2 Data hub and layering them on top of one another to detect small scale changes in forest cover. When a disturbance is detected the system uses Amazon Web Services to email KFS with GPS coordinates of the deforestation event and the satellite images which have triggered the alert.

Kenyan partners and the UOL have worked together through multiple calls and visits to explain how the processing chain works, communicate areas where deforestation has recently occurred and complete a successful test run. The next steps are to input local training data into the system to increase the accuracy of the alerts and KFS will begin cross checking using a phone application with forest rangers.

The Kenyan government are keen to use the deforestation alerts beyond the life of the project, so the UOL, KFS and Ecometrica have developed options for sustainable use through a series of funding models. The deforestation alert system has been discussed between multiple stakeholders in Kenya, to pave the way forward for adoption of the technology.

Section 5: Indonesia

“With support from Forests 2020 IPB have developed algorithms and integrated these into the national forest monitoring system in LAPAN, to move from a manual land use change mapping process to a digital national scale system. The digital classification method enables to include two important variables in defining a forest, namely forest canopy cover and tree height. This results in maps that are more consistent, accurate, objective, cheaper and quicker.”

Lilik Budi Prasetyo
IPB

In Indonesia, we are working with the Bogor Agricultural University (IPB), Daemeter Consulting and PT Hatfield.

According to Greenpeace, in the last half century more than 74 million hectares of Indonesian tropical forests have been burned, logged or degraded. There are a number of estimations of the Indonesian deforestation rate, resulting from various studies. This is usually due to differences in methodologies, for instance disagreement on the definition of deforestation and the inconsistencies in visual classification methods.

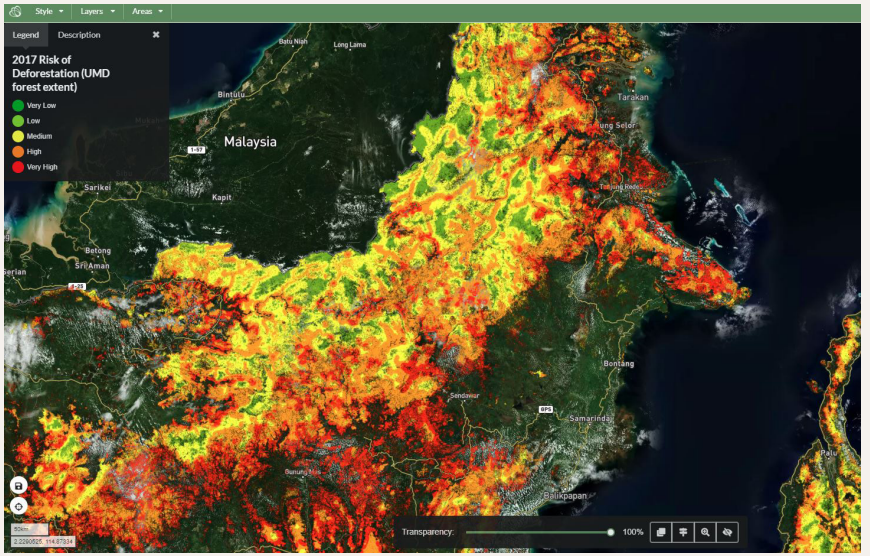
Before Forests 2020 began, land cover maps of Indonesia were produced using imagery from the Landsat satellite and processed manually. This meant land cover maps took up to 2 years to produce. To address this weakness IPB, LAPAN and the Ministry of Environment and Forestry (MOEF) signed a Memorandum of Understanding (MOU) to work together to create algorithms which automate satellite imagery processing and integrate them into the national forest monitoring system. Meetings were held to consider how to share data effectively, explore the most significant indices as a basis for thresholding and rational classification using Landsat imagery.

These algorithms have been integrated into the national forest monitoring system through LAPAN and are instrumental to the digitization of processing methods. The servers which host these processing algorithms and data are shared between IPB and LAPAN, with initial products expected soon.

Integration into LAPAN is an important step for forest monitoring in Indonesia because there is a clear route to mainstreaming digital land cover mapping resulting in reliable, accurate and regular maps of forest cover change. The digital forest change layers will be visualised and disseminated to multiple stakeholders using Ecometrica Mapping.

Deforestation Risk Map for Indonesia

At the beginning of Forests 2020, there was no deforestation risk map available within the forest monitoring system. Daemeter consulting was supported by IPB and Hatfield to develop a deforestation risk map which scores deforestation risk from Very Low to Very High based on variables such as accessibility, suitability for conversion and level of formal protection. Being able to map the drivers of deforestation and identify those areas most at risk is very important for forest protection. It helps targets interventions to those areas most at risk, ensuring funds dedicated to protecting forest are use efficiently. It can also be used as a reference level to monitor the effectiveness of different investments. Daemeter has been using the Hectares Indicator, as risk based methodology to calculate the avoided forest loss of interventions, to monitor the effectiveness of UK Departments of International DEvelopment programmes in Indonesia. Forests 2020 has enabled Daemeter to improve their risk maps and data used for reporting, which in turn is helping making UK investments more effective.



Section 6: Brazil

"Our focus has been supporting the development of mapping applications for the Cerrado biome that feeds into a wider forest monitoring system for the Mato Grosso state. We are also engaging with private sector stakeholders and developing forest monitoring applications to support deforestation free commitments, such as the Brazilian Forest Code."

Paula McGregor
Space Programme Administrator
Ecometrica

In Brazil, Forests 2020 implementing partners are the Brazilian Space Agency (INPE), NGO IPAM Amazonia and KeyAssociados consultancy.

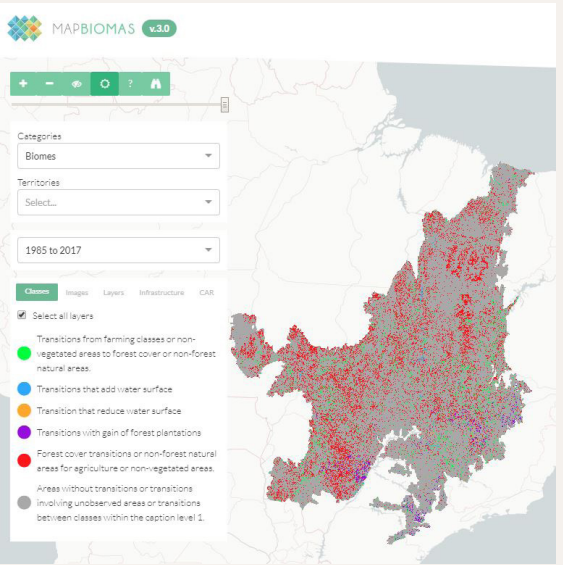
According to the National System for Forest Information (SNIF), approximately 495 million hectares of Brazil - 58% of its territory - is covered by natural and planted forest, making it one of the largest forest areas in the world. There are six continental forest biomes including the Amazon, Cerrado, Atlantic Forest, Caatinga, Pampa and Pantanal, each with different forest cover and population distribution, as well as environmental protection and importance. All of these biomes - especially the Amazon and Cerrado - are threatened by economic activities and social demands that compete for space with forests.

When Forests 2020 began, Brazil had a robust forest monitoring system for the Amazon forest region. The main challenge Forests 2020 partners faced was monitoring forest cover in the Cerrado due to different forest structure and drivers of forest loss.

In response to this challenge, IPAM began developing methods to monitor land use within the Cerrado and analyse the results to identify critical areas of habitat change. In April 2017, in collaboration with the MapBiomass project, IPAM released the first collection of Cerrado biome land cover and land use maps from 2000-2016, as well as critical areas of deforestation during this period. These annual time series maps show changes through different types of forests, savanna and grasslands as well as agriculture and pasture.

The ultimate goal is to develop a forest monitoring, reporting and verification system for the Mato Grosso state to support carbon accountability, the REDD+ policies and decision makers in the state.

“The Cerrado is where natural vegetation is comprised by a mosaic of forest and grassland patches inserted in a savanna-dominated landscape. Agriculture and pasture expansion has been the main driver of vegetation loss in this biodiversity hotspot in the last decades, and still threatens remnant natural ecosystems. The lack of land use change monitoring prevents a complete understanding of the conversion process and its consequences.”



IPAM
Brazil

Using Ecometrica Mapping, partners in Brazil have begun developing applications and data products to support deforestation free commitments in supply chains. According to the study "Securing investments in forest monitoring and protection" one of the major pathways for justifying resources for improved monitoring and forest conservation actions is external, international pressure related to sustainability certification of commodity crops and forest product (Kelly & van der Horst, 2018). In this scenario, a country needs to build capacity to assess, monitor and certify in order to comply with requirements set by importing countries, and the challenges to producers to comply and follow emerging protocols for certification is strong stimulus for robust data on forest change.

Brazil is exposed in hybrid form to this pathway - it is a huge exporter of high value commodity crops such as soy which buyers are placing increasing importance on demonstrating minimal impact on deforestation, and there are also strong domestic policies at both federal level and more local (e.g. biome) that require strong data input. There is also considerable market pressure from production companies such as Unilever, McDonalds, Tesco and Walmart who have joined the FAIRR Initiative which support deforestation free commodities in the Cerrado.

With this in mind, Forests 2020 has developed data products and applications on Ecometrica Mapping that could be used to help the private sector monitor their forest protection commitments such as the Brazilian Forest Code. Large agricultural exporters face increasing pressure from international markets to provide evidence of compliance with sustainability standards, and the financial sector, in particular rural credit lenders, need to monitor and ensure landowners are compliant with the Forest Code before administering loans and credit. Key Associados are working with INPE and IPAM to build a showcase of applications and engage with the private sector to help understand their needs and products Forests 2020 could provide.

"In 2018, we travelled to Brazil to provide training for INPE and engage with IPAM on using Ecometrica Mapping to create forest monitoring applications. Another goal of the visit was to help INPE setup the Brazil Hectares Indicator query on the platform which assesses the effectiveness of investments in forest monitoring by calculating avoided forest loss."

Jil Bournazel
Land Use and Spatial Analysis Team
Ecometrica

Risk Profiler
The Risk Profiler is targeted at private sector organisations with large land holdings and/or assets. Its purpose is to provide a complete assessment of an organisation's land-based assets' long term exposure to deforestation, biodiversity and water risk. It brings together improved land cover and risk maps produced through the F2020 project with dashboard based interactive charts.

Examples of the questions this tool seeks to answer are:
- "Show me all my far in areas of high deforestation risk"
- "Tell me how biodiverse this potential new site area is"
- "What is the ten-year population prediction in this area of low water availability?"

Clients provide Ecometrica with information on location and size of areas of interest and we aggregate the data to provide meaningful insights.

Deforestation Monitoring
The Deforestation Monitoring tool supports businesses to monitor compliance with various forestry regulations for big land portfolios by processing and analysing large amounts of sentinel data and delivering to end users (usually decision makers) via Ecometrica Mapping interface. The Deforestation Monitoring tool processes and analyses large amounts of Sentinel data to identify and delineate forest change over businesses' specific areas of interest.

Section 7: Looking Forward

“An important focus of our work is developing robust sustainability plans so that the outputs we develop continue to add value beyond the end of the Forests 2020 project.”

Sarah Middlemiss
Space Programme Manager
Ecometrica

Looking Forward

The remainder of the Forests 2020 project will focus on selecting the most successful innovations developed in partner countries, scaling these up to national level and embedding them to ensure long term sustainable use.

Our approach to sustainability is very specific in each country context, but broadly falls into the following 3 strategies:

- **Embedding innovations in national systems:** For example, the integration of algorithms for satellite image processing from research partner IPB into the official national forest monitoring system in Indonesia. We are working with governmental and research partners to ensure that Forests 2020 innovations are embedded into national and state forest monitoring systems so that they continue to have an impact after the lifetime of the project.
- **Commercial applications using forest monitoring data:** The most prominent examples of commodities that contribute to partner countries' GDP through exportation but also historically have contributed to deforestation are cocoa in Ghana, avocados in Mexico, palm oil in Indonesia and Colombia and soy in Brazil. Mounting pressure from international initiatives and consumers to prove that these commodities have not contributed to deforestation has led to an increased demand on the role of Earth Observation to monitor deforestation free supply chains. This has opened up new potential sources of funding from the private sector for these types of applications which Forests 2020 is currently exploring and piloting.
- **Building the case for future investment in forest monitoring systems:** Through Forests 2020 data production and visualisation we are building the broader case for continued investment in forest monitoring systems through cost-efficiency analyses and communicating their associated impact on monitoring climate change mitigation initiatives.

References

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