GEM
Global Ecosystems Monitoring Network

SCHOOL OF GEOGRAPHY AND THE ENVIRONMENT

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UNIVERSITY OF OXFORD

Ecosystems Research Programme

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The Global Ecosystems Monitoring network (GEM) is a worldwide initiative to monitor, measure and understand how forest ecosystems are functioning and responding to climate change. GEM research provides understanding into carbon dynamics, quantifies components of the carbon and nutrient cycles, and elucidates the environmental controls of forest physiology. GEM comprises a network of forest research sites around the globe, where standardized measurements are taken at intensive carbon monitoring plots. Many separately funded projects make up the network, in countries such as Brazil, Peru, Bolivia, Gabon, Ghana, and Malaysia. The network is growing, and aims to incorporate new partners and plots in countries such as Belize, Hawaii and China.

GEM-TRAITS project

GEM-TRAITS is a mission designed to generate the first global dataset linking tropical tree diversity to ecosystem function. This will come to fruition with teams collecting extensive primary data on tree functional diversity and on the carbon cycle of forests across the GEM plots. GEM-TRAITS launched in 2013.

From the Andes to the Amazon: the CHAMBASA campaign

CHAMBASA is the first field campaign to run as part of the GEM-TRAITS project. CHAMBASA, which stands for *Challenging Attempt to Measure Biotic Attributes along the Slope of the Andes* launched in the Peruvian Andes in April 2013, and focuses on plots along the elevational transect from the Andes to Amazon. CHAMBASA is appropriately, a colloquial word in Spanish for 'a lot of work'!

Wytham Woods

Located on the edge of Oxford, Wytham is Oxford University's very own long-term research site and living laboratory. A range of research unfurls here, for example an 18 ha plot of 20,000 trees monitored as part of the Smithsonian Institute Global Earth Observatory network, many 1 ha edge and fragment plots that make up a joint project with Earthwatch, and an eddy covariance flux tower has been set up in partnership with the Centre for Ecology and Hydrology.

Remote sensing

Cutting-edge remote sensing techniques have proved indispensable for exploring how functional diversity and ecosystem function vary at different landscape scales. The results provide unparalleled richness and detail. By using airborne and satellite technologies such as laser scanning and hyperspectral imaging, combined with field work and computer modeling, it is possible to measure vast regions such as the Brazilian Amazon, and analyse anthropogenic impact. We collaborate with international leaders in this field, such as Professor Greg Asner, who manages the Carnegie Airborne Observatory project at Stanford, USA.

Africa

Our research in Africa is currently focused in two countries, Ghana (West Africa) and Gabon (Atlantic Central Africa). We have strong collaborative partnerships with the Forestry Research Institute of Ghana and Agence Nationale des Parcs Nationaux in Gabon. These countries were selected as contrasting samples of the West African and Congo Basin forests. In both countries, our sites encompass contrasting wet and dry plots for intensive carbon monitoring, as well as a logging chronosequence, including two plots located within logging concession sites that will be monitored throughout the logging process. This research will generate a powerful simultaneous multi-site comparison between African, Amazonian and Asian tropical forests. We also now collaborate with universities and research organisations in Rwanda, Ethiopia and Uganda in East Africa.

Elephants

The role played by megafauna in ecology is significant, whether through nutrient dispersal or in shaping the landscape through altering vegetation. The African forest elephant is a vibrant example of contemporary megafauna, and can be found at our research sites in Gabon. We are beginning to study the relevance of these creatures to forest ecosystems.

People and ecosystem services

Our research investigates the services that ecosystems can provide to humanity. For example, ECOLIMITS is a consortium project investigating ecosystems services, degradation and links to poverty in the cocoa farm and forest landscape around Kakum National Park, Ghana, and in the coffee growing landscape of south-western Ethiopia. It is funded by the NERC/DfID programme ESPA (Ecosystem Services and Poverty Alleviation) and will run in partnership with the University of Reading, and partners in Africa.

Asia

In Asia we work with the Stability of Altered Forest Ecosystems Project (SAFE) in Malaysian Borneo. Here, research looks into how biodiversity and ecosystem function varies in a landscape of primary forest, logged forest, forest fragments and oil palm plantation in 7 plots. We have two intensive monitoring plots in Lambir Hills National Park in Sarawak, the highest diversity site in the Paleotropics. Together, the Malaysian intensive monitoring plots permit us to conduct the first systematic analysis of the full carbon, water and nutrient cycle of the process of conversion from logged forest to oil palm plantation.

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