

Institution: University of Oxford
Unit of Assessment: 17B Geography
Title of case study: Providing the evidence base for conserving tropical forests
<p>1. Summary of the impact</p> <p>Since 2005 there has been a surge of interest in reducing tropical deforestation as a means of mitigating global climate change, as well as enhancing the protection of tropical biodiversity and contributing to sustainable rural development. Ways of achieving this include the REDD+ (Reducing Emissions from Deforestation and Degradation) within the UN Framework Convention on Climate Change (UNCCC), and also non-governmental (“voluntary”) forest carbon sequestration projects being established across the tropics. The Ecosystems Group, led by Malhi, in the Oxford School of Geography and the Environment, has been actively engaged in natural science and policy/governance research directions, all of which have had impacts on both REDD+ and voluntary forest carbon sequestration projects. The group’s natural science research has developed scientific methodologies for measuring tropical forest biomass, through in situ plots and satellite imagery, and they have been actively involved in establishing pilot REDD+ projects in several countries. On the policy and governance side, the Forest Governance Group, created in 2009, has played a key role in establishing global databases on the effectiveness of protected areas in conserving forests, provided international comparative analyses of forest policies outside protected areas, and actively engaged in global, regional and local REDD+ policy-making fora.</p>
<p>2. Underpinning research</p> <p>The research contribution towards assisting the protection of tropical forests covers three strands:</p> <p>a) <i>In situ</i> assessment of the carbon stocks in biomass and soils of tropical forests. In the last decade the Ecosystems Group has played a major role in the development of a forest plot network across Amazonia and, more recently, Africa and SE Asia. These have provided valuable data for assessing spatial variability on forest biomass and structure, which can be tested against model predictions or satellite-based estimates. Key findings from this work include: a description of the spatial variability of tropical forest biomass [Section 3: R1], a chronology of how tropical biomass is changing, demonstration of the spatial variability of tree structure, and quantification of the relationship between forest productivity and biomass. This work has been funded by NERC, and the Gordon and Betty Moore Foundation. In addition to the group leader, Prof Yadvinder Malhi (2005 onwards), researchers active in this component include: Dr Dan Metcalfe (2008-2010), Dr Chris Doughty (2009-2013), Dr David Galbraith (2009-2012), Dr Cecile Girardin (2007 onwards).</p> <p>b) Providing landscape scale measurements of carbon stocks of tropical forests. In addition to improving the precision of in situ measurements of soil carbon stocks, it is important to scale from site measurements across the landscape. The most promising way to do this is through the use of satellite imagery, but conventional optical satellite data are difficult to interpret in the context of high biomass, closed canopy tropical forests. The research has explored innovative new approaches to mapping forest biomass from satellites. This has included testing the potential of space-borne radar and optical methods to map the biomass of the forest and oil palm landscapes of Borneo [R2], using airborne lidar to pioneer descriptions of forest structure in an elevation gradient in Peru [R3], and employing new approaches looking at forest texture to map forest biomass across Amazonia. In addition to Prof Malhi, the researchers involved in this work have included: Dr Alex Morel (2008-2013), Dr Rosa Maria Roman-Cuesta (2004-2009), Dr Nicolas Barbier (2008), Dr Danae Maniatis (2008-2011), Dr Liana Anderson (2008-2013), Dr Przemyslaw Zelazowski (2006-2011) and Dr Joel Scriven (2008-2011).</p> <p>c) Tackling governance of tropical forests. Reducing deforestation is only partially a natural science issue. Most of the key challenges involve governance, at scales ranging from international, through national, and down to local communities. In 2009, a Forest Governance group was created</p>

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(Drs Connie McDermott, Lauren Coad, Heike Schroeder) to explore the social science and policy challenges of implementing forest conservation at the tropical forest frontier, and to examine how effective forest protection has been in recent decades, and what lessons can be learnt in the context of REDD+. The Group uniquely combines expertise in international forest governance with detailed understanding of domestic forest policies and their intersection with forest cover change [R4]. Key publications include a first-of-its-kind book, systematically comparing domestic approaches to forest governance across all major forested regions [R5], and a cross-disciplinary work examining the intersection of law with tropical forest and climate science in the context of REDD+ [R6]. This research into multi-level governance provides the backdrop for the Group's conceptual work on equity in REDD+ "safeguards" (e.g. [R7]). As discussed in 4 below, safeguarding REDD+ requires navigating the complex interplay of local, national and global demands for forest use and conservation in a manner widely understood to be fair and equitable.

3. References to the research

Supporting grants: multiple grants from NERC, Ecosystems Services for Poverty Alleviation (co-funded by NERC, ESRC, DFID), EC 7th Framework Programme, Gordon and Betty Moore Foundation, Oxford University, the Swedish Research Council (FORMAS) and an ERC Advanced Investigator Award.

[R1] Malhi, Y., Wood, D., Baker, T. R., Wright, J., Phillips, O. L., Cochrane, T., Meir, P., Chave, J., Almeida, S., Arroyo, L., Higuchi, N., Killeen, T. J., Laurance, S. G., Laurance, W. F., Lewis, S. L., Monteagudo, A., Neill, D. A., Vargas, P. N., Pitman, N. C. A., Quesada, C. A., Salomão, R., Silva, J. N. M., Lezama, A. T., Terborgh, J., Martínez, R. V. and Vinceti, B. (2006), The regional variation of aboveground live biomass in old-growth Amazonian forests. *Global Change Biology*, 12: 1107–1138.

[R2] Morel, A.C., Fisher, J.B. and Malhi, Y. (2012) Evaluating the potential to monitor aboveground biomass in forest and oil palm in Sabah, Malaysia, for 2000-2008 with Landsat ETM+ and ALOS-PALSAR. *International Journal of Remote Sensing*, 33(11): 3614-3639.

[R3] Asner, G. P., Anderson, C., Martin, R. E., Knapp, D. E., Tupayachi, R., Kennedy-Bowdoin, T., Sinca, F., and Malhi, Y.: Landscape-scale changes in forest structure and functional traits along an Andes-to-Amazon elevation gradient, *Biogeosciences Discuss.*, 10, 15415-15454,

[R4] Schmitt, C.B., Burgess, N.D., Coad, L., Belokurov, A., Besancon, C., Boisrobert, L., Campbell, A., Fish, L., Gliddon, D., Humphries, K., Kapos, V., Loucks, C., Lysenko, I., Miles, L., Mills, C., Minnemeyer, S., Pistorius, T., Ravillious, C., Steininger, M. and Winkel, G. (2009) Global analysis of the protection status of the world's forests. *Biological Conservation*, 142(10): 2122-2130.

[R5] McDermott, C.L., Cashore, B. and Kanowski, P. (2010) *Global Environmental Forest Policies: An international comparison*. London: Earthscan. 384 pp. ISBN: 9781844075904. Now available from Routledge in paperback.

[R6] Lyster, R., MacKenzie, C. and McDermott, C.L. (eds.) (2013) *Law, Tropical Forests and Carbon: The Case of REDD+*. Cambridge University Press, Cambridge.

[R7] McDermott, C., Coad, L., Helfgott, A. and Schroeder, H. (2012) Operationalizing social safeguards in REDD+: actors, interests and ideas. *Environmental Science and Policy* 21 (Aug 2012) pp.63-72.

4. Details of the impact

Providing the evidence base for the development of policy and implementation of the conservation of tropical forests is a core motivation that runs throughout the group's work as demonstrated by the selection of examples of the impact of this research given below.

a) Pioneering REDD+ Implementation: Providing Tools, Building Capacity

Improving International Capacity

Since 2009, five of the group's PhD students and PostDocs (Drs Maniatis, Scriven, Zelazowski,

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Roman-Cuesta, Girardin) moved to influential positions in the UN-REDD programme, charged with developing government REDD+ programmes across the world. This has helped global governance regimes to have enough trained scientific experts, and the UN team have maintained close links with the group, providing a direct bridge between academic research and policy implementation. As one example, Dr Danae Maniatis, who worked on estimating the biomass of Congo Basin forests for her DPhil, is now the lead technical expert for the UN REDD programme, charged with implementing REDD+ monitoring in 10 Congo Basin countries, and directly designing and implementing the monitoring system for the Democratic Republic of the Congo.

Implementation of Pioneering REDD+ Projects in Africa

The team have been working closely with pilot and prospective REDD+ projects in several African countries, including Ghana, Ethiopia, Nigeria and Sierra Leone. In Ghana, Malhi trained a team of researchers led by Dr Winston Asante (Nature Conservation Research Centre) [Section 5: C1] in methods (developed in previous research) for measuring carbon stocks. Dr Asante and his team have become a regional hub for such monitoring efforts, and provided further training in field methods in Nigeria, Liberia and Ethiopia. The Oxford team has led two training workshops in Ghana (Prof Malhi, Dr Metcalfe), and one each in Gabon (Dr Girardin, Dr Doughty) and Ethiopia (Prof Malhi, Dr Morel). In Ethiopia, for example, Malhi and Morel have a strong scientific involvement in mapping the carbon resources and supporting the development of a REDD+ Project in Bale Mountain National Park, using the ground plot and satellite methods developed in the course of Morel's DPhil. This is in close collaboration with the Ethiopian government and NGOs and may become only the second fully operational REDD+ project in Africa, and therefore a leader in that continent. Furthermore, the government of the state of Oromia (the largest state in Ethiopia) has decided to employ the protocol developed at Bale Mountain for its state-wide strategy.

National Biomass Carbon Maps for African Nations

Malhi led an effort to create a biomass carbon map of Ghana [C2], in collaboration with Ghanaian NGOs and government institutes. This involved providing training in field biomass carbon assessment (using the methods developed and refined in previous work in Amazonia – e.g. [R1], and in satellite remote sensing (e.g. [R2]). The map was made freely available [C3] and has played a significant role in government decision-making, and in informing prospective local-scale REDD+ projects. The model of open and free distribution was used to encourage collaboration and openness with data, and to bypass the need for expensive private consultancies. This model gained traction, and Prof Malhi was invited to a meeting in May 2012 in Addis Ababa, where he presented the Ghana project and the techniques involved. The meeting resulted in plans to begin rolling out a similar product for East African nations including Ethiopia, Uganda and Kenya [C4]. The work has also resulted in close collaboration with the government of Gabon, whom the team is assisting in the development of a national carbon map. Prof Malhi was an official scientific advisor to Gabon at the 2009 climate conference in Copenhagen [C5].

b) Forest Governance*Protected Areas and their Effectiveness*

Since 2009, the Forest Governance group has been working in partnership with the University of Queensland to develop a global database of Protected Area Management Effectiveness assessments (the PAME database). The database now holds over assessments of Protected Area (PA) management for over 6,700 protected areas, completed by PA managers and stakeholders. The database provides a key tool to evaluate national and global progress towards the Convention on Biological Diversity (CBD) targets for protected areas. It has been used to demonstrate progress towards CBD targets in several high-profile publications and at international meetings (including the IUCN World Conservation Congress in 2012), and has also been used to track progress towards the CBD targets by the Biodiversity Indicators Partnership (BIP), the global

initiative to promote and coordinate development and delivery of biodiversity indicators in support of the CBD, Multilateral Environmental Agreements (MEA), IPBES, and national and regional governments. The PAME database is now being integrated into the IUCN World Database on Protected Areas (WDPA), where it will provide an open-access resource for researchers and policy makers [C6].

REDD+ Governance

The UNFCCC REDD+ “safeguards” establish broad principles of good forest governance that are considered critical to the success of REDD+. However the process of operationalizing these safeguards has been controversial, fostering intense debate over the fairness of REDD+ interventions and the distribution of benefits from global to local scales. To help chart a way forward, the Forest Governance Group has developed conceptual tools for mapping out the complex social and economic trade-offs of REDD+ in a manner that is conceptually robust and comprehensive. This includes the design and application of an “Equity Framework” together with the University of Southampton, Australian National University and the US-based Rutgers University. The Equity Framework has been adopted by research partners at the regional level in Asia (RECOFTC) and Latin America (CATIE) as well as the Uganda Coalition for Sustainable Development (UCSD) to assess REDD+-related projects in Bolivia, Uganda, India and Cambodia. McDermott has since been invited by a major Brazilian NGO (IMAFLOA), as well as by the Kingfisher Group, Europe’s largest home improvement retailer, to discuss how the Equity Framework might be used to evaluate the impacts of their forest-related activities.

The Ecosystems/Forest Governance Group’s expertise on safeguards has also been solicited by key governmental and intergovernmental fora. These include the Group’s participation as experts in Germany’s development of Social Standards for its International Climate Initiative (ICI) and the GIZ-CCAD Central American Regional collaboration on REDD+ safeguards, as well as in training sessions for GIZ aid workers engaged in REDD+ activities. It also includes serving on Global Forest Expert Panels for the intergovernmental, inter-agency Collaborative Partnership on Forests (CFP) that assess policy options for international forest governance and REDD+ [C7]. As a result of this Panel work, McDermott has been quoted in over ten different news releases in numerous countries including the US, Finland, France, Germany, and Indonesia regarding the challenges that REDD+ faces in safeguarding the welfare of indigenous and local communities in tropical forests.

5. Sources to corroborate the impact

[C1] Dr Winston Asante, African scientist trained in Ghana carbon map project and subsequently leading such training in multiple African countries

[C2] The story of the Ghana carbon map and our group’s role in it is told at:

http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=8752§ion=home

[C3] Available at http://www.forest-trends.org/documents/files/doc_2837.pdf

[C4] Director of the leading African conservation NGO (the Nature Conservation Research Centre), can describe our impact in both Ghana and Ethiopia.

[C5] Director of the National Parks Service of Gabon can describe our influence in developing and implementing carbon mapping and monitoring in Gabon.

[C6] Vice Chair of the IUCN World Commission on Protected Areas, can describe our collaborative work to develop the METT database, and its international application through IUCN and CBD.7. A

[C7] Executive Director of the International Union of Forest Research Organizations (IUFRO) can corroborate our contributions of forest governance expertise to the Collaborative Partnership on Forests (CFP). CFP members include the UNFCCC, CBD, FAO and 11 other leading international secretariats, agencies and organizations.