Carbon, biodiversity and ecosystem services: exploring co-benefits

Honduras

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Why map carbon, biodiversity and ecosystem services?

Emissions from land use change, mainly forest loss, contribute 17.4% of total anthropogenic greenhouse gas emissions (IPCC 2007). The UN Framework Convention on Climate Change is currently discussing incentives for Reducing Emissions from Deforestation and forest Degradation in developing countries (REDD). In addition to securing carbon, REDD can deliver co-benefits, including conservation of forest biodiversity and maintenance of ecosystem services. To help secure co-benefits, it is useful to find out where high carbon, high biodiversity priority and ecosystem service values overlap.

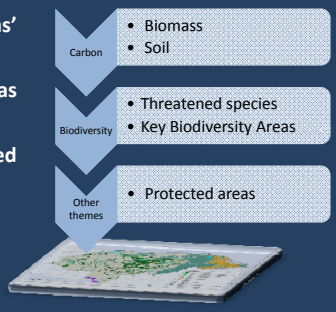
Honduras

In 2005 Honduras had nearly 50 000 km^2 of varied forest cover (FAO 2005), including tropical rainforests, cloud forests, mangroves, and coniferous forests, making it rich in biodiversity. However, it has also had one of the world's highest deforestation rates, losing about 3% of its forest cover annually since 1990.

Data and methods

The best available spatial data for Honduras on ecosystem cover, biodiversity and protected areas were compiled. New national scale data on carbon stocks were derived from the ecosystem cover data and global soil carbon data. The data were overlaid in a Geographic Information System and statistical analyses were run to address questions such as:

1. **How much carbon is stored in Honduras' ecosystems?**
2. **How does carbon storage relate to areas of biodiversity priority?**
3. **How much carbon is stored in protected areas?**



Results

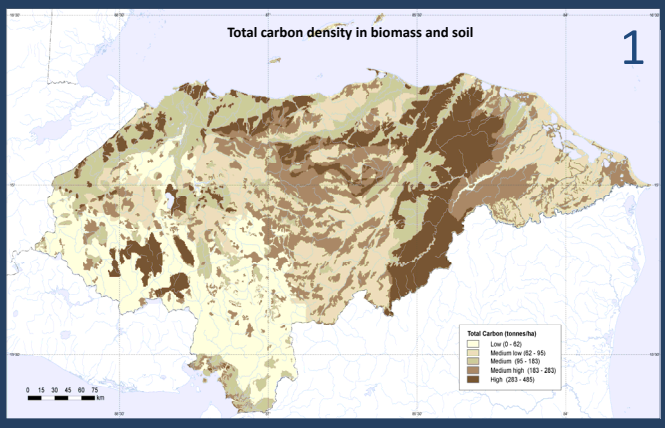
1. Carbon: The ecosystems of Honduras store approximately 1.9 Gt of carbon in their biomass and soil[1], and the most carbon rich fifth of the country holds over a third of the total carbon stock.

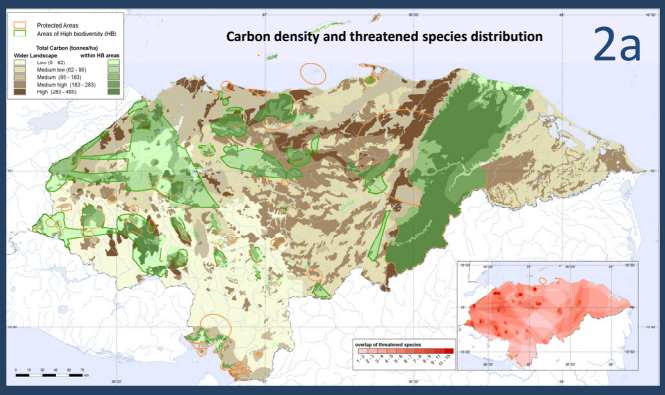
2. Carbon and areas of biodiversity priority: Two approaches were used to identify biodiversity priorities:

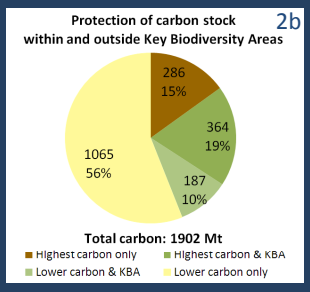
a) Threatened species - 4% of the land area of Honduras is high in both carbon and overlapping distributions of threatened species[2]. Such high priority areas hold 18% of the country's total carbon. As 22% of the areas important for threatened species have low carbon storage, some threatened species may be affected by pressures displaced by reducing land use change in high carbon areas.

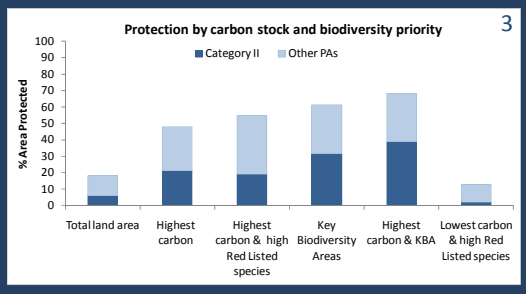
b) Key Biodiversity Areas (KBAs)[3] - These places of international importance for the conservation of biodiversity cover 18% of Honduras's land area and 29% of its total carbon stock.

3. Carbon and protected areas (PAs): In Honduras PAs cover 18% of the land area and 27% of the country's carbon stock. 48% of the areas with the highest carbon stocks are protected (21% in IUCN Category II PAs). PAs cover 55% of land that is high both in carbon and in threatened species' distributions, and 61% of KBAs. High biodiversity priority areas that are low in carbon are poorly protected and may be vulnerable to displaced pressures.









Conclusions and outlook

Although nearly half of the areas in Honduras with the highest carbon stocks have some degree of protection, less than one third of the country's substantial total ecosystem carbon stores are within the protected areas included in this analysis. More than half of those areas that are high in both biodiversity priority and carbon stocks are protected, but some areas important for biodiversity have low carbon stocks and are unlikely to be priority areas for REDD. Such information is important to support decision-making about REDD and co-benefits. Improving data on carbon stocks and incorporating information on ecosystem services will be key next steps for ensuring that REDD decisions in Honduras take account of a full range of benefits.

Notes: 1. C stock estimation based on applying IPCC tier 1 approach using the methods of Ruesch & Gibbs (2008) to ecosystem cover map (CCAD 2003) and combining with data on soil organic carbon to 1m depth (Scharlemann *et al.* 2009). 2. Threatened species data from IUCN (2008a), IUCN (2008b) and Natureserve (2008). 3. Identified at national scale by regional experts using internationally agreed criteria (Conservation International *et al.* 2009).

References: Comisión Centro Americana de Ambiente y Desarrollo (CCAD) 2003. http://www.ccad.ws/ecoportal/sig/sigccadbm/ecomap/Hn_ecomap2003.zip downloaded on 15 June 2009; Conservation International, Center for Applied Biodiversity Science, CI Biodiversity Analysis and Species Unit of CBC Mexico and Central America, BirdLife International, Zamorano 2009. *Honduras Key Biodiversity Areas*; IUCN (2008a). *Digital Distribution Maps of the Amphibians of the World*. Version 1.0 *2008 IUCN Red List of Threatened Species*. http://www.iucnredlist.org; IUCN 2008b. *2008 IUCN Red List of Threatened Species*. http://www.iucnredlist.org; Natureserve 2008a. *Digital Distribution Maps of the Birds of the Western Hemisphere*; Natureserve 2008b. *Digital Distribution Maps of the Mammals of the Western Hemisphere* by Patterson *et al.* 2007. Version 3.0.; Ruesch, A., Gibbs, H.K. 2008. *New IPCC Tier-1 Global Biomass Carbon Map For the Year 2000.* Available online from the Carbon Dioxide Information Analysis Center [http://cdiac.ornl.gov], Oak Ridge National Laboratory, Oak Ridge, Tennessee; Scharlemann, J. *et al*. 2009. *Global map of terrestrial soil organic carbon stocks.* UNEP-WCMC & EU-JRC, Cambridge, UK.

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