Capacity building for carbon- and biodiversity-based payments for ecosystem services in the Peruvian Amazon: Case for Support Part 1 - Previous track record

This proposal brings together a new consortium of UK universities and Peruvian research organisations and NGOs. The wide expertise of the team incorporates individuals involved in the measurement of forest carbon stocks and biodiversity, remote sensing of land-use change, development of payment systems for ecosystem services and the management of conservation and rural development projects.

The School of Geography, University of Leeds, UK is a leading geography department in the UK. Tropical forest ecology is a major research focus and the Ecology and Global Change research cluster leads an international network of forest inventory plots (RAINFOR) to monitor patterns of C cycling in Amazonia funded by NERC, EU, Royal Geographical Society and Moore Foundation grants. **Tim Baker** (PI) has worked throughout Amazonia since 2001 with research interests at the interface of community and ecosystem ecology, with a focus on C cycling in tropical forests: quantifying regional-scale patterns of C stocks and long-term changes in forest structure and dynamics. His second focus is the processes that maintain the high diversity of these forests, particularly the role of disturbance, and thirdly, how the results of ecological studies can be applied to land- and resource-management in the tropics. He held a NERC research fellowship from 2005–7 and currently holds a Research Council Academic Fellowship at the University of Leeds. Relevant publications: **1.** Reed, M., Dougil, A. and Baker, T.R. (2008) Participatory indicator development: what can ecologists and local communities learn from each other? *Ecological Applications*, 18, 1253-1269. **2.** Baker T.R., Honorio Coronado, E., Phillips, O.L., *et al.* (2007) Low stocks of coarse woody debris in a southwest Amazonian forest. *Oecologia*, 153, 495-504. **3.** Baker, T. R., Phillips, O. L., Malhi, Y., *et al.* (2004) Variation in wood density determines spatial patterns in Amazonian forest biomass, *Global Change Biology*, 10, 545-562. **4.** Baker, T.R., Phillips, O.L., Malhi, Y., *et al.* (2004) Increasing biomass in Amazonian forest plots, *Philos. Trans. R. Soc. Lond. Ser. B-Biol. Sci.*, 359, 353-365.

The **Amazon Conservation Association (ACA)** is a pioneering nonprofit organization working to conserve Amazonian forests in Peru and Bolivia. To protect biodiversity, ACA promotes research and the development of innovative conservation tools that support the livelihoods of local communities. Its first program provided incentives to Brazil-nut harvesters for forest protection and in 2001 ACA established the Los Amigos Conservation Concession, the first of its type in Peru. This protected area comprises 145,000 ha of lowland forest and acts as a buffer zone for the world-famous Manu National Park. ACA's Los Amigos Biological Station is now one of the most active research centers in the Amazon. In 2005, ACA created Peru's only permanent research centre for Andean cloud forest ecology and management, and in 2008 ACA facilitated the signing of the first conservation concession in the name of a native community, the Haramba - Wachiperi. **Cesar Moran-Cahusac** (Project Partner; letter attached) is Executive Director of ACA and has a Master's degree in Environmental Management from the Yale School of Forestry. Previously, he worked on a wide range of conservation projects including as project coordinator for the Machu Picchu Program, a debt-for-nature swap between Finland and Peru that supported the Machu Picchu Natural Sanctuary.

The **Instituto de Investigaciones de la Amazonia Peruana (IIAP), Iquitos, Peru** is the major public research and technology transfer institute working in Peruvian Amazonia. Its mission is to improve the quality of life of Amazonian people through research focusing on sustainable development and the conservation of natural resources. IIAP has 46 researchers and an annual budget of ca. US$3 million. **Dennis del Castillo** (CoI) has a PhD in soil physics and conservation and is the Terrestrial Ecosystem Research Director at IIAP with more than 20 years of experience implementing integrated development projects and participatory applied research involving rural development, biodiversity conservation, soil and forest management and sustainable use of natural resources in the Peruvian Amazon, Madagascar, Cape Verde and Bolivia. He was executive president of IIAP (2000-2006) and was an active member of the Peruvian Ministry of Agriculture's Special Advisory Group, the UNDP's Special Advisory Group on Human Development, and other international groups working throughout the Amazon, including Procitropicos, the Initiativa Amazonica and Unamaz (Association of Amazonian Universities). Relevant publications: **1.** Freitas, L., Otarola, E., Linares, C., Martinez, P., Del Castillo, D. (2006) Servicio ambiental de secuestro de carbono en humedales de la Reserva Nacional Pacaya

Samiria. *Documento Tecnico No. 29*, Instituto de Investigaciones de la Amazonia Peruana. 94pp. **2.** Tapia-Coral, S.C., Luizão, F.J., Barros, E., Pashanasi, B., Del Castillo, D. (2006) Effect of *Pontoscolex corethurus*, Muller, 1857 (Oligochaeta:Glossoscolelecidae) inoculation on litter weight loss and soil nitrogen in mesocosms in the Peruvian Amazon. *Caribbean Journal of Science,* 42, 410-418. **3.** Pinedo-Vasquez, M., Barletti J., del Castillo D., Coffey, K. (2002) A tradition of change: the dynamic relationship between biodiversity and society in sector Muyuy, Peru. *Environmental Science & Policy,* 5, 43-53.

The **School of the Environmental and Natural Resources, Bangor University** is Britain's foremost university centre in forestry (annual research grant income £3.7 million). Its research is characterised by the application of interdisciplinary approaches with a focus on ecosystem services and their links to human livelihoods, especially in tropical forest environments. **Julia Jones** (CoI), lecturer in conservation science, focuses on interdisciplinary research into the interactions between biological resources and human behaviour and institutions. She is co-PI on a Leverhulme Trust grant 'Optimizing monitoring as a conservation tool', using theoretical and empirical approaches to incorporate social and economic realities and limitations into design of monitoring protocols for conservation and natural resource management. Her PhD and MSc students research a variety of socio-economic issues in conservation including optimal structure of direct payments for biodiversity benefits and design of monitoring for compliance in conservation programmes. She and John Healey are advisory panel members for a United Nations Environment Programme review 'The evidence for community forest management as a mechanism for supplying environmental benefits and improving rural welfare'. Relevant publications: **1.** Jones, J.P.G., Andriamarovololona, M.A. & Hockley, N.J. (in press) The role of taboos and social norms in conservation in Madagascar. *Conservation Biology*. **2**. Danielsen, F., …. Jones, J.P.G. *et al.* (in press) Local participation in natural resource monitoring: a characterization of approaches *Conservation Biology*. **3.** Jones, J.P.G., Andriamarovololona, M.M., Hockley, N., *et al.* (2008) Testing the use of interviews as a tool for monitoring trends in the harvesting of wild species. *Journal of Applied Ecology*, **45**, 1205-12.

John R. Healey (CoI) is senior lecturer in forest ecology. His research spans forestry, soils and biodiversity, primarily focused on tropical moist forests (management, economics, conservation and restoration as well as fundamental ecology) with recent emphasis on inter-disciplinary environmental-social science and participatory research. His current/ recent grants from EU, Royal Society, NERC, DFID and Darwin Initiative include environmental services of tropical agroforestry, forestry impacts on C, bush-fallow management for sustainable livelihoods, tropical forest restoration and conservation, improved methods for tropical biodiversity assessment, and growth and yield inventory of tropical forests. Relevant publications: **1**. Preechapanya, P., Healey, J.R., *et al.* (in press). Retention of forest biodiversity in multistrata tea gardens in Northern Thailand. *Agroforestry System*. **2.** van der Heijden, G.M.F., Healey, J.R. & Phillips, O.L. (2008). Infestation of trees by lianas in a tropical forest in Amazonian Peru. *Journal of Vegetation Science*, 19, 747-756., **3.** Easdale, T.A., Healey, J.R. *et al.* (2007). Comparative life histories of montane trees. species differ independently by shade-tolerance, turnover rate and recruitment in space and time. *Journal of Ecology* 95, 1234-1249. **4.** Hockley, N.J., Edwards-Jones, G. & Healey, J.R. (2007). Maximizing the efficiency of conservation. *TRENDS in Ecology and Evolution*, 22, 286-7.

The Technical University of Munich (TUM), School of Forest Science and Resource Management (WZW) is an interdisciplinary School with an emphasis on forestry science and forest community projects. The WZW is involved in a university-wide network with Yale University Forestry Department and outreach on the environment. **Rosa María Román** (Project Partner) is currently an Alexander von Humboldt research fellow at WZW (TUM) and a research associate at ECI, Oxford. Her research addresses whether fire disturbances are being modified in tropical ecosystems by climate and humans, fire management for conservation and fire carbon crediting analyses. She works at different spatial and temporal scales strongly relying on remote sensing and GIS techniques. From 1998-2003, her work was based on the Mesoamerican Biological Corridor and since 2004 she has been working on tropical ecology in the Amazon Basin and the Andes. Her current research concentrates on fire impacts on Cloud Montane forests in the Manu National Park in the Peruvian Andes, as part of an ACA research and cooperation program. Relevant publications: **1.** Malhi, Y. and Román-Cuesta, R.M. (2008). Analysis of lacunarity and scales of spatial homogeneity in IKONOS satellite images of tropical forest canopies. *Remote Sensing of Environment* 112: 2074-2087. **2.** Aragao, L., Malhi, Y., Román-Cuesta, R.M, *et al.* (2007). Spatial patterns and fire response of recent Amazonian droughts. *Geophysical Research Letters* vol. 34, L07701. **3.** Román-Cuesta, R.M., and J. Martínez-Vilalta. (2006). Effectiveness of protected areas in mitigating fire within their boundaries: case study of Chiapas, Mexico. *Conservation Biology* 20:1074-1086. **4.** Román-Cuesta, R.M.,*et al.* (2005). A quantitative comparison of remote of sensing methodologies for classifying burned areas with LISS-III imagery. *Int. Journal Remote Sensing* 26:1979-2003.

Capacity building for carbon- and biodiversity-based payments for ecosystem services in the Peruvian Amazon: Case for Support Part 2 - Project description

Introduction

Payments for C sequestration and biodiversity conservation have the potential to generate significant local revenue in forested developing nations [1]. If properly managed, such payments for ecosystem services could play a major role in poverty alleviation in Amazonia. This proposal brings together an interdisciplinary team of academic (Universities of Leeds, Bangor and Munich), NGO (ACA) and Peruvian research institutions (IIAP) with links throughout Amazonia, to identify the full range of opportunities and capacity building requirements to access C- and biodiversity-based payments for ecosystem services in Peruvian Amazonia.

Institutional strengths and needs

The Forest Management and Environmental Services group at IIAP is strongly focussed on improving the technical capacity in Peru to develop projects for payments for ecosystem services. As part of its strategic plan, it has identified the need to train 6 professionals over the next 3-5 years in this area. IIAP has an active research program into the forest C stocks of selected timber and palm species and routinely uses remote sensing data for land use classification. However, specific technical needs include the development of methodologies for large-scale monitoring of forest C stocks, validation of biomass equations and remote sensing of deforestation and disturbance. ACA has extensive experience in community-focussed development projects and in establishing and managing conservation areas. ACA has identified the need to develop a legal framework within Peru to establish equitable payments for ecosystem services and is collaborating with the Sociedad Peruana del Derecho Ambiental. Our project will build on the results of that collaboration. The international partner institutions have complementary strengths: baseline data on forest C stocks and tree biodiversity and expertise in forest inventory (University of Leeds), expertise in remote sensing of disturbance and vegetation change (Technical University of Munich) and expertise on the linkage of forest resource management with local knowledge and livelihoods in payment systems for ecosystem services, ecological economics and participatory research (Bangor University). Existing collaborations between the University of Leeds/IIAP, and ACA/University of Munich underlie this proposal. Our project will create new interdisciplinary collaborations between IIAP/Leeds, ACA/Munich and Bangor University to form a team with the expertise in ecosystem monitoring, policy and community-based conservation that the development of systems for payments for ecosystem services requires.

Strategic importance

The potential value of C-storage and biodiversity based payments in the Peruvian Amazon is large, as there is a strong threat of an increase in deforestation rates and the C storage and biodiversity of these forests is high. Although historical rates of deforestation are low compared with neighbouring Brazil [2], the expansion of oil company concessions to almost all of Peruvian lowland Amazonia outside national parks during the last 5 years and current road infrastructure projects present new threats. There is strong institutional support to develop ecosystem service payments to alleviate poverty (e.g. support for Reductions in Emissions from Deforestation and Degradation to be included in a post-Kyoto emissions agreement, at the Copenhagen UNFCCC meeting in 2009). However, there are substantial scientific and socio-economic challenges. For example, on the demand-side, robust monitoring schemes need to be developed. On the supply-side, because of the weak property rights and poor representation at national and international levels of the dispersed, rural communities, the benefits may not have the desired effect on poverty. The costs to local people must also be carefully incorporated. To assess these constraints and how they can be addressed, our project focuses on the development of specific participatory C-sequestration and biodiversity conservation projects within existing protected areas. These case studies have regional-scale relevance for achieving payments for C sequestration and biodiversity conservation. Our proposal therefore aims to create a blueprint for how equitable payment systems for ecosystem services could be established in Amazonia.

Specific objectives

1. Identify the potential for, and constraints on, developing successful, C- and biodiversity-based ecosystem service payment projects in the Peruvian Amazon. This will include considering: **(a)** methods to measure avoided deforestation and degradation, including remote sensing methods to extrapolate measurements of C stocks/dynamics from inventory plots to forest landscapes subject to contrasting forms of disturbance and methods to assess the benefits for biodiversity, **(b)** methods to identify different local

stakeholders (e.g. councils, individuals dependent on farming or logging), how they may participate in ecosystem service projects and their costs in doing so, and thus the potential of payments to alter patterns of resource exploitation by households in local communities, and **(c)** an assessment of the most appropriate markets and policy options for payment systems, including consideration of monitoring costs.

2. Identify training requirements to develop C and biodiversity-based projects in the Peruvian Amazon.

Methodology, approach and research plan

We will create a new, interdisciplinary team to identify the research needs for developing the monitoring schemes, markets and payment mechanisms for ecosystem services that ensure that their poverty alleviation potential can be realised. Firstly, we will collate information on the threats, challenges and opportunities for such projects in Peruvian Amazonia. The draft report will focus discussion during a workshop to be held in February 2009, at IIAP, Iquitos, Peru. This will address the state of knowledge and challenges for (a) the measurement of stocks and changes in C and biodiversity, (b) identifying the dependence of local communities' livelihoods on natural resources, the economic alternatives that payments might provide and how different stakeholders will be involved, and (c) identifying potential markets for C and biodiversity services and the development of equitable payment systems. The workshop will then identify the opportunities and limitations for developing projects for ecosystem service payments in two case study regions: the Los Amigos conservation concession managed by ACA in Madre de Dios, southern Peru and the network of protected areas (PROCREL) in Loreto, northern Peruvian Amazonia, established by the regional government. The region of the conservation concessions managed by ACA will shortly come under unprecedented pressure from population migration and expansion of agriculture and logging after the completion of the InterOceanica highway, linking Cusco to Brazil. The regional government in Loreto has developed a community-based conservation initiative in a region with recent expansion of concessions for oil exploration. Finally, the workshop will define the research needs to develop projects for the case studies.

Project management, career development opportunities, data stewardship and evaluation

The project will be coordinated by Tim Baker and each topic will be led by a member of the project team:

1. Measurement of C storage and biodiversity	1.1 Measurement of C stocks and biodiversity	T. Baker
	1.2 Monitoring schemes	J. Healey
	1.3 Remote sensing	R. María Román
2. Community involvement in ecosystem service projects	2.1 Livelihoods and resource use in Peru	D. del Castillo
	2.2 International perspective	J. Healey
3. Potential markets, payment systems and policy	3.1 Progress in Peru	C. Moran-Cahusac
	3.2 International perspective	J. Jones

The project will employ one research assistant for 6 months to coordinate the project outputs and workshop and one Iquitos-based Master's student for 3 months. The project experience will give both an excellent basis to undertake new opportunities for project work on payments for ecosystem services. Senior researchers from IIAP and ACA will benefit from identifying the training needs within their institutions to further develop these projects. Tim Baker, Julia Jones and Rosa Maria Román are all early career researchers who will greatly benefit from the interdisciplinary links that will be established through this project. Raw data sets will be managed in accordance with NERC's data policy and copies will be deposited with the appropriate NERC data centre if appropriate and the SIAMAZONIA database on Amazonian biodiversity and ecology managed by IIAP. A project advisory group of individuals from relevant institutions in Iquitos will be formed to advise on project progress and evaluate outputs.

Expected outputs and dissemination

1. A joint proposal to address the training and research needs for C- and biodiversity-based ecosystem service projects in the Peruvian Amazon, based on the 2 case-study locations. **2.** One peer reviewed publication summarising the opportunities and challenges for establishing mechanisms for payments for ecosystem services in Peruvian Amazonia. **3.** Press releases in Peruvian local (La Region) and national (El Comercio) press. **4.** Three reports (in English and Spanish) to be widely disseminated (a) a briefing note for policy makers; (b) a layman's report; (c) a technical report for practitioners. **References 1.** UNEP-WCMC 2007. Reducing Emissions from Deforestation: A Key Opportunity for Attaining Multiple Benefits. UNEP World Conservation Monitoring Centre, Cambridge, U.K. **2.** Oliveira, P.J.C., *et al.,* Science, 2007. 317: p. 1233-1236.