**FINAL REPORT (Newsletter 7, March 2018)** p4ges (can paying 4 global ecosystem services reduce poverty?) was a four and a half year project (2013-2018) involving a consortium of eleven institutions in the UK, Madagascar, the USA, the Netherlands and Switzerland. The project website is at www.p4ges.org. For more information please contact Professor Julia Jones (Julia.jones@bangor.ac.uk) or Professor Bruno Ramamonjisoa (bruno.ramamonjisoa@gmail.com)

**Our central research question was: Can capturing global benefits from ecosystems (specifically carbon sequestration/storage and biodiversity) reduce poverty in low income countries, given bio-physical, economic and political realities?**

We focused on a single ecosystem (tropical forests) in a single country (Madagascar) to achieve the depth required for a complete analysis. We took a multi-dimensional approach to poverty: acknowledging that poverty is about more than a lack of material wealth. We selected tropical forests as they are globally important for climate regulation and biodiversity, support millions of livelihoods, and international payment mechanisms are increasingly important drivers of land use change. Payment schemes which influence land use have the potential to impact the poverty status of local people both positively (e.g. through hydrological benefits) and negatively (e.g. through limiting agricultural expansion).

**Our aim was to influence the development and implementation of international ecosystem service payment schemes such as REDD+ in the interests of poverty alleviation.**

Using the Coridor Ankeniheny Zahamena REDD+ pilot project as a case study we brought together development experts, ecologists, hydrologists, modellers and ecological economists. Our four objectives (identified at the start of the project) are listed below along with outcomes at the end of the project. For more information please see www.p4ges.org.

| Objective | Outcome |
|---|---|
| To understand effects on ecosystem service flows, to local and global beneficiaries, of the land-use changes incentivized under alternative conservation approaches, and the spatial and temporal trade-offs in these flows. | We have greatly increased knowledge of the link between land use change and ecosystem service flows in the swidden agricultural systems of eastern Madagascar (eg Zwartendijk et al., 2017, Andriamananjara et al., 2017, 2018, Ghimire et al., 2017, Razafindrakoto et al., 2017). We have many more papers in progress. We have produced many publically archived datasets underpinning these analyses which are available to the wider community and are being used. We have improved two widely used policy support tools (Co$ting Nature and WaterWorld) which build some of this knowledge into easy to use, freely available online policy support tools supporting decision makers in >140 countries (and provided training to key stakeholders to help them use it). |
| To estimate the magnitude and distribution of net local welfare impacts from a range of alternative designs (incorporating both the effects of payments and land-use change) and the likely influence of | We have made major methodological advances in methods for estimating the welfare impacts of forest conservation and applied these approaches to explore the welfare impacts of aspects of the CAZ REDD+ project and surrounding conservation interventions (Rakotonarivo et al., 2016, 2017a, b, Rasolofoson et al., 2016, 2018, Bidaud |

| | |
|---|---|
| different local and regional institutional structures; | et al., 2016). We have produced an analysis of the transaction costs of different approaches to distributing benefits from international conservation funding to local communities through micro-development projects (Mackinnon et al ., 2018). A full analysis incorporating costs and benefits of conservation (in terms of benefits distributed and ES service costs and benefits) is in progress. |
| To fully quantify the land-use changes and the payments distributed in the existing scheme; | We have explored the impact of the investments in CAZ on deforestation and fire (Tabor et al 2017). We have demonstrated that there are biases in who benefits from some of the benefit distribution in the existing CAZ scheme (Poudyal et al 2016). |
| To develop effective recommendations for improved international schemes that maximise their potential for delivering poverty alleviation, given biophysical, economic and political realities. | We have synthesised our findings for a range of audiences (including a summary leaflet, policy briefs, and presentations) and presented these in many fora. This includes local community meetings (reaching >1000 people in total), national events attended by ministers in Madagascar, a meeting with the president of Madagascar and a UK DEFRA minister, meetings with World Bank officials, presentations at the Conference of the parties of UNFCC, CBD and WFC (World Forest Congress), and training of technical staff from relevant ministries in Madagascar. |

**Key findings**

P4ges has already published 20 academic papers, 14 publically archived datasets, and improved two major policy support tools. Below is a summary of a few of our key findings.

1) We have demonstrated issues with the World Bank social safeguard schemes designed to ensure the poorest are not negatively impacted by bank-funded projects. Poudyal et al (2016) showed that there are biases in who benefits from such schemes (with the richer and better socially connected more likely to received safeguard compensation than those arguably most deserving). MacKinnon et al. (2017) showed that livelihood projects that were implemented as part of a safeguards process were the most expensive and had the lowest proportion of expenditures reaching the community (compared with other approaches of delivering livelihood projects to communities).

2) We have shown that forest soils store substantially more carbon than is stored in above ground biomass and that this soil carbon is surprisingly well conserved after forest loss (below ground stocks vary little between closed canopy forest and shrub fallow). See Andriamananjara et al., 2017, 2018, Razafindrakoto et al., 2017, Ramifehiarivo et al., 2017.

3) Our intensive work of the impact of deforestation on hydrological function (Zwardtendjik et al 2016) has revealed that infiltration capacity can rebuild after land is abandoned and left to regenerate; but it is unclear whether active reforestation can speed up the process.

4) We show that the forests of the CAZ have a limited effect (footprint) downstream so only those close to the forest feel the effects of conservation and/or reforestation on hydrological ecosystem services. Our scenario analysis indicates that the deforestation that has occurred to date is orders of magnitude greater than that which will occur over coming decades, so most of the hydrologically negative impacts have already occurred in the region and rehabilitating these should be a key focus. We show that 95% of people are hydrologically affected by current forest cover (mostly a little), 99% by historic forest loss (mostly a lot). With respect to management options, we show that conservation or afforestation policy options always improves water quality compared with "business as usual", but can have positive or negative effects on water quantity and dry season flow, depending on where and how it is done.

5) We show that choice experiments (when carefully designed and implemented) can be used to quantify the costs of potential future scenarios in a low income country with a population with low literacy. However, where people lack experience of a potential future scenario (as is often the case with conservation restrictions) they may not be able to accurately estimate the costs (Rakotonarivo et al, 2016, 2017a, b). We have shown that the costs of conservation are substantial, and represent an especially high proportion of household income for poorer families.

6) We have carried out the 1st robust national scale analysis of the impacts of Community Forest Management on deforestation and human economic well-being (Rasolofoson et al., 2015, 2016). We showed that CFM designed to promote conservation in Madagascar has effectively slowed deforestation (while CFM incorporating sustainable logging has not). The impacts on human economic wellbeing are, on average, neutral but there is some evidence of negative impacts on those closest to the forest and with lower levels of education.

7) While many REDD+ and conservation initiatives are promoting the use of small-scale livelihood projects (e.g., agricultural production, fish farming) as a means of improving local livelihoods while reducing pressure on remaining forests, there has been little information on how effective these projects are in achieving both livelihood and conservation outcomes. We showed that individual livelihood projects vary greatly in their ability to deliver livelihood benefits, the types of benefits delivered, and the duration of benefits delivered.

8) We have showed that conservation and development investments implemented in the CAZ region have reduced deforestation and fire incidence, but that these relationships are complex and difficult to tease apart especially in the light of political shocks which add noise (Tabor et al., 2017).

9) We published (Bidaud et al 2016) a detailed case study of the biodiversity offsets implemented by one of the largest investments in sub-Saharan Africa (the Ambatovy mine). We showed that overall, local people suffered a net cost from the biodiversity offset and that those who bear the costs are not the same people as those who benefit, and that there is a mismatch in timing between the immediate restrictions and the associated development activities which take some time to deliver benefits. This matters from the perspective of environmental justice, and for the long-term sustainability of biodiversity offsets.

**Progress in impact activities**

1) Madagascar made a commitment to REDD+ in its INDC document submitted to the Paris climate conference in December 2015. This has confirmed the interest of the Malagasy government in REDD+ and the relevance of the p4ges project. The move away from project focus to a national REDD+ strategy is underway and our team (especially those from CI, LRI and ESSA) are centrally involved in this process and are regularly in discussions with key people in the process. The lead on REDD+ from the Malagasy government invited our team to brief the whole national REDD+ team about our research results. Partners from LRI and ESSA are in regular contact with them and members of our team now serve on the REDD+ national safeguarding committee.

2) The national coordination office for REDD+ asked if our carbon team could provide carbon data from the hidden pools (soil, roots etc) for non forest land uses for incorporation into base line assessment and modelling for the national REDD+ strategy and the emissions reduction strategy. Our team from LRI led by Prof Razafimbelo and Prof Razakamanarivo provided this data and helped them use it. This data is being used in a number of ways to support the REDD+ process. Furthermore, use of carbon data generated within p4ges were integrated in a national soil database hosted by LRI in order to update soil carbon map of Madagascar (Ramifehiarivo et al., 2017). More recently (end of 2017 and February 2018 respectively), these same carbon data were considered for: (i) the Global Soil Organic map (GSOC-map) within the Global Soil Partnership (GSP) which is an international initiative of FAO and, (ii) the Land Use Planning for Enhanced Resilience of Landscapes (LAUREL), a program initiated by the World Bank.

3) WaterWorld and Co$tingNature are widely used spatial policy support systems, by more than 1200 institutions across 141 countries. They are used to understand water resource and ecosystem services baselines as well as conservation priority. As solution-focused tools, they are also used to understand the impacts of scenarios for land use and climate change and the impact of management interventions. During P4GES the tools have been further developed for all users with new functionality for calibration of mapped data on the basis of fieldwork, new intervention tools for analysing the impact of paddy rice and improved tools for mapping the distribution of beneficiaries. Version 3 of Co$ting Nature was launched at a meeting on research impact at the House of Commons on the 7th February. The tool is being used in of similar conservation/development applications to those developed in P4GES in Colombia, Honduras, Peru, South Africa, West Africa. The built-in datasets have been improved for Madagascar and we have provided training and support for technicians in key organisations in using the tools.

4) The Green Climate Fund Board has approved a U$70 million project for Sustainable Landscapes in Eastern Madagascar (with a U$53.5 million contribution of the GCF). The overall objective of the new project is that 'sustainable landscape measures are used to enhance the resiliency of smallholder farmers, improve ecosystem resiliency, improve access to low emissions energy sources, and reduce emissions from deforestation'. CI (part of p4ges) will co-implement this project with the European Investment Bank. This highly complex project is the first GCF project proposed by an international NGO, it also the first time the GCF will work with co-implementation arrangements. But maybe most importantly, it is the first time that a green bond for the European market will be directly linked to climate change investments on the ground in a Least Developed Country. If we can show that this model works we could potentially unlock US$3.6 billion in additional climate finance annually. Another unique feature is that the returns of the Investment Fund may flow into a national Climate Change Trust Fund, which will ensure a lasting legacy of this project to Madagascar to continue building resilience of smallholder farmers and communities. The project will be implemented in Ambositra-Vondrozo (COFAV) and Ankeniheny-Zahamena (CAZ) corridors in the eastern part of Madagascar. This confirmation of ongoing investment in our project site (with p4ges organization CI at the heart) gives many opportunities for lessons from p4ges to influence future activities. As the project design is finalised there are a number of ways in which lessons from p4ges have been fed in.

5) The research conducted by p4ges on social safeguard implementation (Poudyal et al., 2016) resulted in our partners Madagasikara Voakajy and an organisation linked to p4ges through representation on our national advisory board (Durrell Wildlife Trust) reviewing their own safeguard procedures for protected areas they manage and ensuring they were adequately ensuring that remote households had opportunities to participate.

6) We have returned to all the communities where our work was carried out to share results (presentations and through distributing our detailed booklet covering all p4ges research). This has empowered local people in ways which are very difficult to quantify or collect evidence for but we have many examples of people telling us how valuable this has been. The two parts which have been particularly valued are 1) information helping communities understand why external actors want to invest in forest conservation (many were aware of the global value of biodiversity but the value of forests in terms of carbon sequestration has not been locally understood but is important context). 2) We presented the results of our hydrological research using a very simple demonstration of the impacts of loss of vegetation on infiltration (see video). Local leaders reported finding this very useful.

7) The Malagasy government has a public commitment to attempt to reforest one million hectares of degraded land. They are therefore extremely interested how our empirical research and the model WaterWorld (which has been improved with funding from p4ges) can be used to optimise this process. We are exploring opportunities to work closely in advising this process and the tools we have developed have great functionality for this.

8) In 2017 the World Bank recently announced their major new investment in Madagascar over the next decade which will replace the National Environmental Action Plan and will combine agricultural and environmental investment into a single programme (Projet Agriculture Durable par une Approche Paysage). We are following this process as closely as possible to ensure any opportunities to feed out results in are identified. P4ges PI Prof Jones was invited in 2017 to brief some of the key developers of this programme on 'The impacts of conservation efforts in Madagascar over the last decade on poverty reduction'. Partners from ESSA and LRI are involved in aspects of the project; bringing lessons from p4ges and are looking for opportunities to engage more.

9) In September 2017 His Excellency the President of Madagascar met with the UK Under Secretary of State at the Department for Environment, Food and Rural Affairs, Thérèse Coffey MP, and delegates from the International Climate Fund, DEFRA, Durrell, Fauna & Flora International and TRAFFIC to discuss the future of conservation in Madagascar. P4ges PI was part of this high level round table to discuss the most appropriate ways forward for combining conservation and development in Madagascar.

**Publications**

We have had 20 papers published (or accepted) in peer reviewed journals and more are under review.


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**Policy briefs (available from p4ges website)**

- How effective are conservation investments in reducing deforestation and fires in Ankeniheny-Zahemena Corridor, Madagascar?
- Does Community Forest Management effectively slow deforestation and what is its impact on human well-being?
- Can REDD+ social safeguards reach the 'right' people?
- The social impacts of biodiversity offsetting in a low-income, high-biodiversity country context
- Who bears the cost of forest conservation?
- What is the cost of providing livelihood projects to local communities as part of REDD+ and forest conservation projects?
- Can Small-Scale Livelihood Projects Deliver Both Livelihood And Conservation Benefits?
- How does land use change in eastern Madagascar influence hydrology?
- Carbon stock surveys in the framework of poverty alleviation in Madagascar

**Publically archived datasets**

We have made all our data available in public archives to it can be widely used.

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**Team**

Over the course of the project, p4ges involved more than 50 researchers, technicians and students (and anther 100 local field assistants from the communities where we worked). Each person played a vital role in the project's success. P4ges was led by: Julia P G Jones (Bangor University), Bruno Ramamonjisoa (University of Antananarivo), Tantely Razafimbelo & Herinsitohaina Razakamanarivo (Laboratoire des Radio-Isotopes), Julie Razafimanahaka (Madagasikara Voakajy), Luciano Andriamaro (Conservation International Madagascar), Celia Harvey (Conservation International), Kate Schreckenberger (Kings College London), Alison Cameron (Bangor University), Ilja van Meerveld (University of Zurich), Mark Mulligan (Kings College London).

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