

## Allocating Community-Level Payments for Ecosystem Services

*Initial Experiences from a REDD Pilot in Tanzania*

Elizabeth J.Z. Robinson, H. Jo Albers, Razack Lokina, and Charles Meshack



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Email: [kenya@efdinitiative.org](mailto:kenya@efdinitiative.org)



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Email: [southafrica@efdinitiative.org](mailto:southafrica@efdinitiative.org)



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## Abstract

Payments for ecosystem services (PES) typically reward landowners for managing their land to provide ecosystem services that would not otherwise be provided. REDD—Reduced Emissions from Deforestation and Forest Degradation—is a form of PES aimed at decreasing carbon emissions from forest conversion and extraction in lower-income countries. A key challenge for REDD occurs when it is implemented at the community rather than the individual landowner level. Whilst achieving this community-level reduction relies on individuals changing their interaction with the forest, incentives are not aligned explicitly at the individual level. Rather, payments are made to the community as a single entity in exchange for verified reduced forest loss, as per a PES scheme. In this paper, we explore how community level REDD has been implemented in one multiple-village pilot in Tanzania. Our findings suggest that considerable attention has been paid to monitoring, reporting, verification, and equity. Though no explicit mechanism ensures individual compliance with the group PES, the development of village level institutions, “social fencing,” and a shared future through equal REDD payments factor into community decisions that influence the level of community compliance that the program will eventually achieve. However, few villages allocate funds for explicit enforcement efforts to protect the forest from illegal activities undertaken by outsiders.

**Key Words:** PES, REDD, collective decisions, Tanzania, forests

**JL Codes:** Q23, Q54

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## 1. Introduction

Globally, deforestation and forest degradation contribute approximately 12% of total CO<sub>2</sub> emissions (Van der Werf et al. 2009), whilst Africa's relatively high rate of forest degradation and loss accounts for approximately 70% of the continent's total greenhouse gas emissions (FAO 2006; Gibbs et al. 2007). REDD – Reduced Emissions from Deforestation and Forest Degradation – recognises both the continuing increase in global CO<sub>2</sub> emissions and the role of forests in lower-income countries by introducing a payment to slow forest conversion and degradation to reduce the emission of greenhouse gases. Though forests have long been a part of climate change discussions through the clean development mechanism (CDM), which focuses on afforestation, REDD, with its focus on avoided forest loss, is a relatively new innovation, first featured in the 2005 Montreal COP (conference of the parties).

Although REDD remains in its early stages, and is currently being implemented under a variety of guises, central to REDD has been the idea that it is a payment for ecosystem services (PES), where payments are conditional on verified reductions in forest loss relative to some baseline (Albers and Robinson 2013; Mahanty et al. 2013). A key yet neglected issue for REDD is the change in incentives that are created for individual forest-dependent households when a REDD scheme is introduced at the community level, as is frequently the case for community-owned or managed forests, and indeed for many PES schemes, in lower-income countries (Sommerville et al. 2010).

To address this characteristic of REDD implementation, we consider the REDD pilot that the Tanzania Forest Conservation Group (TFCG) and the Tanzanian Community Forest Conservation Network (MJUMITA) coordinate in several villages. We focus particularly on community decisions over how REDD funds are allocated within a village; the extent to which the implementation of the REDD scheme accounts for collective versus individual decisions; and

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\* Elizabeth J.Z. Robinson, University of Reading, corresponding author, email: e.j.robinson@reading.ac.uk. H. Jo Albers, University of Wyoming. Razack Lokina, University of Dar es Salaam. Charles Meshack, Tanzania Forest Conservation Group.

whether the allocation of funds is linked to the pressures on the REDD forest. We find that the pilot has taken into account monitoring, reporting and verification (MRV), as well as equity considerations. However, frequently no explicit mechanism is developed to ensure individual compliance with the group PES nor to protect the community scheme from outsiders. In particular, communities allocate only very small shares of the REDD payments to formal enforcement efforts. However, there has been considerable effort to build institutions within the village, which may reflect a tacit assumption that “social fencing” – a sense of collective responsibility to protect a commonly held and used resource – is sufficient to protect the REDD forests (Mishra and Sarin 1988; Brandon and Wells 1992; Lal 1997; Lise 2000; Henkemans 2001; Nielsen 2006; Robinson et al. 2014b). A lack of more formalised enforcement could, however, prove problematic where outsiders with no connection to the REDD villages exert considerable external pressures on the forest.

The paper is structured as follows. In Section 2, we address the literature on payments for ecosystem services in the context of community-level schemes. Section 3 is motivated by the understanding that PES schemes require behavioural changes by villagers and, in the case of the TFCG/MJUMITA REDD pilots, can provide relatively equitable group benefits but may impose very different individual costs. We explore how REDD has been implemented by TFCG/MJUMITA pilot villages in terms of payments, allocation, and compliance. Finally, in Section 4, we consider the more general implications of our findings. This paper is relevant not only to REDD but to other forms of PES and to general payment-as-compensation policies, particularly in lower-income countries, where payments are made at the community level and the group determines how these payments are allocated amongst individuals and community projects.

## **2. PES, REDD, and Community-Based Schemes**

The PES literature has been dominated by papers that consider a voluntary arrangement in which individual or coordinated landowners offer an ecosystem service in exchange for a payment. As such, PES can be considered to have its theoretical basis within a Coasean framework. Market or quasi-market bargaining can achieve socially optimal levels of environmental services (Muradian et al. 2010) without additional government involvement beyond ensuring that property rights are well-defined and protected. With relatively low transaction costs, if the ecological benefits are sufficient to warrant a large enough payment to induce a landowner to supply the ecosystem service rather than undertake alternate activities that are privately profitable but socially less desirable, then a PES is viable. Because the payment is

contingent on a particular set of actions, the landowner has an incentive to comply without any external enforcement.

Operating from this basis of payments to induce changes in forest use behaviour, early discussions of REDD as a new PES in the policy and academic literature focused on implementation issues, including monitoring, reporting and verification (MRV); permanence; additionality; and leakage (some of the many key papers include Lambin 1999; Angelsen 2008; Humphreys 2008; Herold and Skutsch 2009; Lubowski 2008; West 2010; Albers and Robinson 2013). However, increasingly PES schemes in lower-income countries are recognized to be more complex than the theoretical concept might suggest (Tacconi 2012). For example, Sommerville et al. (2010: 1263) recognize explicitly that “community-based PES schemes offer a particular challenge, as incentives aimed to influence individual behaviour ... pass through community institutions.” Mahanty et al. (2013) consider lessons from seven PES schemes, several of which are implemented partially or fully at the community level. Alix-Garcia et al. (2004, 2012) study Mexico’s PES for hydrological benefits from forest protection on communal lands, *ejidos*. Muradian et al. (2010: 1203) similarly highlight that many PES schemes stray far from the Coasean “ideal” of a “voluntary transaction where a well-defined ecosystem is bought by a buyer from a service provider if and only if the provider secures its provision” (quoted from Engel et al. 2008).

In these cases, conditionality operates through incentives at the level of the group but requires compliance at the individual level. Mechanisms to achieve such individual compliance include defining rules of resource access, rules of management actions per person, and consequences to breaking those rules. The development and enforcement of these allocation rules is critical – without established and enforceable rules, individual incentives from *de facto* open access extraction remain even if individuals receive additional income from the project (Ostrom 1990). Ostrom (2009) addresses how such complex social-ecological systems (SES) often lack a common framework to assess the likelihood of self-organisation resulting in a sustainable SES.

Yet, despite recognition that individual compliance with group decisions is difficult but necessary, the literature contains little consideration of how appropriate individual incentives are designed for a community PES. Alix-Garcia et al.’s (2004, 2012) articles that address PES schemes in Mexico’s *ejidos* discuss tree-stealing as a symptom of poorly enforced *ejido* property rights and the costs of that enforcement, but do not focus on *ejido* group decisions or incentives. Even Somerville et al. (2010), which explicitly recognises this need within a PES context, pays relatively little attention to this issue in its specific case study. Rather, the focus of the results is

on how individuals and the community benefit differentially from the PES payment and on the equity of the distribution of payments. Thus, although the economics and policy literatures recognize the prevalence of community-managed resource institutions in lower-income countries, analysis of the implications of group decisions in response to PES payments to a group or community remains limited.

### 3. Methods and Data

In this section, we provide details of our data collection, including background to the pilot REDD project that motivated this paper.

#### 3.1 *The REDD Pilot*

TFCG/MJUMITA introduced the project ‘Making REDD work for communities and forest conservation in Tanzania’ in September 2009. The project’s underlying philosophy incorporates the idea that forests are better managed when the nearby communities are involved in the management of the forests, and that benefits should go directly to the communities that are managing the forests. Documentation states that the project is implemented so as to ‘provide direct and equitable incentives to communities to conserve and manage forests sustainably’ (TFCG 2009a: 1).

The project is being implemented in two districts in Tanzania, Kilosa and Lindi (Figure 1), each of which incorporates biodiversity hotspots: the Eastern Afromontane biodiversity hotspot and the Eastern African coastal forest biodiversity hotspot, respectively (Robinson et al., 2014a). Though the pilot is being funded by a grant, it is being introduced as if it were a performance-based community-level PES in which communities are paid in proportion to the measurable and verifiable reductions in carbon emissions from their surrounding forests. Part of the rationale for this approach is that villages should therefore be well-placed in the future to access REDD/REDD+ funds directly from international carbon markets.<sup>1</sup>

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<sup>1</sup> REDD+ goes beyond the initial aims of REDD by including conservation, sustainable management of forests, and enhancement of forest carbon stocks. The two terms REDD and REDD+ are both currently used in the literature.

Figure 1. Map Showing Areas where Pilot REDD Forests are Located



Source: <http://www.nationsonline.org/oneworld/map/tanzania-administrative-map.htm>

TFCG/MJUMITA developed several norms as conditions for inclusion of a community in the pilot. First, the REDD payment is made to the village through the village natural resource committee (VNRC). Each VNRC must pass its own bylaws as to how the REDD ‘dividend’ is allocated among three areas: community projects; individual community member dividends; and payments to the VNRC for enforcement/protection projects. Payments to individual community members can be influenced by, for example, the length of residency, age, and number of children in the household. However, the payment cannot be influenced by the harm imposed on an individual due to the REDD contract or the efforts that the individual makes toward achieving the REDD sequestration target (Robinson 2014b).

Thus, at the community level, efforts have been made to ensure a clear link between the payment and the reduction in forest loss. There is no such link at the individual level for two key reasons. First, although households are likely to be affected differentially by the REDD pilot, paying equal individual dividends is a pragmatic approach to dealing with a situation in which much of the forest use before the implementation of REDD was *de jure* illegal. Second, all

villagers have a similar monetary stake in protecting the forest in the future (Robinson 2014b). This approach focuses all stakeholders on a shared future rather than an imperfect past of *de jure* government forest rights that were rarely enforced, with decades of technically illegal forest use by villagers.

### **3.2 The Data**

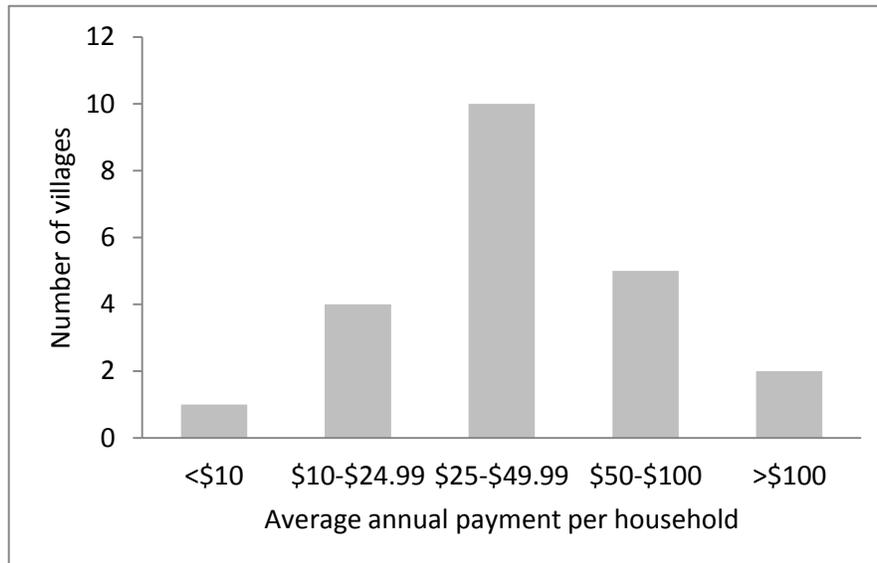
The data describe the actions of 21 of the 35 villages that had dispersed their initial REDD payments at the time of data collection in 2013 through a village-defined payment sharing mechanism. We relied on members of the village environmental committee and the local TFCG/MJUMITA representative to provide the required information. The data include not just the village payments and the allocation of these funds to group projects, individual payments, and enforcement but also stakeholder perceptions of the different pressures on the forest and the different income-generating opportunities available to villagers.

## **4. Findings**

In this section, we describe the allocation of REDD payments to different uses and groups within each village. We consider those allocations through the lens of the economic theory of incentives that underlies the use of REDD payments, as per the discussion above.

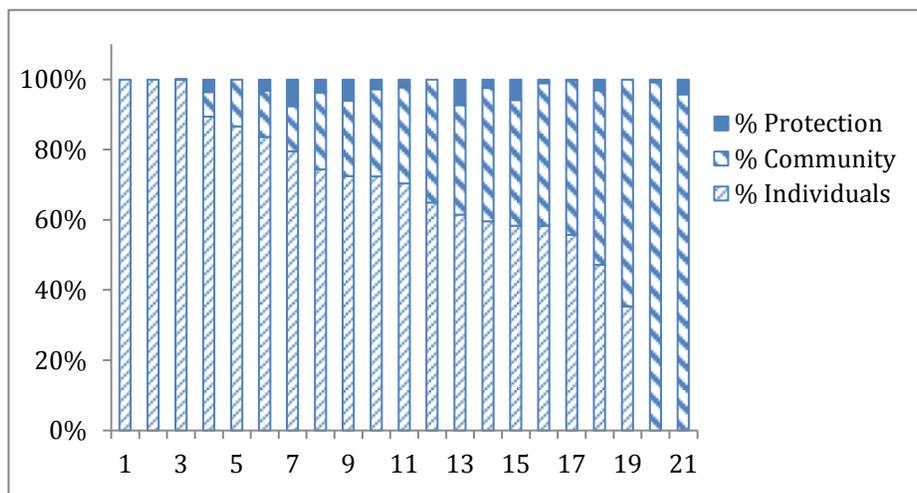
### **4.1 REDD Payments and Allocations**

The size of the payment to each village is based on estimates of historical deforestation rates and future predicted deforestation with and without REDD. Across the 21 villages, these payments varied from Tanzanian Shillings (Tsh) 4.8m to Tsh 63.2m (US \$3000-US \$39,500) at the community level. At the village household equivalent level, these payments range from under US \$10 to over US \$100 (Figure 2).

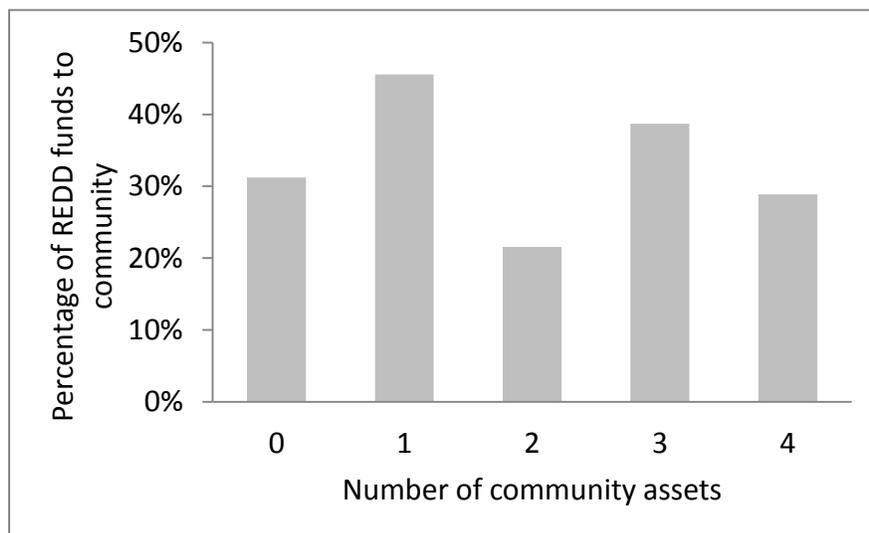
**Figure 2. Level of Community Payments**

We find a full range of sharing allocations between community projects and individual payments (Figure 3). However, across all villages, the allocation of funds for enforcement activities is small and, in many cases, zero. Whilst some villages allocated the entire REDD payment to community projects, others allocated all or most of the payment as cash payments to individuals. Two villages allocated no cash to individuals but rather used it primarily for community projects, with a very small amount allocated to enforcement. On average, villages choose to allocate more of the REDD funds to individuals than to community projects. Given the widespread use of community projects as compensation for lost access to resources in national parks, marine parks, and conservation areas, this tendency to prefer payments to individuals over projects has broader implications for policy in Tanzania.

**Figure 3. REDD Funds Allocated to Individuals and Group, ordered by Individual Share**



Communities that allocated funds toward community projects are eligible for matching funds from the local district. This added funding suggests a strong incentive for allocating at least some of the REDD funds for such public good projects. However, whilst two villages did not allocate any money for individual payments, three villages did not allocate any REDD funds for community projects. Discussions with village groups suggested two primary motivations for these allocation decisions. The first explanation arises from the villages’ perceived needs – some villages already have key community facilities such as a school, clinic, well, and public latrines, whereas others do not, which decreases the marginal value of community projects relative to individual payments. Second, one village stated that earlier bad experiences with poor management of community funds made them wary of entrusting funds to village committees and led to a preference for individual payments. However, in general, no clear pattern of allocations emerges in this first year of the REDD pilot (Figure 4).

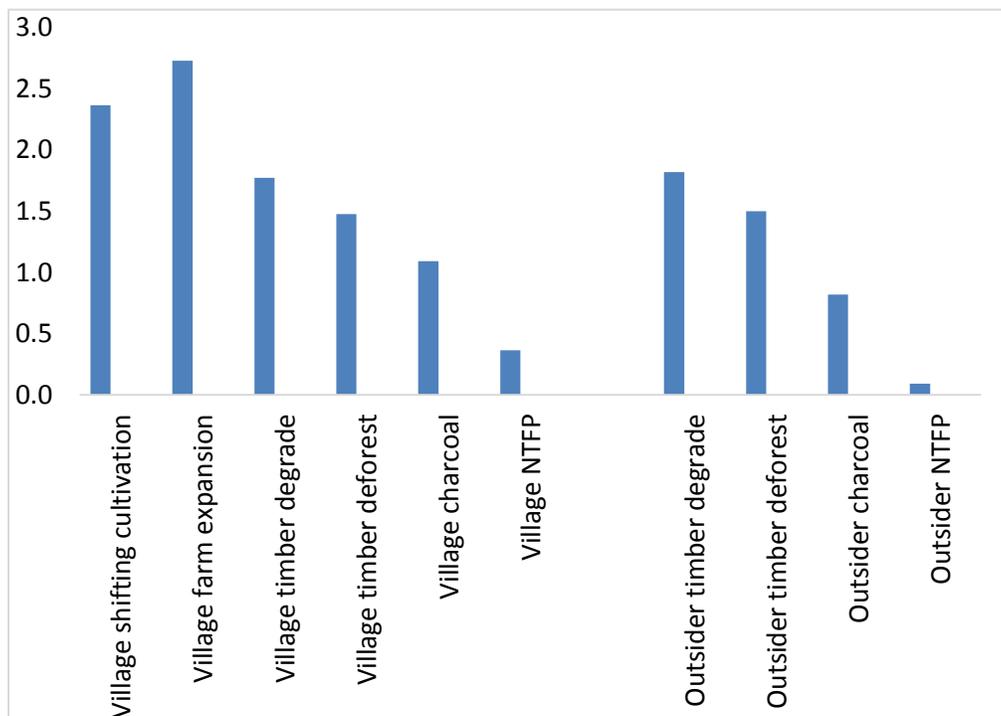
**Figure 4. Link between Community Facilities and Share of REDD Payment**

#### ***4.2 Enforcement and Links to Pressures on the Forests***

However the funds are allocated, when REDD is implemented at the group level, there is no clear mechanism to ensure that individual villagers comply with the restrictions unless there is explicit enforcement. Yet most of the villages do not allocate any funds to enforcement, which suggests either a reliance on voluntary patrols and social fencing or a neglect of this aspect of REDD. Whether or not voluntary enforcement and social fencing are sufficient to ensure the forest is well-enough protected to generate payments is yet to be determined in these pilot villages. Though at present, the detailed data required to assess the effectiveness of the REDD schemes in reducing forest loss are not available due to the newness of these pilots, TFCG has found villagers to be highly attuned to illegal deforestation, wanting to know who was undertaking illegal activities and how action could be taken against the perpetrators. Moreover, anecdotal evidence from other countries' experiences suggests that communities typically become less resistant to using their REDD payment for funding community-level activities, such as enforcement, as they become more confident that the REDD programme will endure and that these activities will be implemented. In Lindi, one of the project areas, TFCG has observed the REDD model working well, with less deforestation and thus fewer emissions than would have been experienced without the initiative. In Kilosa, where outsiders are more of a threat, the communities are struggling to reduce their forest loss.

The pressure on a REDD forest can be reduced through direct efforts to protect the forest—enforcement—or by addressing the drivers of forest loss. To explore the anthropogenic pressures leading to deforestation and forest degradation and whether the key pressures on these particular forests come from insiders or outsiders, we interviewed groups of local individuals, comprised of male and female members of the village environmental committees and local representatives of TFCG. Although the data represent perceptions rather than measurable pressures, these village representatives expressed confidence in their understanding of the pressures on the local forests. The stakeholders identified agricultural expansion, shifting cultivation, timber and charcoal production, and non-timber forest extraction as primary stressors on forests and stated that both community members and outsiders contribute to this degradation. On average across villages, insider pressures are perceived to be greater than outsider pressures, mainly because shifting cultivation and farm expansion is an option only for villagers and not for outsiders, by virtue of their location. However, both villagers and outsiders are perceived to cause both deforestation and degradation due to timber production and, to a lesser extent, charcoal production (Figure 5).

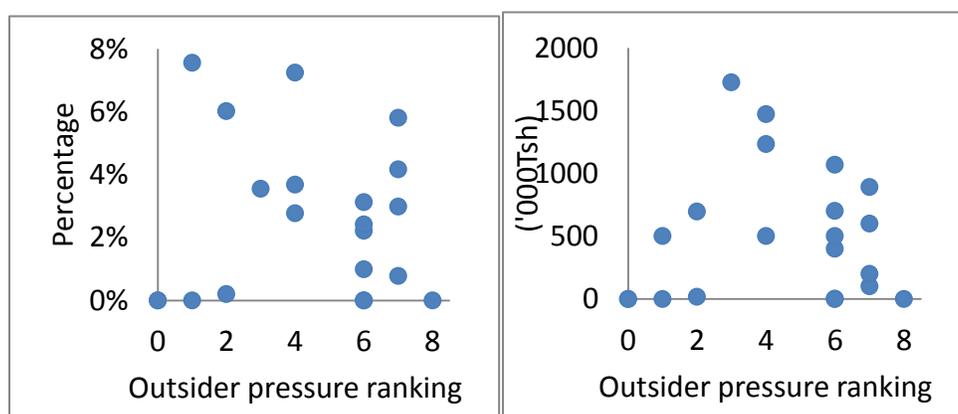
**Figure 5. Perceived Intensity of Different Drivers of Forest Loss**



(0= no perceived pressure; 3= high level of perceived pressure), averaged across all REDD villages

Greater perceived pressure on the forest might reasonably imply a greater need for enforcement activities and, therefore, a greater share of REDD funds allocated toward protecting the forest to increase the likelihood of the REDD payment being made, in accordance with a PES structure. However, locals and outsiders are likely to respond to different protection efforts. Specifically, though “social fencing” might be sufficient to ensure compliance by locals, a “fence and fine” approach may also be needed where there are pressures on the forests from outsiders who do not have a stake in the REDD forest and thus are not affected by REDD payments or a shared sense of future. In our data, however, we find no such relationship, either with respect to perceived pressure on the forests from the local community itself, or from outsiders using the forest for timber and charcoal production (Figure 6 presents the data for external pressures). This lack of a relationship contradicts our prior expectation.

**Figure 6. Percentage and Absolute REDD Enforcement Pending Links to Outsider Pressure**



Several possible explanations arise to explain why villagers allocate so little of the REDD payment to managing and enforcing extraction restrictions in the REDD forest. In many villages, patrols undertaken to protect the forest are voluntary, undertaken by village environmental committee members, and with no payments given or expected. Villagers may assume they can rely on social fencing alone to reduce the local use of the forest cooperatively, under-estimating the impact of external pressures on their ability to achieve the required REDD reduction. Communities may hesitate to enforce against outsiders due to a sense of futility or an impression of ineffective enforcement, inexperience with such interactions, concern for their legal standing, or fear of conflict. Last, communities simply may not perceive enforcement and active management of the forest as an important element in the REDD agreement, especially given long-standing weak property rights institutions.

### **4.3 Revenue Streams in the Short Term**

These REDD pilots have typically been introduced where on-going deforestation and degradation is a problem and thus there is scope for additionality. To achieve the goal of reduced forest loss, in the short run villagers have been required to reduce or eliminate their use of the REDD forest areas, and to incur the set-up costs of a REDD PES scheme, before a verified reduction in forest loss has been achieved and thus before a truly conditional REDD payment can be made. Recognising this, and in common with other documented PES-type initiatives, the first REDD payments were made to the villagers before any measured reduced forest loss. The payments are seen as a way of increasing the likelihood that villagers will cooperate with the REDD scheme in its early years of implementation. Other authors have also found such payments to be a reality. For example, Mahanty et al. (2013) find such ‘front loading’ in a number of PES schemes, including one in Uganda where the contracts ranged from 25 to 50 years but all the payments were dispersed by the tenth year of the project; and one in Mozambique in which the contract duration was 100 years but all the contracted payments were due to be paid out by the end of the 7th year. Although these pre-payments may be criticised as negating the schemes in terms of being true PES, without them such approaches to resource management are likely to fail in the early years or to be rejected at the proposal stage, particularly in lower-income countries where households have few opportunities to smooth their consumption.

Revenues derived from enforcement fines generate another potential stream of income. Some villages reported that they use fine revenues from village patrols to fund various protection activities, including making payments into the village account; five villages use the funds to strengthen security; and one village uses the funds to contribute to village development. Thus, though fine revenues can be used in lieu of allocating REDD funds directly to enforcement, there is little evidence of a consistent source of funding for enforcement across the spectrum of villages. Further, using fines as a revenue source implies that both highly effective and highly ineffective enforcement result in little or no revenue from fines (Robinson 2008).

## **5. Discussion**

With REDD pilots worldwide still new, little information details whether these payments lead to reduced carbon emissions from avoided forest loss. The specific Tanzanian pilot discussed here, however, allows an early examination of some of the REDD implementation issues that arise where payments accrue to a community group rather than creating individual incentives. This study contributes to understanding the potential of community-level REDD

programs to reduce forest loss and thus carbon emissions. Indeed, a large number of REDD programs, implemented at the community level on communally owned or managed forests, present a different situation than that envisaged in much of the REDD literature.

TFCG/MJUMITA's REDD pilots address institutional management issues by establishing or clarifying forest rights for the community and assisting with forest management planning, building on considerable experience of participatory forest management in the country. Our data suggest that communities rely on relationships within the villages to induce changes in the behaviour of individuals within the community rather than using REDD payments to explicitly enforce forest management rules among community members. TFCG helps communities define their legal rights to the forest and, as a condition of inclusion in these pilots, requires villages to develop forest management institutions and plans. These activities may generate significant forest conservation even without the incentives from the payments themselves.

The villagers interviewed identified a number of external pressures on the forest, particularly timber and charcoal production, which are perceived to be similar in strength to internal pressures. Yet there is little explicit enforcement spending to protect the forest from these outsider pressures. 'Outsiders' who are not involved in the PES scheme have no incentive to comply with the REDD requirements, and so are likely to be deterred only through 'fence and fine' approaches. We see examples elsewhere of different approaches to influencing 'insiders' and 'outsiders.' In Tanzania's Kibaha forest, villagers involved in the participatory forest management initiative have been encouraged to reduce the pressure on their forest in exchange for tree planting and beekeeping initiatives. Yet much of the pressure on this forest, located close to the main urban centre of Dar es Salaam, comes from demand for charcoal in the city (Robinson et al. 2014b). Villagers have found that enforcing their property rights against outsiders is difficult even for experienced forest guards; insiders are reluctant to engage in enforcement activities that lead to conflict, and they have limited legal standing within the forest. As the TFCG/MJUMITA REDD projects evolve over time, evidence should emerge as to the extent to which funds need to be explicitly allocated to enforcement activities.

These REDD pilots raise the question of what is a fair or equitable REDD scheme. Where private landowners are involved with PES, a key concern in lower-income countries is whether poorer households can access and thus be involved with the PES scheme (for example, Kaimowitz 2008; Borner et al. 2010; Blom et al. 2010). In contrast, where the PES is implemented at a community level, a key equity concern is the differential impact on community members. In the REDD pilot discussed here, all villagers in the community are automatically

included in the pilot and receive payments that are not linked to how an individual benefited from the forest before the REDD project. That rule aims at what might be considered forward-looking fairness but does not recognize that inequities can remain because the costs imposed on each villager by changing forest behaviour can differ markedly across villagers. Tying the equity issues to the functioning of the PES, the individual incentives to cooperate with the group's forest restrictions may be particularly low for villagers for whom there is a net cost to their participation in REDD, even after the payment.

Finally, one of the biggest threats to Tanzania's forests remains conversion to agriculture and thus any interventions to reduce forest loss need to address this. Though community approaches to forest management can protect forests from conversion, direct interventions in the agricultural sector should make it easier to enforce village regulations and reduce leakage.

Charcoal is another driver of both degradation and deforestation, often accompanied by conversion of land to agriculture. Thus, interventions, particularly with respect to urban fuel demand and supply, where charcoal is currently the dominant cooking fuel, are also likely to improve the success of forest-oriented REDD initiatives.

REDD is conceptually relatively straightforward: PES-type payments can be used to align private and social optima so as to reduce the current rate of forest loss and thus carbon emissions. Yet, in lower-income countries, where forests are often owned by the government but used by local communities, where institutions governing these forests are typically weak, and where people rely heavily on forests for their livelihoods, REDD implementation differs from that of PES in a country with well-functioning property institutions. This paper, in documenting one particular REDD pilot scheme, sheds light on some of the key issues for REDD implementation.

## References

- Albers, H.J., and E.J.Z. Robinson. 2013. 'Reducing Emissions from Deforestation and Forest Degradation.' In *Encyclopedia of Energy, Natural Resource, and Environmental Economics*. Elsevier, p. 78.
- Alix-Garcia, J.M., E.N. Shapiro, and K.R.E. Sims. 2012. Forest Conservation and Slippage: Evidence from Mexico's National Payments for Ecosystem Services Program. *Land Economics* 88(4): 613-638.
- Alix-Garcia, J.M., A. de Janvry, and E. Sadoulet. 2004. Payments for Environmental Services: To Whom, for What, and How Much? Giannini Foundation Working Paper. September 2004.
- Angelsen, A. 2008. REDD Models and Baselines. *International Forestry Review* 10(3): 465-475.
- Blom, B., T. Sunderland, and Murdiyarmo, D. 2010. Getting REDD To Work Locally: Lessons Learned from Integrated Conservation and Development Projects. *Environmental Science and Policy* 13(2): 164-172.
- Börner, J., S. Wunder, S. Wertz-Kanounnikoff, M.R. Tito, L. Pereira, and N. Nascimento. 2010. Direct Conservation Payments in the Brazilian Amazon: Scope and Equity Implications. *Ecological Economics* 69(6): 1272-1282.
- Brandon, K.E., and M. Wells. 1992. Planning for People and Wildlife: Design Dilemmas. *World Development* 20: 557-570.
- Engel, S., S. Pagiola, and S. Wunder. 2008. Designing Payments for Environmental Services in Theory and Practice: An Overview of the Issues. *Ecological Economics* 65(4): 663-674.
- FAO (Food and Agriculture Organization of the United Nations). 2006. Global Forest Resources Assessment 2005, Main Report. FAO Forestry Paper No. 147
- Gibbs, H.K., S. Brown, J.O. Niles, and J.A. Foley. 2007. Monitoring and Estimating Tropical Forest Carbon Stocks: Making REDD a Reality. *Environmental Research Letters* 2(4): 045023.
- Henkemans, A.B. 2001. 'Tranquilidad' and Hardship in the Forest: Livelihood and Perceptions of Camba Forest Dwellers in the Northern Bolivian Amazon. PhD Dissertation. PROMAB Scientific Series 4. Utrecht: University of Utrecht.

- Herold, M., and M.M. Skutsch. 2009. Measurement, Reporting and Verification for REDD. *Realising REDD* 85.
- Humphreys, D. 2008. The Politics of 'Avoided Deforestation': Historical Context and Contemporary Issues. *International Forestry Review* 10(3): 433-422.
- Kaimowitz, D. 2008. The Prospects for Reduced Emissions from Deforestation and Degradation (REDD) in Mesoamerica. *International Forestry Review* 10(3): 485-495.
- Lambin, E.F. 1999. Monitoring Forest Degradation in Tropical Regions by Remote Sensing: Some Methodological Issues. *Global Ecology and Biogeography* 8: 191-198.
- Lal, J.B. 1997. Community Forest Management in Southern Asia: A Survival Issue. *Journal of Sustainable Forestry* 4(3-4): 73-88.
- Lise, W., 2000. Factors Influencing People's Participation in Forest Management in India. *Ecological Economics* 34(3): 379-392.
- Lubowski, R.N. 2008. 'What Are the Costs and Potentials of REDD?' In *Moving Ahead with REDD: Issues, Options and Implications*, edited by A. Angelsen. Bogor, Indonesia: CIFOR.
- Mahanty, S., H. Suich, and L. Tacconi. 2013. Access and Benefits in Payments for Environmental Services and Implications for REDD+: Lessons from Seven PES Schemes. *Land Use Policy* 31: 38-47.
- Mishra, P.R., and M. Sarin. 1988. Case Study 2: Social Security through Social Fencing, Sukhomajri and Nada North India. *The Greening of Aid: Sustainable Livelihoods in Practice*, 22.
- Muradian, R., E. Corbera, U. Pascual, N. Kosoy, and P.H. May. 2010. Reconciling Theory and Practice: An Alternative Conceptual Framework for Understanding Payments for Environmental Services. *Ecological Economics* 69(6): 1202-1208.
- Nielsen, M.R. 2006. Importance, Cause and Effect of Bushmeat Hunting in the Udzungwa Mountains, Tanzania: Implications for Community Based Wildlife Management. *Biological Conservation* 128(4): 509-516.
- Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.
- Ostrom, E. 2009. A General Framework for Analyzing Sustainability of Social-Ecological Systems. *Science* 24(5939): 419-422.

- Robinson, E. J. (2008). Wanted Dead and Alive: To What Extent Are Hunting and Protection of an Endangered Species Compatible? *Environment and Development Economics* 13(05): 607-620.
- Robinson, E.J.Z., H.J. Albers, C. Meshack, and R.B. Lokina. 2014a. 'Will REDD+ Be Successful in Tanzania? Practical Issues of REDD+ Implementation.' In *Forest Tenure Reform in Asia and Africa: Local Control for Improved Livelihoods, Forest Management, and Carbon Sequestration*, edited by R. Bluffstone and E.J.Z. Robinson. Washington, DC: Resources for the Future and London: Routledge.
- Robinson, E.J.Z., H.J. Albers, G. Ngeleza, and R.B. Lokina. 2014b. Insiders, Outsiders, and the Role of Local Enforcement in Forest Management: An Example from Tanzania. *Ecological Economics* 107: 242-248.
- Sommerville, M., J.P. Jones, M. Rahajaharison, and E.J. Milner-Gulland. 2010. The Role of Fairness and Benefit Distribution in Community-based Payment for Environmental Services Interventions: A Case Study from Menabe, Madagascar. *Ecological Economics* 69(6): 1262-1271.
- Tacconi, L. 2012. Redefining Payments for Environmental Services. *Ecological Economics* 73(1): 29-36.
- TFCG. 2009a. Making REDD Work for People and Forests in Tanzania: Lessons Learnt from Participatory Forest Management in Tanzania.
- TFCG. 2009b. TFCG and MJUMITA Launch Community REDD Project. *The Arc Journal*. Biannual Newsletter 24.
- Van der Werf, G.R., D.C. Morton, R.S. DeFries, J.G. Olivier, P.S. Kasibhatla, R.B. Jackson, G.J. Collatz, and J.T. Randerson. 2009. CO2 Emissions from Forest Loss. *Nature Geoscience* 2(11): 737-738.
- West, Simon. 2010. Command without Control: Are Market Mechanisms Capable of Delivering Ecological Integrity to REDD? *Law, Environment and Development Journal* 298. <http://www.lead-journal.org/content/10298.pdf>