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Common pool resource management and PES: Lessons and constraints for water PES in Tanzania ☆

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ABSTRACT

Research into common pool resources from the field and in the laboratory has provided a series of insights for the successful management of such resources. The consequences of action and inaction in managing common pool resources are often most strongly felt (gains or losses) by local people. Several ecosystem services can be considered CPRs but in some cases the benefits of (mis)management are enjoyed by one group while the costs are levied on another group. Here we discuss some of the key findings of the CPR literature and how these relate to key considerations for using PES as a management tool. We focus on the role that ecosystems play in regulating water flows in two basins in Tanzania where feasibility studies have been conducted for the potential implementation of PES for water. We find that the lessons from CPR research shed light on some of the key implementation problems for PES mechanisms, and provide a useful guide for highlighting important user-resource considerations especially in contexts similar to East Africa.

1. Introduction

Payments for Ecosystem Services (PES) have become an important mechanism for linking conservation outcomes to market-based incentive approaches. Clear arguments in the literature have been made as to why direct payments for sought after outcomes are more cost-effective than "combined approaches" such as integrated-conservation development programs. Additional research has shown the potential for 'double dividend' payoffs in terms of biodiversity conservation and poverty reduction (van Wilgen et al., 1998). There is also the spectre of win–win–win scenarios where conservation can deliver the provision of ecosystem services, biodiversity protection and livelihood improvements (Miles and Kapos, 2008). While the benefit of creating such situations is great and should be investigated, on the ground interventions need also to be informed by empirical research and detailed case studies. For example, research into whether the poor really do gain in PES schemes clearly needs to explore the direct impact on the poor over time, and also recognize that if PES programs proliferate there may be macro-economic impacts (Bulte et al., 2008). This impact may come in the form of changing food prices, labor and land costs indirectly conditioning the poor's livelihoods.

In this paper we use lessons from research on common pool resource (CPR) management to assess implementation impediments that arise when trying to manage and market complex services like those delivered by ecosystems. Drawing on the work of CPR scholars, we focus our discussion on enabling characteristics of CPR for successful management of natural resources (see Ostrom, 1990; Ostrom et al., 1994; Agrawal, 2002). These include characteristics of the resource itself, of the user groups, of existing institutions and of the relationships among these. The importance of understanding these characteristics is applicable to the design of PES interventions due to the rival and non-excludable characteristics of many ecosystem services. We draw on the literature for examples of the interplay between PES and some of the suggested key CPR management principles by looking at two case studies for a water PES in Tanzania. The case studies (Pangani River Basin and Rufiji River Basin) share some of the typical impediments already shown to exist in PES schemes in developing countries; such as the lack of formal property rights (Pagiola et al., 2005), poor monitoring capacity (Wunscher et al., 2008) and information asymmetries (Corbera et al., 2007a,b). We add to this literature by discussing particular challenges embodied in an East African context. We believe that this is the first attempt to look at the institutional issues of PES in East Africa, and the case studies are based on a feasibility studies for potential PES for water in two large basins. Drawing on stakeholder interviews,

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government reports, household surveys and workshop results we suggest that consideration of CPR management principles is likely to aid the implementation of PES systems in East Africa.

2. CPRs, Ecosystem Services, and PES

Common pool resources are typically defined in economic terms as resource systems that are rival and non-excludable. In other words, CPRs are systems where it is difficult to exclude users through physical or institutional barriers and where the use of the resource by one person or group leaves less for another (Ostrom et al., 1994). Deep-sea fisheries are an example — where one agent's exploitation leaves less for others and at the same time it is difficult to exclude other users from exploiting the resource. In some cases this type of fishery is also an open-access resource, meaning there are no rules, regulations and management regimes connected to the resource itself. However, not all CPRs are open access. Common property regimes arise when rights and rules are associated with CPR use, and are developed through collective action or shared ownership (Dietz et al., 2002). This differs from the more statutory private property regimes, which are typically tied to individuals, not user groups.

Many ecosystem services operate under the characteristics of CPRs, i.e. they are rival and non-excludable (or at least excludability is costly). For example, water provision from catchment and cloud forests — its use is difficult to exclude across a landscape and the use by one person leaves less for another. An additional complexity in governing ecosystems and ecosystem services is that the use of one service or benefit can in many cases affect the level of provision and appropriation of other services (in addition to the rivalry of the service itself). For example, all of the ecological processes that allow a landscape to regulate water flows and provide water in rivers over time provide a final service to humanity i.e. fresh water. This freshwater in turn can lead to benefits of irrigated crops, drinking water and hydroelectric power generation. This freshwater could also be important in fish production. However, one user's extraction for irrigation upstream, not only leaves less of the resource for downstream irrigation, but may also affect fish populations, channel stability, recreation potential and several other benefits.

The difference between CPRs and ecosystem services is perhaps a subtle one. CPRs are systems or resources that deliver services or benefits to people, while ecosystem services are the processes of ecosystems that deliver benefits. Water regulation, timber provision (net primary productivity), and carbon sequestration are all services that flow from some system which could be a CPR such as a community forest. Therefore there is often a direct relationship between managing CPRs and ecosystem service delivery. We do not manage "water regulation" but rather we manage the system which provides water regulation.

This is where PES ties in. PES is a tool designed to use an economic incentive system for protecting, ensuring or augmenting the delivery of benefits to human from natural systems (see Bulte et al., 2008; Engel et al., 2008; Muradian et al., 2010-this issue). Decades of CPR research have focused on the characteristics that lead to better management of systems for delivering such benefits to user groups. Three seminal works on understanding enabling factors are Wade (1988), Ostrom (1990) and Baland and Platteau (1996). Agrawal (2002) synthesized the findings from these studies into six main facilitating characteristics for sustainably managing CPRs — summarized as:

- Small resource size and knowledge of the resource boundaries by stakeholders facilitate better management.
- Small stakeholder group size, shared norms and interdependencies enable management.
- Proximity of resource users (and other stakeholders) to the resource facilitates management success.
- Governance rules must be clear in nature and seen as appropriate by local stakeholders.
- The better the overlap between the resource system (and forces which affect it) and the governance institutions, the more likely management will be successful.
- Understanding/forecasting potential exogenous factors (e.g. technology, demographic shifts) can help build more resilient management.

PES implementation lessons are already coming to similar conclusions as the CPR research. This overlap has been acknowledged in institutional analyses of PES (see Corbera et al., 2007a,b; Clements et al., 2010-this issue; Muradian et al., 2010-this issue), but here we explicitly use the major enabling principles of CPR management and link them to current experiences in PES and to two case studies in Tanzania looking at the feasibility of PES for water. Our main goals are to 1) understand if utilizing the CPR literature sheds additional light on design and implementation of PES and 2) see if in a context such as East Africa, where many resources are open access, CPR management lessons could assess potential problems with future PES for water schemes.

3. Case Study Areas — Rufiji and Pangani Basins

Both the Rufiji and Pangani basins drain from the Eastern Arc Mountains and surrounding lowlands, and flow to the Indian Ocean (Fig. 1). The Pangani Basin also drains Mount Kilimanjaro. The Eastern Arc Mountains are an area of great importance for global biodiversity, one of the world's 34 hotspots, and a globally important ecoregion for biological diversity (Mittermeier et al., 2004; Burgess et al., 2004, 2006). It is also an area undergoing continual degradation of the landscape — having lost 11% of its primary forests and 41% of its woodlands since 1970 (Doggart and Burgess, 2005). These mountains are also important sources of timber and fuel wood as well as water for irrigation, domestic water provision and generation of hydroelectricity (Doggart and Burgess, 2005). The hydroelectric power generated by flows originating in the Eastern Arcs represents about 60% of all electricity generation in Tanzania (The Economic Survey, 2007). Hence the Tanzanian government and NGO community have been exploring ways to set up PES schemes. Some progress has been made, but there is no overall PES framework for the country at the present time. The only operational PES scheme is in the Ruvu Basin, centred on a small sub-catchment within the Uluguru Mountains.

The main water PES activities until now have involved the production of feasibility studies in the Pangani and Rufiji Basins and their findings form the basis of this paper (Kulindwa, 2005; Mwanyoka, 2005; Kulindwa et al., 2006). We use insights from both studies since they represent investigations in different contexts.

3.1. The Rufiji Basin

The Rufiji Basin covers over 175,000 km^2 — about 20% of Tanzania. It is an extensive area of land that includes mountains, savanna woodlands, farmland areas, and extensive wetlands. Farmed areas cover around 50% of the basin, and are mainly concentrated in the mountains and in the peripheral lowlands where the rainfall is highest. The largest part of the basin experiences longer dry seasons and shorter wet seasons, but there are also mountain regions such as the Udzungwa and Southern Highlands that have a less seasonal climate and provide the main water catchment areas in the dry season. It has been observed that of the total annual flow, about 65% to 80% passes in the wet season (5 months). The basin has 82 forest reserves, predominantly in upper catchment areas, and there are also National Parks and Game Reserves, primarily in the lowlands. The population has doubled in the basin in the last two decades and currently more than 3 million people live in the basin. The main livelihood activity is subsistence agriculture. Hydroelectrical capacity is large, with the Kihansi, Kidatu and Mtera reservoirs