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Governance and implementation challenges for mangrove forest Payments for Ecosystem Services (PES): Empirical evidence from the Philippines

Benjamin S. Thompson[a,*], Jurgenne H. Primavera[b], Daniel A. Friess[a]

[a] Department of Geography, National University of Singapore, 1 Arts Link, Singapore 117570, Singapore
[b] Community-Based Mangrove Rehabilitation Project, Zoological Society of London, 132 Quezon St., Iloilo City, Philippines

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ABSTRACT

Mangrove forests have been considered as potentially suitable for PES, though few mangrove PES schemes exist worldwide, suggesting they - and the broader social-ecological and governance systems in which they sit - may not be as conducive to PES as first thought. This study assesses economic, social, and governance challenges to implementing PES in mangroves. It draws on empirical evidence from two prospective community-level mangrove carbon PES schemes in the Philippines, where fishing and aquaculture are major livelihoods. We conducted (1) policy reviews and interviews with local communities, government, and NGOs to investigate governability; (2) village income accounting to determine the extra income that participants could receive through PES; and (3) a choice ranking exercise to elicit preferences on how payments could best be spent to enhance participant wellbeing. The latter approach identifies key gender differences, and enables potential PES-induced social-ecological trade-offs to be pre-empted. Blue carbon PES can contribute an additional 2.3–5.8% of current village incomes, while villagers would prefer to spend the monies on more effective fishing equipment, which could perversely jeopardize fishery sustainability. To be most successful, coastal PES schemes in the Philippines need to be managed through a multi-level governance regime involving co-management and local participation.

1. Introduction

Mangrove forests are threatened primarily by anthropogenic activities, with over 100,000 ha of mangroves deforested in Southeast Asia alone between 2000 and 2012 due to agriculture and aquaculture (Richards and Friess, 2016). This is despite the number of critical ecosystem services (ES) that mangroves provide to coastal and regional populations. Traditionally, mangroves have been valued for their important provisioning ecosystem services, such as fuel wood, charcoal, timber, and non-timber forest products that are often vital for the livelihoods of local coastal communities (Walters, 2008). Mangroves are also considered as nursery areas to support coastal and offshore fisheries, thereby sustaining seafood provision (Aburto-Oropeza et al., 2008), and are potentially important buffers against incoming hydrodynamic energy (Barbier, 2016; Mazda et al., 2006). Most recently, mangroves have been valued for their global climate change mitigation services via their 'blue carbon' sequestration and storage functions (Donato et al., 2011; Siikamäki et al., 2012). Ecosystem service assessments have now been conducted at hundreds of mangrove sites across the tropics (Brander et al., 2012; Vo et al., 2012).

Payments for Ecosystem Services (PES) schemes incentivize land managers to implement new modes of natural resource management that maintain or enhance ES provision, (see Wunder (2015)). The wide range of ecosystem services provided by mangroves could be leveraged to incentivize their conservation, and the potential of mangrove PES has matured into a topic of current and critical debate (e.g. Locatelli et al., 2014; Thompson et al., 2014; Warner et al., 2016; Warren-Rhodes et al., 2011; Wylie et al., 2016). While traditionally an approach taken in terrestrial forests and watersheds, Lau (2013) claims that, "if designed correctly, PES can achieve in marine and coastal settings what has been achieved on land". However, mangrove PES has primarily been considered from an academic perspective only, and greater empirics are needed to assess how conducive mangrove systems are to PES approaches (Locatelli et al., 2014). Such research is vital to understand why despite being globally threatened and providing numerous ecosystem services to humankind, little more than 85 km^2 of mangrove forest is currently included in operational PES. Established schemes include: *Mikoko Pamoja*, a mangrove carbon

Abbreviations: BFAR, Bureau of Fisheries and Aquatic Resources; CBFMA, Community-based forest management agreement; CBCRM, Community-based coastal resource management; DENR, Department of Environment and Natural Resources; PO, People's Organization; ZSL, Zoological Society of London

* Corresponding author.
E-mail address: Benjamin.thompson@u.nus.edu (B.S. Thompson).

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project at Gazi Bay in Kenya; *Mangroves and Markets* in southern Vietnam, which aims to simultaneously access carbon finance and promote shrimp certification; and, a small tourism-related scheme on Krabi, Thailand established by the country's Biodiversity-based Economy Development Office (Jarungrattanapong et al., 2016; Wylie et al., 2016). In addition, a mangrove carbon scheme is being developed in Madagascar (Jones et al., 2014). Ultimately however, PES seems particularly difficult to operationalize in mangroves due to a number of ecological, economic, social, and governance challenges (Friess et al., 2016; Locatelli et al., 2014).

Considerable attention has been given to the ecological challenges of quantifying mangrove ES (e.g. Alongi, 2011; Friess et al., 2016). For example, it is relatively easy to measure mangrove biomass and soil carbon stocks using established protocols (e.g. Kauffman and Donato, 2012), and to valorize stocks using trade prices on the voluntary carbon market. However, soil carbon is seldom included in forest carbon accounting standards, and is therefore often non-tradable, despite contributing the majority of carbon stored in mangroves (Thompson et al., 2014; Wylie et al., 2016). Seafood has a market price, though the proportion of fisheries value attributable to mangrove presence is often unclear (Loneragan et al., 2005). Previous methods are limited in that they award the same proportion (typically 10% of total fishery value) to every species in the fishery, which lacks precision since each individual species will fit somewhere on a continuum between being fully capable and incapable of surviving without mangroves. Meanwhile, if mangrove PES is to compete with alternative approaches for addressing coastal protection (such as state-subsidized property insurance in the USA, or donor support in the developing world), then the valuation of this ES will require improvement (Barbier, 2016; Friess and Thompson, 2016). Mangrove ES show high heterogeneity even within the same forest (e.g. Barbier, 2008; Donato et al., 2011; Thompson et al., 2014), because of *inter alia* variations in species composition, inundation time, adjacency to seagrasses and coral reefs, and bathymetry. In this regard, site-specific assessments are advocated (Emmett-Mattox et al., 2010; Vo et al., 2012).

Unlike the challenges surrounding quantification, the economic, social, and governance challenges of mangrove PES remain less-well explored empirically (Locatelli et al., 2014; Thomas, 2014). In this paper we investigate three key considerations as to why PES might be particularly challenging to implement in mangrove systems: (1) economic and livelihood considerations, which determine whether payment amounts are meaningful to ES providers; (2) social preferences regarding how payments are spent, and whether or not restrictions are needed to prohibit certain purchases; (3) governability of mangrove PES given the capacities and desires of coastal stakeholders. We then take a multi-method approach, eliciting primary data from two coastal sites on Panay Island in the Philippines, in order to examine each consideration empirically. In Section 2 we elucidate the economic, social, and governance considerations, with particular focus on the Philippines. In Section 3 we outline the study sites and previous research upon which this investigation builds. In Section 4 we explain the methodological approaches taken, and in Section 5 we discuss the outlined considerations in the context of our findings.

2. Research context

2.1. Consideration 1. Economic and livelihood conditions

Critical to effective incentive-based coastal management is ensuring natural resource users have access to finance (Uraguchi and Mohammed, 2016). Livelihoods depend on and interact with ES (Fazey et al., 2010), while the ability to pursue new livelihood strategies depends greatly on the assets of coastal resource users (Ferrol-Schulte et al., 2013). On Panay Island for example, there is evidence of fishers struggling to pay annual fees for boat registration and fishing licenses (Baquiano, 2016). In light of this, the payment amount - or rather, the extra income that the PES provides - must have meaningful value to the recipients if they are to participate in a scheme. PES has been found to have success in both relatively high (Adhikari and Agrawal, 2013) and low (Ingram et al., 2014) income settings, but ultimately, it is the relative value of the payment that is important, and this will depend on the local context. Leimona et al. (2015) noted that a scheme in Cidanau, Indonesia generated direct PES of around 3% of the total community income. Payment contributions to household incomes are highly variable; in a review of 23 PES schemes, only 12% generated payments considered sufficient to enhance household economic productivity and diversity (Hejnowicz et al., 2014). Many resource users in the coastal tropics have the option of either gaining more of their livelihood from mangroves, fisheries, aquaculture, or alternative sources (Ferrol-Schulte et al., 2013). Indeed, incorporating livelihood aspects appears to be important for successfully implementing mangrove PES (Wylie et al., 2016). Therefore, comparing current household and community incomes against the potential additional incomes generated through PES schemes is warranted, and would help determine whether the payment amounts were meaningful to the recipients in ways that could promote sustainable coastal resource management and/or finance alternative livelihoods.

2.2. Consideration 2. Payment preferences and social-ecological trade-offs

Benefit distribution, the mechanism by which the payment is made to the participants (i.e. those selling the ES), is receiving increased attention in PES literatures (e.g. Pascual et al., 2014) but has rarely been discussed in coastal contexts. The absence of direct research into social topics on blue carbon PES is “striking” (Thomas, 2014). Payments can either be made to individual households, or accrue at the community level - a crucial decision for inducing behavioural change (Muradian et al., 2013). Payments can also be made ‘in cash’ or ‘in-kind’. It has been argued that payments should be made (a) in-kind rather than in cash, and (b) to community groups rather than individuals/households, because of risks of unfair distribution and corruption (e.g. Pascual et al., 2014; Vatn et al., 2015). However, Pham et al. (2014) note it is often unclear how to most effectively spend incoming monies at the community-level. Tenure conditions and the spatial scale of implementation can greatly affect the benefit distribution mechanism of choice (Chapman et al., 2015). Mangrove forest areas are typically smaller than those of terrestrial forests or watersheds. Unlike in terrestrial areas where households can be scattered across remote locations (e.g. Poudyal et al., 2016), coastal communities typically demonstrate high population densities because fishers prioritize access to the sea. This localization could encourage cost-effective distribution to individual households, but also, community-level in-kind payments since a greater proportion of residents would able to benefit from infrastructure improvements frequently. Community-based management, informal institutions, and community committees are also quite common in coastal areas - which can facilitate financial management (Bavnick et al., 2015). Evidence suggests participants in Southeast Asian schemes generally prefer in-kind incentives (Leimona et al., 2015). *Mikoko Pamoja* operates similarly to this, although the community does not manage the fund. In light of the above, coastal sites may be particularly suited to community-level benefit distribution, but further research is required to support this.

Changing socioeconomic conditions and coastal resource management can create new (or strengthen existing) social–ecological trade-offs, which can impact the wellbeing of stakeholder groups differently (Daw et al., 2015; Granek et al., 2010). PES would create new social–ecological interactions by instigating new systems of natural resource management and revenue streams to local communities. Unlike trade-offs between ES, those occurring within the broader social–ecological system can be difficult to perceive and are often poorly acknowledged in conservation projects (Daw et al., 2015; Jax et al., 2013). It is