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## **Payments for Forest Ecosystem Services: Global and Local Assessments of Costs and Benefits**

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# CHAPTER 6 ■

## Conclusions

### 6.1 REVISITING THE MAIN RESEARCH QUESTIONS

The question to what extent market-based instruments in general and PES in particular can help halting global deforestation and forest degradation has been widely discussed amongst scientists and policy makers. PES schemes implemented in both developed and developing countries show a wide diversity in terms of their institutional design and socio-economic and environmental impacts. Several special issues have been devoted in different journals (e.g. *Ecological Economics*, *Environmental and Development Economics*, *Environmental Conservation*) to PES in which the topic and existing schemes were extensively reviewed, both theoretically and empirically, concerning their scope, setting, design, and efficiency. As noted by Muradian *et al.* (2010) and Pattanayak *et al.* (2010), there exists a disconnection between the theory around PES and its implementation in practice, calling for a better coordination between scientists, practitioners, ecosystem service providers, and beneficiaries. To narrow down the gap between what is scientifically developed by the academic research community and what is practically happening and feasible in the field, a clearer understanding of PES' cost-effectiveness, especially related to especially the co-benefits of PES and the transaction costs (TC) of PES is very much needed. As pointed out in the PES literature, the occurrence of TC is often associated with the costs of gathering information and scientific knowledge in order to understand the causal relationships between land use practices and the provision of environmental services (Muradian *et al.*, 2010; Naeem *et al.*, 2015). A global review of PES by Wunder *et al.* (2008, p. 849) showed that data on TC is insufficient for “determining whether PES programs have lower TC than traditional conservation approaches”. Moreover, one must be careful when interpreting available TC data given the fact that their collection and measurement is incomparable in many aspects.

Similarly, quantitative empirical evidence for assessing the link between PES and poverty alleviation as the most common co-objective besides regional development and employment creation remains limited and mixed (Engel *et al.*, 2008; Muradian *et al.*, 2010). The extent to which poor farmers actually benefit from participating in PES seems case-specific, with findings reporting both positive (Pagiola *et al.*, 2005; Corbera *et al.*, 2009) and (potentially) negative effects (Kosoy *et al.*, 2007; Locatelli *et al.*, 2008; Kronenberg and Hubacek, 2013). Quantifying the effects of PES on biodiversity as another potential side-objective is even more challenging and hence hardly reported so far.

Acknowledging the limited scientific understandings of PES TC and co-benefits, this PhD thesis' prime aim is to contribute to the current body of PES literature by further exploring these issues at global and local level. In the Introduction of this thesis, three main research questions were set out along the lines of the main study objectives. The **first research question** examined how avoided deforestation costs vary at global level and identified the factors that explain these variations. This question is addressed in chapter 2 where a meta-analysis is employed to show that in developing countries the magnitude of the unit costs varies considerably and significantly depending on a mixture of context and study design characteristics, including carbon accounting methods. Compared with two similar meta-analyses conducted by van Kooten *et al.* (2004; 2009), the list of explanatory variables built upon the ones already included in the previous meta-analyses but was significantly further extended to better capture the specific circumstances of forest conservation in developing countries, such as the drivers behind deforestation and the general rate of forest loss. It is this introduction of new additional variables that are both 'internal' and "external" to the studies that is considered the main novelty here since some of these new elements were proven to significantly govern the cost per tonne of carbon. They include additional cost components, prior logging, area size, alternative land uses, beneficiaries of non-forest land uses and land use pressures measured via the share of agriculture in GDP. All have a significant positive effect on the unit costs of avoided deforestation. Results from the meta-analysis also clearly indicate the lack of literature on TC and co-benefits in a majority of the studies investigated. Most of the examined studies neglect TC related to the preparation and implementation of avoided deforestation measures. Contrary to expectations, accounting for co-benefits turned out to have no significant effect on the unit costs of avoided deforestation. However, in a very limited number of studies only those co-benefits were factored in that could be monetized, calling for a need to focus more explicitly on the non-market co-benefits of forest conservation policy.

Trying to answer the first research question called attention to focus more on TC and co-benefits of PES. The **second research question** therefore tried to identify and measure different types of TC and their driving factors. A variety of PES schemes targeting forestry ES was investigated in chapter 3 and 4, focusing on carbon sequestration and watershed protection at global and local scale, respectively. In these studies, TC were measured both internally and externally of the studied organizations, in monetary and non-monetary (e.g. person days) terms. For analysing the TC driving factors, a conceptual framework was developed based on theoretical assumptions and empirical observations in previous studies. The application of the conceptual framework using primary data collected from a global PES survey is a novel contribution to the PES literature related to TC. The results from the survey not only focus on current understanding of TC, but further extend what has been discussed in the literature so far. Findings from the two studies helped to prove the theoretical relevance of the conceptual framework, with TC being driven by a combination of different factors, including the characteristics of the transaction, transactors, institutional design, and the PES schemes general characteristics.

Notably, the significant effect of institutional design on TC reaffirms the context dependency nature of PES as well as the complex setting where the scheme is often operated in developing countries. In chapter 3, market type was shown to be a significant influencing factor, with CDM market related projects experiencing significantly higher TC than non-CDM related ones. A plausible explanation for this observation appears to be the inherent difference in project administrative regulation and governing mechanisms of the market within which the project is operated. While the CDM market is essentially based on strict and formalized procedures and standards, the non-CDM market is operated on the basis of voluntary participations in a (more) flexible manner. Co-benefits as one of the transaction characteristics was found to increase TC, implying a possible trade-off between cost-effectiveness and co-objectives.

At local level in the case study in Vietnam, chapter 4 showed that the sum of TC related to conditionality compliance checking and payment redistributions by intermediaries accounted for 30 to 45 percent of the PES coordinating organization's total operation costs. When comparing the TC between the same coordinating organizations in two different provinces in Vietnam, the dominant underlying driver of TC also appears to be the local historical-institutional design characteristics resulting in different types of forest property rights and numbers of PES scheme participants. Another important conclusion drawn from this latter study presented in chapter 4 is that the occurrence of TC seems to be expected if multiple objectives play a role. In other words, given the centralized political system in

Vietnam and the limited maturity of emerging PES markets, aiming for a purely voluntary and perfect functioning PES market with dismissible TC seems unattainable.

The **third research question** to what extent PES yields multiple (co-)benefits was answered in chapter 5. The study presented in chapter 5 is one of the few that simultaneously examine both the environmental and socio-economic impacts of PES on local forest ecosystems and communities. The study reveals that the oldest PES scheme implemented in Vietnam has had a positive impact on forest cover as well as the level and distribution of income amongst participating households. A statistically significant increase of 5 percent in tree-cover was observed between the pre-PES period and six years after the PES introduction in 2014, while the absolute and relative changes in household income proved to be significantly higher for participating than non-participating households. Using the Gini coefficient as an indicator for income inequality, a 20 percent reduction in income inequality was observed for the PES participants before and after implementation of PES, while the result for the non-participants showed a much lower decrease in income inequality of only 3 percent. This study shows furthermore that whilst controlling for other socio-economic explanatory variables, changes in income levels are significantly influenced by the number of years families participated in the PES scheme. A positive relationship was detected for this variable: the longer the household participates in PES, the more their absolute and relative income changes. In addition, compared to agricultural revenues, the periodic PES payment is stable and helps families to pay their children's tuition fees, daily living expenses and outstanding loans. However, an important concern relates to the long-term financial viability of the PES scheme in view of the fact that the contracts between forest owners and farmers are renewed annually, with payments largely depending on the involvement of and overall coordination by the legally responsible organization.

## 6.2 STUDY LIMITATIONS

Along with the academic contributions and novelties of this PhD thesis, it is worth mentioning some of the limitations of the applied research methodologies, the quality of the data and the general applicability of the results. The main methodological approach applied in this PhD thesis has been the use of survey methods. There are a number of shortfalls related to this approach. Amongst those is the small number of observations obtained in the meta-analysis presented in chapter 3 where just 17 forestry projects were included in the regression model. Because of this, it was hard if not impossible to include all the explanatory factors originally foreseen, which means that besides the careful interpretation of the results

based on these 17 projects there may also be a possible problem of omitted variable bias. There are two main reasons for the low number of observations in this study:

First, TC are not only difficult to measure, but often also sensitive and confidential in nature, challenging any research in this area. Information about TC are not publicly available and often mixed up with other types of costs. An apparent solution to this challenge seems to conduct more research on TC, both qualitatively and quantitatively, which depends heavily however on the willingness of PES practitioners to collaborate with academic researchers. Once trust and a willingness to collaborate have been established, different communication tools can be used, such as emails, telephone calls and meetings in person. The latter are considered essential because they allow the researchers and practitioners to see each other, which will help to reduce anonymity and create trust. Also, a clear definition of the required data and information with follow-up questions or discussions is very important.

Secondly, the use of an online survey applied at a global scale seems to have been partly the reason for the low response rate. The response rate was for example considerably higher based on the face-to-face survey (83%) in Vietnam compared to the global online survey (20%). This shortcoming of such a low response rate was to some extent offset by the inclusion of projects that seem fairly representative for the current situation on the global carbon market. For instance, projects are located worldwide across Latin America, Africa, and Asia and involve a diverse range of forestry activities, from forest conservation to afforestation and reforestation and sustainable forest management. Moreover, both regulated CDM and non-CDM PES projects were included, with market transactors varying from state, private company, NGOs to individuals.

Since two out of the four studies were conducted at local level in Vietnam, some caution should also be exercised in generalizing these results. Although interviews were conducted with representatives from the two oldest PES schemes in Vietnam, the results presented in chapter 4 may not provide a representative overview of TC related to PES in Vietnam more generally. An important outcome of the study was that the local historical-institutional context is one of the most important drivers behind the estimated TC. Similarly, also the case study results presented in chapter 5 are not necessarily representative for the country as a whole. The sample population was merely representative for the province.

Another disadvantage of using surveys to collect data is that the reliability of the collected information depends mainly on respondents' statements rather than non-subjective information (Boerner and Macher, 2002). This may have introduced a degree of

unreliability and possibly strategic reporting bias. For example, in the farm household survey conducted in Vietnam, the information provided by the interviewed farmers could not be verified since there are no statistical records of household incomes in the study area. In the online survey, we furthermore acknowledge the fact that the data quality can be (negatively) affected by the way questions were posed besides respondents' potential strategic behaviour. To deal with this problem, the surveys, both the face-to-face and online surveys, included thorough pre-tested, straightforward and easy-to-understand questions, clear explanations where necessary of what data or information was required, and an easy-to-follow sequence of questions. Whenever possible, respondents' answers were cross-checked with secondary data sources such as previous research, project documents, governmental and non-governmental reports.

The use of meta-analysis for examining the relationships between the dependent variables of interest here (avoided deforestation cost in chapter 2 and transaction costs in chapter 3) and a host of independent explanatory variables also introduces a number of issues. These include overlooked interactions between the independent variables or the dismissal of potential factors of influence, due to measuring difficulties or highly correlated covariates. In order to control for the potential interaction between independent variables in the estimated meta-regression models, only uncorrelated explanatory variables were included to avoid multi-collinearity. Although this may make sense from a statistical point of view, in practice it could very well be the case that highly correlated factors influence the response variable of interest. This possibly also applies to the influence of related policy instruments. The introduction of PES in the political arena often makes it part of a policy mix where various policy instruments, especially command-and-control regulations, already pre-exist (Engels *et al.*, 2008; Vatn, 2010). In fact, most of PES schemes "complement prior regulatory approaches to conservation such as protected area regulations and conservation planning" or are integrated as part of a pre-existing conservation and rural development projects (Muradian *et al.*, 2010; Ring and Barton, 2015; Wunder, 2006). PES was studied in this PhD as a single, independent instrument rather than as part of a 'policy mix'. As noted by Ring and Barton (2015), to evaluate PES interactions with other instruments, PES programs have to be implemented on a large enough scale and over a long enough period, which is not easy to find in practice. In addition, when assessing the environmental and economic impacts of PES schemes, full consideration should in principle be given to issues such as permanence, additionality, and leakage as well as the distributional effects of PES across different actors and between start-up and recurrent TC, which was not the case in this PhD due to the lack of data and time.

The omission of correlated explanatory factors and the sometimes low number of observations may also have caused some of the unexpected results in the meta-regression analysis, such as the positive effect of area size on the unit costs of avoided deforestation (which seems to go against the expected economies of scale) or the positive effect of past experience of working together on TC, which was expected to reduce TC as suggested by Vatn (2010). These outcomes clearly require further investigation.

## 6.3 POLICY RECOMMENDATIONS AND FUTURE RESEARCH

Given the potential of PES to address environmental externalities and resolve conservation and development trade-offs (Naeem *et al.*, 2015), political interest in implementing this market based instrument is expected to remain high. This final section discusses a number of policy recommendations, especially those relating to the institutional setting in which PES is embedded.

First, PES should be evaluated in a policy mix context since understanding how PES interacts (complementary or conflicting) with other policy instruments is a key question. For instance, as observed by Robalino *et al.* (2015), it could be more effective to place protected areas and PES away from each other, rather than in the same location or near each other given the presence of conservation spillovers.

A second compelling question would be to identify under which circumstances PES would be the most relevant and effective measure, i.e. where ecosystems are mismanaged because their benefits are externalized from the perspective of ecosystem managers (Pagiola and Platais, 2007). Vatn (2010) warns that when contextually misused, PES may create moral hazards by changing the logic from doing what is considered appropriate due to intrinsic motivation to start thinking in instrumental, monetary terms.

Thirdly, PES evaluation in general should not be based solely on its environmental and economic impacts, but a more comprehensive set of criteria, including environmental effectiveness, cost-effectiveness, distributional impacts (equity, fairness), administrative feasibility (legitimacy), and institutional compatibility (Ring and Barton, 2015). Only aiming at reducing TC may undermine the scheme environmental effectiveness as “low TC may result from under-spending for monitoring or other important activities and a cheap program might also be an ineffective one” (Wunder *et al.*, 2008, p. 848). As observed by Muradian *et al.* (2010) equity is considered a main concern for PES practitioners, particularly in developing countries. When aiming to conduct a cost-benefit analysis of PES practices,



one ought to take into account both TC from the cost-side and co-benefits from the benefit-side before concluding whether PES is economically desirable or not.

Fourth, policy makers should be aware of and understand the potential trade-offs between different PES objectives, especially when it comes to TC. In reality, practitioners typically face a trade-off between the need to obtain accurate, complete ecological and socio-economic information to reduce uncertainties and the need to keep TC low enough to make PES schemes feasible (Muradian *et al.*, 2010; Norgaard, 2010; Vatn, 2010). Differentiating payments furthermore rather than using a uniform flat rate normally involves greater TC (Ferraro, 2008), while bundling services can increase TC as a result of additional complexity and uncertainty in measuring outcomes (Kemkes *et al.*, 2010). Similarly, explicitly targeting the poor for the purpose of poverty alleviation may come at the expense of achieving environmental objectives as well as the economic surplus of PES (Farley and Costanza, 2010; Wunder *et al.*, 2008).

Lastly, an important question often faced by PES practitioners is how to effectively reduce TC without hampering other objectives. Here three solutions are proposed. First, as discussed in chapter 5, using group contracts for both ES providers and buyers are recommended. Kemkes *et al.* (2010) stress the importance of creating monopsony power in contrast to monopoly where a single potential party has greater bargaining power and can drive up the price of a service, assuming that costs can be further reduced when participating parties are organized cooperatively. Secondly, owing to the fact that in developing countries decisions are often made in a context of incomplete information, existing skilled intermediaries should be better utilized, given their rich experiences and networks (Kemkes *et al.*, 2010; Muradian *et al.*, 2010; Vatn, 2010). Finally, in the case of forestry management, making use of GIS and remote sensing techniques is expected to help bring down TC considerably too as a result of less field monitoring (Banks-Leite *et al.*, 2015).

The scientific implications of this PhD research are primarily reflected by its contribution to the field of transaction costs in general and PES in particular. Since hardly has been researched on these topics, the developed conceptual framework, the collected data and obtained findings of this study can serve as a benchmark for future studies. For instance, researchers can adopt our data collection protocol (i.e. Annex A and C) so that their studies can be conducted in a similar way. We are also open to share our data set with other partners, thereby making transaction costs data more accessible and comparable. Furthermore, this PhD thesis calls attention to invest more effort in two main aspects. First, future research should appropriately place PES in a mixed policyscape (Ring and Barton, 2015) rather than

a single, independent instrument. As noted by Ring and Barton (2015) frameworks for describing and identifying the functional roles of PES in a policy mix setting are still relatively limited. The second important subject for future PES research which is not sufficiently addressed yet in the literature is the role of intermediaries in coordinating the transfer of resources between ES buyers and providers, especially to reduce TC. Intermediaries often become influential agents who are expected to define the traded ES, set the conditions between buyers and sellers, and influence the TC associated with the exchange (Kosoy and Corbera, 2010; Vatn, 2010).