

Fairly efficient or efficiently fair:
success factors and constraints of payment and reward
schemes for environmental services in Asia

Beria Leimona

Thesis committee**Thesis supervisor**

Prof. dr. H.B.J. Leemans
Professor of Environmental Systems Analysis
Wageningen University

Thesis co-supervisor

Dr. R.S. de Groot,
Associate Professor
Environmental Systems Analysis Group
Wageningen University

Dr. M. van Noordwijk,
World Agroforestry Centre

Prof. dr. P.J. Ferraro,
Georgia State University, US

Other members

Prof. dr.ir. E. Bulte, Wageningen University
Prof. dr. R. Costanza, Portland State University, USA
Dr. L.C. Braat, Wageningen University
Dr. R. Muradian, Radboud University Nijmegen

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Beria Leimona

Thesis

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Propositions

1. A broader categorization of PES' conditionality, recognizing the interdependency between fairness and efficiency as opposed to a strict and prescriptive PES definition, is essential for successful implementation of PES (This thesis).
2. In order to be pro-poor, a PES has to adapt to local conditions because decision making in an environmental service market based setting is influenced by many factors beyond financial cost-benefit rationality (This thesis).
3. A shared understanding of multiple ecological knowledge systems among all PES actors increases efficiency and fairness of PES schemes (This thesis, Meine van Noordwijk, Fiona Chandler and Thomas Tomich)
4. In his lecture on “Why Economics Will Change”, Ronald Coase suggested that we need empirical work which actually changes the way we look at the (economic) problems.
5. The sighting of the first black swan illustrates a severe limitation to our learning from observation or experience and the fragility of our knowledge. One single observation can invalidate a general statement derived from millennia of confirmatory sighting of millions of white swans (Nassim Nicholas Taleb).
6. The seventh-century French mathematician and philosopher Blaise Pascal argued that deciding whether or not to believe in God is essentially engaging in a wager. If we choose to behave as if there is a God and we get to the end and it turns out it isn't, it's not such a big deal (Thomas Catchcart and Daniel Klein).
7. Truth is the most valuable thing we have. Let us economize it (Mark Twain)

Propositions belonging to the thesis, entitled

“Fairly efficient or efficiently fair: success factors and constraints of payment and reward schemes for environmental services in Asia”

Beria Leimona

Wageningen, 3 October 2011

Preface

Payment for environmental services (PES) starts gaining global attention. Only two decades ago, the concept of environmental service was not well-understood and was often interpreted by the general public as a rubbish truck picking up our domestic waste. Just a decade ago, the PES concept was introduced in Asian developing countries thus contesting pros and cons about its application in countries with high poverty incidence and poor environmental governance. Today governments, companies, academics and environmental practitioners are increasingly expressing interest and commitment in the concept.

Yet, pioneering efforts in Asia have shown that the process to establish PES in practice poses great challenges. Application of market-based environmental services in Asian developing countries involves some issues beyond exchanging money for such services, such as intrinsic rights for land, moral issues in monetizing environmental services, social concerns and lack of adequate good environmental governance. How to effectively develop a PES scheme in developing countries with such intricate linkages between conservation and poverty alleviation? How to design and implement an efficient and fair PES scheme for relevant actors with a tremendous variety of socioeconomic and cultural contexts? How to avoid marginalized actors to become worse-off? Despite my years of involvement with the Rewarding Upland Poor for Environmental Services in Asia (RUPES) project of the World Agroforestry Centre, I still found myself puzzled and concerned about the debate.

This thesis is the final result of my PhD journey which provides myself and the readers with some answers to these questions, and provides guidelines for the development of efficient *and* fair PES schemes in developing countries. Taking empirical experiences from Indonesia, the Philippines, and Nepal, this book describes a wide-range of practical cases in which efficiency and fairness aspects are balanced and attentively considered in designing emerging PES schemes. These cases show that there is no simple solution and this thesis is therefore not about PES efficiency or fairness as separate conditions but about developing payment schemes that are “fairly efficient and efficiently fair” which might work better in the real world which is not black or white.

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1. Introduction

1.1. Background & problem statement

Environmental degradation and climate change have become prominent problems in today's world, especially in Asia, where almost two thirds of the world's population live. Soil erosion, land degradation, water resource degradation, deforestation and loss of biodiversity are among the most serious environmental problems with increasing trends of destruction in rural Asia (FAO 1995; Suzuki 2003; UNEP 2010). These adverse phenomena have an increasingly negative impact on the livelihood of especially poor people who depend on natural resources in many ways (MA 2005). A multitude of complex and interacting root causes are responsible for the environmental problems in Asia (Tomich et al. 2004). Two of the most important causes are market imperfections and policy distortions that have neglected the social and economic importance of natural resources and environmental quality (Tomich et al. 2004; TEEB 2010; Carpenter et al. 2006; MA 2005).

According to most literature sources, environmental degradation and poverty are closely interlinked leading to a "vicious circle" between both problems (Reardon and Vosti 1995). To break this vicious circle, poverty alleviation and reduction of environmental degradation must be dealt both simultaneously. Forty years ago, the 'Club of Rome' reports (Meadows, Meadows, and Randers 1992; Tinbergen 1976) opened the eyes of policymakers on the environment-poverty linkage and stimulated concepts of sustainable development in Reshaping International Order. Falling short of achieving this order, the 1992 Rio Declaration on Environment and Development endorsed the synergy between environmental and economic development and led to wide promotion of concepts derived from environmental economics: the need for internalization of environmental costs, polluters-pay principle and compensation for victims of pollution and other environmental damage (UN 1992). These concepts which are collectively called "market-based instruments" have become alternatives to complement non-market-based policy – including regulatory, legal and administrative instruments – in solving a range of environmental problems.

Market-based instruments include broad approaches from "fines and sanctions that are linked to traditional command-and-control regulations to laissez-faire concept that depend on consumer advocacy or private litigation to provide incentives for improving environmental management" (Huber, Ruitenbeek, and Da Motta 1998). Da Motta et al. (1999) concluded that market-based instrument are used to address a variety of goals: improve cost-effectiveness, decrease externalities, generate revenue, and mitigate uncertainty by applying market forces and flexibility for private actors to meet a given (environmental) standard.

With the release of the Millennium Ecosystem Assessment, the concept of ecosystem services was introduced to expand the domain of environmental concerns to *all* benefits that humans gain from

ecosystems. The services provided by ecosystems range from provisioning services supplying tangible value to people, such as food, fuel, and other consumable goods; to regulating services (such as air and water purification), habitat or supporting services (e.g. nursery services), and cultural and amenity services that give intangible benefits to human well-being (MA 2005; De Groot et al. 2010). These services provide many economic benefits and over the years a wide variety of financing mechanisms have been developed to capture at least some of the monetary value of these economic benefits, including government regulated (taxes & subsidies), government supported market creation (offset and cap & trade-schemes, such as carbon credits), private market mechanisms (e.g. user fees & payment for environmental services) and private non-market mechanisms (e.g. donations & lotteries) (De Groot et al., 2007).

The principle of market-based instruments is applied for capturing the financial value of ecosystem services through monetization and commoditisation of ecosystem services (Gómez-Baggethun et al. 2010) of which payment for environmental services (PES) is an important component. Initial debates on PES focussed on the quest of enhancing economic efficiency of conservation and enforcing markets to link supply and demand for ecosystem services. The main reason for the application of market-based instruments for ecosystem services is because the real value of ecosystem services to human wellbeing is not, or only partially included in market economics (Costanza et al. 1997; De Groot 1992; Turner, Pearce, and Bateman 1994). This situation refers to market failures, i.e. the failure of markets to reflect to full or true value of so-called free services such as pure water (without the need for purification) or pollination enhancing crop yields, and neglect to recognize negative effects of economic activities on environmental public goods (i.e. so called negative externalities). The articulation of market forces in solving these negative externalities aims to transfer external values to local decision makers in providing such environmental services at the lowest possible social cost. Effective legal structures with well-defined and enforceable policy rights can overcome the problems of market failures associated with environmental externalities (Coase 1960). Schemes with voluntary contracts as opposed to strict command-and-control instruments may better approximate social optimum and increase efficiency in generating environmental goods and services.

A valid line of argument on PES exists among scientists and practitioners that a PES instrument should not be burdened by additional social equity goals in achieving its environmental and cost-effectiveness goals of ES provisions. The question is what environmental integrity aspects can be segregated from social inequity issues? Nevertheless, recent literature discussed that the Coase's and pure market approach, that dominate the conceptualization of PES cannot be easily generalized and implemented in practice (Muradian et al. 2010). Moreover, Kosoy and Corbera (2010) through the lens of "commodity fetishism" argued the commoditisation of ecosystem services was problematic. Case studies in Latin America showed social values beyond merely financial payment induced participation in PES (Kosoy et al. 2007) and monetization of environmental services was mostly rejected by the PES recipients (Asquith, Vargas, and Wunder 2008). However, potential combination between equity and efficiency may be possible (Pascual et al. 2010). Thus, there is a clear need to adjust Coase's argument and incorporate context and perspective of local stakeholders. Especially, when PES schemes are applied in developing countries with skewed wealth distribution, contested property rights, low law enforcement and weak institutions (Neef and Thomas 2009).

1.2. Objectives and research questions

The conceptualization and analysis of PES in Asian countries is still partly analysed. PES has multiple interpretations and definitions since it is an evolving concept, How to balance between efficiency and fairness involved in changing current land use, socio-cultural values and behaviour of relevant stakeholders remains poorly known. Based on empirical research in Indonesia, Philippines and Nepal, this PhD thesis aims to test the overarching hypothesis that without combining efficiency and fairness aspects, the PES concept will not provide sustainable solutions and its implementation may achieve neither an increase of ES provision nor livelihood enhancement.

The overarching hypothesis is tested through a number of research questions:

1. *How do current PES designs and practices in Asia balance fairness and efficiency of the payment schemes?*

Sub-questions include:

How broad can the basic PES concept be interpreted beyond its formal, restrictive definition?

How does its design, including the defining types and forms of rewards, adapt to the local context?

2. *What are the key considerations in designing and implementing a PES scheme as a multiple-goal policy instrument in the context of densely populated Asian landscapes?*

Sub-questions include:

To what extent does the concept of a market-based approach of PES match with the strict conditionality of PES?

How does the ecological knowledge of PES actors influence efficiency and fairness of PES establishment?

3. *How to integrate PES mechanisms into a wider concept of sustainable development in a developing country context and what policy recommendations can be offered?*

Sub questions include:

How can the sustainable livelihood framework be captured in the establishment of PES schemes?

To what extent does the actual cash flow to individual service providers contribute to poverty alleviation?

1.3. Research framework and explanation of used concepts

Knowledge on and experience with PES has been enriched over the past decade, but there is no unified understanding of the ES and PES concepts as yet. Efficiency and fairness of PES are also often perceived differently by researchers and practitioners depending on their views and disciplines. This section is to clarify the concept of ES and PES, including its efficiency and fairness aspects that are carried throughout this PhD thesis.

1.3.1 Environmental services and ecosystem services

Environmental services and ecosystem services are two important terms widely used in the academic and empirical literature to discuss environmental policy, sometimes as synonyms, sometimes with different delineations. The concept of *services* in both terms refers to the flows of benefits obtained by people. The MA concept of *ecosystem services* included *provisioning services* which focus on goods that can be derived from ecosystems. Some definitions of *environmental services* exclude the provisioning services categories. Most of the environmental degradation issues can be linked to an overdependence on provisioning services, at the cost of the other services, so combining them into a single category is not helpful. Markets generally function for the goods obtained from provisioning services, and the main market failures may be due to lack of enforceable property rights and/or effective collective action, rather than lack of appreciation for this category of services.

Other differences in interpretation refer to agro-ecosystems and ecosystems with a strong human management component. Environmental services are defined as human benefits derived from natural and/or actively managed landscapes, which involve natural capital in their generation, while ecosystem services is a subcategory of it, provided by “natural” subsystems (Swallow et al. 2009; Muradian et al. 2010). Ecosystem services are interpreted as the flow of benefits from natural capital and its processes to human-being (Wegner and Pascual 2011; MA 2005). Natural capital is an autonomous complex system providing ecological services and amenities that contribute to human welfare without ever passing through market (Costanza 2003). In theory, the notion of environmental services is “input-based and focused on the efforts undertaken by actors to generate environmental improvements and improved natural capital” and ecosystem services is “outcome-based and focused on the wellbeing benefits provided to society from natural capital” (Greiner 2010).

The main difference between ecosystem services and environmental services is the inclusion or exclusion of provisioning ecosystem services (Swallow et al. 2009). Market-based instruments are generally much more effective for provisioning services than for regulating, supporting or cultural services because provisioning services can be physically traded in a market place. Environmental services are provided by different human-managed land uses including agriculture or forestry that are primarily targeting provisioning services (Van Noordwijk, *pers com*). Therefore, the focus of this PhD research is on environmental services where markets deal with the intangible values of regulating, supporting and cultural services of ecosystems. Given the multiple interactions and diversity of situations, the term *environmental services* is used as umbrella while greater specificity of service, providers and beneficiaries is needed for various contexts.

1.3.2 Payment, reward and compensation for environmental services

Payment for environmental services has been defined as “a voluntary, conditional transaction where at least one buyer pays at least one seller for maintaining or adopting sustainable land management practices that favour the provision of a well-defined environmental service” (Wunder 2005). PES refers to a wide range of possible incentives for environmental service (ES) providers, ranging from one-off direct payments by ES beneficiaries to ES providers to more complex market mechanisms involving offset credits traded among many buyers and sellers. Early literature on PES classified the forms of PES in practice and recognized at least four types of PES schemes, differentiated by the degree of government intervention in administration of the schemes, by the characteristics of the buyers and sellers, and by the source of payments (Smith et al. 2006; Scherr et al. 2006). By pointing out the weaknesses of indirect environmental interventions such as Integrated Conservation and Development Programs, Ferraro and Simpson (2005) argued that PES can create a direct incentive

scheme between ES sellers and buyers and thus might better achieve both conservation and development objectives by better targeting and lowering transaction costs.

PES is intended to be a performance-based payment where land managers (i.e. environmental service providers), who manage their lands through environmental benign techniques and provide and/or maintain a flow of environmental services, voluntarily enter agreed contractual conditions, and directly get payments or rewards from environmental service beneficiaries, (i.e. those who benefit from their conservation efforts). Its concepts were tested as a possibility to increase effectiveness in environmental protection and reduced (public) conservation budgets in Latin America, the US and Europe (Landell-Mills and Porras 2002; Wunder, Engel, and Pagiola 2008; Pagiola and Platais 2002).

Starting about a decade ago, PES has gained broader attention in developing countries of Asia and Africa (Swallow et al. 2007; Swallow et al. 2010; Neef and Thomas 2009; Ferraro 2007; Leimona, Joshi, and Van Noordwijk 2009). Proponents of fairness dimensions as elements that need to be added to effectiveness and efficiency prefer the use of the broader concept of *rewards* (RES) rather than *payment* for environmental services (Van Noordwijk, Tomich, and Chandler 2004; Gouyon 2003; Swallow et al. 2007). The notion of RES focuses on the “multiple goals of ecological sustainability, just distribution and economic efficiency and favours a variety of payment mechanisms to achieve these goals, both market and non-market” (Farley and Costanza 2010; Muradian et al. 2010). RES further involves the integration of pro-poor elements into economic instruments to enhance environmental services with the basic argument that poverty alleviation has to be included into any portfolio to protect the environment, especially in developing countries.

The term RES also offers broader recognition to ES providers, not only focusing on financial transactions between stakeholders but also including in-kind reward, such as access to land, access to markets, capacity building, and recognition of identity and rights (Van Noordwijk, Tomich, and Chandler 2004). Swallow et al. (2009) introduced the term *compensation and rewards for environmental services* to refer to “a range of mechanisms linking ecosystem stewards and environmental service beneficiaries, including the mechanisms normally included under the term payment for ecosystem service”. They noted that the relationships between ecosystem stewards, environmental service beneficiaries and intermediaries may be more complex than a simple transaction, with agreements that are not wholly voluntary and payments that are not wholly conditional. Some in this thesis differentiate both terms and use RES for the pro-poor PES and PES for other special cases focused on financial transaction. However, in general, the chapters interchangeably use *rewards for environmental services* (RES) and *payment for environmental services* (PES) recognizing that the concept of PES has been broadened to encompass the equity and fairness aspects.

1.3.3 Efficiency and fairness, and their trade offs

Efficiency is to produce the greatest societal value (as determined subjectively by individuals and as measured by economist either in markets or by using non-market methods) for the least possible social cost. In short, efficiency is enhanced when net value is maximised or gained positive net benefit. Welfare economics refer efficiency as Pareto efficiency where “an allocation of goods is Pareto efficient if no alternative allocation can make at least one person better off without making anyone else worse off” (Boardman et al. 2001). The link between positive net benefits and Pareto efficiency is straightforward: if a policy has positive net benefits, then it is possible to find a set of transfer, or side payments that makes at least one person better off without making anyone else worse off.

In environmental policy, goals reflecting other values to be relevant to social problems and the public policies proposed to solve them are commonly considered. Boardman et al. (2001) recommend that when goals in addition to efficiency are relevant, as well as when efficiency is the only goal, but relevant impact cannot be confidently monetized, *multigoal analysis* provides the appropriate framework. This analysis can include equity, fairness and social justice.

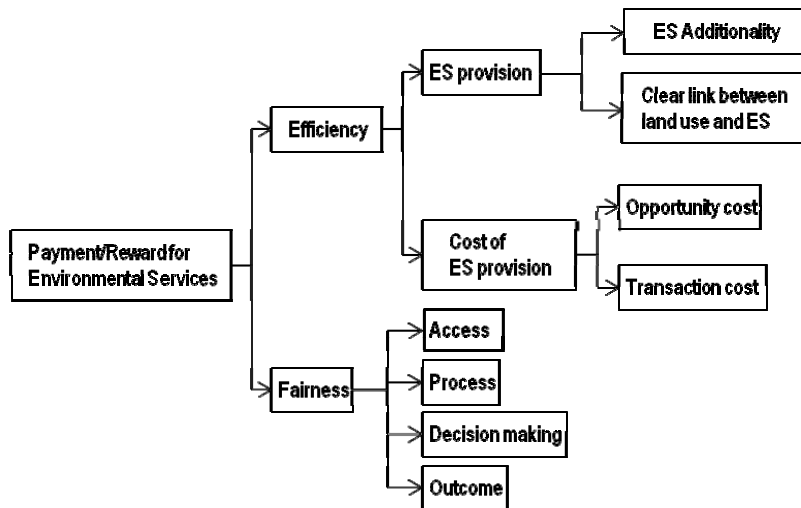


Figure1.1 Elements of efficiency and fairness within a reward for environmental service scheme

A PES scheme involves at least two actors who initiate exchanges for mutual interest and make agreements in achieving effective ES provisions. The actors can usually be referred to as external stakeholders (including regulators who benefit from the provision of ES and are willing to invest some capitals to gain increase in ES), and local stakeholders who provide ES through their land use practices and behavioural change. Figure1.1 shows the elements of efficiency and fairness within payment/rewards for environmental services. Efficiency refers to ES additionality gained by clearly linking land use practices contracted under PES scheme and ES provisions, and cost-effectiveness of the scheme. Fairness attributes pro-poor aspects of PES, where marginalized actors of the scheme have just opportunities in participating, planning, designing, implementing and monitoring the scheme, and getting benefits from it.

The three main stages of development of a locally appropriate RES mechanism are (1) scoping and stakeholder analysis – by identifying and engaging with ES beneficiaries and all agents with credible land claims and threats to conservation, explicitly outlining baselines, calculating conservation opportunity costs and customizing reward/payment modalities; (2) negotiation – reaching agreement on terms of contract, amount of payment, rights, liabilities and criteria for and modalities of monitoring; and (3) implementation and monitoring of contractual agreement. Each stage of RES development interplays efficiency focusing on ES provision and its costs, and fairness focusing on

perceived equity of all stakeholders in access, process, decision making and outcomes of RES scheme (Figure 1.2).

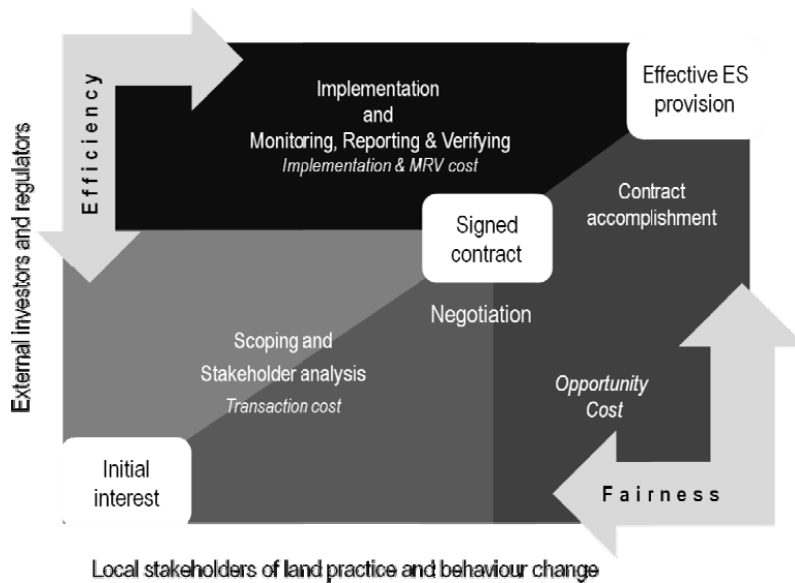


Figure 1.2 Stages in RES development and its links with efficiency-fairness (Adapted from van Noordwijk et al 2011)

1.4. Study area

Over one-third of the Asian countries’ inhabitants depend on agriculture and natural resource based utilisation accounted for their livelihoods (Dixon et al. 2001). This region has immense diversity of landscape ranging from closed forest to open-field agriculture with many intermediate land cover, such as ‘upland intensive mixed’, ‘highland extensive mixed’ and ‘tree-crop mixed’. Each agro ecological zone provides its unique combination of environmental services. Therefore it offers many opportunities to explore the interactions between forest conversion, intensification of land use and provision of environmental services, such as biodiversity conservation, watershed function and carbon sequestration (Hadi and Noordwijk 2005).

The pilot sites in Southeast Asia and South Asia where I coordinated and conducted research for this thesis, cover nine sites in three countries (Indonesia, the Philippines and Nepal) (Figure 1.3). Following the analysis of Hadi and van Noordwijk (2005), some combinations of agro ecological zones can be distinguished from these sites for analyzing potential establishment of rewards for environmental services through the interaction of tree-based and more intensive agriculture or urban land use system. For example, RES is potentially operational for watershed functions in Sumatra – Indonesia, Luzon and Mindanao – the Philippines, and some parts of South Asia, where lowland rice is located at the downstream of upland mosaic, forest, or tree-crop mixed, or in some parts of South

Asia, where ‘highland mixed’ is located at the upstream of urbanized areas. Rewards for biodiversity conservation can occur where tree-crop or upland mosaic is located adjacent to forest threatened by further expansions of intensive anthropocentric land use.

In Asian rural areas, traditional land and resource management systems fail as population increases and miniaturization of land leads to overuse. Skewed land distribution often compels the poor to survive by cultivating marginal land – erosion- prone slopes and other environmental problems. Without tenure, and often with only passing claims on the land they cultivate, the poor are less likely to make investments to protect natural resources (Van Noordwijk, Tomich, and Verbist 2002; Brandon and Ramankutty 1993). These socioeconomic conditions are apparent on research areas of this thesis.

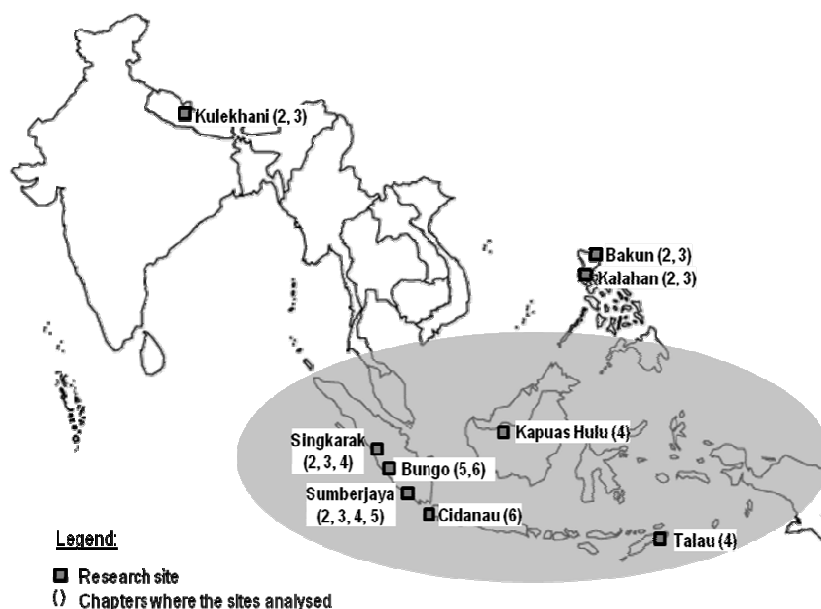


Figure 1.3 Research sites in Asia with pilot-level researches conducted in Indonesia

Furthermore, the sites are action and learning sites of the Rewarding Upland Poor for Environmental Services (RUPES) project of World Agroforestry Centre (ICRAF) Southeast Asia Region, which are the pioneers of rewards for ES initiative in each of the three countries. Indonesia and the Philippines were selected to represent the Southeast Asia region, where natural resource management is growing in practice (CGIAR 2011) and where ICRAF’s *sentinel landscapes* exist to provide collection of the long-term data sets and to test models. Nepal was included as a case study in South Asia, where collective action and social movement are relatively advanced, especially in its upland area. Figure 1.3 shows that analysis at local level was mostly conducted in Indonesia, while the case studies in the Philippines and Nepal provide lessons at the regional level.

Most of the sites focus on rewards for watershed services under private and public schemes (Table 1.1). Two of pilot sites (Singkarak, Indonesia and Kalahan, the Philippines) are testing the voluntary

carbon market and one of the sites (Bungo, Indonesia) is seeking opportunities for eco-certification scheme of rubber agroforestry. The stages of implementations are also various, ranging from initial development of RES, where the intermediary partners are conducting scoping studies on biophysical and socioeconomic aspects of the pilot, to mature schemes, where contractual agreements have been signed and schemes are ready to be scaled up.

Table 1.1 Research sites and the status of the applied 'rewards for environmental service' scheme

Site	Started in	Main ES	Scheme	Status
<i>Indonesia</i>				
Singkarak, West Sumatra	2002	Watershed services	Distribution of royalty of a parastatal hydroelectric power (HEP) company	Ad-hoc share of royalty
		Carbon sequestration (voluntary)	Financial payment from an international carbon broker	Agreed 10 year contract in total 49 hectares
Bungo, Jambi	2002	Agrobiodiversity conservation of jungle rubber	Financial payment from a philanthropic scheme	Ad-hoc reward of a micro hydro
			Eco-certification for jungle rubber	Scoping elements for RES development
Sumberjaya, Lampung	2002	Watershed services, mainly sedimentation reduction	'Conditional CSR' from a parastatal HEP company	Agreed 1 year contract and scaled up to other sites
Cidanau, West Java	2001	Watershed services for domestic and industrial demands	'Conditional CSR' from a water company	Agreed 5 year-contracts in 4 villages
Kapuas Hulu, West Kalimantan	2008	Watershed services for a district water company	Earmark payment from water bill	Scoping elements for RES development
Talau, East Nusa Tenggara	2008	Watershed services for a district water company	Earmark payment from water bill	Scoping elements for RES development
<i>The Philippines</i>				
Bakun	2004	Watershed services for private HEPs	Distribution of HEP's royalty to community	Agreed share of royalty
Kalahan	2002	Carbon sequestration (voluntary)	Financial payment from national companies	Initial negotiation with potential buyers
<i>Nepal</i>				
Kulekhani	2002	Watershed services for a private HEP	Distribution of HEP's royalty to community	Agreed share of royalty

1.5. Structure of the thesis

The thesis consists of seven chapters covering an array of issues in efficiency and fairness of PES application in Asia. Figure 1.4 presents the flow of chapters in this thesis based on Figure 1.2 and shows the contribution of each chapter to different stages of PES development. Table 1.2 presents literature as basis of theory of each chapter, assumptions that I and my collaborators made, facts that empirically experienced and hypothesis as the basis for this PhD research.

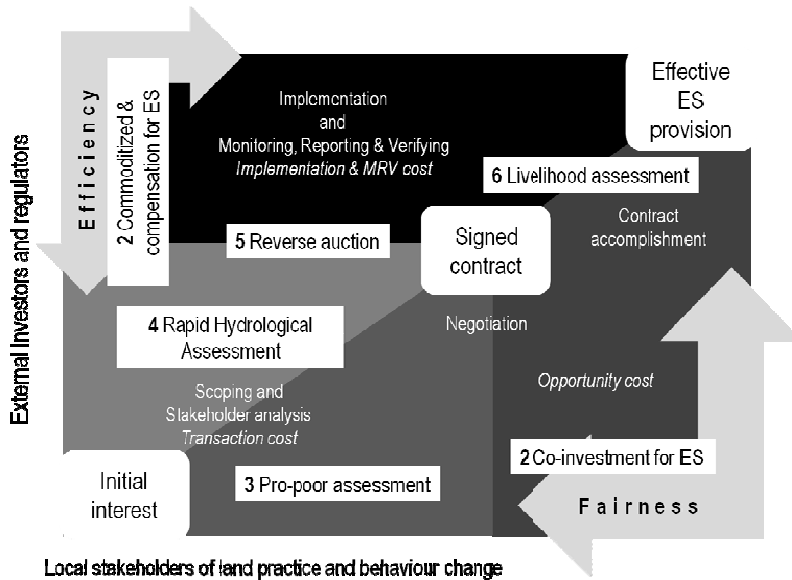


Figure 1.4 Discussion flow of the thesis. Numbers in boxes indicate the chapter(s)

This introductory chapter identified major challenges and opportunities arising in PES practices and clarified some concepts used in analyzing PES. The initial two chapters (Chapter 2-3) reviewed and contested the efficiency and fairness aspects of PES. Chapter 2 recommends the principles and concepts of pro-poor PES as the basis of analysis of the remaining chapters in this thesis. Chapter 3 emphasizes the importance to include pro-poor approach in developing any PES schemes and analyzes specific circumstances where cash incentives from PES can contribute substantially to poverty alleviation. Chapter 4 and 5 discuss experiences in reducing information gaps among stakeholders involved in PES scheme by providing information through a scoping study of watershed service provision and an experiment in PES procurement auction in providing ES. The scoping study provides debates and contrasts among different perspectives of stakeholders on how watersheds provide hydrological services. The experiment in reverse auction was tested in providing information on environmental service supply curve determining opportunity cost of farmers in joining a PES scheme. Chapter 6 further assesses a PES scheme using the sustainable livelihood framework.

Table 1.2 Framework of the PhD thesis

Literature basis	Assumption	Fact	Hypothesis
<p>The dominant conceptual approach towards PES is derived from Coasean economics and PES is primarily seen as a way to improve economic efficiency (Muradian et al. 2010).</p> <p>Poverty alleviation is a positive 'side effects' and should be targeted as long as their inclusion does not imply efficiency loses (Pagiola, Arcenas, and Platais 2005)</p>	<p>A market-based instrument is efficient in internalising environmental externalities by "getting the price right".</p>	<p>A normative and restrictive vision of efficiency improvement as a guiding principle may create a mismatch between theory and practice (Pascual et al. 2010).</p>	<p>Preconditions for application of the PES concept with strict conditionality are not met in many developing countries' contexts and a wider PES interpretation is needed. . (Chapter 2)</p>
<p>PES schemes are more cost-effective than other approaches in conservation and poverty alleviation nexus, such as integrated conservation and development projects (Ferraro and Simpson 2002)</p>	<p>PES directly targets land managers who provide ES and payment (mostly financial one) must be sufficient relative to income and at least commensurate with opportunity cost.</p>	<p>Relative numbers and wealth of ES providers and beneficiaries are varied thus willingness and ability to pay may be lower than willingness to accept of ES providers.</p>	<p>Only under specific circumstances, will cash incentives from PES contribute substantially to increasing disposable income and alleviating poverty of ES providers. (Chapter 3)</p>
<p>Monetization of environmental services is the basis for enhancing the efficiency of environmental policy and correcting market failure of ES by capturing total economic value of ES (Gómez-Baggethun et al. 2010).</p> <p>Commoditization of environmental services transforms natural capital to financial capital.</p>	<p>Cash payments are frequently viewed as having the highest degree of flexibility because they can be converted to local goods and services as prioritized by the receivers.</p>	<p>Cash payments for participating individuals are mostly much smaller than opportunity cost.</p>	<p>Indirect non-financial benefit at community scale contributes to reducing poverty or a common-goods PES design (Pascual et al. 2010). (Chapter 3)</p> <p>PES schemes open links between community to various types of capitals (Chapter 6)</p>
<p>PES schemes that aim at obtaining efficient outcomes must have a well-defined ES.</p>	<p>All ES providers as ES suppliers participate and voluntarily negotiate with ES buyers with balanced power.</p>	<p>PES schemes are likely to change (and sometimes reinforce) existing power structure and inequalities in decision making and access to resources, with significant equity implication (Corbera, Kosoy, and Martínez Tuna 2007; Pascual et al. 2010)</p>	<p>Reducing discrepancies and improving synergies of ecological knowledge of all actors in PES balance effectiveness and fairness of a PES scheme. (Chapter 4)</p>

Literature basis	Assumption	Fact	Hypothesis
PES aims at a well-defined trading commodity, and active supply and demand sides must coexist with information asymmetries limiting the effectiveness of PES schemes.	Procurement of goods and services for which there are no well-established market is commonly performed using auctions by using bidding rules and market competition to reduce the incentive for sellers to inflate their contract prices (Ferraro 2008).	ES providers are mostly located in rural areas with low education, low asset endowment, small plot size and where market-based competitiveness especially for intangible goods is not so common.	Specific elements of procurement auction have to be designed and administered for farmers with low formal education, prone to social conflicts and influenced by power structures within their community (Chapter 5) A PES procurement contract auction increases efficiency of PES contract allocation.