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Payments for Environmental Services (PES)
A Review of Experiences across Countries

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Foreword

The Centre for Economic and Social Studies (CESS) was established in 1980 to undertake research in the field of economic and social development in India. The Centre recognizes that a comprehensive study of economic and social development issues requires an interdisciplinary approach and tries to involve researchers from various disciplines.

The centre's focus has been on policy relevant research through empirical investigation with sound methodology. In keeping with the interests of the faculty, CESS has made important contributions to social science research in several areas; viz., economic growth and equity, agriculture and livestock development, food security, poverty measurement, evaluation of poverty reduction programmes, environment, district planning, resettlement and rehabilitation, state finances, education, health and demography. It is important to recognize the need to reorient the priorities of research taking into account the contemporary and emerging problems. Social science research needs to respond to the challenges posed by the shifts in the development paradigms like economic reforms and globalization as well as emerging issues such as optimal use of environmental and natural resources, role of new technology and inclusive growth.

Dissemination of research findings to fellow researchers and policy thinkers is an important dimension of policy relevant research which directly or indirectly contributes to policy formulation and evaluation. CESS has published several books, journal articles, working papers and monographs over the years. The monographs are basically research studies and project reports done at the centre. They provide an opportunity for CESS faculty, visiting scholars and students to disseminate their research findings in an elaborate form.

The CESS has established the Research Unit for Livelihoods and Natural Resources (RULNR) in the year 2008 with financial support of Jamsetji Tata Trust. The core objectives of the RULNR are to conduct theoretical and applied research on policy relevant issues on human livelihoods and natural resource management, especially in areas related to river basins, forest and dryland ecosystems and to provide an effective platform for debates on policy relevant aspects for academicians, policy makers, civil society organizations and development practitioners. RULNR intends to adopt a multi-disciplinary approach drawing on various disciplines such as ecology, economics, social anthropology, political science.

This RULNR-CESS monograph titled "Payments for Environmental Services (PES): A Review of Experiences across Countries" is an attempt to critically review the experience

of PES program both in developed and developing countries and draw insights for promotion of such programs in India. In recent years, Payments for Environmental Services (PES) have become important policy instruments in many of the developed as well as developing countries for conservation of environmental resources. Such attempts have attracted a lot of attention amongst academicians, policy makers, environmentalists and various donor agencies. Countries across the globe have adopted the PES program on a variety of environmental resources and accordingly a large body of literature drawing on the experience of these programs in various countries has developed. A critical review of these studies can shed light on the factors that are responsible for both promoting and hindering the success of the program and thereby provide necessary insights to other countries towards designing and implementing such programs according to their own context.

This monograph provides valuable suggestions to policy makers from the analysis of important case studies from across countries and a detailed review of literatures. I hope it would be useful to the research community, policy makers, development practitioners and all those interested in the promotion of conservation of environment and livelihoods.

Manoj Panda
Director, CESS

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Executive Summary

Of late, Payments for Environmental Services (PES) have become important policy instruments in many of the developed as well as developing countries for conservation of environmental resources. Such attempts have attracted a lot of attention amongst academicians, policy makers, environmentalists and various donor agencies. Countries across the globe have adopted the PES program on a variety of environmental resources (e.g., biodiversity, water conservation, scenic beauty, carbon sequestration, etc.) and accordingly a large body of literature on country-wise experiences of these programs has been developed. A critical review of these studies can shed light on the factors that are responsible for both promoting and hindering the success of the program and thereby provide necessary insights to other countries towards designing and implementing such programs accordingly.

Against this backdrop, the objective of the present study is to critically review the experience of the PES program in terms of their implementation (e.g., the genesis and evolution), management (e.g., design of payment mechanism, setting target groups, providing administrative and legal support), and outcomes (e.g., environmental conservation, income generation, poverty alleviation, livelihood promotion, strengthening property rights, etc) in both developed and developing countries. Apart from looking at the countries' perspective, the study also makes an attempt to critically analyze the above-mentioned aspects of PES across its various types (e.g., user-financed or government financed) and presents some interesting case studies from countries across the globe. In addition, the study also draws insights and critically analyzes factors for successful implementation of PES schemes in India, based on the findings from the literature review and analysis from the case studies.

The rest of the report is structured in the following way: Chapter II reviews the existing literature on PES experiences in different countries and highlights the important issues and their implications. The implications of the review are substantiated further with detailed analysis of some selected cases on PES in Chapter III. Chapter IV analyzes in detail the key aspects of PES scheme in Costa Rica, particularly its evolution and impacts. Chapter V makes a critical assessment of the ecosystem management approaches followed in India. Chapter VI summarizes the major findings and highlights the important issues that can be addressed for future research on PES program in India.

The review of the existing literature in Chapter I highlights two important issues. First, the application of PES mechanism as a market-based instrument to internalize the externalities has grown considerably over the last one decade or so. Second, the growing popularity of the PES schemes and the associated high expectation levels could not match with the outcomes in practice when one analyses the strengths and weaknesses. It is observed that PES schemes differ substantially from one another. The differences can be attributed to differential adaptation of PES concepts in different ecological, socio-economic and institutional conditions. One of the important strengths of PES schemes is supply and demand side innovations for environmental conservation. Historically, environmental conservation has been viewed as a lose-lose situation because of lack of effective demand from the buyers as conservation outcomes generally fall under the category of public goods. The innovation of PES schemes has made the conservation of environmental conservation a win-win situation by creating buyers and sellers for it. However, the efficiency of PES depends on the sellers who have to continuously supply the ecological services (ES) to the buyers, which is known as conditionality. This conditionality tends to be violated when ES sellers face high transaction and opportunity costs and a host of other socio-economic and institutional factors.

The discussions on the important PES schemes/projects across various countries in Chapter II highlight the fact that the design and implementation of PES and/or PES-like programs are quite different and are largely location specific. The scale of the programs depends mainly on the political and administrative will of the respective governments. For instance, China's SLCP program has achieved phenomenal success because of the food and other subsidies that the government has been providing. Similarly, in the case of Los Negros, Bolivia, the local government has contributed a large sum of money on behalf of individual irrigators that was given to service providers. On the other hand, PES initiatives by individual users and service providers and also by the NGOs have been quite successful. However, the outcomes of PES are dependent on ecological conditions, as well as on the nature and the quantum of services that the ecosystem is providing.

The analysis of four PES-like cases in India in Chapter III highlights the potential for widespread implementation of PES programs in the country. It is appears that the government and the NGOs working at the local community level need to identify the ecological context where both service users and providers can not only be identified easily, but also be encouraged for possible negotiations towards trading of environmental services. Further, the ecosystem management institutions in India have failed to manage resources largely because of lack of adequate incentives. Linking these institutions to PES-like schemes may prove to be effective and can also be adopted across different

resources and locations in the country. Few lessons can be drawn from the international experience in terms of institutional innovation for successful adoption of PES programs in the Indian context. For example, China's SLCP program can be conceived in line of National Rural Employment Guarantee Act (NREGA) in India to provide incentives to households involved in activities that are environmentally degrading and reduce services to the society at large. In this way, one may expect National Rural Employment Guarantee Scheme (NREGS) to have immense potential in facilitating successful design and implementation of PES programs in the country.

Interestingly, the review of PES schemes in Costa Rica in Chapter IV suggests that despite several positive outcomes, PES schemes in Costa Rica are not free from potential threats and difficulties. The major challenges identified by the researchers include lack of knowledge of and demand for ES, improper valuation of ES, high opportunity costs, insecure land tenure, high transaction costs, inadequate access to technical assistance, market price of ES, etc. These factors are expected to affect the sustainability and effectiveness of the PES schemes in Costa Rica in a considerable way. However, it may be said that PES schemes in Costa Rica have the potential to become successful environmental conservation strategies in addition to benefiting the poor and the society at large. This potential will be gradually fulfilled as the major threats and critical issues are addressed properly. The extent of positive effects of PES on sustainable development will rise if their distributional impacts are considered and if adequate efforts are made to build capacities in poor.

The discussions on the extent and causes of degradation of various ecosystems in India in Chapter V point out that, though India has variety of ecosystems, many of them are fragile. The causes of degradation of these ecosystems can be attributed to market failures, institutional, government or policy failure. The challenge of management of ecosystems in a sustainable fashion is to correct the above-mentioned failures. In this context, PES mechanism can be used as a policy approach towards resolving the above failures, especially the market failures.

Hence, the PES scheme appears to be a relatively new approach and the outcomes so far seems to be mixed, though it would be too early to come to any definite conclusion on the efficacy of the scheme. However, in the light of the above review, it can be said that the PES scheme has tremendous potential for many other emerging countries including India. It has great prospects of slowing down environmental degradation, greater conservation of environmental resources, and improvement in livelihoods of the marginalized sections of the society. Some of the key factors that might either promote and/or hinder the success of the PES scheme include uniformity of the scheme, property

rights, nature of the scheme, valuation and assessment, information dissemination, nature of contract, cost-benefit analysis, multiple sources of revenue, continuity of scheme, trust across the stakeholders, consensus empirical support from different studies, technical assistance in land use, targeted payments, improper identification, proactive role by the NGOs and the civil society, inclusiveness and transparency.

With increasing demand for ES in India and the consequent degradation of natural resources, perhaps the time has come to adopt market-based instruments like PES for environmental protection. Given the vast array of natural resources, their importance in the development process, and the available ecological conditions, India has tremendous scope for adopting PES-like schemes to fulfill the objectives of both conservation of environment, and promotion of local livelihoods and social security. Some initiatives in this regard have already been taken by local NGOs and the community. However, the factors identified to be important for success of PES schemes and the provisions for essential policy supports may not be easily available in Indian context.

The present study points out that designing PES schemes is a complex task and there is no simple prescription or blueprint for optimal designs. The differential outcomes of PES schemes can be understood by examining institutional, socio-economic, biophysical, and contextual factors associated with the individual scheme. The PES scheme is likely to be more successful where there are secured property rights over land and forest resources, as well as necessary policy supports that promote community-based approaches to natural resource management. The necessity of clearly-defined property rights and security of tenures is imperative. In this connection, one critical challenge that India is likely to encounter is the insecure and ill-defined property rights over a majority of its natural resources related to a large number of ES. India's ecosystem management institutions are mostly operating under the state ownership of natural resources such as forests, coastal resources and water bodies. Further, it is also pointed out that most of the institutions responsible for managing natural resources have failed to achieve their targeted objectives primarily because of lack of active participation by local people in the program, owing to insecure property rights and lack of enabling policy support. Therefore, successful adoption of PES schemes in India requires reforming the existing provision of property rights. However, such policy reforms need to be approached very carefully, given India's complex socio-economic and political set up, as such reforms can create both winners and losers and hence conflicts of interests.

However, agents with greater access to information and institutional provisions may benefit in a larger way from the policy reforms through rent-seeking. In addition, the defined and secured property rights may also cause disincentives for the land owners

against optimal utilization of natural resources. All these may result in increasing inequality in the society. It is, therefore, necessary to develop an appropriate institutional framework that can restrict rent-seeking attitude of the agents under information asymmetry. This should be combined with an incentive structure to encourage the land owners towards optimal utilization of resources. As a large section of landless and marginal people depend on de facto state-owned natural resources and/or village common lands for their daily livelihoods, initiating PES scheme under such conditions requires tenure-based rights over land to ensure long-term access to land and hence to develop markets for ES.

However, the bigger challenge in India perhaps will be to organize large number of small landholders and alter their land use pattern for the PES schemes. There are two fundamental issues involved. First, majority of the empirical studies on PES suggest that wherever large landholders are involved, PES schemes are likely to perform better vis-à-vis small landholders. This is so because communicating with fewer large landholders is much easier than doing the same with large number of small landholders. As a consequence, the decision-making process becomes much complicated. Further, with increasing group size, more effort and time are required in organizing the land owners and applying capacity-building measures. This makes the entire process very costly, posing uncertainty in economic feasibility of the schemes. Moreover, in the case of small landholders, the benefits of economies of scale are not adequately utilized. This means that small landholders may not receive as much benefits as their larger counterparts from the adoption of new land use pattern under the PES schemes. Hence, the constraints related to ensuring profitability through adoption or modification of land uses should be adequately addressed while designing the PES schemes in the Indian context to account for the interests of the poor and small landholders. This is very important, especially to enhance the acceptability of the PES schemes amongst the poor and small landholders, as participation of such landholders may be low if payments are not sufficient to meet the costs associated with socially and environmentally acceptable land use practices.

However, success of the PES schemes requires participation of broader section of the society. Some empirical evidence has shown the importance of participation of broader sections of the society, especially the gender dimension, for adopting market-based approaches to watershed services. But, traditionally, Indian society consists of socially and economically heterogeneous people with the practice of age-old caste system in a diverse religious framework. Social heterogeneity is further accentuated with persisting gender inequality over the years. While ensuring participation of all sections of people in the PES schemes from such a diversified society can be a very difficult proposition, the existing socio-economic, religious and political differences may limit the effectiveness of the PES schemes.

CHAPTER 1

Introduction

It is well recognized that maintaining environmental quality and supply of natural resources is crucial for the health, productivity and well being of the people (Pearce and Warford, 1993; Dasgupta, 2001). Degradation of environment followed by inadequate availability of natural resources results in loss of economic output and hence human welfare (Dasgupta, 2001; Reddy *et al.*, 2001). In the past two decades or so, rapid degradation of environmental resources such as deforestation and degradation of forests, decline in quality and quantity of water, degradation of land and loss of biodiversity have taken place both at regional and national levels across the globe (Baland and Platteau, 1996; Behera and Reddy, 2002; Reddy and Behera, 2006), putting sustainability of the development process and well being of the nation at stake. On the other hand, environmental pollution such as air pollution, especially in cities and industrial locations is on the rise. Pollution of water resources (both surface and groundwater) is increasing every passing day, making these precious resources scarcer. Issues concerning global warming and their negative effects on society as a whole have made the scenario more complex. According to the Intergovernmental Panel on Climate Change (IPCC, 2007), climatic conditions are changing rapidly across the globe because of the global warming caused by increasing emission and concentration of carbon dioxide and other greenhouse gases in the atmosphere.

Further, the report on Millennium Ecosystem Assessment of the United Nations (MA, 2005) observes that between 1960 and 2000 the demand for ecosystem services grew significantly as the world population doubled and the global economy increased by more than six fold. It also reveals that nearly two-thirds of the global ecosystem services are on the decline. Such evidences of rapidly degrading ecosystem services and their negative effects on human welfare require urgent investigation into the causes, consequences and possible solution.

One of the key reasons behind the increasing environmental problems is the failure of the market forces to capture adequately the services that the environmental resources provide (Panayotou, 1993). In other words, in many cases, markets tend to ignore costs (and benefits) that accrue to third parties from the action of two parties engaged in an exchange. In economics terms, these costs (and benefits) are external effects. These external costs and benefits are caused by market failure because the market fails to function efficiently. Many environmental services are publicly good natured, which are characterized by non-excludability; and indivisibility in consumption makes it extremely difficult to function efficiently. Markets also cannot function properly if the property rights governing natural resources are poorly defined.

Hence, there is a need to internalize the externalities so that the owners have the incentives to use and manage natural resources in an efficient and sustainable fashion. Payments for Environmental Services (PES) programs developed by the World Bank (Pagiola, 2005) and being implemented in different countries, especially the Latin American countries (Pagiola *et al.*, 2005), are directed towards providing economic incentives for the conservation of natural resources. These programs are expected to generate continuous flow of environmental services in the long run, along with maintaining their quality. In other words, PES is considered as a mechanism to translate external non-market values of the environment into financial incentives so that provisions for such services are ensured (Engel *et al.*, 2008).

Such increasing importance of PES has motivated a number of countries to adopt various programs in this line and accordingly a large body of literature on country-wise experiences of these programs has been developed (Wunder and Alban, 2008; Turpie *et al.*, 2008; Pagiola et al., 2008; Engel and Palmer, 2008; Wunscher *et al.*, 2006). However, the so far experiences from these countries on outcomes of PES programs have shown mixed results. The results seem to vary widely across geographical regions (both within and across countries); the different types of natural resources upon which PES program is based, and the different types of PES (government financed and user financed). Little effort has been made so far to critically review these existing studies, especially, in respect of designing the programs, their implementation and outcomes that can help in having a clear understanding on the issues and thereby in designing appropriate programs in the Indian context. Some of the pertinent research questions in this regard are: Why are the PES programs being introduced in different countries? How are these programs designed? How have these programs performed so far? What are the factors that influence the performance of the programs? What are the distributional implications of the PES programs? Are the environmental service users benefited from the PES programs? What are the best possible practices/models of PES programs that can be adopted in the Indian context?

Section - II
Payments for Environmental Services: A Conceptual Overview

Definition of Environmental Services

The concept of ES has generated lot of interest amongst academicians and policy makers and consequently, it has become an important area of research during the last one decade or so. The significance of the concept emerged particularly after the publication of the Millennium Ecosystem Assessment (MA) report of the United Nations, an enormous work involving over 1300 scientists across the globe. Despite such growing importance of research on ES, there is no universally accepted definition of the concept. The existing research studies and reports have defined ES differently, depending on the context. In this section, we document and systematically analyze the various definitions of ES that are used in research on ES. This will help in having a clear understanding of the concept of both ES and PES. In addition, such an effort will also facilitate in bringing about a clear and consistent definition of what ecosystem services are, the key characteristics of ecosystems and the services they provide.

Three definitions commonly cited in literature include the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life (Daily, 1997a), the benefits human populations derive, directly or indirectly, from ecosystem functions (Costanza *et al.*, 1997), and the benefits people obtain from ecosystems (MA, 2005). According to Daily (1997a, 1997b), ecosystem services refer to the "conditions and processes", as well as the "actual life-support functions". According to Costanza *et al.* (1997), ecosystem services represent the goods and services derived from the functions and utilized by humanity. In the MA, services are benefits, writ large. Boyd and Banzhaf (2007) offer an alternative definition to the ones above. In their definition, ecosystem services are not the benefits humans obtain from ecosystems, but rather, the ecological components directly consumed or enjoyed to produce human well being. Ecosystem services are the aspects of ecosystems utilized (actively or passively) to produce human well being. The key points are: (1) services must be ecological phenomena; and (2) that they do not have to be directly utilized. Defined in this way, ecosystem services include ecosystem organization or structure as well as process and/or functions if they are consumed or utilized by humanity either directly or indirectly. The functions or processes become services if there are human beings that benefit from them. Without human beneficiaries they are not services.

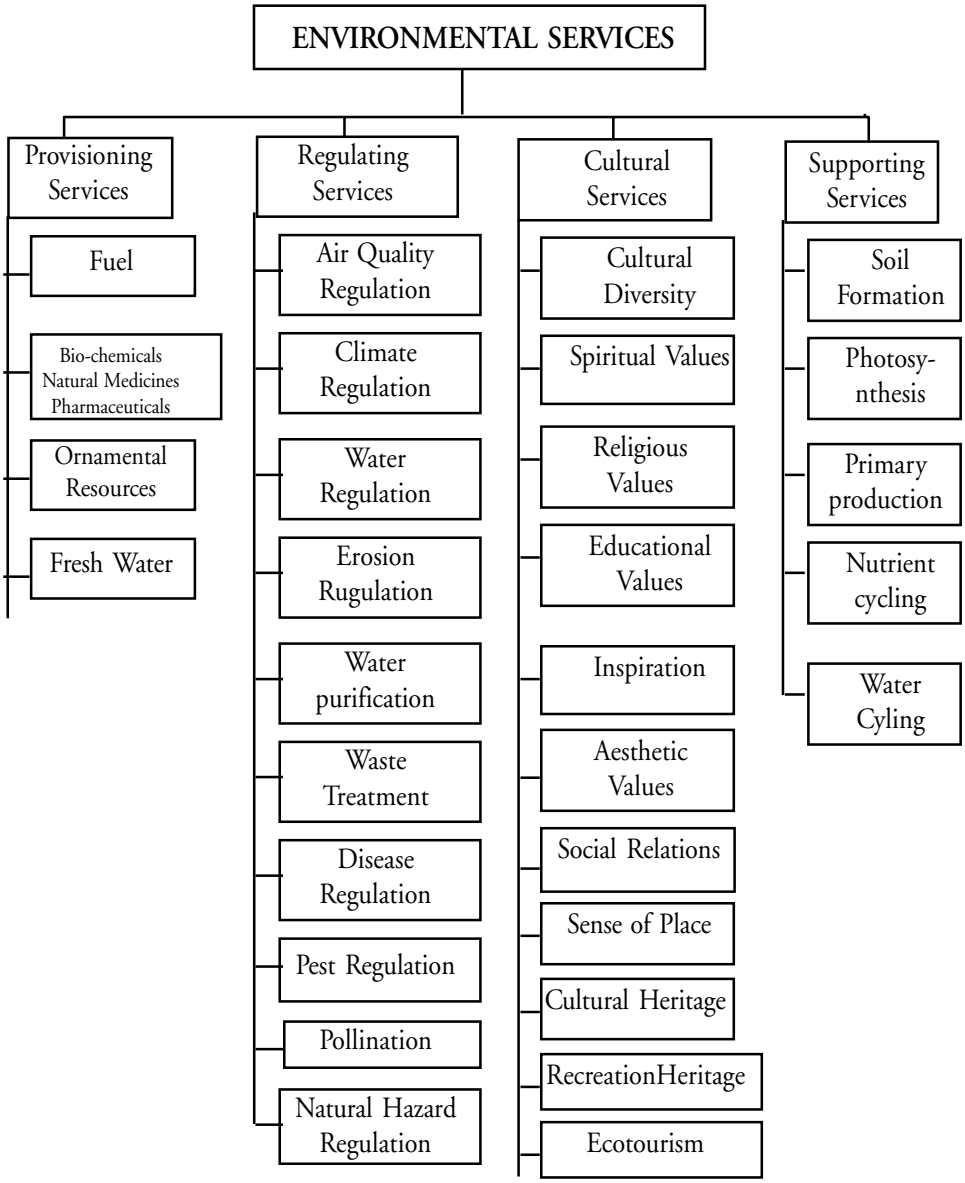
The Millennium Ecosystem Assessment Report (MA, 2005) has defined ecosystem services as the benefits people obtain from ecosystems. These include provisioning, regulating, and cultural services that directly affect people and the supporting services needed to maintain other services. Many of the services listed here are highly interlinked (primary production, photosynthesis, nutrient cycling and water cycling; for example, all involve different aspects of the same biological processes).

The Costa Rican Forest Law provides a definition of environmental services along the following lines:

"Those provided by forests and forestry plantations that have an impact on environmental protection and improvement. They are the following: mitigation of greenhouse gas emissions (fixing, reduction, sequestration, warehousing and absorption); protection of water for urban, rural or hydroelectric use; biodiversity protection to conserve it and for sustainable, scientific and pharmaceutical use; genetic research and improvement; protection of ecosystems, life forms and natural scenic beauty for tourism and scientific ends. (Rosa et al., 2003)"

In the line of these definitions, Environmental Services (ES) can broadly be classified as provisioning services, regulating services, cultural services and supporting services; and each of these services can again be sub-classified (Figure 1). Westman (1977) suggested that the social value of the benefits that ecosystems provide could potentially be enumerated so that the society can make more informed policy and management decisions. He termed these social benefits as 'nature's services' and commonly referred them as 'ecosystem services' ? a term first used by Ehrlich and Ehrlich (1981). ES are also defined as a set of benefits generated for the society by the existence and dynamic developments of natural resources or ecosystems. ES can also be seen as a set of regulatory functions (on stocks and flows of matter and energy) of the natural ecosystems and some agro-ecosystems that help to maintain or improve the environment and people's quality of life (Odum and Odum, 2000; NRC, 2004). De Groot *et al.* (2002) define ecosystem functions as "the capacity of natural processes and components to provide goods and services that satisfy human needs, directly or indirectly".

Figure 1: Classifications of Environmental Services



Source: Millenium Assessment (2005)

Definition of Payments for Environmental Services (PES)

The types of ES and the way they influence human societies has become complex over the years. There are alternative definitions that are used to understand and describe the interactions between the natural environment and human societies. The PES schemes are confined to those ES that have existing market demand or for which such demand can emerge under appropriate conditions. Such ES generally fall within four categories: water services, carbon sequestration, biodiversity conservation and landscape beauty. Although the concept of PES has been defined differently, it broadly refers to any kind of market-based mechanism for conservation of natural resources, such as eco-certification and charging entrance fees for tourists. One of the widely accepted definitions of PES has been provided by Wunder (2005). According to Wunder (2005), PES is a voluntary transaction where a well-defined ES is bought by an (minimum one) environmental service buyer from the ES provider and the ES buyer does so if and only if the ES provider over time secures the conditional provision of that service. Similarly, CIFOR defines PES as a voluntary transaction where a well-defined ES (or corresponding land use) is bought by an (minimum one) ES buyer from an (minimum one) ES provider if and only if ES provision is secured (conditionality). This simple definition provides the theoretical basis of subsequent developments in PES literature.

This conventional approach to PES, however, singles out the ES such as carbon sequestration, water regulation or filtration, single species biodiversity, etc., and focuses on the use of economic instruments for achieving environmental goals at the lowest possible costs (Rosa *et al.*, 2002). Further, it emphasizes on simplified and large-scale ecosystems, preferably owned by few people, to reduce transaction and monitoring costs along with secured private property rights to reward landowners.

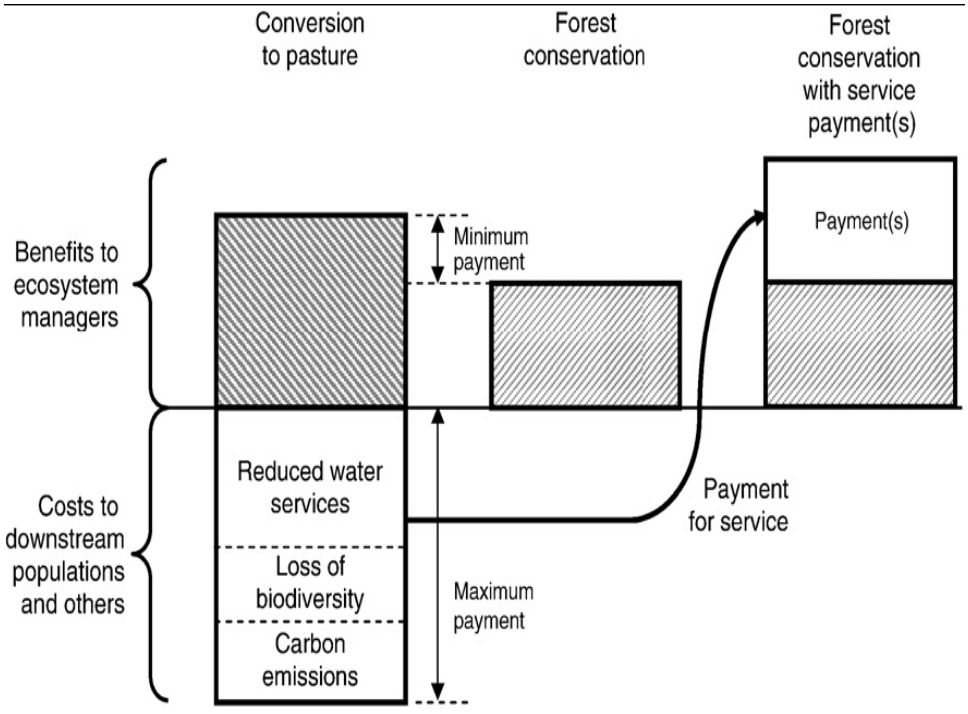
This PES definition includes several sub-dimensions and categories (Wunder, 2005), of which two particularly should be distinguished for poverty-assessment purposes. First, public-sector schemes (central, state or municipalities) tend to have different access filters and less payment differentiation mechanisms than ones with private-sector buyers. Second, people can be paid either for conservation of pre-existing environmental services ("use-restricting" schemes) or for their restoration ("asset-building" schemes).

There is no commonly agreed definition of PES schemes, but rather a series of classifications based on environmental services, structure, types of payments, or others. This lack of common definition/classification reflects the great diversity of models, but also generates some confusion and lack of clarity in the literature as to which mechanism should be considered payments for ES (Mayrand and Paquin, 2004). The basic principle behind PES is that resource users and communities that are in a

position to provide ES should be compensated for the costs of their provision, and that those who benefit from these services should pay for them, thereby internalizing these benefits (Pagiola and Platais, 2002).

Figure 2 provides the basic logical structure of PES mechanism. According to this, an ecosystem manager/owner, whether he or she may be a farmer, loggers, and/or ecosystem protector, often receive few benefits from the land use that promotes conservation of environmental resources. However, these benefits are frequently less than the benefits that would be received from the alternative land uses such as conservation of forest to pasture and/or crop land uses. Though alternative land uses provide more benefits to owners, they are likely to generate negative externalities for people living downstream, who used to receive a variety of ecosystem services (e.g., water filtration, reduced soil erosion and siltation, etc.,) from the conservation of environmental resources. Payments by the receivers of these environmental benefits can help make conservation of ecosystem more attractive for the managers/owners of these resources, and thereby induce them to adopt conservation measures.

Figure 2 : The Logical Structure of PES



Source: Engel *et al.*, 2008.

The above explanation of the PES mechanism appears to be quite simple and straightforward and capable of addressing any environmental problems. But in actuality this is not the case. PES mechanism cannot be applied to all kinds of environmental problems. Ecosystems may be mismanaged for many reasons; not all of them are amenable to PES as a solution (Pagiola, 2003). For example, ecosystems can be managed badly because of lack of properly defined property rights over natural resources, lack of adequate awareness or information about land use practices, lack of sufficient provision of credit facilities to the land users, etc. (Engel *et al.,* 2008). In the absence of clearly defined property rights, ecosystem managers cannot exercise their authority over the resources and thereby cannot take management decisions because the ecosystem either belongs to none or it belongs to the state, which cannot enforce property rights, leading to open access. In such situations, the best solution would be to assign appropriate property rights. Similarly, if ecosystem mismanagement is due to inadequate information and awareness about land use practices that are economically beneficial for local ecosystem managers to adopt such land use practices, then the appropriate solution would be to provide access to education and spread awareness that would help the owners of the ecosystem. On the other hand, if ecosystem managers are not able to adopt certain land use practices that would generate extra benefits because of lack of access to credit facilities, then the government must make efforts to provide sufficient credits. The sources of market failure can easily be resolved with the help of policy intervention, and use of PES mechanism may not be required.

Section - III

Market, Policy, Institutions and PES

There are, however, sources of market failure such as externalities and public good. Under such conditions the above-mentioned voluntary action may not be effective to correct market failure, for instance, in several cases where ecosystem is mismanaged because many of their benefits are externalities from the perspective of ecosystem managers. In such situations, providing property rights and/or awareness to ecosystem managers will not be sufficient to deter the other agents from receiving the benefits of the ecosystem. It is often observed that most ES are pure public goods; users cannot be prevented from benefiting from the ES provided and consumption by one user does not affect consumption by another (e.g., carbon sequestration). Hence, voluntary approach is unlikely to bear fruit. The scope for the application of PES mechanism under such situations as described above is being increasingly seen as a potential corrective measure for market failures (Engel *et al.,* 2008).

Section - IV

Emerging Issues and Objective of the Study

The objective of the present paper is therefore to critically review the existing literature on PES programs across different countries and identify the key issues for a greater understanding of the factors that can hinder and/or promote the success of these programs in a developing country. Based on international experiences, the paper also aims at deriving the direction for future research on PES programs in the Indian context.

Section - V

Methodology and Source of Information

In order to address the above research questions, the existing studies will be classified on the basis of geographical locations of the countries, status of their development (e.g., developed, developing, and under-developed countries), and the types of resources covered (e.g., water, forests, lands, etc.). The rationale behind such classification is to capture the diversities in socio-economic and political set up as well as institutional arrangements and environment (e.g., benefit-sharing arrangement, user participation, planning and execution), leading to different PES outcomes across the countries. Further, the outcomes of the PES programs are also expected to vary across different types of natural resources as the dynamics of the provision of ecosystem services of each natural resource and the users of these services are likely to be different. Therefore, in order to have a clear understanding of the effectiveness of the PES programs and various conditioning factors that are likely to hinder the outcomes, it is necessary to have an analytical framework that can adequately address these diverse issues.

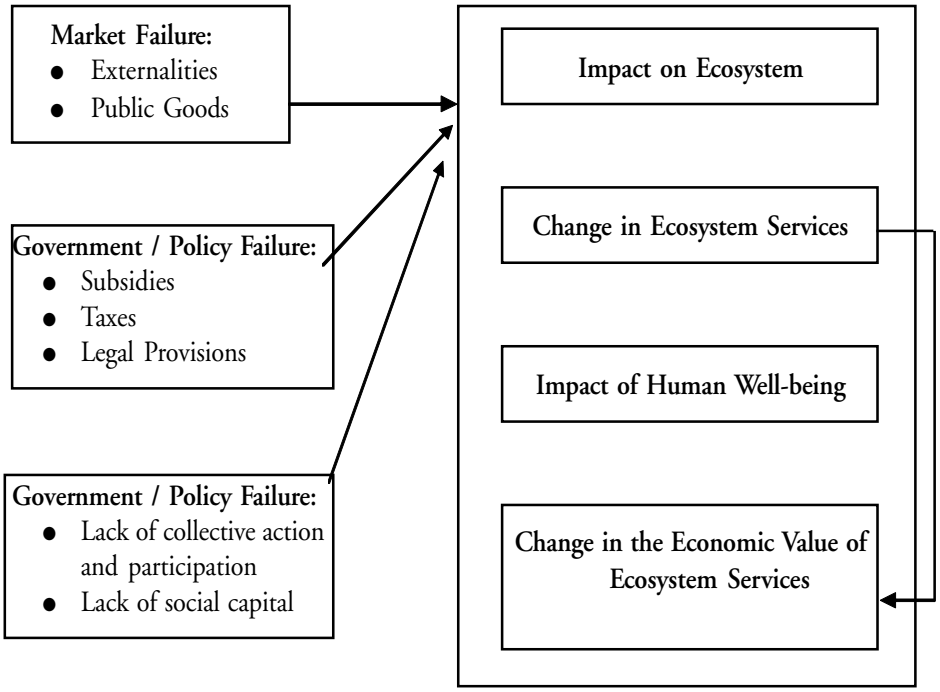
Analytical Framework

The factors responsible for degradation of natural and environmental resources can be classified into three groups, viz., policy failure, institutional failure and market failure (Pearce and Warford, 1993; Panayotou, 1993). Policy failures occur when policy intervention by the government limits efficient functioning of the market forces and thereby results in degradation of natural resources[1] . Governments across the globe distort the market prices of irrigation, energy, pesticides, forests, etc., by subsidizing and/or introducing administered price that cannot recover costs. This encourages the consumers

[1]For example, many natural resources are priced even below marginal costs. The effects of this under pricing can produce results that are not socially optimal.

to use the critical environmental resources unsustainably. In addition, governments also use various policies relating to agricultural production and industrial pollution that result in economic distortions and frequent degradation of the environment. Environmental and natural resources also get degraded due to failure of institutions at the national, regional and local level. Faulty design of rules and the legal framework that govern conservation and use of natural resources on many occasions provide wrong signals to the users and motivate them to over-exploit the same. Further, when vast tracks of natural resources are collectively managed by local users, it is observed that due to lack of collective action amongst the users, these local institutions may become ineffective, leading to mismanagement and degradation of natural resources.

Figure 3: Market-Institutions-Policy-Ecosystem Relationships



Thus, policies, market forces and institutions either individually or collectively influence the ecosystem and economic valuation of the ecosystem services (Figure 3). But, what is more important is that market failures on the part of the market forces, policy interventions or the institutions are not independent of each other. Figure 3 shows the inter-linkages amongst these factors and their impact on the environment. It is observed that market failure may lead to institutional failures through failures in policy interventions.

Section - VI

Organization of the Report

The rest of the report is structured in the following way: Chapter II reviews the existing literature on PES experiences in different countries with special emphasis on the study by Wunder *et al.* (2008) and highlights the important issues and their implications. The implications of the review are substantiated further with detailed analysis of some selected important cases on PES in Chapter III. Chapter IV analyzes in detail the key aspects of PES scheme in Costa Rica, particularly its evolution and impacts. Chapter V makes a critical assessment of the ecosystem management approaches followed in India. Chapter VI summarizes the major findings and highlights the important issues that can be addressed for future research on PES program in India.

CHAPTER 2

EXPERIENCES OF PES: A REVIEW

Introduction

In this chapter, we critically review various approaches that different countries across the globe have followed while designing their respective PES schemes. In addition, we also critically review and analyze the factors that have contributed to the effectiveness and efficiency of the PES program and their key outcomes. Two approaches are followed for this purpose. First, we review around 65 empirical research papers that are published in various international and national scientific journals, including the working papers of different multilateral institutions such as the Asian Development Bank, World Bank, Food and Agriculture Organization, etc. Five summary characteristics of PES programs of each research paper are emphasized, viz., PES types (e.g., government financed or user financed), ES types (e.g., water services, biodiversity services, carbon sequestration, landscape beauty, etc.), country location, pricing mechanism and main findings of the study. A detailed review of the existing studies across these five characteristics is presented in Table 1. Next, we have also used key information from a review of case studies by Wunder *et al*. (2008) to supplement our analysis. The idea of using information from Wunder *et a*l. (2008) is that they provide some interesting dimensions of the PES program which they have specifically collected from field study. This gives us a comprehensive view about the PES schemes. The major findings of Wunder *et al*. (2008) are presented in the Appendix.

Section - II
Review of the PES Programs

As regards the different types of PES programs across countries, it is observed that there are three types of PES schemes in operation - government financed, user financed and hybrid (NGOs and/or donor financed) (Table 1). This is quite consistent with our theoretical understanding as presented in the introductory chapter. However, government

financed PES programs are found to be more predominant than user financed programs. Interestingly, the literature on hybrid PES programs is very limited. There are, of course, cases where initially the government has funded the PES scheme and subsequently the PES has become user financed (Classen *et al.*, 2008). In Latin American countries, PES programs, both government and user funded are frequently observed, which is in our definition a mixed or a hybrid type PES scheme (Koellner *et al.*, 2008). In addition, NGOs and/or national and international donor agencies are also found to be engaged in supporting PES schemes across countries (Wunscher *et al.*, 2006; George, 2009; Oestreicher *et al.*, 2009; Asquith *et al.*, 2008). Most of these donor agencies are found to be involved in biodiversity and other environmental resource conservation projects that have reached the critical threshold level (Wunder *et al.*, 2008). For example, protection of habitat for birds and other species of flora and fauna have been primary objectives of donor funded PES programs (Asquith *et al.*, 2009).

As mentioned above, there are mainly four types of ES that are frequently seen to be targeted by PES schemes - watershed services, biodiversity services, carbon sequestration and land conservation. The review of these studies in Table 1 indicates that watershed protection is observed to be the single most dominating ES that most of the PES schemes across countries have been focusing on, followed by carbon sequestration and biodiversity conservation. It is also observed that most of the watershed protection PES schemes are user financed and the PES schemes with objectives of carbon sequestration are financed by the governments. This suggests that wherever ES are private and/or club goods in nature, user financed PES schemes are more likely to emerge. On the other hand, when ES involve public good, such as carbon sequestration and biodiversity conservation, government financed PES schemes are preferred. The theoretical understanding of these issues has been discussed in detail in the previous chapter.

Interestingly, a number of pricing mechanisms are used in different PES schemes. The pricing mechanism ranges from willingness to pay for benefits derived from ES in US (Bayles *et al.*, 2008), to market-based pricing, command and control (Kosoy *et al.*, 2006), replacement costs (Gret-Regamay *et al.*, 2008), and input and technology costs (Bayles *et al.*, 2008). It is important to note that willingness to pay for ES has been widely used in PES schemes as a mechanism to determine the price of the ES. However, in a market with both the buyers and sellers having equal power to decide the price, the price of ES should be based on the buyers' maximum willingness to pay and sellers' minimum willingness to accept. Of course, the different pricing mechanism followed does not necessarily suggest that ES is being traded entirely on the basis of market signals.

The second approach followed in this chapter is based on review findings of Wunder *et al.* (2008). They have synthesised the characteristics of various PES programs in terms of their design, costs, environmental effectiveness, etc. The existing works have emphasised on how the PES programs are funded and Wunder *et al.* (2008) have classified them accordingly. It is observed that majority of the PES programs initiated so far are financed by the government and therefore suffer from the problem of high administrative and transaction costs. Further, on many occasions, successful implementation of government financed PES programs are constrained by political pressures that lead to poor design of the programs and operational inefficiency. Interestingly, in government financed PES programs, the funding generally comes from a third party, leading to the problem of transparency, accountability and rent seeking. Such source of funding from a third party also reduces the incentive for the implementing agency.

On the other hand, in user financed programs, the funding comes from the users of the ES. As the users pay, there is lack of trust in most cases. Further, the user financed programs are also observed to have the problem of free-rider and high monitoring costs. In addition, constraints in communal capacity and lack of appropriate incentive structure also create obstacles in successful implementation of the PES programs.

Thus, neither the government financed nor user financed PES programs are free from constraints in their implementation. In fact, successful implementation of PES programs is largely conditioned by the market conditions, supportive policies, enforcement agencies, incentive structure and institutions. In other words, the source of financing of the PES programs may not influence the outcomes in a considerable way. On the other hand, the income-generating effects of the user financed programs in many cases are higher as compared to that of the government financed PES programs. Probably that is why some of the government financed programs are attempting to evolve in such a way that they become closer to the user financed programs.

Table 1: Approach to PES across Countries

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Heal, G (2009)		Not country specific		Use of discount rate to remove intergenerational discrimination
	The study justifies the need for climate action through cost-benefit analysis. However, the issues relating to the impact of climate change on natural capital and the ways in which this may compromise with the flow of essential ecosystem services remain unexplored			
Adhikari, B (2009)	User-based approach	Vietnam, Nepal, China, India, Australia, Philippines	Land management, forestry, water supply, biodiversity	
	The paper demonstrates the significance of four major elements facilitating the adoption and implementation of PES schemes, viz., property rights and tenure security, transaction costs, household and community characteristics, communications and the availability of PES-related information. The paper suggests that PES schemes should target win-win options through intervention in these areas; aim at maintaining the provision of ecological services, and improving the conditions for local inhabitants.			
Bayles, K *et al.* (2008)	Govt. support	USA and European Union	Agricultural services	In USA, it is based on benefits derived. In EU it is based on input or technology use.
	The paper compares USA and EU policies of paying for environmental services produced by agriculture. It argues that agri-environmental policy in the EU primarily addresses the positive environmental externalities generated by agricultural production, while the USA policy mainly addresses negative externalities.			
Dobb & Pretty (2008)	Long-term contract between the government and the farmers	UK	Protection of valued landscape	

Contd...

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
	Early ES programs such as ESA and CSS had mixed results. Both ESA and CSS proved to be generally effective in enrolling many farmers at the entry-level contracts but failed to attract high levels of enrollment in the intensive farming areas. Following the reforms of the EU's CAP, England's ESA and CSS are being replaced by a new consolidated package of schemes.			
Claassen *et al.* (2008)	Initially govt. funded and subsequently user funded	US	Agri-environmental services	
	The study reviews key features of US agri-environmental programs and finds that benefit-cost targeting using environmental indices can increase environmental cost effectiveness.			
Koellner *et al.*(2008)	Both user financed and govt. financed	Countries of Latin America	Ecosystem services	
	This paper studied Latin American organizations that "sell" ecosystem services from tropical forests in terms of their general management, marketing, forest management, client and stakeholder satisfaction, and forest ecosystem status. It found that supplying organizations vary widely with respect to their achievements in these areas.			
Ferraro, P.J (2008)	User financed			Through bidding
	The two dominant forms of price setting for PES contracts are bilateral bargaining and posted prices. However, these two methods may result in highly inefficient outcomes because information between contract buyers and sellers is highly asymmetric.			
Koso, N *et al.*(2008)		Central America	Water-related services	Market based and not command and control
	The study compared three cases of payments for water-related environmental services (PES) in Central America, and found that, in general, the opportunity costs are larger than the amounts paid, which apparently contradicts the economic foundation of PES schemes and suggests that the role of "intangibles" is important in inducing participation. The results also show that trade-offs between different environmental and social goals are likely to emerge in PES schemes. It also found that PES schemes may work as conflict-resolution instruments, facilitating downstream-upstream problem solving.			

Contd...

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Zhang *et al.* (2008)	Govt. funded	China	Sloping land conversion program	
	The paper highlights various problems related to land conversion program.			
Bennet, M.T (2008)	Govt. funded	China	Sloping land conversion program	
	The paper provides some suggestions for better and effective land conversion program.			
Raymond, C.M *et al.* (2008)	User financed	Australia	Ecosystem services	
	This study develops a new method for mapping community values for natural capital assets and ecosystem services that address the need for capturing a broader range of values assigned to ecosystems over geographic space.			
Wunder & Alban (2008)	User funded	Ecuador	Water shed and carbon sequestration	
	The study compares two decentralized cases of environmental services and finds that both schemes have been relatively effective in reaching their environmental objectives in terms of having probably high additionality levels and low leakage effects. Targeted environmental service and a strong degree of conditionality seem to be the two key factors explaining these achievements.			

Contd...

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Fisher, B *et al.* (2009)		Not country specific	Ecosystem services	
	There have been several attempts to come up with a classification scheme for ecosystem services, but there has not been an agreed upon, meaningful and consistent definition for ecosystem services. This paper offers a definition of ecosystem services that is likely to be operational for ecosystem service research and several classification schemes.			
Wunder *et al.* (2008)	Studies both user financed as well as govt. financed.	Developed vs. developing	Ecosystem services	
	One of the important findings has been that user financed PES programs are much more likely to be efficient than government financed ones.			
Brand, F (2008)		Not country specific	Maintenance of critical natural capital.	
	This article revisits the concept of critical natural capital and examines its relation to the concept of ecological resilience, and proposes that ecological resilience can help a great deal in specifying the "ecological criticality" of specific renewable parts of the natural capital. More specifically, it suggests that the degree of ecological resilience is inversely related to the degree of threat ecosystems are prone to.			
Gren & Isac (2009)		Sweden	Forest, water, agriculture and landscape	
	The main purpose of this paper has been two-fold: to derive a measurement of non-marketed ecosystem services to be included in regional income accounts and to apply this for calculation of regional green accounts in Sweden. A specific feature of this paper is the treatment of natural capital assets as inputs into production of ecosystem services. The result indicated a change in the regional pattern of income/capita, the environmentally adjusted income being highest in the northern regions, while the conventional income is highest in the southern regions.			

Contd...

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Smith & Applegate (2004)		Countries of Asia and Latin America	Forest management	
	The paper finds that forest management projects may be less cost effective than previously assumed. Therefore, expectations about their potential contribution to improved management should be scaled down. At the same time, the extent to which such projects will enable industrialized countries to avoid reducing industrial pollution is also unlikely to be significant.			
Gret-Regamey *et al.* (2008)		Swiss Alps	Avalanche protection, timber production, scenic beauty and habitat	Willingness to pay method for tourism; habitat replacement cost for pricing habitat; risk analysis is made for avalanche protection.
	The study compares the impacts of a human development scenario and climate scenario on the value of these ecosystem services. Urban expansion and tourist infrastructure developments have a negative impact on scenic beauty and habitats. These impacts outweigh the benefits of the developments in the long term. Forest expansion, predictable under a climate change scenario, favours natural avalanche protection and habitats. In general, such non-marketed benefits provided by the case-study region more than compensate for the costs of forest maintenance.			
George *et al.* (2009)	Hybrid	Thailand	Watershed management	
	The study's main findings are: (i) acceptance of PES principles and constraints are directly related to stakeholders' perception of their land rights irrespective of their actual rights; (ii) Willingness to Pay (WTP) is very low among local stakeholders, making any PES market unlikely to emerge without external support.			

Contd...

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Kumar & Managi (2009)	Govt. financed	India		
	It discusses mechanisms to compensate local governments for the public provision of environmental services using the theory of optimal fiscal transfers in India. This study highlights the need for both, lump sum and earmarked grants for internalizing the spillover effects. Earmarked grants are better suited for environmental clean-up activities and for financing ways in which human resources & built infrastructure can be improved to build resilience to environmental degradation. Lump sum transfers are better suited for precautionary activities such as nature preservation, soil & water protection.			
Corbera & Brown (2008)	Govt. financed	Mexico	Carbon forestry program	
	The paper identifies theoretical and practical barriers to implementing institutional arrangements for forest carbon trading.			
Engel *et al.* (2008)		Not country specific	All types of ES	
	The paper discusses the scope and definition of PES. It reviews some of the principal dimensions and design characteristics of PES programs and then analyses how PES compares to alternative policy instruments. Finally, it examines in detail two important aspects of PES programs: their effectiveness and their distributional implications.			
Grieg-Gran *et al.* (2005)	User financed	Latin American countries	Carbon sequestration and watershed management	
	The paper recommends pro-poor policy measures such as reducing smallholders' transaction costs and removing inappropriate access restrictions.			
Wunscher *et al.* (2008)		Costa Rica	Forest-based ES	
	Using data from Costa Rica's Nicoya Peninsula, the study empirically tests the tool's potential to increase the financial efficiency of the forest-focused PES program in place. The results show that, given a fixed budget, efficiency increases radically if per hectare payments are aligned to landowners' heterogeneity in participation costs, involving opportunity, transaction and direct costs of protection, respectively.			

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Graff-Zivin & Lipper (2008)		Not country specific	Carbon sequestration	
	The result suggests that pooling soil carbon sequestration payments and devising other group schemes to help farmers share risk and offer the potential of providing an effective way of stimulating agricultural development and poverty reduction through climate change mitigation initiatives.			
Alix-Garcia *et al.* (2008)		Mexico	Forest management	
	This paper discusses the gain in efficiency from including deforestation risk as a targeting criterion in payments for environmental services programs. Using observed past deforestation, it is found that while risk-targeted payments are far more efficient, capped flat payments are more egalitarian.			
Pagiola, S (2008)	User financed	Costa Rica	Carbon sequestration, water, biodiversity, etc.	
	This paper examines the experience of Costa Rica's PSA program and points out that there is considerable room for improvement in the efficiency with which PSA generates environmental services.			
Russo & Candella (2006)		Costa Rica	Considers most of the ES	
	The paper highlights the lessons learnt from Costa Rican PES program. It also points out the role and goodwill of the govt. in proper implementation of PES.			
Ortega-Pacheco *et al.* (2009)	User financed	Costa Rica	Watershed	Willingness to pay
	It examines the viability of using locally financed payments to protect watershed services in rural eastern Costa Rica. Using dichotomous choice contingent valuation, it measures households' willingness to pay higher water bills for a local PES program to adjust upstream land use practices in order to protect downstream water quality. It found that every income segment of the local population of water users exhibited significant demand and willingness to finance the PES program to protect local water quality.			

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Bulte *et al.* (2008)		Not country specific	Considers different types of ES	
	The studies presented here offer insights into the design of PES programs, their direct and indirect impacts, and the constraints affecting their performance.			
Pagiola *et al.*(2008)	User financed	Nicaragua	Considers different types of ES	
	This paper uses data from Payments for Environmental Services project being implemented in Nicaragua to examine the extent to which poorer households that are eligible to participate are in fact able to do so. The study site provides a strong test of the ability of poorer households to participate, as it requires the participants to make substantial and complex land use changes. The results show that poorer households are in fact able to participate - indeed, by some measures they participated to a greater extent than better-off households.			
Leimona & Joshi (2009)		Asian countries	Considers different types of ES	
	This paper assesses some key issues associated with the design and implementation of Reward for Environmental Services (RES) in various Asian pilot sites. Model of the income share of RES payment value demonstrates that RES can only have a significant effect on rural income in upstream areas under certain conditions.			
Miranda *et al.* (2006)	User financed	Costa Rica	Participatory forest management	
	The Costa Rican case shows that financial incentives can play an important role in participatory forest management. However, the success of the approach depends on a society's consensus on the value of nature, the availability of relevant knowledge, on an adequate implementation structure with well-qualified NGOs, and last but not the least, on enough funding possibilities. Thus, the approach should be exported only to countries in which these cultural, organizational and economic conditions are present.			

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Reynolds *et al.* (2009)		Ethiopia	Natural capital	
	This paper investigates the potential for investments in human & natural capital in Ethiopia to promote sustainable development. It finds that targeted investments in human & natural capital might allow rural Ethiopians to replace cycles of poverty, sickness and environmental degradation with cycles of knowledge, health and life.			
Seeberg-Elverfeldt *et al.* (2009)		Indonesia	Agro-forestry	Linear programming model is used to determine carbon price. Transaction cost is not taken into account.
	This study assesses the impact carbon sequestration payments for forest management systems have on the prevailing land use systems. The paper finds that if carbon payments are applied in general to all agro-forestry systems, there will not be a great impact in terms of a contribution to environmental services. However, if other criteria, such as the provision of further environmental services are included, specific systems can be targeted in order to promote a switch towards these agro-forestry services.			
Prasetyo *et al.* (2009)	Govt. and user funded	Indonesia	Watershed and forest management	
	PES schemes are still new in Indonesia, and most are in the phase of conceptual development and experimental implementation. Different stakeholders and institutions are involved at different stages of the process in order to define the most appropriate scheme for a particular community and the potential for putting payments/rewards in place.			
Jack, B.K (2009)		Kenya	Watershed externalities	
	This study models a payment for environmental services intervention in an experimental field laboratory in Nyanza Province, Kenya. Upstream and downstream individuals are paired in a standard investment game, in which the upstream mover's investment represents land use decisions and the downstream mover responds with a choice of compensation payment.			

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Corbera *et al.* (2007)		Meso-America	watershed recharge and CO2 fixation by forests	
	This paper investigates the equity implications of marketing ecosystem services in protected areas and rural communities. It uses a three-tiered equity framework to analyse four distinct efforts to commercialise watershed recharge and carbon dioxide fixation by forests in Meso-America. It shows that project development and participation are strongly mediated by organisational networks, as well as existing rights of access over land and forest resources.			
de Groot & Hermans (2009)		Netherlands	Water-related environmental services	
	This paper addresses the question of how the development processes of payment schemes for water-related environmental services could be understood and supported. The results from case studies in the Netherlands indicate that the concepts and the analytical tools of negotiation analysis provide a useful addition to the existing lenses through which PES development is regarded.			
Barton *et al.* (2009)		Costa Rica	Biodiversity conservation	
	This paper explores the use of biodiversity complementarity's value in considering the cost effectiveness of payments for environmental services. It finds that the more recent PES allocation criteria in Costa Rica for 2002-2003 are more than twice as cost efficient as the criteria applied during 1999-2001 in terms of biodiversity representation and opportunity cost to agricultural and forestry sectors.			
Oestreicher *et al.* (2009)	Hybrid	Panama	Forest management	
	The result of the study illustrates that coupling surveillance measures with greater funding and strong governance are paramount to reducing deforestation. Alone, however, these factors are insufficient for forest protection. It argues that conservation approaches that complement effective surveillance with community participation and equitable benefit sharing will address the wider issues of leakage and permanence.			

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Ortega-Pacheco *et al.* 2009	User funded	Costa Rica	Watershed	Household's willingness to pay estimated by CVM.
	The study examines the viability of using locally financed payments to protect watershed services in rural eastern Costa Rica. The research finds a strong indication of support for and willingness to pay for local, collective protection of hydrological services in the study areas' headwaters.			
Jourdain *et al.* (2009)	Govt. funded	Vietnam	Forest management	
	This paper reviews the potential response of upland farming households in Vietnam to a PES scheme that rewards them to set aside part of their land for the production of environmental services. It finds that farmers are unlikely to participate in a voluntary land retirement program unless they are "compensated" for the loss in food production.			
Munoz-Pina *et al.* (2008)	Both govt. and user funded	Mexico	Hydrological services	
	This paper describes the process of policy design of the Payment for Hydrological Environmental Services, the main actors involved in the program, its operating rules, and provides a preliminary evaluation. One of the main findings is that many of the program's payments have been in areas with low deforestation risk. Selection criteria need to be modified to better target the areas where benefits to water users are highest and behavior modification has the least cost.			
Frost & Bond (2008)		Zimbabwe	Wildlife services	
	The study suggests five main lessons for emerging PES schemes: community-level commercial transactions can seldom be pursued in isolation; non-differentiated payments weaken incentives; start-up costs can be high and may need to be underwritten; competitive bidding can allow service providers to hold on to rents; and schemes must be flexible and adaptive.			

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Asquith *et al.* (2008)	Hybrid	Bolivia	Bird habitat and watershed protection	
	Local water users in Bolivia are often unable to sustainably manage their water resources because they lack accurate information, fair institutional mechanisms, and appropriate incentives. The model, being piloted in Los Negros, tries to address these three obstacles by introducing an incentive-based, transparent system of watershed management.			
Kumar & Kumar(2008)		Not country specific	Ecosystem services	
	The paper addresses lacunae in valuation of ecosystem services from a psychological perspective by arguing that the common person's perception of the ecosystem is quite different from what is conceptualized by conventional economists. The paper shows how the ecological identity of individuals is revealed at various levels of the decision-making hierarchy that is, from local to regional and further, onto a global level.			
Zabel and Roe (2009)		Not country specific	Different types of ES	
	The study reviews and translates key aspects of the economic theory of incentives into the context of performance payment schemes with special attention paid to two practical issues: risks outside the individual's control and distortion in the measurement of environmental services. Four different incentive payment approaches are presented, and the effects of risk and distortion on optimal incentives are discussed.			

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Sangkapitux *et al.* (2009)		Thailand	Land conservation	Marginal willingness to pay is estimated by dividing the attribute coefficient with the price coefficient
	This paper discusses the potential of developing compensation schemes in a socio-political context where upland farmers - mostly belonging to ethnic minority groups - tend to be considered a threat to the natural resource base rather than providers of environmental services. Results from the study suggest that downstream resource managers would be willing to provide on average nearly 1% of their annual income for a substantial improvement of the quantity and quality of water resources, which could be achieved by compensating upstream farmers' change of their agricultural systems towards more environment-friendly practices.			
Akca *et al.* (2005)		Not country specific but primarily for LDCs	Agricultural externality	
	In the past, agricultural policies have taken little or no account of the environmental side effects of actions designed to raise output and productivity. There is considerable scope for improving the environmental awareness of agricultural policies. The present paper provides some proposals to improve environmental awareness of agriculture.			
Kerr *et al.* (2007)	Govt. funded	India	Watershed	
	In India, the most widespread approaches for internalizing watershed externalities are investment subsidies and indirect benefits such as temporary employment. Less common approaches, more frequently pursued by the best NGOs, are moral suasion, building local organizational capacity and facilitating negotiation, and locally implemented restrictions, fines, and user fees. Approaches found only very rarely are adaptations of payment for environmental services and mergers.			

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Pagiola, S (2008)		Costa Rica	Watershed, biodiversity, carbon sequestration	
	The PSA program of Costa Rica has considerable room for improvement in the efficiency with which it generates environmental services. With experience, many of these weaknesses are being gradually corrected as the PSA program evolves towards a much more targeted and differentiated program. An important lesson is the need to be flexible and to adapt to lessons learned and to changing circumstances.			
Dillaha *et al.* (2008)		Regional synthesis (Latin America, Africa, Asia)	Watershed services	
	Payment for Watershed Service (PWS) and PES programs featuring all their PES characteristics are exceedingly rare in the developing world. PWS and PES programs are the most advanced in Latin America and the least advanced in Africa, which has only two watershed service programs with PES-like elements. The identified factors that tend to promote successful PES programs include secure land tenure; technical capacity to design and manage programs, including layering financial and non-financial incentives; the presence of fair brokers acting as intermediaries between buyers and sellers; higher standards of living, etc.			
Wunder, S. (2007)		Latin American and Asian countries	ES in tropical conservation	
	PES are arguably best suited to scenarios of moderate conservation opportunity costs on marginal lands and in settings with emerging, not-yet realized threats. Actors who represent credible threats to the environment will more likely receive PES than those already living in harmony with nature. A PES scheme can thus benefit both buyers and sellers while improving the resource base, but it is unlikely to fully replace other conservation instruments.			

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Robertson & Wunder (2005)		Bolivia	Ecotourism, watershed, carbon sequestration	
	This study provides an overview and assessment of environmental, economic and social effects of various PES-related initiatives as well as an overview of challenges and promoting factors to PES in Bolivia. The present paper studied 17 ongoing initiatives in Bolivia. However, none of them are "pure" PES schemes, as no pure PES scheme currently exists in Bolivia.			
Blackman & Woodward	User financed	Costa Rica	Hydropower	
	The study uses original survey data and official statistics to analyse user financing in Costa Rica's renowned national PES program, focusing on the amounts and sources of such financing. It finds that user financing from all sources supports less than three percent of the program's total payments to environmental service providers.			
Kallesoe and Alvis (2004)	Govt. financed and hybrid	Sri Lanka	Different types of ES	
	It studies the status of PES and environmental service markets in Sri Lanka and describes the opportunities and constraints found within the legal and institutional framework. Overall, the experiences with implementing sustainable financing mechanisms in an effort to improve local livelihoods and secure environmental integrity are limited in Sri Lanka.			
Manez-Costa and Zeller (2005)		Guatemala	Watershed program	
	The paper tries to calculate the amount of compensation required to be provided to farmers to induce them to take part in PES. It creates and studies different scenarios and proposes the creation of incentive scenarios for greater involvement of farmers.			

Table 1: Contd..

Author (Year)	PES Types	Country	ES Types	Pricing Mechanism
Wunder (2005)		Latin American & Asian countries	Different types of ES	
	This paper aims to help demystify PES for non-economists, starting with a simple and coherent definition of the term. It then provides practical "how-to" hints for PES design. It considers the likely niche for PES in the portfolio of conservation approaches. This assessment is based on a literature review, combined with field observations from research in Latin America and Asia.			
Perrot-Maitre (2006)	User financed	France	Water conservation	
	The paper examines the methodology used by Vittel (Nestle Waters), and the ten year process that was necessary to transform conflict into a successful partnership. The study clearly demonstrates that there is a strong business case for private sector participation in water-related PES.			
Huang *et al.* (2007)		Asian countries	Watershed	
	The general sense among PES practitioners is that given the complex nature of poverty and environmental services, PES schemes alone are unlikely to induce the necessary incentive-based behavioural changes to achieve environmental, and potentially, poverty alleviation goals in Asia. Rather, PES will likely need to be coupled with other complementary, alternative approaches to ensure poverty alleviation and the sustainable flow of hydrologic and other environmental services.			
Agarwal *et al.* (2007)		India	Watershed	
	This report shares field experience and lessons in developing Incentive-Based Mechanisms (IBMs) for watershed protection services and improved livelihoods at micro- and macro-scales, derived from an action-learning project in India. It finds that application of IBMs on a long-term basis will provide the motivation for catchment protection throughout the operational phase of a dam. IBMs will also help to maintain and enhance the provision of environmental services.			

Section - III

Issues and Implications

The review of the existing studies on PES as carried out in the previous section clearly show that the PES schemes, whether financed by the users or by the governments, face a number of obstacles in their successful implementation. The exact set of these constraints, however, vary across the schemes. As a generalization, the following issues may be highlighted while analysing the PES schemes, particularly in the context of the developing countries like India:

Targeting

A targeted PES program may have a greater impact against an untargeted program as experienced in Costa Rica (Robalino *et al.*, 2008). The PES program is found to have little impact on deforestation rates due to lack of appropriate targeting. A properly targeted PES program can save most of its budget or drastically increase the impact of its current budget. This is likely to be so particularly when the program targets those areas of the country that face a relatively high threat of deforestation (Pfaff *et al.,* 2007).

Spatial targeting is an improved target mechanism developed by Wünscher *et al.* (2008). The amount of environmental services achieved with a given conservation budget can largely be enhanced through such targeting. There may be three specific targeting criteria, viz., benefits, threat levels and participation costs. Targeting a PES program on the basis of benefits may pose a challenge of dealing with potential trade-off between multiple service-provision objectives, choosing amongst or combining multiple indicators available even for single objectives, and considering spatial interactions. Targeting sites may have high environmental services scores, but it hardly poses any threat of deforestation. This leads to the issue of additionality. On the other hand, targeting PES programs on the basis of threat levels poses the challenge of estimating spatially explicit baseline scenarios of deforestation.

Hence, improved targeting requires administrative challenges like simultaneous decisions of all applications after a deadline. Targeting is also likely to face political challenges, as it may be perceived as inequitable and thereby may reduce popular support while channelling payments to selected recipients only. For instance, the landowners may protest against differential payments if homogenous payments have already been introduced with an apprehension of facing arbitrary discriminations. This means that transparency in the selection process is highly essential. In addition, there is also a need to compare gross environmental efficiency gains with the incremental transaction costs of targeting (Pfaff *et al.,* 2007).

Negotiation

A PES contract generates economic rent. Its distribution between the buyers and the sellers depends on the negotiation power of the respective stakeholders. It is possible that collective negotiation will reduce the transaction costs. Negotiation costs involve time and effort in organizing buyers and sellers, assessing current land uses and land use practices, establishing and designing contracts, and preparing documentations, as well as the costs of making implementation decisions (Mayrand and Paquin, 2004).

A fair negotiation may be possible if both the negotiating parties are equally powerful. However, in practice, environmental service buyers are often, though not always, in a better negotiating position on account of being fewer in number, more well-informed and initiative-seeking than the sellers of environmental service. The use of seller price differentiation, inverse auctions and other bidding tools is designed by the buyers to squeeze the sellers' share of the rents, thus reducing their welfare gains. In this respect, by enhancing organization and information levels among environmental service providers, their negotiating positions can sometimes be improved (Wunder, 2008).

Transaction Costs

Transaction costs that include costs associated with monitoring, negotiation and enforcement of the scheme, viz., costs of certification, monitoring of contractual obligations of buyers and sellers, and among groups of buyers and sellers (Swallow *et al.*, 2005; Adhikari and Lovett, 2006) play a pivotal role in the PES schemes. Given that the PES schemes involve creation of new markets with legal, fiscal and institutional support, there is a risk of transaction costs exceeding the potential benefits of the system. If transaction costs are too high, PES schemes may not be cost-optimal strategies to deliver environmental services. In that situation, managing transaction costs becomes a priority of the PES schemes (Mayrand and Paquin, 2004).

The costs of establishing a PES system and managing the same may be high. These costs may involve scientific research, consultations with land users and beneficiaries, assessments of current land uses and practices, contract design, implementation of a pilot phase, and so on. In addition, there are transaction costs such as monitoring, contracting and managing payments, associated with the maintenance of the system. All these costs are likely to reduce as markets mature and institutional supports needed become less intensive (Mayrand and Paquin, 2004).

Many a time, transaction costs are underestimated and this may undermine the viability of a PES scheme (Landell-Mills and Porras, 2002). Therefore, the PES schemes must aim at appropriate estimation of transaction costs by choosing the most effective

institutional set up (Eggertsson, 2005). There are three distinct sources of transaction costs, namely contact, contract and control (North, 1990). Contact involves the cost of measuring the valuable attributes of what is being exchanged. In PES, the cost of getting this information can be high. As compared to contact, contract involves the costs of protecting property rights. PES schemes require allocation of titles *de jure or de facto* on environmental externalities that benefit third parties. Protection of rights over environmental services entails high costs as they are transient in nature. Finally, control involves the costs of policing and enforcing agreements. Enforcement poses no problem as far as it is in the interest of the other party to live up to agreements. Without institutional constraints, self-interested behaviour is likely to exclude complex exchange in the presence of the uncertainty that the other party may face in his or her interest. This conflict of interest coupled with asymmetric information gives rise to contract theory (Laffont and Martimort, 2001).

Transaction costs can be reduced if land users are organized and structured enough to receive and redistribute payments. The operating costs are closely linked to the types of contracts and payments. The costs of contracting with land users are generally lower if simple contractual obligations are followed in practice. The waiting time for contract approval is another significant transaction cost that prevents small landowners from entering the system. Contract renewal procedures are other sources of transaction costs. In order to reduce transaction costs, an automatic renewal contract system may be introduced. If not that, at least there should be a lighter approval process for contract renewals if land users have been consistently complying with their obligations (Mayrand and Paquin, 2004).

Opportunity Cost

It is found that landowners with high-productive land are less likely to participate in a PES program, as their opportunity cost is much higher. Payments thus tend to go primarily to owners of low-productive land. Although this seems to make the poor more likely to receive payments, it is very difficult to generalize such proposition (Pagiola, 2005). In fact, the desirability of adopting a PES-promoted land use depends not only on per hectare profitability, but also on whether the land fits into the overall farming system. Larger holdings may, at times, have more flexibility in adopting PES-promoted land uses than smaller and subsistence-oriented holdings (Nowak, 1987). This has serious implications in the Indian context, as in many parts of the country, the lands are highly fragmented due to land reforms.

Section - IV
Concluding Remarks

The review of the existing literature including that of Wunder *et al.* (2008) highlights two important points. First, the application of PES mechanism as a market-based instrument to internalize the externalities has grown considerably over the last one decade or so. Second, the growing popularity of the PES schemes and the associated high expectation levels could not match with the outcomes at the ground when one analyses the strengths and weaknesses. As it is shown above, PES schemes differ substantially from one another. The differences can be attributed to differential adaptation of PES concepts in different ecological, socio-economic and institutional conditions. One of the important strengths of PES schemes is supply and demand side innovation of environmental conservation. Historically, environmental conservation has been viewed as lose-lose situation because of lack of effective demand from the buyers as conservation outcomes generally fall under the category of public goods. The innovation of PES schemes has made possible the conservation of environmental conservation a win-win situation by creating buyers and sellers for it. However, the efficiency of PES depends on the sellers who have to continuously supply the ES to buyers, which is known as conditionality. This conditionality tends to be violated when ES sellers face high transaction and opportunity costs and a host of other socio-economic and institutional factors as well. The next chapter provides detailed insights of how various PES case studies have been designed by taking into account the above-mentioned factors.

Appendix: Table 1: Characteristics of User and Government Financed PES Programs

Sl. No.	Case Country, Source	Environmental Services - Targeted	Environmental Services Paid for	Who Buys ?	Who else Benefits ?	Who Sells ?	Who Initiated ?	Starting year	Spatial Scale & Current Size	Obstacles to Implementations
User Financed PES Programs										
1	Los Negros, Bolivia (Asquith *et al.*, 2008)	Watershed and biodiversity protection	Carbon sequestration	Pampagrande Municipality, US Fish and Wildlife Service	Local water users, mostly irrigators	Santa Rosa farmers (46 landowners)	Fundación Natura (NGO)	2003		Trust building slow, low water-user payments
2	Pimampiro, Ecuador (Wunder and Albán, 2008)	Watershed Protection	Forest and páramo conservation/ restoration	Metered urban water users (20% fee)	Unmetered water users, irrigators	N. América Coop. (81% of members)	CEDERENA (NGO)	2000		Monitoring costs, free riders, link land use-service
3	PROFAFOR, Ecuador (Wunder and Albán, 2008)	Carbon sequestration	Re- and afforestation	FACE (electricity consortium)	Climate change mitigation beneficiaries	Communal and individual landholders	PROFAFOR (company set up by buyer)	1993		Fires, grazing constraints in communal capacity and incentives
4	Vittel (Nestlé Waters), France (Perrot-Maître, 2006)	Water quality	Best practices in dairy farming	Vittel	River basin agency	Dairy farmers - all 27 farms enrolled	Vittel	1993		Integrating non-agricultural sector (golf course, etc.)

Appendix: Table 1: Contd..

Sl. No.	Case Country, Source	Environmental Services - Targeted	Environmental Services Paid for	Who Buys ?	Who else Benefits ?	Who Sells ?	Who Initiated ?	Starting year	Spatial Scale & Current Size	Obstacles to Implementations
User Financed PES Programs										
5	Virilla, Costa Rica (Miranda *et al*., 2003)		Watershed				PSA Peugeot Citroen			Restriction on using forest as a temporary shelter for cattle, distrust on legal systems
6	Peugeot Carbon Sink, Brazil (May *et al.,* 2004)	Carbon sequestration	Forest	PSA Peugeot Citroen						
7	Bananal Project (May *et al.*, 2004)	Carbon storage	Reforestation, agro-forestry and regeneration	A philanthropic group initiated by UK Gas Utility Company	Providing local population with environmental education and support for sustainable income generation		Instituto Ecological a regional socio-enviro-nmental NGO			

Appendix: Table 1: Contd..

Sl. No.	Case Country, Source	Environmental Services - Targeted	Environmental Services Paid for	Who Buys ?	Who else Benefits ?	Who Sells ?	Who Initiated ?	Starting year	Spatial Scale & Current Size	Obstacles to Implementations
8	Mantadia Project, Madagas car	Carbon sequestration	Carbon emission reduction and biodiversity conservation	World Bank's Bio-Carbon Fund	Reforestation and forest management of the corridor area	Government of Madagascar	Minister of Environment, Water and Forest of Madagascar	2004		Need for capacity building with local organization and govt. organization, align-ment of govt. institutions for better policy coherence and clarification of the land tenure
Government Financed PES Programs										
9	Sloping Land Conversion Program (SLCP), China (Bennett, 2008)	Watershed protection	Carbon sequestration	Central Government	Downstream water users, timber consumers	Rural households	Central Government	Pilot 1999-2001, full scale 2002	7.2 million ha retired and 4.92 million ha reforested (2005)	Local government administration overburdened local governments retain farmer payments

Appendix: Table 1: Contd..

Sl. No.	Case Country, Source	Environmental Services - Targeted	Environmental Services Paid for	Who Buys ?	Who else Benefits ?	Who Sells ?	Who Initiated ?	Starting year	Spatial Scale & Current Size	Obstacles to Implementations
10	Payments for Environmental Services (PSA), Costa Rica (Pagiola, 2008)	Water, biodiversity, carbon, scenic beauty	Forest and páramo conservation/ restoration	FONAFIFO (autonomous state agency)	Tourism industry, water users	Private landholders, indigenous communities	FONAFIFO (autonomous state agency)	1997	National target areas, 270,000 ha (end 2005)	Funding availability, knowledge of land use-service links
11	Payments for Hydrological Environmental Services (PSAH), Mexico (Muñoz-Piña *et al.*., 2008)	Carbon sequestration	Re- and afforestation	CONAFOR (state forest agency)	All water users in watershed and those using aquifers	Communal and individual landowners	CONAFOR (state forest agency)	2003	National priority areas, 600,000 ha (2005)	Rent-seeking by communities with timber firms
12	Conservation Reserve Program (CRP), USA (Claassen *et al.*., 2008 - this issue; Baylis *et al.*., 2008)	Water quality	Best practices in dairy farming	US Government	Natural resource users (e.g. water users, recreation)	Farmers	US Government	1985	14.5 million ha (2005)	Links land use-service little researched; political factors reduce efficiency

Appendix: Table 1: Contd..

Sl. No.	Case Country, Source	Environmental Services - Targeted	Environmental Services Paid for	Who Buys ?	Who else Benefits ?	Who Sells ?	Who Initiated ?	Starting year	Spatial Scale & Current Size	Obstacles to Implementations
13	Environmental Quality Incentives Program (EQIP), USA (Claassen *et al.*, 2008 - this issue; Baylis *et al.*., 2008)	Water, soil, wildlife protection (also air, carbon)	Watershed	US Government	Natural resource users (e.g., water users, recreation)	Farmers	US Government	1996	Not area-driven	High admin. costs and transactions cost of customized schemes
14	Environmentally Sensitive Area (ESA) and Countryside Stewardship Scheme (CSS), United Kingdom (Dobbs and Pretty, 2008)	Biodiversity, recreation, watershed protection	Forest	Private foundation (targeted at CAP)	Natural resource users (e.g., recreation, water users)	Farmers in targeted areas	US Government + EU	ESA: 1986-2003; CSS: 1991-2003	England (2003): ESA: 640,000 ha CSS: 530,620 ha	Not available

Appendix: Table 1: Contd..

Sl. No.	Case Country, Source	Environmental Services - Targeted	Environmental Services Paid for	Who Buys ?	Who else Benefits ?	Who Sells ?	Who Initiated ?	Starting year	Spatial Scale & Current Size	Obstacles to Implementations
15	Northeim Model Project, Germany (Bertke and Marggraf, 2004)	Agro-biodiversity	Reforestation, agro-forestry and regeneration	Australian Government	Recreational beneficiaries of regional biodiversity	Farmers in modeled region	Private foundation (targeted at CAP)	Pilot 2000-03; payments 2004	288 ha grassland (28 farmers, 159 fields), Northeim District	Service property rights/ metric; monitoring costs; risk of reducing other incentives
16	Wimmera, Australia (Shelton and Whitten, 2005)	Groundwater salinity control	Carbon emission reduction and bio-diversity conservation		Downstream water users	Landholders in Steep Hill Country	Australian Government	2005	28,000 ha (10%) in steep hill country in Upper Wimmera	NA
17	Huetar Norte, Costa Rice (Miranda *et al.*, 2003)	Carbon watershed protection, biodiversity, landscape beauty				Private forestland owners		1996		

Appendix: Table 1: Contd..

Sl. No.	Case Country, Source	Environmental Services - Targeted	Environmental Services Paid for	Who Buys ?	Who else Benefits ?	Who Sells ?	Who Initiated ?	Starting year	Spatial Scale & Current Size	Obstacles to Implementations
18	Noel Kempff Mercado Climate Action Project, Bolivia	Carbon and biodiversity benefits						1997		
19	The Program of Payment for Hydrological Environmental Services for Forest, Mexico (Munoz-Pina *et al.*, 2008)	Watershed protection and forest preservation		Ministry of Environment, Govt. of Mexico	Industries, active users	Owners of the forest and citizens	Ministry of Environment, Govt. of Mexico	2003	180,000 ha	Obligations to have sustainable forestry management plans before undertaking any resource extraction and authorization to change land use in natural resources which requires an Environmental Impact Assessment

Source: Wunder *et al.* (2008)

Appendix: Table 2: Characteristics of PES Like Programs

Sl. No.	Case Country, Source	Environmental Services - Targeted	Environmental Services Paid for	Who Buys ?	Who else Benefits ?	Who Sells ?	Who Initiated ?	Starting year	Spatial Scale & Current Size	Obstacles to Implementations
1	CAMPFIRE, Zimbabwe (Frost and Bond, 2008 ? this issue)	Hunting, landscape beauty, biodiversity conservation	Conservation of / access to natural landscapes	Private safari operators and international donors	Global conservation community	Communities through Rural District Councils (RDCs)	Zimbabwe Park Authority, with various NGOs	1989	Communal lands 14.4 million ha (target blocks 4.3 million ha)	Power struggles, RDC non-devolution, recentralisation
2	Working for Water (WfW), South Africa (Turpie *et al*.., 2008 ? this issue)	Watershed protection, biodiversity	Clearing alien invasive plants	Central Government (85%) and water users (15%)	Landowners whose land productivity increases	WfW, by employing workers	Government of South Africa	1995	National, not area-driven	High costs of clearing

Source: Wunder *et al.* (2008)

Appendix: Table 3: Features of PES Programs

Sl. No.	Case	Intermediaries	External Donor Support	Seller Selection	Monitoring	Sanctions	Conditionality	Linked to other Policy Tools?
User Financed Programs								
1	Los Negros, Bolivia	Fundación Natura (NGO)	USFWS as biodiversity buyer/donor	Village focus: high threat + strategic service site	Yearly site inspection	Temporary PES exclusion (not applied so far)	High in principle - but *de facto* still untested	Local rules on deforestation
2	Pimampiro, Ecuador	CEDERENA (NGO)	Inter-American Foundation covered startup costs	Village focus: high threat+ strategic service site	Quarterly site inspection - now deteriorating	Temporary or permanent PES exclusion (applied)	High, lately some decline	Complements weakly enforced Forest Law
3	PROFAFOR, Ecuador	PROFAFOR (buyer organ)	No	Biophysical conditions, price, minimum size, clusters	Yearly site Inspection + aggregate model	PES payback + land mortgage (applied to individuals only)	High for individual owners, lower for communities	No
4	Vittel	Agrivair (buyer-created agricultural extension agency)	No	All 27 dairy farmers in catchment	Farm inspection (at unknown frequency)	Information not available	High	Compete with EU subsidies for intensive dairy farming
5	Mantadia Project, Madagascar	National Association for the Management of the Protected Areas, Conservation International and several local facilitating organizations	Govt. of Madagascar, Conservation International and the US Agency for International Development	Strategic service site and voluntary participation	Periodic monitoring and verification		High	

Appendix: Table 3: Contd...

Sl. No.	Case	Intermediaries	External Donor Support	Seller Selection	Monitoring	Sanctions	Conditionality	Linked to other Policy Tools?
Government Financed Program								
6	SLCP, China	Village, township and county governments	None	Based on land slope, plot size, retired land contiguity	Frequented by village officials, less by township/ county, random by upper-level government	Withholding of subsidies - but weak enforcement	High for area retired, lower for successful forest plantation	No
7	PSA, Costa Rica	FONAFIFO (autonomous state agency), with support from SINAC, NGOs, private forest engineers	GEF	Priority areas (currently based on biodiversity and poverty criteria, but water criteria being added)	Compliance monitored by private forest engineers, with sample audited	Loss of future payments	High	Forest Law that created PSA also bans forest clearing
8	PSAH, Mexico	Water Commission collects, Finance Ministry transfers, Forestry Commission administers	GEF	2003 almost random, 2004 basic grading + regional balance, 2005 grading in place	Forest cover: yearly satellite image analysis; random (few) site visits	Intentional: current + future payments cancelled (3 cases in 2 years) Unintentional (fire, etc.): affected area is not paid for	High compliance w.r.t. forest-cover conservation (water service not monitored)	Reforestation, plantation and development programs

Appendix: Table 3: Contd...

Sl. No.	Case	Intermediaries	External Donor Support	Seller Selection	Monitoring	Sanctions	Conditionality	Linked to other Policy Tools?
Government Financed Program								
9	CRP and EQIP, USA	None	No	Based on environmental benefits and cost index	CRP: Annual inspection of 5% contract sample; EQIP: 17% non-full compliance	CRP: repay with interest, but options to rectify; EQIP: lax enforcement of sanctions	Conservation work needs be completed before payment, but low inspection rate	Cross compliance with other government payments
10	ESA and CSS, UK	Government agency (DEFRA) + NGOs	EU funds supplemented running costs	ESA: open to all (in target areas); CSA: selection	By DEFRA, universities, etc. ? low annual sample (5%)	From warnings to exclusion and repayment	Low risk for non-compliers of getting caught	Compete with EU CAP 1st pillar prod. subsidies; cross compliance
11	Northeim Model Project, Germany	University of Göttingen, with district authorities	Private foundation ? seller/donor role	Tendering procedure	Annual full Inspection	Non-payment (annual, *ex post*)	High	Agri-environment pillars of CAP
12	Wimmera, Australia	Wimmera Catchment Management Authority	No	All SHC landholders eligible (SHC create more salt loads)	Random (audit style approach) ? results publicized (accountability)	Yes - but difficult to enforce in court. Social and cross-compliance may be stronger pressures	Designed as such - but reduced by large upfront payments and low sanction risk	

Appendix: Table 3: Contd...

Sl. No.	Case	Intermediaries	External Donor Support	Seller Selection	Monitoring	Sanctions	Conditionality	Linked to other Policy Tools?
Government Financed Program								
13	The Program of Payment for Hydrological Environmental Services for Forest, Mexico	Government either at the Federal, State or Municipal level	World Bank	NA	Strong monitoring and enforcement	No payment at the end of the year	High, no payment at the end of the year even for the slightest deforestation	Overlapping mechanisms removed to prevent strategic behavior

Source: Wunder *et al.* (2008)

Appendix: Table 4: PES Like Programs

Sl. No.	Case	Intermediaries	External Donor Support	Seller Selection	Monitoring	Sanctions	Conditionality	Linked to other Policy Tools?
1	CAMPFIRE, Zimbabwe	RDCs (in part representing communities)	Substantial: USAID (main) NORAD, DFID	Preferences for large wildlife populations	Wildlife ground counts, aerial and satellite imagery	No, only indirect (when contracts are renegotiated)	Apparently high compliance	Local by-laws; Wild Life Act strengthened
2	WfW, South Africa	WfW (buyer organ)	No	Previously unemployed people in priority catchments	Works self supervised by WfW	NA	Clear: payment provided only if clearing work is done	Link to not yet enforced laws that require private owners to clear lands of aliens

Appendix: Table 5: Details Regarding Payments to ES Providers

Sl. No.	Case	Mode of Payment	Payment Amount, Cash Equivalent (US$/ha/yr)	Timing of Payment	Differentiation (spatial, other)	Contract Duration
User Financed PES Programs						
1	Los Negros, Bolivia	In-kind + TA	1.5-3.0	Annual, ex ante	Higher for cloud forest and primary vegetation	Variable length (1+ yr)
2	Pimampiro, Ecuador	Cash	6-12	Monthly, post monitoring	Higher for primary vegetation	Initially 5 yr, now unlim ited
3	PROFAFOR, Ecuador	Cash + in-kind + TA	100-200 (up front)	Years 1-3 plus tree harvests	Yes, site-level negotiation	
4	Vittel	Cash + TA + Agrl. labor costs + land rent	300 for 5 yr upto 225,000/farm cost reimbursements	NA	Yes, on farm-by-farm basis	18-30 yr
5	Virilla, Costa Rica	(Miranda et al., 2003)		820 per month		
6	Mantadia Project, Madagascar	Cash according to the opportunity cost + incentives	45			30 yr
Government Financed Programs						
7	SLCP, China	Cash + grain (phased out) + free seedlings + TA	Cash: 36; total cash equiv. 217-308 (2005); de facto lower and highly variable	Annual, normally	Higher in Yangtze River than Yellow River Basin	Max. 8 yr for timber, 5 yr orchards, 2 yr grass land
8	PSA, Costa Rica	Cash	45-163	Annual, after monitoring compliance	No	5-yr forest conservation (renewable), 15-yr timber plantation

Appendix: Table 5: contd...

Sl. No.	Case	Mode of Payment	Payment Amount, Cash Equivalent (US$/ha/yr)	Timing of Payment	Differentiation (spatial, other)	Contract Duration
9	PSAH, Mexico	Cash	27-36	Annual, *ex post*	Higher for cloud forests	5 yr (conditional renewal)
10	CRP and EQIP, USA	Cash + technical assistance	Variable	Annual; post adoption (EQIP)	Yes, site-level bids and environmental index scores	10-15 yr
11	ESA and CSS, UK	Cash	ESA: 20 (2003) CSS: 16 (2003)	Share of initial capital costs; annual payments	Yes, multi-tier	1-10 yr
12	Northeim Model Project, Germany	Cash	Variable	Annual, *ex post*	Yes, through tendering and model-sites selection	10 yr
13	Wimmera, Australia	Cash	Variable	Large upfront payment	Yes, reverse auction	1 yr
14	Huetar Norte, Costa Rice (Miranda *et al.*)		516			5 yr
15	The Program of Payment for Hydrological Environmental Services for Forest, Mexico	Cash	27.3 for all except cloud forest which receives 36.4	Annual	Fixed price program with two tiers decided. These tiers differentiate only by type of forest, with cloud forest in the upper-tier	5 years; contract will be renewed if conditions are fulfilled

Source: Wunder *et al.* (2008)

Appendix: Table 6: PES Like Programs

Sl. No.	Case	Mode of Payment	Payment Amount, Cash Equivalent (US$/ha/yr)	Timing of Payment	Differentiation (spatial, other)	Contract Duration
16	CAMPFIRE, Zimbabwe	Cash to RDC; mostly in-kind to communities	NA	Annual to RDCs, delays often to communities	Yes, quality of hunting/ eco-tourism sets auction price	1-7 yr, conditional renewal
17	WfW, South Africa	Cash	Not area based	Paid *ex post,* contract-based	No	Programs last 10 yr

Appendix: Table 7: Factors Affecting Effectiveness and Efficiencies of PES Programs

Sl. No.	Case	Baselines and Scenarios	Opportunity Cost	Additionality	Land use Service Link	Leakage	Permanence	Transaction Costs (US$) Start Up	Transaction Costs (US$) recurrent
User Financed PES Programs									
1	Los Negros, Bolivia	Implicit - declining natural vegetation	Not studied	Probably low, as low-threat areas are enrolled	Assumed, not proven	Low; some at on-farm level	Not secured beyond contract period	46,000 (17/ha)	3000/yr (1/ha/yr)
2	Pimampiro, Ecuador	Implicit future scenario ? likely decline in natural vegetation	Not studied	High, for land use: clear trend change towards conservation	Assumed, not proven likely in part	Zero; no effect displaced within watershed	Not secured beyond contract period	37,800 (76/ha)	3600/yr (7/ha/yr)
3	PROFAFOR, Ecuador	Explicit _ static land use	Only labor costs known	High (vis-à-vis baseline)	Explicit	Low- some livestock ubstitutions	Not secured beyond contract period	4.1 million (184/ha)	76,600/yr (3/ha/yr)
4	Vittel	Explicitly modelled (4 yr of research), declining ES	Studied, large in size, fully compensated	High, clearly improved water quality	Explicit at plot level	Zero	Not secured beyond contract period	Not divided up	Total costs (incl. payments) 1993-2000 24.5 million (600/ha/yr)

Appendix: Table 7: Contd..

Sl. No.	Case	Baselines and Scenarios	Opportunity Cost	Additionality	Land use Service Link	Leakage	Permanance	Transaction Costs (US$) Start Up	Transaction Costs (US$) recurrent
5	Virilla, Costa Rica (Miranda *et al.*, 2003)		Average per hectare returns from alternative land uses (dairy farming, export agriculture) are higher than the service payments					NA	NA
6	Peugeot Carbon Sink, Brazil (May *et al.*, 2004)						Not secured beyond contract period		
7	Mantadia Project, Madagascar			The proposed area is not a high-threat area and thus suggests that many protected areas are failing to prevent deforestation and poaching within their boundaries; 20% of the areas targeted in the PES program overlap with the areas proposed for sustainable forests				10000	NA

Appendix: Table 7: Contd..

Sl. No.	Case	Baselines and Scenarios	Opportunity Cost	Additionality	Land use Service Link	Leakage	Permanance	Transaction Costs (US$) Start Up	Transaction Costs (US$) recurrent
Government Financed Programs									
8	SLCP, China	Implicit	Only roughly known	High for land retirement; lower for reforestation	Assumed so far? ongoing research to quantify	Barely studied but one survey suggests leakage does occur	Not secured beyond contract period, but estimated at about 60%		
9	PSA, Costa Rica	Explicit static forest-cover baseline	Not studied, but implicitly based on extensive grazing	Unclear ? studies give widely divergent results	Explicit, good research on impact of aliens on water runoff	Low	Not secured beyond contract period		7% of pay ments (limited by law);some costs pushed onto providers
10	PSAH, Mexico	Explicit static forest-cover baseline; threat area modelling	INE estimated distribution of opp. costs in target areas - payment is more than 30% of distribution	Unknown - but evidence that some low-threat areas are offered	Extensive research, but not explicitly modelled	Not yet tested. Within villages, depends on % of area under contract	Not secured beyond contract period		4% of payments (limited by law)

Appendix: Table 7: Contd..

Sl. No.	Case	Baselines and Scenarios	Opportunity Cost	Additionality	Land use Service Link	Leakage	Permanance	Transaction Costs (US$) Start Up	Transaction Costs (US$) recurrent
Government Financed Programs									
11	CRP and EQIP, USA	Implicit, variable shape	Not known- to be revealed in part by bidding	Not researched	Explicit, thresholds well documented	For CRP, estimates vary from small to 21%	Scheme renewal uncertain; hoped-for transition to timber forestry + some local PES	High investment in geo-referenced EBI system	CRP: 15.5 million (2005); 1% of CRP transfers (+ research costs)
12	ESA and CSS, UK	Implicit, static Baselines	Calculated for model farms (labor and capital costs)	Significant effect on agricultural margins - little on prime agricultural lands	Modelled, service provision estimated	Some on farm leakage; little in the larger landscape	Not secured beyond contract period - but estimated at 49% for CRP	Not separated out	ESA (England), 1992/3-1996/7: 18% admin. costs (start-up + running)
13	Northeim Model Project, Germany	Implicit, declining: intensification or abandoned cultivation	Not known - to be partly revealed by tendering	Probably high, as participants' extensive agricultural practices decline	Explicit, thresholds well documented		Low (CSS: two-thirds recipients reapply)		

Appendix: Table 7: Contd..

Sl. No.	Case	Baselines and Scenarios	Opportunity Cost	Additionality	Land use Service Link	Leakage	Permanance	Transaction Costs (US$) Start Up	Transaction Costs (US$) recurrent
Government Financed Programs									
14	Wimmera, Australia	Explicit, static (minimum duty-of-care scenario)	Not known - to be partly revealed by auction	Designed high: ES outcome-oriented targeting	Modeled- ES provision estimated	Negligible risk predicted	Not secured beyond pilot phase, but targeted at CAP	High, due to pilot nature of scheme (65,000-100,000)	High, due to pilot nature (33-465, 000/yr)
15	Huetar Norte, Costa Rica (Miranda *et al.*, 2003)		Participants lose eligibility for subsidized housing and bank credit but the opportunity costs are low as soils are poor and communities are remote				Not secured beyond contract period-but some changes may last		
16	The Program of Payment for Hydrological Environmental Services for Forest, Mexico		Not known						

Source: Wunder *et al.* (2008)

Appendix: Table 8 : PES Like Programs

Sl. No.	Case	Baselines and Scenarios	Opportunity Cost	Additionality	Land use Service Link	Leakage	Permanance	Transaction Costs (US$) Start Up	Transaction Costs (US$) recurrent
1	CAMPFIRE, Zimbabwe	Implicit	Not studied, but positive	Marked rise in wildlife population and hunting revenues	Explicit: wildlife Habitat dependence	Limited, since prime wildlife areas are targeted	Not secured, but changed local attitudes to wildlife		1989-2001: 3.7 million (12.1%, 0.07/ ha)
2	WfW, South Africa	Implicit, but more exotics (ES decline) are likely	Known labor opportunity costs (small); land opp. costs negative	High, demonstrated improved runoff	Extensive esearch, but not explicitly modelled	None	Not secured beyond contract period, but some lasting changes		1989-2001: 3.7 million (12.1%, 0.07/ha)

Appendix: Table 9: Side Objectives and Welfare Effects on Poor Service Providers of PES Programs

Sl. No.	Case	Side Objective	Welfare Effects on Poor Sellers
User Financed Program			
1	Los Negros, Bolivia	None	Small, through diversified income (bees)
2	Pimampiro, Ecuador	None	Higher income and spending
3	PROFAFOR, Ecuador	None	Higher income_+_tree assets, investments
4	Vittel	None	Small farmers assured to keep their farms (land purchases)
5	Virilla, Costa Rica		Minimal impact
6	Peugeot Carbon Sink, Brazil	Employment generation and paid local communities for paying seed for native species	Social integration program includes environmental program for school children and distribution of seedlings of native species to local farmers
7	Bananal Project		Providing local population with environmen tal education and support for sustainable income generation but as a whole, minimal impact
8	Mantadia Project, Madagascar	None	Sustainable livelihood alternatives to logging, land tenure clarification and some employ ment generations
Government Financed Program			
5	SLCP, China	Poverty reduction, grain subsidies, timber production	No explicit targeting, does reach the poor, but low income effect
6	PSA, Costa Rica	Poverty reduction	Positive, but magnitude unknown
7	PSAH, Mexico	Implicit but weighty biodiversity and poverty criteria	PES can yield up to 10% of their total income

Appendix: Table 9: Contd...

Sl. No.	Case	Side Objective	Welfare Effects on Poor Sellers
8	CRP and EQIP, USA	Reduce agricultural commodity supply, support prices and farmer incomes	CRP: poor not targeted, but strongly overrepresented in CRP sample
9	ESA and CSS, UK	No explicit-implicit farmer-income support, cultural landscape values	Positive, but large farms had more landscape fitting criteria
10	Northeim Model Project, Germany	None	NA
11	Wimmera, Australia	Explicitly - none	NA
12	Noel Kempff Mercado Climate Action project, Bolivia	Reducing leakage that was curbing forest in the neighbourhood areas, monitoring of the logging companies	Community development, employment generation, assisting to gain land titles, micro-credit schemes, agricultural and forestry extension
13	Huetar Norte, Costa Rica (Miranda *et al.*, 2003)		Negative effects: participants of the PES schemes were barred from assessing other public benefits such as housing subsidies; land reform beneficiaries are not eligible for PES even if their land contains forest
14	The Program of Payment for Hydrological Environmental Services for Forest, Mexico		
PES-like Program			
12	CAMPFIRE, Zimbabwe	Empowerment, local capacity building	Moderate, non-cash (improved services)
13	WfW, South Africa	Poverty alleviation employment creation	Employment; training; health and education programs

Source: Wunder *et al.* (2008).

CHAPTER 3

REVIEW OF IMPORTANT CASE STUDIES ON PES

In this chapter, we briefly review few important case studies on PES across developed and developing countries dealing with various types of ES such as watershed protection services, biodiversity conservation, carbon sequestration and landscape beauty. In addition, a few case studies on PES and/or PES-like schemes from India are also discussed for a deeper understanding of the implications. The rationale for such attempt is to provide the genesis of evolution, design and implementation of PES schemes and draw some general insights on the factors that may affect the performance of market-based instrument for ES. The rest of the chapter is organized in the following way: Section II deals with some important PES-related schemes from abroad, and Section III discusses some important PES and/or PES-like schemes from India and makes concluding remarks on these case studies.

Section - II

Case Studies from Abroad

Paying for the Hydrological Services of Mexico's Forests:
Analysis, Negotiations and Results (Munoz-Pina *et al.*, 2008)

Mexico faces both high deforestation and severe water scarcity. In order to overcome these environmental problems, the Government of Mexico has initiated the Payment for Hydrological Environmental Services (PSAH) Program, hoping that such initiation would complement other policy responses to the crisis at the interface of these problems. Through the PSAH, the Mexican Federal Government pays participating forest owners for the benefits of watershed protection and aquifer recharge in areas where commercial forestry is not currently competitive. Funding comes from fees charged to water users and nearly US$18 million are earmarked for PES. Applicants are selected according to several criteria such as the extent of water scarcity in the region. Approval of this policy by the Congress is an example of political commitment towards environmental protection.

There is widespread perception amongst the key stakeholders that the forest-water relationship is very crucial even though scientific knowledge raises questions about the exact relationship. In Mexico, the PSAH occupies a special niche among landscape programs.

It seeks to complement the more richly-endowed reforestation, plantation and forestry development programs by addressing well-preserved forests that are at risk of deforestation but that lack the countering force of profitable timber or non-timber forestry activities. Not surprisingly, it is at odds with agricultural policies that give incentives to expand the area under cultivation and pastures, as would any other environmental policy. Hence, in order to make the new environmental policy initiative of Hydrological Environmental Services of the Government of Mexico effective, it is necessary to bring certain changes in the existing agricultural policy.

The CAMPFIRE Program in Zimbabwe:

Payments for Wildlife Services Frost & Bond, 2008)

Communal Areas Management Program for Indigenous Resources (CAMPFIRE) was introduced in the late 1980s to manage wildlife and wildlife habitat in the communal lands of Zimbabwe for the benefit of the people living in these areas (Martin, 1986). This policy initiative involves sale of rights to access wildlife, by rural authorities to entrepreneurs, who in turn market safaris to hunters and eco-tourists. CAMPFIRE was therefore designed specifically to stimulate the long-term development, management and sustainable use of natural resources in Zimbabwe's communal farming areas. It aimed to align land use more closely with the natural opportunities and constraints of these agriculturally marginal areas. As originally conceived, CAMPFIRE was to encompass four major natural resources - wildlife, woodlands, water and grazing - all to be managed by natural resource cooperatives. In practice, however, wildlife use predominates as it produces the most value, principally through safari hunting and ecotourism. Venison production and the capture and sale of wild animals were other expected sources of wildlife revenue, but they have produced little. Although its underlying philosophy places it firmly within the "community conservation" paradigm, its workings share some features with PES.

When CAMPFIRE started, it was relatively small (2 districts, 16 wards, and about 8,880 households). For the first five years, the number of participating districts and wards grew almost linearly, reaching 12 districts, 102 wards and at least 104,932 households by 1993. The numbers then expanded rapidly as many districts sought appropriate authority, even though most of them had little wildlife. By 2002, the CAMPFIRE Association represented 37 Rural District Councils, covering over 244,000

km2 and supporting some 777,000 households, though just 23 of these really functioned as intended. However, only 12 of these districts have had a consistently marketable quota of wildlife for hunting or some other sellable natural attraction (Khumalo, 2003). Within these districts, the actual wildlife production areas covered 118 wards with 43,000 km2 and 121,550 households. At least some of this expansion was prompted by the prospect of receiving development aid, large amounts of which were attracted to CAMPFIRE by its initial success and promise of broader change. The increase reinforced a perception of success of community-based natural resource management, which attracted further support and encouraged yet more districts to join.

The Northeim Model Project for Agro-biodiversity in Lower Saxony, Germany (Osterburg, 1999; Bertke and Marggraf, 2005)

Grassland extensification measures are one of the most important components of PES programs in Germany that covers almost 25% of the total permanent grasslands. Grassland in Germany which is rich in biodiversity faces problems of degradation because of agricultural expansion and intensification. Moreover, any attempt to adopt grassland extensification measures on arable land are less accepted by farmers. The Northeim Model Project for agro-biodiversity in Lower Saxony, Germany, is undertaken to support grasslands that are valuable with respect to diversity in plant genetics. A private foundation pays farmers to reduce agricultural intensification and to adopt practices that favor species richness, boosting both biodiversity (regionally endangered plant species) and recreational benefits from landscape beauty (enjoyed by visitors). It is a pilot program using tendering procedures to determine payments to farmers for changed land uses, with a view to a later upscaling of the experience by incorporating it into the EU's Common Agricultural Policy. Payments were carried out since 2004 to 28 farmers (out of 159 bids) on 288 ha. The University of Gottingen assists in this trial to scientifically document the outcomes. Although the response to the project from the farmers has been relative slow, the participation of farmers over a period of time has grown and is quite encouraging.

Willingness of Upstream and Downstream Resource Managers to Engage in Compensation Schemes for Environmental Services in Thailand (Sangkapitux *et al.*, 2009)

The Mae Sa watershed in Mae Rim district, Chiang Mai Province, covers an area of 142.2 km2 and extends from 20 to 45 km northwest of the northern city Chiang Mai. The watershed is intensively used for market-oriented agriculture, mainly fruit, flower and vegetable production. About 80% of the total agricultural area of 1,086 ha is under irrigation (Schreinemachers et al, 2008). The watershed has been part of a pilot project

of the Thai Government to introduce river basin committees and sub-basin working groups to enhance public participation in water governance (Heyd and Neef, 2006; Neef, 2008). The Mae Sa Watershed Management Working Group is the first of its kind in Thailand.

Most resource managers in northern Thai watersheds are smallholder farmers and tend to be among the poorest and most marginalized groups of society. It has often been argued that these people are driven by short-term economic interests only and are not willing to engage in efforts to sustain the ecological functions of mountain watersheds in the long run. Yet, as this study shows, both upstream and downstream resource managers in the Mae Sa watershed are aware of a deteriorating environment and are likely to get involved in compensation schemes for environmentally friendly agricultural practices. The finding that the poorer groups among the upstream farmers are more willing to engage in such compensation schemes underscores the potential of PES to become an effective tool for poverty alleviation by its ability to provide a continuous, albeit modest stream of income.

Watershed and Biodiversity Protection in Los Negros, Bolivia (Asquith *et al.*, 2008)

In the rain forest of Amboro National Park, Bolivia, water has ironically become an increasingly scarce resource. Farmers in Los Negros are losing out to farmers in Santa Rosa, who source their water upstream in the same watershed. To help resolve this conflict, the two communities adopted a PES scheme, where farmers in downstream Los Negros compensate farmers in Santa Rosa when the upland farmers conserve forest cover, which in turn conserves water. The compensation arrives in the form of beehives, allowing Santa Rosa farmers to explore alternative livelihoods. In this PES scheme, annual contracts prohibit tree cutting, hunting and forest clearing on enrolled lands. Farmer-landowners as service providers are subjected to independent yearly monitoring, and are sanctioned for non-compliance of the contract. The scheme is facilitated by a local NGO, Fundación Natura Bolivia. There are mainly two environmental service buyers involved in this scheme. The first service buyer is an international conservation donor (the US Fish and Wildlife Service) that is interested in biodiversity conservation. The second service users are downstream irrigators who are likely to benefit from stabilized dry-season water flows if upstream cloud forests are successfully protected. However, the individual irrigators have been reluctant to pay, but the Los Negros Municipal Government has on their behalf contributed US$4,500 to the scheme. The negotiated payment mode is annual in-kind compensations in return for forest protection. Largely, the payments are made in the form of "contingent project implementation", transferring beehives supplemented by apicultural training. With regard to service provision, environment committees and education programs have increased awareness in

downstream communities of the probable water-supply reduction effect of continued upstream deforestation. External donors have funded subsequent studies providing basic economic, hydrological and biodiversity data, and covered PES start-up (US$40,000) and running transaction costs (US$3,000 per year over the last 3 years). The greatest challenges in the development of the PES mechanism have been the slow process of building trust between service buyers and providers, and in achieving clear service-provision additionality.

Participatory Forestry on Degraded Forest Lands, Sri Lanka
(Kallesoe & De Alvis, 2004)

Between the year 1993 and 2000, the Government of Sri Lanka implemented the Participatory Forestry Project, with an aim to reduce deforestation and improve household livelihoods by promoting co-management and agro-forestry. The project targeted all state owned degraded forestlands except in the north and eastern provinces. The main objectives of the project were to facilitate reforestation by issuing lease agreements to farmers and by adopting a participatory approach to forest management. It was envisaged that this would create employment opportunities, raise income, reduce poverty and rehabilitate degraded areas. Furthermore, the institutional capacity of the Forest Department was to be strengthened, thereby enabling the expansion of its programs for non-forest tree planting, adoptive research and privately-operated village plant nurseries. Over the period of 7 years, the target was a total of 14,750 hectares of reforested land, 9,000 hectares of homestead gardens, 4,000 hectares of Farm Wood Lots (FWL), 1,500 hectares of Protective Wood Lots (PWL) and 250 hectares of miscellaneous plantings. The objective of the homestead garden subcomponent was to improve poor families' livelihoods and health status by providing alternative livelihoods in the form of growing and selling timber and fruit. Around 20 to 40 seedlings of timber and fruit tree species were distributed to each household involved in the project.

The main objectives of establishing FWL was to halt illegal encroachment and logging of state forests while developing poor rural areas. The local communities and farmers were provided with lease agreements in return for undertaking sustainable forest management. Within a block of 20 to 30 hectares of degraded forestland, 0.4-1 hectare plots were given to poor and marginalized farmers for a period of 25 years. This included ownership of the trees grown in the wood lots. Lease agreements were subject to yearly renewal for the period of first five years based on the farmers' compliance towards maintaining the allocated land under forest cover. After the 15th year, commercial thinning would be allowed with the approval of the Forest Department. During the initial phases of the project, the participating households were also provided with food coupons in return for labor.

Providing farmers with property rights even for a limited period of time proved to be an important first step in creating incentives for reforestation and sustainable land management. Secured land tenure rights are often seen as a prerequisite for the continuous provision of environmental services, and as an initial guarantee that providers are able to influence and secure service provisions through their actions. Also, developing a co-management structure seems to strengthen local participation and involvement.

FWL and homestead gardens are excellent examples of how forests, if managed properly, can provide food, timber and income, while maintaining the provision of environmental services. By promoting joint management and stewardship, the project was able to improve local livelihoods and generate positive externalities.

Payment for Environmental Services: The Sloping Land Conversion Program in Ningxia Autonomous Region of China (Zhang *et al.,* 2008)

China's Sloping Land Conversion Program (SLCP), which literally means "return cropland to forest or grass", has been in full implementation since 2002 after a short pilot between 1999 and 2001. SLCP was initiated in 1999 by the Chinese Central Government as a response to the severe dry-out in the Yellow River basin and the devastating floods in the Yangtze River Basin and northeast China in 1998. Ecological degradation in these river basins, deforestation in particular, is believed to be the main cause of these disasters. The strengthened national treasury and the surplus of grain at the end of the 1990s enabled the implementation of such a large-scale land conversion program (SFA, 2003). The primary goal of this program is to rehabilitate the ecological environment by retiring steeply sloping land (greater than 25 degrees) from cropland and turning it into forests and grassland, with the target of converting 14.67 million hectares of cropland to forests, and an additional "soft" goal of afforesting 17.33 million hectares of wasteland by 2010 (SFA, 2003; WWF, 2003). The program also intended to act as an instrument for restructuring local agricultural economies and reducing poverty in the targeted regions. By the end of 2003, this program covered 25 provinces, regions and municipalities, more than 2000 counties and tens of millions of households, mainly in western and central China.

By offering farmers food and income for withdrawing land from crop production, the SLCP provided an opportunity to break through the vicious cycle of poverty-ecological degradation-poverty, and to enter a path of sustainable development. The SLCP has set favorable conditions for surplus agricultural labor to engage in other off-farm businesses after land conversion based on two prerequisites: farmers' incomes can be sustained, and off-farm economic activities are available.

Given the huge investment in SLCP and its ecological and socio-economic impact, this government-initiated program has triggered a flood of debate. The program appears to be a perfect model of ecological modernization (Mol, 2006; Zhang et al., 2007). However, since 2004, there has been a shift in attention and debate from the implementation capacity of the government towards the sustainability of the program. Although overachievement of land conversion targets has been reported in many provinces, concerns have emerged about the livelihood of farmers 5 or 8 years after implementation, when compensation stops (Yeh, 2004; Groom *et al.,* 2007).

Decentralized Payments for Environmental Services: The Cases of Pimampiro and PROFAFOR in Ecuador (Wunder and Alban, 2008)

In Ecuador, several Payments for Environmental Services (PES) or "PES-like" initiatives have been developed. The programs are: funds for watershed conservation in Cuenca (Echavarría et al., 2004) and Quito (Echavarría, 2002), and compensation schemes in the Celica and El Chaco municipalities (Yaguache et al., 2005). Unlike in Costa Rica where a central PES implementing authority exists, the Ecuadorian schemes are all decentralized, i.e., self-organized, without central-state coordination.

In 2000, the Municipality of Pimampiro (12,951 inhabitants) established a payment system for the Palaurco River upper watershed that delivers its drinking water. The PES proposal was part of a forest management plan, designed by a Non-Governmental Organization (NGO), the Ecuadorean Corporation for the Development of Renewable Natural Resources (CEDERENA), which also recommended sustainable land-use alternatives such as ecotourism and medicinal plant extraction. Young engineers familiar with Costa Rica's PES system also included the innovative PES element (CEDERENA, 2002). A long drought in 1999, followed by the construction of a canal to increase water flow, facilitated the successful introduction of PES. This remarkable water-supply improvement scheme enhanced the willingness of commercial and domestic water users' to pay. The PES system was designed to protect native vegetation, which allegedly would help safeguard both water quality and dry-season quantity.

Although the scheme doesn't target poverty alleviation or other side objectives, it is likely to have improved the PES recipients' welfare, mostly through higher level of incomes ? increase not only in current consumption but also in investments, medicinal plants extraction and ecotourism (minor), improvement in natural vegetation cover and conservation of wild fauna, less pastures and croplands, etc.

The Wimmera Catchment Pilot Program for Salinity Control in Victoria, Australia (Wunder *et al.,* 2008)

This program was initiated in 2005 with the aim to reduce recharge to saline aquifers. It focuses on land uses in the steep, hilly part of the watershed ? a 28,000 ha area within the Upper Wimmera Catchment. The beneficiaries are various downstream water users. The Catchment Management Authority (CMA) is using taxpayer money to organize inverse auctions to obtain the most desired land use changes from upstream landowners at the lowest possible cost. Landholders submit voluntary offers to provide the targeted services, and the CMA ranks these offers according to cost per unit of expected salt reduction. Then it approves applications for cash payments up to a budget limit or a preset reserve price. The program is designed as conditional, but this is de facto reduced by high upfront payments and low sanction risks. Nevertheless, compliance is still expected to be high, due to local mechanisms of social control. Start-up transaction costs have been relatively high, but this is seen by the CMA as an investment for future upscaling of the program.

The Working for Water Program: Evolution of Payments for Ecosystem Services Mechanism that Addresses both Poverty and Ecosystem Service Delivery in South Africa (Turpie *et al.*, 2008)

Payments for Ecosystem Services in South Africa have largely come about through the establishment of the Working for Water (WfW) Program in 1995. This government program was initiated in response to the realization of the gravity of the threat that alien plants posed to water supplies. Today, WfW is a public agency under the jurisdiction of the Department of Water Affairs and Forestry (DWAF) with the mandate of controlling invasive alien plant infestation. What is particularly unusual about the program is that it was initiated and is funded primarily as a poverty relief public works program. This emerging PES system differs from others in that the service providers are previously unemployed individuals that tender for contracts to restore public or private lands, rather than the landowners themselves.

The WfW program has been hailed as highly successful in terms of its objective of restoring water supply in alien-infested catchments (Macdonald, 2004). Hobbs (2004) calls it one of the most successful integrated land management programs in the world, referring to the program's impacts on biodiversity, water and socio-economic development. Mooney and Neville (2000) described the program as an outstanding example of dealing with invasive alien plants in a holistic manner. Woodworth (2006) calls it inspirational in terms of restoration of natural capital. Since its inception, the program has cleared more than one million ha of invasive alien plants. Marais and

Wannenburgh (2007) estimate that the clearing of invasive alien plants from riparian areas between 1997 and 2006 increased stream flow by nearly 46 million m^3 per annum.

The program has created thousands of jobs, with strong emphasis on gender equity, and provides considerable benefits such as skill training and health and HIV/AIDS awareness programs. For example, Milton *et al.* (2003) estimate that 24,000 previously unemployed people, 52% of whom are women, were employed in the year 2000. It also generates further income through the development of value adding industries, such as furniture, fuel wood, and charcoal that use alien vegetation as inputs.

Can the Poor Participate in Payments for Environmental Services? Lessons from the Silvopastoral Project in Nicaragua (Pagiola *et al.*, 2008)

The Regional Integrated Silvopastoral Ecosystem Management Project is piloting the use of PES in three areas: Quind´?o, in Colombia, Esparza, in Costa Rica, and Matigu´as-R´-10 Blanco, in Nicaragua (Pagiola *et al.*, 2004). The project is financed by a US$4.5 million grant from the Global Environment Facility (GEF), through the World Bank. The project is being implemented in the field by local Non-Governmental Organizations (NGOs). In Nicaragua, this work is being conducted by Nitlapan, a NGO affiliated with the Central American University. Silvopastoral practices which combine trees with pasture offer an alternative to prevalent cattle production systems. Cattle production has long been an important cause of the loss of natural habitat and biodiversity in Central America (Downing *et al.*, 1992; Kaimowitz, 1996). In addition to the environmental problems caused by the initial loss of forest, extensive grazing often suffers from loss of soil fertility and diminishing grass cover, resulting in soil erosion, contamination of water supplies, air pollution, and landscape degradation. Lower income for producers results in continuing poverty and can lead to pressure to clear additional areas. Silvopastoral practices include: (1) planting high densities of trees and shrubs in pastures, thus providing shade and diet supplements while protecting the soil from packing and erosion; (2) cut and carry systems, in which livestock is fed with the foliage of specifically planted trees and shrubs ("fodder banks") in areas previously used for other agricultural practices; and (3) using fast-growing trees and shrubs for fencing and wind screens. These practices provide deeply rooted, perennial vegetation which is persistently growing and has a dense but uneven canopy.

By the end of first year of the project it was observed that there was substantial land use change: 545 ha (over 17% of the total area) experienced some form of land use change. A wide variety of changes were observed, ranging from minor changes such as sowing improved grasses in degraded pastures to very substantial changes such as planting high-density tree stands or establishing fodder banks. The area of degraded pasture experienced

the largest fall, being reduced by over half (467 ha of the original 869 ha), and the area of annual crops also fell by almost a third (70 ha of the original 232 ha). Pastures with low tree density experienced a net increase of 228 ha, while pastures with high tree density experienced a net increase of 201 ha (in addition, substantial areas of natural pastures with either low or high tree density were sown with improved grasses). There was also a substantial increase in the area devoted to fodder banks (66 ha, almost doubling the original area).

The Vittel Payments for Ecosystem Services: A "Perfect" PES Case? (Perrot-Maitre, 2006)

In the early 80s, the de la Motte family, then owners of the Vittel Brand, realised that the intensification of agriculture in the Vittel Catchment posed a risk to the nitrate and pesticide levels in Grande Source and consequently to the Vittel Brand. The artesian spring for Vittel's Grande Source is located in the thermal park and all farms in the catchment are located upstream from the spring. In order to address the risk of nitrate contamination caused by agricultural intensification in the aquifer, the world leader in mineral water bottling business, Vittel (Nestlé Waters), developed and implemented PES program in north-eastern France through financing farmers in the catchment to change their farming practices and technology.

The PES scheme was able to maintain farmers' income level at all times and finance all technological changes, but the primary reason of success of the scheme was not financial. Trust-building through the creation of an intermediary institution (locally based and led by a "champion" sympathetic to the farmers' cause); the development of a long-term participatory process to identify alternative practices and a mutually acceptable set of incentives; the ability to link incentives to land tenure and debt cycle issues and to substitute the old technical and social support networks with new ones, were all fundamental conditions of success.

The Vittel experience is most likely to be replicable in places where land cannot be purchased and set aside for conservation, and where the risk to business is high while the link between ecosystem health and farming practices is well understood and expected benefits are sufficiently high to justify the investment. Although this set of conditions is more likely to be found in industrialised countries (Nestlé Waters has used a similar approach with Perrier and Contrex in France), it could be applicable to a developing country context provided there is good enforceable contract law.

Finally, the study clearly demonstrates that there is a strong business case for private sector participation in water-related PES (particularly in terms of water quality, as the

link with ecosystem protection is more easily demonstrated than is the case for water quantity). Care needs to be taken in order to ensure that PES does not lead to a *de facto* privatization of the water resource. The entire program was essentially a "learning-by-doing" experiment and it was the ability to "think beyond the box" that brought success to the endeavor.

Section - III

Case Studies from India

PES-like Scheme under NREGS (Gupta, 2009)

The Forest Department of Bihar has recently launched a new social forestry scheme under the National Rural Employment Guarantee Scheme (NREGS) in six districts of Tirhut Range in Bihar. This has attracted a lot of attention from the local people as well as NGOs and academicians. Under the scheme, the villagers are encouraged to plant fruit-bearing trees like jamun, mango, litchi, guava and gooseberry, or those with medicinal values such as neem. Some trees like mahogany and teak are also grown for their expensive wood values. Each family is asked to plant at least 200 saplings and nurture them over the next three years. If 90% or more saplings survive, the family gets Rs.10,000 a year, equivalent to a year's wage under the NREGS. The remuneration will be nearly half if 75% of the saplings survive. If the survival rate is below 50%, the family will not get any remuneration. Depending on the need, the government will dig new wells to water the saplings. Regular audits are carried out to see if a given family is maintaining the saplings. If the family is found to be unable to maintain the saplings, the saplings are transferred to the next family. Payments under this scheme are made through cheques every fortnight.

Currently, the scheme is being implemented in six districts of Bihar, namely, Vaishali, Sitamarhi, Muzzarfarpur, Hajipur, and East and West Champaran. About 12 million saplings were planted under this scheme during February-August 2009. The idea is that people will earn wages under NREGS while the saplings grow, and after four years they can earn by selling fruits from the mature trees. The villagers have formed vigilance committees to protect the saplings. In this way, the scheme is likely to achieve two objectives: (1) daily wage employment through NREGS; and (2) mitigation of climate change impact.

Fair Deals for Watershed Services in India (Agrawal *et al.*, 2007;Adhikari, 2009)

Here, we discuss three notable watershed management projects, viz., Kuhan and Suan of Himachal Pradesh and Bhoj of Madhya Pradesh. These projects aim at adopting incentive-based mechanisms to watershed protection and rural livelihoods improvement in the areas.

The Bhoj Wetlands

The Bhoj Wetlands area located around Bhopal city is recognized as wetlands of international importance. It consists of two man-made reservoirs - the Upper Lake and the Lower Lake. Constructed in the 11th century by King Bhoj of Dhar, the Upper Lake was created by building an earthen dam across the Kolans River. Although it includes some parts of the city, the catchment area is predominantly rural. Created in 1794, the Lower Lake receives water from the Upper Lake through seepage as well as from its urban catchment area. The wetlands support a variety of flora and fauna. It is also an important source of drinking water and recreation for the 1.8 million residents of Bhopal. Further, livelihoods of many people are directly linked to the wetlands. However, the wetlands are facing twin problems of poor water quality and reduction in storage capacity due to siltation. The decline in the quality of water is largely due to inflow of sewage and solid waste from urban areas and the runoff from the nearby agriculture fields.

Suan Micro-Catchment

The Suan Micro-catchment has a decade-old history of upstream-downstream collaboration. It requires maintaining and enhancing summer flows in the main stream to make investment in a small irrigation scheme viable. While downstream users showed initial interest in financially supporting the protection of additional areas of the upstream, a variety of factors contributed to their eventual reluctance, despite considerable facilitation by the project team. These factors include a need to first fence the cropped area to reduce losses from crop-raiding wild animals, a lack of initial success in securing government funds for the irrigation project, conflict in the lower village, and a geo-hydrological assessment which indicated that the impact of land use change might be limited.

Kuhan Micro-Catchment

In Kuhan, the high silt load in its main stream was choking up the reservoir that serves as the water source for the local Lift Irrigation System (LIS). The initial facilitation process had two objectives: the first objective was to make the local institutions more robust to expand irrigation downstream. This broadened the water user base from eight to over 50, creating a larger constituency of beneficiaries and greater surplus funds for catchment protection. The second objective was to help the farmers realize the relevance of changes in the land uses upstream and their role in promoting it. A geo-hydrological assessment helped identify erosion-prone zones and build consensus towards a transaction. Eventually an agreement was signed whereby the upper village closed a small patch of sloping land adjacent to the stream ? identified as a high erosion potential zone ? to grazing for eight years in order to allow re-growth and reduce erosion. In return, the

lower village provided tree saplings which were also planted in the closed area, creating further interest for the upstream village in the closure. Subsequently, the villagers made at least seven brushwood check dams in the tributaries of the main rivulet to prevent silt from flowing downstream.

Payment for Environmental Services: A Case Study from Makhan, Manipur, NE India (USAID Online)

Makhan watershed has been home to the Liangmei Clan of the Naga Tribe for centuries where they practiced *hump* cultivation on hill slopes. But of late, over three-quarters of their forest has been left barren, or reduced to scrubland due to growing land pressures, and the resulting shortened fallow cycle does not allow time for forest recovery. In recent years, the community has also leased some of its forests to neighboring Nepali villages as pasture land. Unfortunately, burning to stimulate grass growth and over grazing has further denuded the lower watershed. As the watershed vegetation has diminished, so too has the water flow in the dry season. Concerned by their declining agricultural yields, growing scarcity of fuelwood, and diminished water flows, the Nagas of Makhan entered into a dialogue with the Community Forestry International (CFI) team and its partners. The emerging agreement reflected a mutual commitment to establish better strategies to sustainably manage their rich natural resources in order to conserve their extraordinary biodiversity, as well as to improve family incomes.

Community Forestry International (CFI) and its partners are assisting the Liangmei Nagas of Makhan Village in Manipur to conserve threatened biodiversity and restore degraded natural forests by creating a partnership that empowers customary institutions, while building their capacity to address growing pressures and threats. The CFI and the villagers (under the auspices of the Local Working Committee and the Village Authority) have entered into a three-year contract to formalize and strictly protect their Community Conservation Area of 350 hectares on the ridge top, and to restore the degraded forest landscape in the middle of the watershed. A joint team framed the guidelines for the contract, identifying monitoring indicators and agreeing for funds to offset opportunity costs related to forest protection. The agreement required Makhan families to adopt a resolution involving conservation and forest restoration strategies. Correspondingly, CFI and its partners committed to providing technical support, training, and PES for silvi-cultural activities, forest protection, micro-finance, as well as agricultural transitions. The community requested the renovation of a small runoff river irrigation canal to bring water to rain fed fields. This is expected to allow farmers to secure two crops per year and intensify production by 30 percent. CFI and its partners, including the Manipur Forest Department and a local NGO, the Weaker Sections Development Society (WSDS), are also working with the Makhan Community to demarcate forest boundaries, and

register community forests and Community Conservation Areas (CCA) with the Senapati Autonomous District Council. Finally, CFI is facilitating new buyers for the biodiversity and carbon services provided by the Makhan CCA.

Payment for Environmental Services: A Case Study from Meghalaya, NE India (USAID online)

Expanding limestone quarrying and coal mining along with rapid increase in population in Meghalaya has progressively reduced forest area. The disappearance of extensive forest tracts, driven by an increasingly short *jhum* fallow cycle, resulted in the denudation of waste tracts of upland watershed. The privatization of community and clan forests often led to their permanent clearance for agriculture. Problems stemming from deforestation have been compounded by widespread quarrying for stone, limestone, and other construction materials. Forest loss, soil erosion and mining have all had significant impact on the hydrology of these critical watersheds. Due to the high demand for quality stones produced from quarries in the project area, the communities face significant loss of income in closing these enterprises. Threatened by decreasing forest and water resources, the Mawphlang Community entered into a dialogue with Community Forestry International (CFI) for biodiversity conservation.

Community Forestry International seeks to assist Mawphlang Lyngdohship to conserve threatened biodiversity and restore degraded natural forests by creating a partnership that empowers customary institutions, while building their capacity to address growing pressures and threats. CFI is helping Mawphlang to gain recognition by the local District Council as well as national and international attention as a Community Conservation Area (CCA). Many endemic, rare and endangered species of flora and fauna in Meghalaya are confined to a few areas where Sacred Groves exist, including Mawphlang. Meghalaya is a major hotspot of amphibian biodiversity with 18 identified species either threatened or red-listed for extinction, some of which are found in the ponds and streams located within and around the Sacred Grove. CFI project activities have helped the community identify a number of threats to the Sacred Grove and the surrounding watershed. The dangers that posed the case study area were discussed with the communities during numerous awareness programs and meetings. The indigenous leadership of the communities residing in the project area signed a resolution to control seasonal fires, grazing by cattle, unsustainable firewood harvesting and quarrying. The CFI has agreed to provide financial aid of US $ 12,131 per year and technical support for a three-year project period to the community resource management institution as Payments for Environmental Services.

Section - III
Concluding Remarks

The preceding discussions on the important PES schemes/projects across various countries have highlighted the fact that the design and implementation of PES and/or PES-like programs are quite different and are largely location specific. The scale of the programs depends mainly on the political and administrative will of the respective governments. For instance, China's SLCP program has achieved phenomenal success because of the food and other subsidies that the government has been providing. Similarly, in the case of Los Negros, Bolivia, the local government has contributed a large sum of money on behalf of individual irrigators that was given to service providers. On the other hand, PES initiatives by individual users and service providers and also by the NGOs have been successful. In addition, the outcomes of PES are dependent on ecological conditions, as well as on the nature and quantum of services that the ecosystem is providing.

The analysis of PES-like cases in India is interesting and quite encouraging. All the four cases highlight the potential for widespread implementation of PES programs in the country. Both the government and the NGOs working at the local community level need to identify such ecological context where both service users and providers can not only be identified easily, but also encouraged for possible negotiations towards trading of environmental services. As it will be discussed in Chapter V, the ecosystem management institutions in India have failed to manage resources largely because of lack of adequate incentives. Linking these institutions to PES-like schemes may prove to be effective and can also be adopted across different resources and locations in the country. Few lessons can be drawn from the international experience in terms of institutional innovation for successful adoption of PES programs in the Indian context. For example, China's SLCP program can be conceived in line of National Rural Employment Guarantee Act (NREGA) in India to provide incentives to households involved in activities that are environmentally degrading and reduce services to the society at large. In this way, one may expect National Rural Employment Guarantee Scheme (NREGS) to have immense potential in facilitating successful design and implementation of PES programs in the country.

CHAPTER 4

PAYMENTS FOR ENVIRONMENTAL SERVICES PROGRAM IN COSTA RICA: A REVIEW OF EFFECTIVENESS AND SUSTAINABILITY

Introduction

Environment provides a range of essential services that are critical for the sustenance of life. While the demand for these services is increasing incessantly, the capacity of ecosystems to provide such services is seriously at risk, primarily on account of environmental degradation and overuse (Lambert, 2006). Almost 15 million hectares of forest was lost every year during the 1990s, mostly in the tropics (FAO, 2001). One of the important reasons for this loss is that land users receive no compensation for the environmental services they generate for others. As a result, they have little incentive to provide these services (Pagiola *et al.*, 2005). Recognition of this problem and of the failure of past approaches to deal with this important issue has prompted the environmental thinkers and other concerned entities to develop systems in which land users are paid for the environmental services they provide, thus aligning their incentives with those of the society as a whole (Landell-Mills and Porras, 2002; Pagiola *et a*l., 2002). This calls for the development of a systematic mechanism for Payments for Environmental Services (PES) approach.

The premises on which PES approach is based are that those who provide environmental services should be compensated for doing so and that those who receive the services should pay for their provision (Pagiola and Platais, 2007). In recent years, considerable attempts have been made to emphasize on PES to finance conservation (Landell-Mills and Porras, 2002; Pagiola, *et al.*, 2002; Pagiola and Platais, 2007). PES, in essence, is an effective way to induce conservation while compensating those who incur its costs. Such compensations inter alia under conservation policies are likely to lessen conflicts between conservation and local welfare (Ferraro, 2001). Such an approach appears to have created a global appeal (Chomitz et al., 1998; Rojas and Aylward, 2003; Smith, 1995; Szentandrasi *et al.*, 1995) that is expected to go a long way to address environmental issues more effectively.

The emergence of PES is attributed partly to a response to a need to identify additional sources of financing conservation of resources and also partly to a response to the extensive discontent over conventional approaches to conservation. The latter approaches are primarily based on command and control, or unconditional economic incentives, such as those provided as part of the so-called integrated conservation and development projects promoted during the 1980s and 1990s (McShane and Wells, 2004).

Until recently, more than 300 PES programs have been implemented worldwide (Pagiola and Platais 2002; Wunder et al., 2008). Most of them are stated to have limited geographic scope and are basically user financed for specific environmental services. Only a few programs possess national characters and are financed by the respective governments that act on behalf of users of environmental services. China, Costa Rica, Mexico and South Africa have already implemented such programs, and Brazil and Zimbabwe are in the process of implementing them (Wunder, 2005; Engle *et al.*, 2008; Pagiola, 2007). In this chapter, we examine the evolution, implementation, management and various outcomes of PES schemes in Costa Rica.

Costa Rica has pioneered the use of the PES in developing countries by establishing a formal country-wide program of payments called *Pago Por Servicios Ambientales* (PSA). Primarily, the PSA program has had twin objectives: to save the country from the rampant deforestation and degradation of forest resources and to compensate for the environmental services. Several other developing countries have either adopted similar such programs or are in the process of developing them. The Cost Rican program, having been the lead example, provides avenues to many developing countries to initiate or improve upon their respective programs (Chomitz *et al.*, 1998; Ferraro, 2001; Miranda *et al.*, 2003; Pagiola, 2002; Rojas and Aylward, 2003; Sierra and Russman, 2006; Zbinden and Lee, 2005).

The objective of this chapter is to critically review the PES program of Costa Rica, a leading country in the world in terms of scale and longevity. In particular, the chapter makes an attempt to assess the effectiveness and sustainability of the program and highlight the major challenges that the program is faced with. This analysis is expected to enhance our understanding of the evolution and the functioning of PES schemes in Costa Rica, which will in turn provide some insights for other developing countries to develop effective PES mechanisms.

Section - II

Evolution of PES in Costa Rica

Costa Rica's PES program has a long history of systematic evolution and its origin traces back to the reforestation and forest protection efforts under the first Forestry Act of 1969 (No. 4475). Timber plantation expenditure was deductible from income tax under this act as a measure towards promoting reforestation (ORTIZ, 2002 cited in Arriagada, 2008). However, this act did not bear much fruit as many landowners were not paying income taxes. During the 1980s, however, there was a growing domestic and international concern over reports that Costa Rica's forest cover has reduced in size to just over a quarter of its land area. Consequently, the government started providing subsidies to encourage reforestation and the conservation of existing forests (Pagiola, 2008). The government introduced *"Certificados de Abono Forestal"* (CAF) in 1986. These credit certificates were cashed in other financial transactions by those who had made reforestation investments. Two important laws, namely, Law 7032 (1986) and Law 7174 (1990) created newer regulations regarding forests and private plantations. The forestry law of 1986 officially introduced forest reserves and restricted land use change by forbidding logging in areas 20 meters alongside a water channel. Incentives like the Forest Payments Title (1986), the Fund for Municipalities and Organization (1986), and the Forest Advance Payment Titles (1988), were certain such schemes under this law. A centralized forestry institution was set up, which had the responsibility of keeping an eye on the complex procedures of plantation, management, cutting and transportation of forest products.

In 1990, two new versions of forest credit certificates called *"Certificado de Abono Forestal por Adelantado"* (CAFA) and "Certificado de Abono Forestal para Manejo" (CAFMA) were initiated. Under CAFA, upfront payments were made that helped small landlords pay for reforestation investments when they would not dispose of financial resources otherwise. As compared to CAFA, CAFMA encouraged sustainable management of existing natural forests. In 1995, another forest credit certificate, CAFMA-2000, was introduced. All these certificates ensured the conservation of natural forests with provisions to compensate landowners who were refraining from any natural forest exploitation (ORTIZ, 2002 cited in Arriagada, 2008).

A new law, 7575, enacted in 1996, witnessed a paradigm shift in Costa Rica's efforts towards forest conservation. This law clearly recognized four environmental services provided by forest ecosystems, viz., mitigation of greenhouse gas emissions, hydrological services, including provision of water for human consumption, irrigation and energy

production, biodiversity conservation, and provision of scenic beauty for recreation and ecotourism. The law provided the regulatory basis to contract landowners for the services provided by their lands, and established the National Fund for Forest Financing (*Fondo Nacional de Financiamento Forestal,* FONAFIFO). Eventually, since the beginning of 1997, Costa Rica developed an elaborate PES program called *Pago por Servicios Ambientales* (PSA) (Pagiola, 2008).

PSA of 1997 brought about two fundamental changes in the earlier programs: first, the justification for payments to change from support for the timber industry to the provision of environmental services; second, to change the source of financing from the government budget to an earmarked tax and payments from beneficiaries. In other respects, however, the PSA program was very much similar to earlier forest sector incentives (Pagiola, 2008). It is worthwhile to mention here that the PSA program of 1997 replaced the system of forest credit certificates which were considered as a type of subsidy, as a measure under Costa Rica's structural adjustment program signed with the International Monetary Fund (Wünscher *et al.*, 2006). Many other implementation issues, such as the payment amounts and the scheduling of payments, were carried over from the earlier programs. Yet, over time, the PES system underwent significant changes (Pagiola, 2005).

In 2000, the array of instruments was simplified to only two: timber plantations and forest conservation. In 2004, an agro-forestry contract and a natural regeneration contract were introduced. Initially completely untargeted, the PES program is found to have moved towards a greater degree of targeting (Pagiola, 2008). Costa Rica's PES program comprises 11 programs targeting different types of activities and land uses. In each program, a landowner receives annual payments to carry out certain specified practices such as preserving the existing forest cover or planting new trees. Till May 2008, these programs together had made payments on roughly 377,000 hectares, accounting for 7.4 percent of the land area of the country. The most important of the programs is forest protection, which accounts for 86% of the 377,000 hectares receiving FONAFIFO payments (Table 2). Two other programs - reforestation and forest management - account for 9% and 4% of participation, respectively, and the remaining 8 programs account for only 2% (Blackman and Woodward, 2009).

Table 2: Percentage of Land Receiving FONAFIFO Payments (377,000 ha, Total), by Program and Funding Source, through May 2008

Program	IBRDa & GEFb	KfWc	Ordinary Budget	User Financed	All
Forest Protection	57	14	11	3	86
Reforestation	4	2	2	0	9
Forest Management	2	2	0	0	4
Others	1	0	1	0	2
All Programs	**65**	**18**	**13**	**3**	**100**

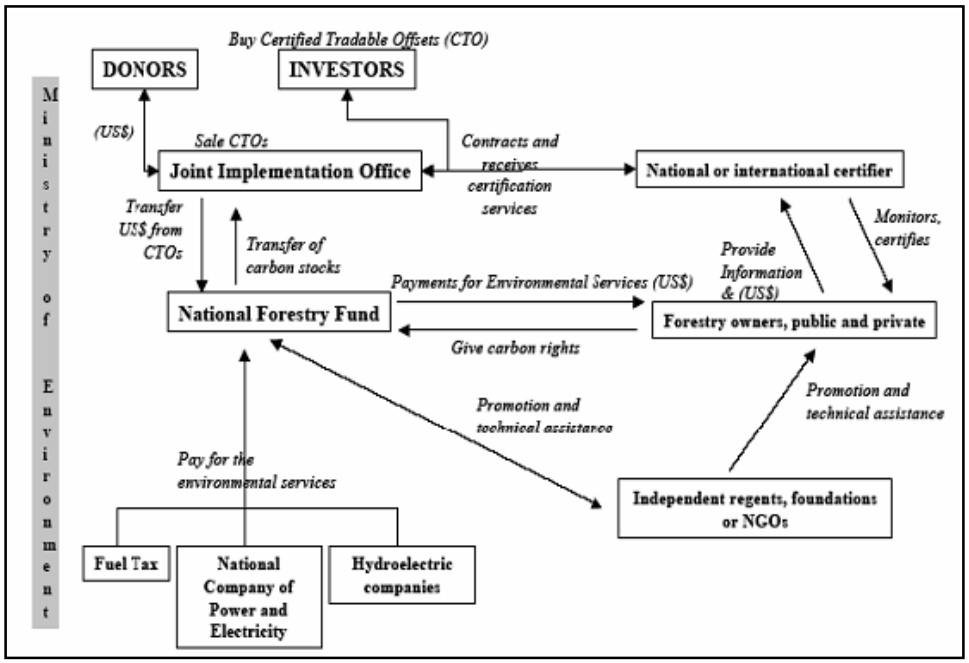
a International Bank for Reconstruction and Development.
b Global Environment Fund.
c German International Development Bank (Kreditanstalt für Wiederaufbau).
Source: FONAFIFO 2008a as cited in Blackman and Woodward, 2009.

Institutional Structure of PES Program in Costa Rica

The institutional structure of the PES program is headed by the Ministry of Environment (MINAE) through FONAFIFO, which is responsible for disbursing payments to private forestry owners and protected (conservation) areas (Miranda *et al.*, 2003) (Figure 4). The State Forestry Authority constitutes three entities: the National Conservation Areas (SINAC) and National Forestry Financing Fund (FONAFIFO), both of which are accountable to MINAE, and the National Forestry Office (ONF), which is a participatory body for designing policies, comprising various stakeholders from the private forestry sector to ecological organizations.

SINAC, the most important forestry administrative body, was created in 1995 through an executive decree, which meant an important change in the management of the country's natural resources. The 1996 Forestry Law created FONAFIFO, a subsidiary organization of MINAE, as a national environmental service fund for forestry development, which is a semi-autonomous agency with independent legal status. The main objective of FONAFIFO is "to get funds for the environmental service payment program and other necessary activities to develop the natural resources sector" (Forestry Law No. 7575). FONAFIFO is empowered with a relative degree of autonomy in making personnel decisions and in managing funds, but it remains subjected to a variety of governmental restrictions. Its budget must be approved by the Ministry of Finance, while payment levels and priorities are set annually by executive decree. Delays in these administrative procedures have often hampered FONAFIFO's work.

Figure 4: Institutional structure of Costa Rican PES Program



During 1990s, all Costa Rican universities introduced special curricula in environmental studies. Forestry and Costa Rican researchers participated actively in international research programs like COSEFORMA (with Germany), the Forestry Research Program (with the UK), SUDESCA (with Denmark), COSUDE and PROSIBONA (with Switzerland), and OLAFO (with Norway, Switzerland, and Denmark). The international Costa Rican-based *Centro Agrono´mico Tropical de Investigacio´ny Ensen˜anza* (CATIE) emphasized its research efforts on the implementation of the FSC principles and INBio, the National Institute of Biodiversity, on forest ecosystems. Scientists from all these institutions introduced policy proposals and commented on draft versions of the forestry law also (Miranda *et al*., 2006).

The business sector was represented by the Costa Rican Forestry Chamber (CCF), a chamber of commerce of 140 forestry firms, and by JUNAFORCA, the Board of Smaller Forestry landholders. The business sector joined forces in the National Forestry Office (ONF) with the legal assistance of CEDARENA, the *Centro Derecho Ambientaly De Recursos Naturales*. In 1996, the Partido Liberacio´n Nacional (PLN) Government finished the negotiations. The process resulted in a broad consensus in the Costa Rican society on the new forestry law and the ESP (Miranda *et al*., 2006).

Table 3 : User Financed Contributions to FONAFIFO, 2003-2007

Type of Donor	Amount (000 US$)	Percentage of Total from all Donors	Percentage of Total from Purely Private Sourcesb
NGO (Pax Natura)	9,675.4	55	-
Government-owned hydroelectric	5,762.9	33	-
Private hydroelectric	580.6	3	35
CATIE a /World Bank	441.0	3	-
Brewery	272.7	2	16
Carbon credits	215.	1	13
Agriculture related	199.5	1	12
Hotels	126.8	1	8
Airlines	85.7	0	5
Agricultural cooperatives	75.0	0	4
Construction/cement	57.0	0	3
Hydroelectric cooperative	22.4	0	1
Tourism	14.9	0	1
Public Utility	9.1	0	1
Plastics	8.6	0	1
Sports association	1.4	0	0
Personal associations	1.1	0	0
Consulting/advertising	1.0	0	0
Personal	0.6	0	0
Total	**17,551.4**	**100**	**100**

a Center for Tropical Agricultural Research and Training (Centro Agronómico Tropical de Investigación y Ensenañza).

b Excludes funds from government-owned firms, multilateral sources, and the NGO Pax Natura.

Source: Analysis of Blackman and Woodward (2009) on the basis of data from Garcia, 2008.

Sources of Funding

FONAFIFO gets funding from several sources; the fossil fuels' tax raised by the Costa Rican State is its main source of funding. Besides, FONAFIFO also receives funds from the sale of carbon bonds by the Costa Rican Office for Joint Implementation (OCIC), another subsidiary body of MINAE on the international market (Miranda *et al.*, 2003 cited in Arriagada, 2008). Its another source is the Global Environment Facility (GEF)

to protect territories included in the Mesoamerican Biological Corridor, and from private hydropower companies and a beverage company (Florida Ice & Farm) (Arriagada, 2008). Several other sources are tried as well to fund the activities of FONAFIFO (Table 3). Since 2000, the PES program has also been supported by a loan from the World Bank and a grant from the Global Environment Facility (GEF), through the Ecomarket project. Besides, it has also received a grant from the German KfW development bank through the *Huetar Norte Forest* Program (Pagiola, 2005). However, these funds have not been sufficient to enroll all the landowners who have applied for the program (Pagiola, 2008).

In addition to loan and grants from bilateral and multilateral donors, a part of the PES program also operates with direct inputs from the users of environmental services. The program invites individual hydroelectric plants, breweries, irrigated farms and other organizations that benefit from environmental services to pay FONAFIFO to negotiate contracts with the providers of these services. To date, a number of entities have voluntarily contributed some US$17 million to FONAFIFO under these provisions (Table 3), which comprise only about 3% of the hectares enrolled under the program (Table 2) (Blackman and Woodward, 2009).

The Forestry Law has restricted FONAFIFO's ability to promote the supply of environmental services due to inadequate funds and limitations on the earmarking of general taxes (Pagiola *et al.*, 2002). In 2003, contributions from the GEF/World Bank Ecomarket Project and German KfW support comprised more than half of the PES budget. Until 2005, the World Bank loan and GEF grant were required to meet shortfalls (Sierra and Russman, 2006). Demand for PES contracts has exceeded supply as the payments are often compared favourably to opportunity costs of other land uses and income opportunities (Pagiola *et al.*, 2004). PES applications are formally selected by FONAFIFO in consultation with the National System of Conservation Areas (SINAC), based on selection criteria laid down every year by presidential decree. Until 2002, a large number of criteria were detailed for each conservation area, but little actual priority-setting was carried out by FONAFIFO in practice (Barton *et al.*, 2009).

Section - III

Impact of PES in Costa Rica

The PES programs in Costa Rica have undoubtedly several positive impacts and may be considered to be fairly successful environmental conservation measures. Nevertheless, there are failures and lapses in certain fronts, which may need our attention for possible rectification. The most obvious impacts of the PES program are reported to be environmental conservation and livelihood benefits. In addition, there is expected to be

a range of non-income impacts as well. As long as participation in PES program is voluntary, it can be assumed that the program has the potential to make the participants better off. An important aspect of the benefits provided by a PES program is that the income received by the participating households is likely to be much more stable than the income they receive from other sources (Pagiola *et al.*, 2005).

Impact on Environment

The literature on PSA in Costa Rica does not offer a clear picture about the impact of the program on land use changes. Moreover, as Pagiola (2008) puts it, it is difficult to compare results of previous studies on PSA's impact as they apply to different areas, different time periods, different dependent variables, and use different methodologies. Notwithstanding these limitations, an understanding of the nature and the extent of impact, especially on environment, carries significance.

The basic idea behind PES is to generate and restore environmental services for which payment is made to the service provider. Whether these payments affect the supply of environmental services or not is a matter of how they affect landowners' decisions to avoid deforestation (Robalino *et al.*, 2008). There is evidence that the forest area enrolled in the PSA program of Costa Rica at the end of 2005 represented about 10% of the country's forest area (Pagiola, 2008). But the role of PES is not just limited to avoiding deforestation. It also includes restoration of ecosystem services wherever lost.

There are empirical evidences as well as facts and figures that present both the nature and the extent of the impact of PES on forests. Several studies have reported that implementation of PSA in Costa Rica coincides with a decline in gross deforestation in the country (Sánchez-Azofeifa et al., 2001; Kerr *et al.*, 2002; Kleinn 2002). Robalino *et al.* (2008) estimated the magnitude of the effect of PES on deforestation in Costa Rica between 2000 and 2005. They found that only 0.4 percent of the parcels in the program would have been deforested in a given year if payments had not existed. This low return on investment is, to the first order, the same as was witnessed for the period 1997-2000 (Sánchez-Azofeifa et al, 2007; Pfaff *et al*, 2007). However, Robalino *et al.* (2008) found that shifts in implementation have eliminated the bias in PSA location towards places where PSA's impact on deforestation was even lower than on average plots. Thus, they showed that the impact increased due to changes in how program parcels were chosen. However, their study suggested that significant potential gains can be realized by increasing target areas with some deforestation pressure, including payments that differ over space.

Several studies have found that PSA recipients have higher forest cover than non-recipients. In a study by Zbinden and Lee (2005), it was found that PSA recipients in Northern

Costa Rica had 61% of their farm under forest as compared to only 21% for non-recipients. Similarly, Sierra and Russman (2006) established that PSA recipients in the Osa Peninsula had over 92% of their farm under forest or bush as compared to 72% for non-recipients. Tattenbach *et al*. (2006) developed an econometric model of gross deforestation during the period 1996-2000 using district-level data from the Cordillera Volcanica Central Conservation Area (ACCVC). They estimated that the primary forest cover of Costa Rica in 2005 was about 10% greater than what it would have been without the PSA program. Likewise, using a propensity score matching method with farm-level data from Sarapiquí from 1997 to 2000, Sills *et al.* (2006) proved that PSA has encouraged protection of mature native forest. Sierra and Russman (2006) stated that conservation impacts are indirect, and realized with considerable lag, as they are largely achieved through land use decisions affecting non-forest land cover.

Contrary to the above findings, there are studies that question the favorable impact of PES program, especially on forests. There are evidences of PSA participants stating that they would have protected their forest even in the absence of the PSA program (Pagiola, 2008). Using observed and projected deforestation rates, including for matched analysis, Pfaff *et al.* (2008) found that Costa Rica's PSA program had little impact on deforestation rates. The reasons, according to them, were low national rate of deforestation; lack of targeting by the PSA of where the payments could matter; and goal of transferring surplus to landowners. They proposed that PSA has the ability to save most of its budget or drastically increase impact for its current budget, if it could target those areas of the country that face a relatively high threat of deforestation.

That FONAFIFO has a long waiting list of applicants willing to enroll at current prices, which indicates that clearing forest is not very profitable in many areas. It may be suggested that FONAFIFO could have enrolled a much larger area with the same budget (Pagiola, 2008). Pfaff *et al.* (2006), but it was found that the PSA program was likely to have a minimal impact on deforestation during the period 1997-1999.

While the above studies point towards understanding how PES program of Costa Rica has affected forest cover in course of its implementation, there are also studies that have attempted to probe whether and what environmental services have been generated. PSA in Costa Rica, while generating environmental services solely through forest land uses, has created three major environmental services: water services, biodiversity conservation services, and carbon sequestration services. Coming to water services, the primary concern in Costa Rica is over water quality rather than its quantity (FAO, 2000). Bruijnzeel (2004) found a positive link between forest cover and water quality in Costa Rica. The number of contracts with water users has increased over time indicating the fact that people have developed the perception of benefiting from the forests (Pagiola,

2008). Most of these contracts are in watershed. However, there are also skepticisms over the contribution of these contracts to water services. Tattenbach *et al.* (2006) found that a substantial part of the program's resources were spent in areas where few water services were likely to be generated. Besides, only a small part of the hydrologically important areas was being reached. There are also instances that the PSA program often fails to conserve areas that could potentially generate environmental services. Areas conserved tend to fall short of targets even in watersheds that have been targeted for over five years (Pagiola, 2008).

Taking the percentage of enrolled area located in biodiversity conservation priority area as a crude indicator of effectiveness of providing biodiversity services, there have been varying findings on the magnitude of the coverage based on various definitions. Silvopastoral practices, which combine trees with pastures, have proved to play a significant role in the survival of wildlife species by providing scarce resources and refuge; to have a higher propagation rate of native forest plants; and to have provided shelters to wild birds. They can also help connect protected areas. Silvopastoral practices can also fix significant amounts of carbon in the soil and in the standing tree biomass (Fisher *et al.,* 1994; Pfaff *et al.*, 2000).

PES will have the desired effect only if they influence land use decisions appropriately. Silvopastoral practices tend to be unattractive to land users despite their long-term benefits, primarily because of their substantial initial investment and because of the time lag between investment and returns. This leads to the hypothesis that a relatively small payment provided early could "tip the balance" between current and silvopastoral practice by increasing the net present value of investments and reducing the initial period in which these practices impose net costs on land users. The time when payments end, the silvopastoral practices will have begun generating income for land users. The payments also alleviate the liquidity problems faced by many land users and help them finance the required investments (Pagiola *et al.*, 2005).

Impact on Poverty

The PES approach has been undertaken as a mechanism to improve the efficiency of natural resource management rather than as a mechanism for poverty reduction. Many proponents have argued, however, that PES can also have positive impacts on poverty (Landell-Mills and Porras, 2002; Pagiola *et al.*, 2002). PES may reduce poverty primarily by making payments to poor natural resource managers in upper watersheds. The extent of the impact depends on how many PES participants are poor, their ability to participate, and on the amounts paid. There can be important synergies when program's design is well thought out and local conditions are favourable (Pagiola *et al.*, 2005).

However, the literature on the impact of PES on poverty reduction is both varied and conflicting.

Landell-Mills and Porras (2002) argue that by increasing the value of existing marginal land, PES programs could enhance incentives for powerful groups to have control over it. PES might thus aggravate problems in situations where tenure is insecure. A different concern is voiced by Kerr (2002) and Rojas and Aylward (2003). They apprehend that the livelihoods of the landless poor - the women and herders who do not participate in PES programs are under-represented within local representative institutions and often depend on gathering non-timber products from forests ? may be adversely affected if PES conditions limit their access to forested land. Consequently, there is a risk that PES programs might further marginalize them within their own communities by institutionalizing inequitable payment schemes or by excluding them. Under such conditions, PES schemes could be undermined on account of growing conflicts over resources or the spread of illegal activities resulting from the exclusion of important segments of the population. It is, in this context, pivotal to state that PES schemes should not make poor communities more vulnerable to climate or market-driven revenue fluctuations (Mayrand and Paquin, 2004).

There are also adverse effects on the labour market. Certain groups of poor people are being employed in some of the environmentally most threatening activities, viz., logging-company workers, firewood cutters and charcoal makers, extractors of over-harvesting Non-Timber Forest Products (NTFP), or farm hands hired for clearing land and for cultivating converted soils. They often depend on environment for their livelihoods and are likely to lose out in terms of employment or informal-sector income. Besides, PES can also change output markets. For instance, a successful ecotourism scheme could raise local demand and prices of certain protein-rich food stuffs, which the on-site poor with low income cannot afford to buy. There can also be some output-market effects off-site. For instance, cutting off raw-material supply may have notable downstream development impacts. Quantitative welfare effects of PES are bound to remain very low as compared to national poverty-alleviation goals. Some pro-poor interventions may be possible due to PES programs, but increasing regulations could curb PES efficiency and implementation scale, which could eventually harm the poor. The prime focus of PES should thus remain on the environment, not on poverty (Wunder, 2008).

In attempting to understand when PES becomes beneficial to the poor, Zilberman et al. (2006) present some useful arguments. Although, the study is not confined to Costa Rica, it still merits attention. To Zilberman *et al.* (2006), generally, PES is suitable for landowners and may negatively affect consumers if food demand remains inelastic.

The correlation between poverty and environmental amenities also determines the impacts. In the face of the richer farmers providing the best environmental services, the poor farmers may lose. If there is negative correlation between environmental services and productivity, then the poorer landowners are likely to gain from environmental services. The distribution of land also matters. If small landholders depend on their earnings from work on larger farms, then PES may create a negative impact on them. Pagiola *et al.* (2005), in this context, suggest that services in PES are the result of particular kinds of land use and the payments made are compensation to land users. This makes the distribution and ownership patterns of land critical for the poverty impact of PES programs. Even if poverty rates in the targeted parcels are high, it does not follow that payments will be received solely, or even principally, by the poor. Even in a situation of high poverty, some land users are likely to be better-off, and there can be substantial variability in the level of poverty among the poor. Even with primarily only poor population, there is no guarantee that the payments will reach the poorest (Pagiola e*t al.*, 2005).

Impact on Society

Beyond participating land users, many other groups of people may be getting affected by PES programs. Among them, the prominent ones are those who are employed in agriculture or who collect a variety of products from forests. Maintenance of natural forest cover may demand less labour than converting that land to agricultural use. If PES-promoted land uses reduce the demand for labour, those depending on such employment could be adversely affected. Costa Rica's PSA program mostly involves conserving the existing forest (Pagiola, 2002), which is a much less labor-intensive land use than crop production. The extent of the impact depends both on the change in local labour demand and on the existence of alternative sources of employment. There is however a counter argument that PES-promoted land uses may not necessarily reduce labour demand. The silvopastoral practices supported under the World Bank's Regional Integrated Silvopastoral Ecosystem Management Project are expected to increase farm labour use in the project areas by 34% in Costa Rica (World Bank, 2002).

If PES programs result in a switch from agriculture to forestry, the agricultural production is expected to fall, leading to rise in food prices[2]. Such an effect, however, appears quite unlikely as the most productive agricultural land does not normally get enrolled, as its opportunity cost is too high. The production effect of PES programs, therefore, is likely to be proportionately smaller than the area involved (Pagiola, 2005). Rather there are

[2] However, if switching over from agriculture to forestry is accompanied by improvements in farm productivity, agricultural production may not decline and hence food prices may not rise.

several other beneficial social effects in terms of creation of social assets: (i) continuous institutional innovation in order to adapt to the development of the PES; (ii) a process of "de-bureaucratization" to increase effectiveness of the PES, with more interaction with intermediaries and local bodies and less involvement of national level institutions; (iii) promotion of voluntary agreements to improve the environment; (iv) promotion of organizational and community innovation; and (v) promotion of inter-institutional co-ordination, among FUNDECOR, FONAFIFO, MINAE, CNFL, and other institutions such as the Ministry of Education, through the environmental education program (Miranda *et al.*, 2003).

There are many non-monetary benefits to land users. These may include access to credit, capacity building, training, infrastructure, and support for revenue diversification or market development. Some other prominent outcomes are land-tenure consolidation, increase in human and social capital, and higher visibility *vis-à-vis* external investors (regarding tenure, there is an apprehension that PES could induce more powerful groups to crowd out small landholders from their land whenever insecure property rights exist (Landell-Mills and Porras, 2002). Despite the existence of land-appropriation fears among peasants, PES participation in practice has increased small landholders' land-tenure security vis-à-vis neighbours or squatters. It is rather argued that most PES gains are not large enough to attract the interest of the powerful (Rosa *et al.*, 2004; Robertson and Wunder, 2005). These non-monetary benefits are very important from the perspective of the participants and are the key to ensuring sustainability of land use changes.

Land-tenure security can be enhanced through two distinct mechanisms applied in PES programs. First, tenure consolidation efforts can explicitly be enabled by the PES scheme - as an up-front requirement, or as an accompanying result. Mapping, demarcating and legalizing land claims are also often done as PES implementation proceeds. Second, a major tenure-securing effect of a PES scheme can be to create local recognition that land set aside for conservation has tangible economic value and is not just idle "reserve land" up for grabs by immigrants or neighbors (Robertson and Wunder, 2005).

Beyond land-tenure effects, experiences confirm that PES participants tend to increase their human and social capital by improving internal organization, e.g., through collective bargaining and action vis-à-vis the service buyers (Grieg-Gran *et al.*, 2005; Rosa *et al.*, 2004). PES is found to have created human assets in terms of improved capacity building of different kinds. There has been significant improvement in environmental education and solid waste management wherein schools, parents and civil society organizations have been involved. Increased knowledge base about forestry and farm management is an added dimension of PES that help further forestry research and policy (Miranda *et al.* 2003).

Section - IV
Major Challenges

Despite several positive outcomes, PES schemes in Costa Rica are not free from potential threats and difficulties. The following challenges are identified by the researchers, and are likely to affect the sustainability and effectiveness of the PES schemes in Costa Rica:

Lack of knowledge of and demand for ES

Wunder (2005) identifies two key obstacles of PES schemes in Costa Rica such as limited demand and poor knowledge. Very few service users are confident about the mechanism that they are willing to pay as the link between land use and environmental services provision is insufficiently understood or ambiguous. Besides, there is poor knowledge about the institutional requirements entailing incentive and livelihood mechanisms. Poor knowledge on the links between desired ecosystem services and ecosystem management practices can lead to *de facto* non-conditionality. This indicates that PES arrangements have to be designed on the basis of "assumed" rather than "proven" causal relationships. Such arrangements between paid-for management practices and demanded ecosystem services ought to be accompanied by mechanisms that frequently examine the validity of these assumptions and contain options for re-negotiating the agreement in case new knowledge renders these assumptions invalid (Ravnborg *et al.*, 2007).

Proper valuation of ES

Ideally, payment should be determined by both the values of the environmental services to the beneficiaries and the costs to land managers. It should lie between the service users' "maximum willingness to pay" and sellers' "minimum willingness to accept". In reality, however, only the latter principle has been in use. Upstream land managers are weak in bargaining as they are large in number, dispersed, and hold very small sizes of land. It is also difficult for them to estimate the value of the services to downstream users than it is for proponents to estimate the opportunity costs of changing land management practices. The payments in Costa Rica's PES program, for instance, were determined by the opportunity costs of land areas suitable for ranching, besides available funds (Pagiola *et al.*, 2005).

Opportunity Costs

Another problem pertains to the bundling of different environmental services. Environmental services, if bundled together, as it is in practice in Costa Rica, may lead to distributional inefficacies. It is also true that opportunity costs for good arable land is considerably higher than most incentive payments, and farmers would lose money if

they opt for a conservation strategy. However, restrictive land use legislation prevents alteration of existing forested lands and also leads to an artificial incentive to encourage farmers to participate (Porras and Hope, 2005).

Insecure Land Tenure

Yet another obstacle to the success of PES is the insecurity in land tenure system. As PES payments are made to particular land uses, it may not be possible to undertake this program if tenure is insecure. This will often be the case in frontier areas with active deforestation. Secure tenure is especially important in cases where PES programs require long-term investments (Pagiola, 2005).

Access to Technical Assistance

Where adoption of PES practices requires considerable technical capacity, the poor may fail to participate due to their lack of education or access to technical assistance. Few PES programs require the adoption of land uses as complex as silvopastoral practices. In many other cases, PES payments may be for doing nothing excepting for maintaining natural forest (Pagiola, 2005). If the latter becomes the case, lack of technical assistance ceases to be an obstacle.

High Transaction Costs

One of the most potential hindrances to the participation of the poor in PES is high transaction costs. Working with many small and dispersed farmers amounts to high transaction costs. As a result, there is a definite incentive for PES programs to favour contracts primarily with larger farms (Pagiola, 2005). National programs have the ability to spread these costs over a large number of agents, facilitating PES agreements that may otherwise be prohibitively costly. However, an important disadvantage of national programs is the potential inefficiency. Since national governments are not direct users of environmental services, they generally do not have detailed local knowledge about the value, provision, and use of these services. Moreover, they are motivated by political and bureaucratic interests. Consequently, they often fail to identify the providers of important environmental services, negotiating cost-effective contracts, and monitoring compliance. A second disadvantage of national PES programs is that they often lack sustainable long-term financing. They depend principally on national tax revenues and international assistance, which are vulnerable to changing political and macro-economic conditions (Blackman and Woodward, 2009).

Market Price of ES

Economic valuation of certain environmental services is complex. There are two obvious problems: (i) an identification problem in allocating value to services not revealed by

market behaviour; and (ii) a referencing problem in determining a baseline condition from which agreed changes are evaluated. Valuation of ES through a monopsony or private transactions also requires a pricing strategy. Prices can be fixed or may vary. In Costa Rica, a fixed price was determined for different land management options. Such an approach is transparent, easy to administer and appears equitable. Adopting a fixed price may be fiscally and socially inefficient (Hope, 2005).

Finally, it may be said that PES schemes in Costa Rica have the potential to become successful environmental conservation strategies besides benefiting the poor and the society at large. This potential will be gradually fulfilled as the major threats and critical issues are addressed properly. The positive effects of PES on sustainable development will rise if their distributional impacts are considered and if adequate efforts are made to build capacities in poor.

CHAPTER V

ECOSYSTEM MANAGEMENT INSTITUTIONS IN INDIA: A CRITICAL REVIEW

Introduction

The ecosystems of India are diverse and complex. These ecosystems range from high altitude Himalayan Mountains with exotic species of flora and fauna in the north to vast areas of coastal belts in the south, and the rich forest resources in the eastern and central parts of India. In addition, several important rivers form the major river basin water ecosystem support livelihood systems of the country. We discuss the importance and management of these ecosystems under following headings: forests, water (both surface and ground) and land, biodiversity, and coastal resources.

The rest of the chapter is designed in the following way: While Section II deals with the forest ecosystem, Section III discusses the major aspects relating to land and water resources. Issues related to biodiversity and coastal ecosystem are dealt with in Section IV and Section V respectively. Section VI concludes the chapter by summarizing the major findings and highlighting the important issues relating to PES in the Indian context.

Section - II

Forest Ecosystem

About 23% of India's geographical areas are covered under forests. Forests occupy an important place in India's economy in terms of their contribution to the Gross Domestic Product (GDP), employment and livelihoods of poor people. The contribution of forests to India's GDP varied from 1.0% to 1.5% during 1993-94 to 2002-03 (CSO, 2004). In India, forests meet nearly 40% of the energy needs of the country of which more than 80% is utilised in the rural areas; and about 30% of fodder needs of the cattle population (Singh and Shishodia, 2007). Forest products also play a very important role in rural and tribal economy as many of the Non-Timber Forest Products (NTFP) provide

sustenance for the rural poor. For landless households and marginal farmers, forest-related activities often represent the primary source of income. Besides these direct tangible economic benefits, forests provide a number of benefits which are not directly visible and yet they have a great influence in affecting the quality of life. Among the most important services that the forest ecosystem provides are: amelioration of climate, conservation of soil and moisture, flood control, carbon sequestration, control of environmental pollution, enhancement of diversity in agro-forestry system and beautification of human environment.

The management regime over forest resources in India has been undergoing considerable changes over time. During the pre-colonial period, the forests were controlled and managed by village communities, resulting in a common property regime with no private claims by individuals, and access to all community members according to their needs (Ghate, 2003). This property regime changed when the first forest policy statement of the Colonial British Government announced in 1865 that forests were transformed into state property (Guha, 1983). After independence, the Indian Government did not reverse the main centralization trend of colonial forest policy, but rather strengthened it through a series of legislative and other measures enhancing government's control over forest resources and multiplying the restrictions imposed upon the tribal population in view of continuous forest degradation (Baland and Platteau, 1996). Since independence, there have been three forest policy pronouncements in India: the 1952 Forest Policy, the National Commission on Agriculture (NCA) 1976, and the 1988 Forest Policy (Saxena, 1999). It is widely argued that the four decades of forest policy preceding 1988 were mainly concerned with timber production for commercial purposes, and have neither been sustainable in terms of checking the process of deforestation, nor improved people's access to forests for meeting their basic needs. In light of the massive deforestation and forest degradation leading to increased social unrest and conflict between state and village communities, the 1988 Forest Policy was a landmark in Indian forest policy. It implied a radical shift from the earlier revenue orientation towards conservation, now being considered a priority. Commercial forest exploitation by industries became prohibited, while soil conservation and other ecological functions as well as subsistence requirements of the local people became major objectives.

In a follow-up document issued in 1990, the Central Government issued guidelines to all state governments to implement Joint Forest Management Systems in order to regenerate degraded forest and improve living standards (GoI, 1990). The guidelines suggested that the state governments might devolve everyday forest protection, management and development responsibilities to local institutions at the village level (Forest Protection Committees (FPCs)) and prescribe benefit-sharing arrangements

following regeneration, implying a clear shift from a system of pure state management to one of co-management. In 2000, a revised JFM resolution was issued, containing some significant changes, e.g., the extension of JFM to good forests and the requirement that 33% of FPC members be women (GoI, 2000). Within the broad framework of rules and regulations provided by the Central Government, the state governments have the scope to implement their own resolutions of rules and regulations, depending on their prevailing requirements and situations. As we will see below, state resolutions vary widely. Little is known about the underlying reasons for this observed inter-state asymmetry in JFM implementation. Certainly, the interests of the Forest Departments (FDs) and the governing political party influence decisions. Donor activities also play an important role (Damodaran and Engel, 2003). Decisions are rarely made on the basis of economic, social and institutional efficiency, but rather, respond to pressures from various stakeholder groups (Khare *et al.*, 2000; Saxena, 1999; Vira, 1995).

It appears that the conditions for effective co-management - particularly the conditions that property rights should be secure and well-defined, and that appropriate and sufficient powers be transferred to communities (Ribot, 2002; Larson and Ribot, 2004) ? are not satisfied in the case of JFM. Rights are insecure because they are only administrative, not legal rights, and as such can be withdrawn at any time. The transfer of property rights to communities has been partial, and its degree differs widely across states. While it may be conceptually appropriate that the state retains some rights, e.g., the determination of forest areas to be included to account for externalities, it appears that it often also retains rights where the community would conceptually have an advantage (e.g., the right to punish and cancel membership). The incomplete transfer of rights is likely to result in reduced community incentives for sustainable resource management, and provides incentives to overexploit forests for quick economic benefits (Bulte and Engel, 2006).

Empirical evidence on the outcomes of forest resource management across major Indian states shows wide variations owing to significant differences in policies (Damodaran and Engel, 2003; Ballabh *et al.*, 2002). As indicated, forest resources are controlled by the Central Government through various acts. The Central Government issues guidelines to state governments under which the states formulate their forest policies on how to use and manage the resources. Hence the performance of the state forest resources depends primarily on the policies designed by the states. The performance of JFM policies, as described above, is critically linked with the level of people's participation in the decision-making process which in turn depends on the incentives that are provided through transfer of property rights (Behera and Engel, 2006). In addition, equal participation in the decision-making process by all sections of people in the society is thwarted by elite

capture of devolved power (Behera and Engel, 2007). Further, many common property resources at the local level are used and managed by the Panchayat Raj Institutions (PRI), especially, under the PESA (the Provisions of the Panchayats (Extension to the Scheduled Areas) Act, 1996). Given that the effectiveness of PRIs varies widely across states depending on the political will and related policies of the respective State Government, and the extent of devolution of power to PRIs, even a resource-rich state may suffer on the development front when the PRI is weak.

Section - III
Water and Land Ecosystem

Water is a finite but renewable natural resource that is an integral part of the environment. Apart from economic use of water resources such as drinking, washing, agricultural and industrial production, generation of hydro-power and abatement of pollution, water is also essential for recreation and maintenance of ecosystems (Singh and Shishodia, 2007). In India, water resources are under tremendous biotic and abiotic pressure, as most of the rivers, lakes, tanks and ponds are polluted, and the groundwater aquifers are being over exploited in most of the arid and semi-arid regions, and are on the verge of complete exhaustion and depletion.

Sustainable development and management of water resources is crucial for achieving rapid economic development for any economy. In India, water resource is primarily a state subject and hence the state governments have primary responsibilities to control and manage this important resource by enacting various laws. However, at the national level, the Central Government is responsible for the development, conservation and management of water resources in the form of providing general policy guidelines on water resource development, technical assistance to states on various projects that deal with water, and resolving inter-state river water disputes as the majority of the rivers flow through many states. Data on groundwater suggest that groundwater utilisation varies widely across the Indian states. Both the conditions of under and over utilization of ground water can be attributed, to a large extent, to the state policies. Empirical evidence shows that a large number of groundwater irrigation wells are concentrated in peninsular India (hard-rock area) where the recharge potential is extremely low, leading to over exploitation of groundwater resources (Nagaraj *et al.*, 1999). In addition, heavy subsidies in electricity supply in some states have resulted in either fuller utilisation or depletion of groundwater resources (Reddy and Dev, 2006).

Besides, a large portion of water resources (both surface and ground) is also managed at the local level, and lack of effective institutions at the local level has resulted in

misallocation, deterioration of quality of water and severe overdrafts of groundwater (Nagaraj et al., 1999; GoI 2007). Devolution of water resource management and usage rights to user groups is strongly suggested and implemented as an alternative viable institution for sustainable exploitation of water resources. Large-scale implementation of watershed development programs across India since 1990s is one such example. Though many Water Users' Associations (WUA) were formed at the village level and elections were conducted in states like Andhra Pradesh, Gujarat, Maharashtra and Bihar, the progress in terms of their effectiveness is uneven. This is attributed to the extent and scale of devolution of rights and responsibilities of water distribution across states (Reddy and Dev, 2006).

Further, use and management of water resources is critically linked with sustainable use and management of land resources. Therefore, judicious use, large-scale conservation and proper management of these resources are keys to sustainable development of agriculture in India. The present crisis in the Indian agricultural sector, to a large extent, can be attributed to the fact that these two crucial resources have been poorly managed, at least since the adoption of the green revolution. As a result, soil and water depletion have taken a toll, both directly and indirectly, on agricultural growth. A holistic approach is required to manage resources by laying equal emphasis on soil and water conservation while adopting intensive cultivation of green revolution. However, this was not the case. For example, traditional water harvesting systems such as tanks and ponds were neglected by the government and farming communities at large, dislodging the complex ecological balance that existed (Reddy and Behera, 2009a, 2009b).

As indicated above, the massive watershed development program launched across India by the Ministry of Rural Development was primarily aimed at conserving water and soil resources in order to enhance land productivity in dry and rain fed regions. However, despite spending large sums of money on the program, the expected outcomes were disappointing. Again, the failure of watershed development programs can be attributed to social, policy and institutional factors such as lack of people's participation, less accountability and transparency. It is largely observed that the watershed development program failed because of poor implementation at the ground level (Reddy 2006). This can be seen as a policy failure leading to poor ecological outcomes.

An integrated approach that links natural resources and people through vibrant institutions is the need of the hour for sustainable management of resources. Often, it is observed that focus has been on a particular component while other vital components are neglected. For example, during the initial phase of implementation of the watershed development program, importance was given to watershed technology (constructing

water and soil conservation structures) without paying much attention to watershed committees (institutions), which are vital for sustaining the program in the long run (Behera and Mishra, 2007).

Section- IV
Biodiversity Resources

In economics literature, the role of biodiversity conservation in economic development is well recognised (TEEB, 2009; Ninan, 2007). Diversity of species and environments is essential for long-term productivity and sustainability. Its preservation is a form of investment for the future. India is rich in biodiversity resources. India has two of the world's 25 biodiversity hotspots, namely, the Western Ghats and the Eastern Himalayas. It has 6% of the world's flowering plant species, 14% of the world's birds, one-third of the world's identified plant species, numbering over 45,000 and about 81,000 identified species of animals. At least 166 species of crop plants and 320 species of wild relatives of cultivated crops originate from India (Singh and Shishodia, 2007). More than 90% of all medicines in India come from plant species, many of them harvested in the wild. These facts about biodiversity in India indicate that it is an important natural resource that is crucial for the development of human livelihoods and well being.

However, despite its tremendous importance, sustainable use and management of biodiversity in India has been neglected. Owing to lack of proper management strategies, biodiversity resources in India are under great biotic pressure for the last several decades. India's increasing growth of human and animal population, high growth of urbanization, industrialization and commercialisation of agriculture, high incidence of poverty and high level of illiteracy have all contributed to the degradation of natural resources and loss of biodiversity. As a result, many species are on the brink of extinction.

In response to the above concern, India has adopted a policy known as the Protected Area (PA) approach to biodiversity conservation. It means that certain areas are notified as "protected" from human interference under the Wildlife (Protection) Act 1972. The act provides for setting up of national parks and wildlife sanctuaries with a view to afford varying degrees of protection to a whole range of animal species. This act has been amended several times in 1982, 1986, and 1991. The 1991 Amendment affords protection to schedule plants and prohibits commercial felling in wildlife sanctuaries. The recent launching of Eco-development Projects in 7 Pas, by the Government of India in collaboration with several international donor agencies such as UNDP, GEF and IDA, has further strengthened the conservation of biodiversity at the policy level. However, despite all these policy measures loss of biodiversity is on the rise. This is

because of ineffective implementation of these policies and lack of adequate coverage to a vast majority of natural resources that house important biodiversities.

Section - V
Coastal Ecosystem

Coastal resources are another important ecosystem that contributes to India's economic development immensely. India is surrounded on three sides by ocean and has one of the largest coastlines of 7,500 km. The coastal areas have a vast economic potential and attract tourists from all over the world to their beach resorts blessed with unparalleled scenic beauty. The coastal locations where land and sea meet happen to be environmentally fragile. There is erosion of coastline due to climatic changes, and destruction of mangroves has exposed the coastline to the ravages of weather. This has been aggravated by the pollution created by chemical industries, upcoming ports and impact of tourism activities that are ravaging the coastline. Depletion of coastal resources is a matter of serious concern and poses an immense challenge to policy makers. The recent emergence of the issues of rising sea level due to global warming has posed serious challenges to the policy makers, which is shifting the shorelines, affecting both coastal ecosystems and human lives. Hence, both anthropogenic and natural interventions are responsible for degradation of the coastal ecosystem. The Government of India has recently launched the Coastal Management Zone (CMZ) that prohibits activities in the coastal regions that affect coastal ecosystems, for e.g., prevention of pollution and encroachment of mangrove forests (GoI, 2008). Though the CMZ scheme is designed to protect the coastal ecosystem at large, the larger issues that remain out of the scheme are the issues of traditional fishing communities and their livelihoods security, in addition to several other areas of concern (Mathew, 2008). Further, the implementation of CMZ is likely to be ineffective because of the immensity of the area and the associated administrative costs involved.

Section - VI
Summary and Conclusions

The preceding discussions on the extent and causes of degradation of various ecosystems in India have highlighted the fact that India has variety of ecosystems and many of them are fragile. The causes of degradation of these ecosystems can be attributed to three failures: (1) Market; (2) Institutional; and (3) Government or Policy Failure, as discussed in detail above. The challenge of management of ecosystems in a sustainable fashion is to correct the above-mentioned failures. In this context, PES mechanism can be used as a sort of policy approach towards resolving the above failures, especially the market failures. A few interesting PES-like cases in the Indian context are presented in the next chapter and the applicability of PES mechanisms are explored in detail in Section 3.

CHAPTER VI

CONCLUDING REMARKS AND IMPLICATIONS FOR INDIA

The objective of this report is to review the experiences of PES schemes across the globe and understanding the implications of such schemes in the Indian context. Attempts are made to develop a conceptual framework for the analysis of PES schemes and to review the existing studies on PES and related literature by using this framework. In addition to literature survey, few interesting case studies from countries with diverse nature of ES markets and their geographical location are also analysed for a deeper understanding of the issues. From the preceding discussions it is clear that PES scheme is a relatively new approach and the outcomes so far are mixed. Hence, it would be too early to come to any conclusion on the efficacy of the PES scheme, though it appears to be simple and straightforward. However, in the light of the experiences of some of the Latin American countries during the last one decade or so, it can be said that the PES scheme has tremendous potential for many other emerging countries including India. It has great prospects of slowing down environmental degradation, greater conservation of environmental resources, and improvement in livelihoods of the marginalized sections of the society. Some of the key factors that might either promote and/or hinder the success of the PES scheme are highlighted below.

- *Uniformity of the Scheme*

So far, there is hardly any uniform scheme for a particular ES across the countries or across the regions within the same country. While this gives enough flexibility to design the schemes as per the requirements of a particular market, replication of a successful model becomes a difficult proposition, as it requires necessary modifications to be adoptable in different ES markets and ecological conditions. This means that the PES scheme has to be tailored to the specific needs and conditions of the market for a particular ES in a specific location.

- ***Property Rights***

The PES scheme is likely to be successful when environmental services are clearly visible and both the beneficiaries and the land users (suppliers of ES) are well organised. In addition, property rights over environmental resources should be clearly defined and secured from any involuntary encroachment. There should be a strong legal framework under which this newly created market for environmental services can effectively function. However, it should be ensured that there is no conflict between the market forces and the legal structure.

- ***Nature of the Scheme***

Broadly, the existing PES schemes can be classified into three groups: (1) user financed; (2) government financed; and (3) hybrid (where both the government and the users or a third party such as NGOs and/or international/national donors are involved). Literature suggests that user financed PES schemes are more likely to perform well as compared to the government financed ones. This may be so due to the fact that in user financed PES schemes the conditions for the success of PES such as clearly-defined property rights, low transaction cost, consideration of ES as private or club goods, involvement of small numbers of actors, etc., are met. On the other hand, in government financed PES schemes, most of the ES are public goods with lack of clearly-defined property rights and involvement of large number of actors, which makes the scheme less effective. It is also observed that most of the government financed PES schemes across the world are much like any other subsidised government program, which totally relies on government funding. This is particularly so because of the fact that the government buys ES from the sellers for other beneficiaries and there is no direct contact between the ES users and the sellers. This raises an important issue, whether the state financed PES programs may suffer from the problems of information asymmetry and rent seeking due to principal-agent relationships between the executives and the suppliers/users of ES. When it is so, sustainability of PES scheme may suffer to a large extent.

- ***Valuation and Assessment***

Proper assessment of ES generation and their appropriate valuation is a critical issue in most of the PES schemes. In many cases, it is seen that a PES scheme generates more than one service, but is accounted only for a specific ES. Moreover, a clear and consensual scientific evidence to link land uses to the provision of services is missing in many cases, which can potentially undermine the effectiveness of ES markets (Gret-Regamey *et al.*, 2007).

- *Information Dissemination*

The case studies reviewed in the report demonstrate the importance of credible scientific information, particularly in the hydrological watershed projects. In fact, the market-based instruments can function well when there is an established link between the land-use practices in the upper watershed and downstream provisioning of the ecosystem services through an effective information dissemination network. In addition, success of PES schemes are also conditioned by insights from good valuation studies that can link payment options with increasing provisions for environmental service.

- *Nature of Contract*

The effectiveness of the PES schemes also largely depend on the nature of contracts that the sellers and the buyers of ES are confined to. It is suggested that flexible, ongoing and open-ended contracts can go a long way to make the schemes effective (Barton *et al.*, 2009; Ferraro, 2008). Since the PES schemes are relatively new and everything is in the process of learning and experimentation, an open-ended contract can provide enough scope to correct the constraints.

- *Cost-Benefit Analysis*

Potential benefits in excess of costs may make the schemes sustainable in the long run. Hence, there is always a need for substantial reduction in transaction costs to make the schemes economically viable for both the sellers and the buyers (Wunder et al., 2008). Experience from some developing countries suggests that the start-up costs are so high that either the government or some donor agencies need to fund the PES scheme in the initial period (Alix, 2003). While this may be feasible at the initiation phase of the project, its sustainability in the long run requires enough scope for own resource mobilization.

- *Multiple Sources of Revenue*

Scope for multiple sources of revenues is likely to be an important factor for success of the PES scheme (Mayrand and Paquin, 2004). This is true particularly in the case of government and/or hybrid type of PES schemes where funding crunch can hamper the sustainability and effectiveness of the scheme to a large extent. Multiple sources of revenue can help in reducing the uncertainty in the under flow of financial resources.

- *Continuity*

Continuous provision of ES is a prerequisite for success of PES scheme in the long run, and that is why the conditionality of constant supply of ES is attached with the sellers. In order to ensure the same, close monitoring of compliance of contracts and changes in

the land use pattern is very crucial. However, proper monitoring appears to be a very challenging task. This is so because monitoring vast areas of land effectively imposes huge cost on the enforcement agencies and thereby makes the scheme economically unviable. While monitoring is essential to make ES buyers accountable and responsive towards ES sellers and thereby ensure equitable contribution to the scheme, this additional cost of enforcement puts a threat on the sustainability of the schemes (Wunder *et al.*, 2008).

- *Trust*

It is observed that the absence of transparency and the resultant lack of sufficient trust between the buyers and the providers hinders the success of the PES schemes (Wunder, 2008). For instance, due to miscommunication and/or lack of adequate information about the schemes, a sense of fear may be created in the minds of ES providers that their lands would be appropriated by the agency in later period (Wunder, 2008). When it is so, the service provider may be discouraged and the scope for ES may be limited.

- *Consensus*

When the PES schemes are implemented in village common lands and/or a PES scheme is required to bring all the landowners under the new land use, then lack of consensus on the part of all the landowners or stakeholders, whether it is common land or private land, may obstruct the progress of the scheme (Wunder, 2008). Under such circumstances, what is more important is to have an incentive structure along with transparent agreement on land use, backed by effective regulatory mechanism. While the incentive structure will encourage the people to have a consensus, the agreement and regulation will protect their property rights along with their interests against misuse and misappropriation of land.

- *Empirical Support*

On many occasions, the PES schemes are designed and implemented largely on the basis of scientific generalizations of the schemes without necessary empirical support (Landell-Mills and Porras, 2002). It is often found that there is a great degree of uncertainty, as well as disconnectivity between conservation activities undertaken and the associated ecological outcomes. Willingness to pay for environmental services often increases if there is an established link between the upstream land use practices and their corresponding effects on downstream environmental outcomes.

- *Technical Assistance in Land Use*

Effective and sustainable changes in land use pattern require providing certain technical assistance to the ES providers. Several studies have found inadequate technical assistance

to the PES provider (e.g., Pagiola *et al.*, 2008; de Janvry and Sadoulet, 2000; Lopez and Valdes, 2000). This may not only make the land use pattern sub-optimal, but also put significant threat on the environment.

- *Targeted Payments*

PES schemes with targeted payment approach are likely to be more successful than those with the system of flat rate payments (Alix-Garcia *et al.*, 2008). In addition, arbitrary setting of charges for ES in isolation of demand conditions and economic valuation of the resources are found to be prevalent in some markets (Ronald *et al.*, 2009). This may fail to estimate the prices of the ES properly and thereby cause disincentive for the users.

- *Improper Identification*

On many occasions, the ES suffer from the problem of improper identification of users and the service itself (Wunder and Alb´an, 2007). Sometimes, execution of the scheme is carried out without proper monitoring or control (Swallow *et al.*, 2005; Adhikari and Lovett, 2006). This means that in the absence of proper monitoring and control, such improper identification may result in inappropriate pricing and incentives, limiting the success of the schemes.

- *NGOs and Civil Society*

Adoption of PES is found to be higher in cases where there is presence of NGOs and civil society institutions, particularly community-based organizations (Adhikari, 2009). Factors such as markets, access to credit, and appropriateness of proposed technology appear to be critical. Building trust between buyers and sellers is also important. Even where there is initial lack of support, PES initiatives should seek to create a policy dialogue among different actors. A well-informed dialog may involve multiple components, all having a foundation in local engagement and consultation. Active involvement in all these activities by NGOs will go a long way in successful implementation of PES schemes.

- *Inclusiveness and Transparency*

Greater inclusiveness and transparency of the program design helps improve program effectiveness, strengthen links between producers and beneficiaries, reduce the enforcement costs, and improve outcomes. Further, the gender dimension of PES, such as consultation with women members for ensuring their participation in all aspects of PES design is very crucial.

PES in India: Prospects and Challenges

With increasing demand for ES in India and the consequent degradation of natural resources, perhaps the time has come to adopt market-based instruments like PES for environmental protection. Given the vast array of natural resources, their importance in the development process, and the available ecological conditions, India has tremendous scope for adopting PES-like schemes to fulfill the objectives of both conservation of environment, and promotion of local livelihoods and social security. As presented in the case studies above, some initiatives in this regard have already been taken by local NGOs and the community. However, the factors identified to be important for success of PES schemes and the provisions for essential policy supports may not be easily available in the Indian context. What follows is a brief discussion on the challenges that India may face while adopting PES schemes:

This report has clearly pointed out that designing PES schemes is a complex task and there is no simple prescription or blueprint for optimal designs. The above literature review and analysis of case studies suggests that the differential outcomes of PES schemes can be understood by examining institutional, socio-economic, biophysical, and contextual factors associated with the individual scheme. One very important aspect that emerges from this review is that PES is likely to be more successful where there are secured property rights over land and forest resources, as well as necessary policy supports that promote community-based approaches to natural resource management. The arguments of clearly-defined property rights and security of tenures have consistently emerged in all the case studies. In this connection, one critical challenge that India is likely to encounter is the insecure and ill-defined property rights over a majority of its natural resources related to a large number of ES. As discussed above, India's ecosystem management institutions are mostly operating under state ownership of natural resources such as forests, coastal resources and water bodies. Further, it is also pointed out that most of the management institutions have failed to achieve their targeted objectives primarily because of lack of active participation by local people in the program, owing to insecure property rights and lack of enabling policy support. For example, one of the most popular and widely talked-about forest ecosystem management institutions in India and abroad is the Joint Forest Management Program. However, this initiative could not last long mainly due to lack of *de jure* property rights over forest resources (Behera and Engel, 2006). Similar is the case with other ecosystem management institutions as well. Therefore, successful adoption of PES schemes in India requires reforming the existing provision of property rights. However, such policy reforms need to be approached very carefully, given India's complex socio-economic and political set up. This is particularly so as such reforms can create both winners and losers and hence conflict of interests.

However, agents with greater access to information and institutional provisions may benefit in a larger way from the policy reforms through rent seeking. In addition, the defined and secured property rights may also cause disincentives for the land owners against optimal utilization of natural resources. All these may result in increasing inequality in the society (Adhikari, 2009). It is, therefore, necessary to develop an appropriate institutional framework that can restrict rent-seeking attitude of the agents under information asymmetry. This should be combined with an incentive structure to encourage the land owners towards optimal utilization of resources. In this context, it may be pointed out that in India, a large section of landless and marginal people depend on *de facto* state-owned natural resources and/or village common lands for their daily livelihoods. Initiating PES scheme under such conditions requires tenure-based rights over land. This will ensure long-term access to land and hence will develop markets for ES.

In some cases, the PES schemes helped in strengthening land rights (e.g., temporary rights established through frontier activities) through informal tenure security (Adhikari, 2009). According to Adhikari (2009), in the Bungo watershed in Indonesia, biodiversity services were supported by providing land use rights over forest frontier activities[3] . One can also expect similar outcomes in the Indian context, provided the schemes are made location specific and necessary policy support is extended. In addition, the existence of informal institutions at the community level also helps to adopt conservation measures as well as to reduce transaction costs by increasing local participation. A large body of literature on forest and other natural resource management in India has indicated the very existence of such informal institutions (Heltberg, 2001; Behera, 2008, 2009). One may, therefore, expect the PES schemes to benefit largely from collective approaches of the landowners and other stakeholders.

However, the bigger challenge in India perhaps will be to organize large number of small landholders and alter their land use pattern for the PES schemes. There are two fundamental issues involved. First, majority of the empirical studies on PES suggest that wherever large landholders are involved, PES schemes are likely to perform better *vis-à-vis* small landholders. This is so because communicating with fewer large landholders is much easier than doing the same with large number of small landholders. As a consequence, the decision-making process becomes much complicated. Further, with

[3] These forest frontier activities include plantation of cash crops such as rubber, cinnamon and other tree crops. Plantation of these cash crops facilitates the adoption of PES schemes, which in turn, provide a sufficient basis for farmers to claim permanent land rights in areas where the PES schemes are functional.

increasing group size, more effort and time are required in organising the land owners and applying capacity-building measures. This makes the entire process very costly, posing uncertainty in economic feasibility of the schemes. Moreover, in the case of small landholders, the benefits of economies of scale are not adequately utilized. This means that small landholders may not receive as much benefits as their larger counterparts from the adoption of new land use pattern under the PES schemes. Hence, the constraints related to ensuring profitability through adoption or modification of land uses should be adequately addressed while designing the PES schemes in the Indian context to account for the interests of the poor and small landholders. This is very important, especially to enhance the acceptability of the PES schemes amongst the poor and small landholders, as participation of such landholders may be low if payments are not sufficient to meet the costs associated with socially and environmentally acceptable land use practices (Pagiola, 2002).

Adoption of new technology for land use may be a major constraint to the success of the PES schemes. Failure to adopt technology properly may hinder the returns, particularly under uncertain and imperfect market conditions (Wunder *et al.*, 2008). Further, in the absence of well-functioning rural credit market, adoption of modern technology may not be so easy for rural landholders, as these technologies may be expensive. In addition, adoption of technology requires adequate skill and knowledge that can only be promoted through education and training. Unfortunately, a vast majority of Indian farmers are illiterate and/or semi-skilled. Hence, provision of easy access to credit markets and sufficient technical and extension services to the farmers may be prerequisite for successful implementation of the PES schemes.

Finally, success of the PES schemes requires participation of broader section of the society. In one of his case studies, Adhikari (2009) has shown the importance of participation of broader sections of the society, especially the gender dimension, for adopting market-based approaches to watershed services. But, traditionally, Indian society consists of socially and economically heterogeneous people with the practice of age-old caste system in a diverse religious framework. Social heterogeneity is further accentuated with persisting gender inequality over the years. While ensuring participation of all sections of people in the PES schemes from such a diversified society can be a very difficult proposition, the existing socio-economic, religious and political differences may limit the effectiveness of the PES schemes.

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