



FORE

Developing Payment for Ecosystem Services

A synthesis of the approach
and lessons-learned from a pilot
project to protect mangrove
forests in Vietnam

**Scott Cole
Ana P Aponte
Linus Hasselström
Ulrika Stavlöt
Daniel E Stenson**

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About FORES

FORES—Forum for Reforms, Entrepreneurship and Sustainability—is an independent think tank dedicated to furthering entrepreneurship and sustainable development through liberal solutions to meet the challenges and possibilities brought on by globalization and global warming. FORES' main activities are to initiate research projects and public debates that will result in concrete reform proposals in relevant policy areas such as: environmental policy; migration; entrepreneurship; and economic policy.

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About this Study

Within environmental policy circles there is an increasing use and acceptance of the concept of Ecosystem Services (ES). This term denotes the benefits that nature provides society, namely: producing food; maintaining abundant and clean water, regulating the climate and diseases; and providing recreational, cultural and spiritual benefits. Given the recognition of economic value provided by these ES, there is an increased interest in developing and implementing policy instruments aimed at protecting or preventing the decline of such services.

One of the measures attracting significant attention from policy makers and researchers is the use of Payment for Ecosystem Services (PES-schemes). This is a policy instrument that creates incentives for public or private entities to conserve or increase the supply of ES.

Today, so-called ‘ecosystem service markets’ across the globe target biodiversity, water quality, water

quantity, air quality, climate regulation, and open-access fisheries.

Yet the concept of PES is rather new to policymakers and academic experts, and as a result, the development and evaluation of alternative PES designs based on experience remain limited.

This report aims to shed light onto the issue of when and how to use PES-schemes. From this pilot study, we develop an approach for assessing the suitability of PES-schemes in different contexts and develop criteria to compare PES schemes.

This type of comparison illustrates the types of trade-offs facing policy makers, which can ultimately help them design PES models that best fit their policy needs. The approach we outline is being applied to the Mu Ca Mau National Park (MCMNP) in Southern Vietnam.

Foreword

Market mechanisms help save ecosystems – here's how!

Only now are we starting to fully understand the vital importance of our planet's ecosystems, and yet we are still far from designing a system that protects these natural resources in a way that enables us to enjoy the services they provide. We are only beginning to comprehend the high cost of replacing the services provided by nature, and that many of these services cannot be replaced at any cost.

Using priced-based mechanisms such as markets to protect ecosystems from degradation, in conjunction with other conventional regulatory approaches, has generated intense discussion over the last several years. Such market mechanisms have been the subject of numerous studies, including Fores's report on opportunities for Payment for Ecosystem Services (PES) presented at the Rio Summit in 2012.

Payment for Ecosystem Services is often viewed as a possible way to help alleviate poverty, since many of the beneficiaries of key ecosystem services are found in

low income countries. While this is true, ecosystem services are also of key importance to countries at the other end of the income spectrum. The effects of ecosystem services on higher income countries was examined in a 2013 Swedish government-appointed study, which highlighted the need to incorporate the value of ecosystem services in decision-making at all levels of government.

In order to move forward, we need to better understand which mechanisms can best be applied in specific situations and contexts. This report aims to fulfil this need by providing a framework for evaluating PES alternatives and applying the framework to the case of mangrove degradation in the Mui Ca Mau National Park in Southern Vietnam.

While mangrove forests have historically been viewed as wastelands, they are in fact vital for protecting biodiversity on land and in the sea. Mangroves provide a wide range of ecosystem services both locally and globally. For example, mangroves serve as a source of food, timber and forage while also protecting fresh water catchments from salt intrusion, sheltering coastlines from the effects of storms, and maintaining habitats like coral reefs. Recently the importance of mangroves in mitigating climate change has become better understood. Mangroves function as a carbon sink and also help local communities adapt to consequences stemming from climate change. Given that

mangroves provide so many ecosystem services, they make for a compelling case in studying the application of PES models.

In this report, we develop guidelines for when to use certain PES models over others. Additionally, the report provides insight into opportunities for combining different PES approaches. While the findings are in part case-specific, we attempt to generalise the findings to provide policy-makers with a concrete tool to use when addressing the many challenges and trade-offs when developing effective policies. These insights and recommendations include: how to prioritise between different ecosystem services; how to keep transaction costs at an acceptable level; how to deal with transaction costs and the concept of additionality so as to ensure that the environmental gains provided by the chosen PES model would not have otherwise occurred.

Ecosystem services are complex and may not be protected effectively by simplistic approaches. While there is a need for further research – in which we aim to be of relevance – it is also beneficial to clearly acknowledge that price-based mechanisms will be essential in forging a way forward for ecosystem protection. This study provides the insight for doing so.

Mattias Goldmann

CEO, Fores

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Executive Summary

Within environmental policy circles there is an increasing use and acceptance of the concept of Ecosystem Services (ES). This term denotes the benefits that nature provides society, namely: producing food; maintaining abundant and clean water, regulating the climate and diseases; provisioning recreational, cultural and spiritual benefits. Given the recognition of economic value provided by these ES, there is an increased interest in developing policy instruments aimed at protecting or preventing the decline of such services.

One of the measures attracting significant attention from policy makers and researchers is the use of Payment for Ecosystem Services (PES-schemes). This is a policy instrument that creates incentives for public or private entities to conserve or increase the supply of ES (Wunder et al., 2005). Today, across the globe, so-called ‘ecosystem service markets’ target biodiversity, water quality, water quantity, air quality,

climate regulation, and open-access fisheries.¹

Ideally a PES system is designed so that those who benefit from an ES (i.e., the beneficiaries or users) become the *buyers*. Furthermore, those who have influence over an ES become the *sellers* (i.e., suppliers or providers). Take for example global citizens who benefit from additional carbon sequestration. These people may buy carbon credits from local landowners, who have an economic incentive to supply this ES through forest restoration or protection.

Yet the concept of PES is rather new to policymakers and academic experts, and as a result, the development and evaluation of alternative PES designs based on experience remain limited.

This report stems from the project “*Developing a piloting model on payments for coastal wetland ecosystem services in Mui Ca Mau National Park in the context of climate change contributing to poverty reduction in local communities*”. The project, funded by the Swedish International Development Cooperation Agency (Sida), was undertaken by FORES in cooperation with partners at the Vietnamese Biodiversity Conservation Agency (BCA) and the research institute FORWET.²

1. For an overview of Asian case studies involving wetlands, see the background report *Review of international case studies of Payment for Ecosystem Services (PES)* available at: <http://fores.se/ekosystemtjnster-i-vietnam/>. For a review of ES markets in general see Cole et al. (2012).

2. Vietnamese partners also included the Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE), which is situated within Vietnam’s Ministry of Natural Resources and Environment (MONRE). FORES experts included Inclusive Business

The project spanned from November, 2012 to December 2013 and focused on Mui Ca Mau National Park (MCMNP) in Southern Vietnam.

This report describes the approach developed from the project carried out in Mui Ca Mau, where Vietnamese authorities have been interested in applying PES to protect ES from coastal wetlands and mangrove forests. Our approach assesses the suitability of alternative PES schemes in different contexts and develops essential criteria to facilitate comparisons between different PES schemes. These comparisons help reveal the inevitable trade-offs that policymakers grapple with in designing alternative PES schemes.

The approach developed in Mui Ca Mau consisted of three parts:

- Conduct a preliminary scoping study to assess PES feasibility, by considering the political, cultural and institutional aspects of the local context. Important questions addressed in this preliminary stage include:
 - > Is there government support for the PES-scheme?;

- > What types of valuable ES are provided? Are they at risk? What is their importance on different regional scales? Who are the potential beneficiaries and buyers?;
 - > Does the community have the organisational capacity to participate in a PES-scheme, and can they overcome challenges?; and
 - > Are reasonable legal structures in place to support PES?
- **Define and propose PES schemes**, by identifying key ES specific to the local context, the potential geographic scale over which they are produced (supplied) and consumed (demanded), and the potential beneficiaries and providers of these ES. For MCMNP, the report identified at least five alternative PES-schemes, some of which can be combined:
 - > **PES Alternative 1a.** Aqua- and Agriculture: Households (buyers) pay the national park (sellers) for their allocated land through labor aimed at protecting and restoring the mangrove ecosystem ('in-kind payment'). Households earn income through improved aqua- and agriculture production.

- > **PES Alternative 1b.** Eco-tourism: Tourists (buyers) pay the national park for their recreational experience and 90% of the revenue goes to individual households (sellers) that host the tourists.
- > **PES Alternative 2.** State buyer for shoreline stabilisation: The state or an environmental organisation acts as a buyer on behalf of the general public (beneficiary) and pays for shoreline stabilisation services from willing coastal households (sellers).
- > **PES Alternative 3.** Carbon markets: NGOs and businesses compensate for carbon emissions or other voluntary actors (buyers) purchase offsets through an international carbon trading scheme that ultimately pays households (sellers) to preserve mangrove forest in MCMNP.
- > **PES Alternative 4.** Ecolabelling: Households (sellers) receive a price premium from domestic and international seafood consumers (buyers) for engaging in more sustainable aquaculture practices, thereby preserving ES and improving income opportunities.

- **Develop criteria to assess trade-offs among PES schemes.** To gain better insight into the advantages and disadvantages of the proposed PES alternatives, we apply our nine essential criteria to the PES proposals in MCMNP:
 - > Measurability;
 - > Existence of buyers;
 - > Existence of sellers;
 - > Technically feasible interventions (e.g., to improve ES supply);
 - > Defined property rights;
 - > Voluntary participation;
 - > Direct payment to providers;
 - > Additionality; and
 - > Conditionality

Table 3 defines these last terms as well as outlining additional assessment criteria. By employing these nine criteria, it was possible to compare the alternative PES-schemes and highlight trade-offs associated with any given design.

Conclusions

Our approach takes the form of a screening assessment, which aims to propose and assess alternative PES schemes. Our main contribution to the growing field of PES has been the development of a set of assessment criteria that highlight the strengths and weaknesses of proposed PES schemes based on the inherent characteristics of the ES being bought and sold, the attributes of the buyers and sellers, the legal structure within which the PES model would operate, etc. Applying these criteria can assist decision-makers in designing an optimal PES scheme for their specific needs given that it may highlight a number of trade-offs, such as:

- **Additionality vs Overall ES supply:** A PES scheme that focuses on ensuring additionality for one ES may inadvertently lead to the decline of a different ES within the same area.
- **Additionality vs Leakage of ES:** A PES scheme that successfully increases the supply of a local ES may actually lead to the decline of that ES in another area (leakage).

- **Budget implications vs Existence of buyers:** A PES scheme that targets non-local buyers may benefit from critical external funding to ensure an effective PES implementation, but this may come at the cost of giving up local control and administration of the PES scheme.
- **Transaction costs vs Conditionality/Additionality:** A PES scheme that focuses on reducing transaction costs may have insufficient funds to monitor ES flows, which makes it difficult to ensure conditionality and additionality.

Assessing these trade-offs is challenging given the many difficult policy questions that arise, some of which may require subjective value judgments. However, identifying trade-offs is a critical first step in designing an optimal PES scheme, as it can assist decision makers in making some of the necessary judgments. For example, information about trade-offs can be combined with guiding principles, such as national environmental objectives or regional management plans, and help design a PES scheme that suits policy needs.

For example, in many cases ES value is a function of location. A locally valued ES, such as storm surge pro-

tection, may lend itself towards arguing for allowing some regional leakage in order to protect this locally valued ES. If policy makers are first informed of this trade-off, they can assess it in light of other information (e.g., environmental strategy documents that may identify a locally valuable ES) and motivate the protection of that ES even if it implies a negative impact elsewhere. Thus, identifying trade-offs first can lead to valuable policy insight when designing and tailoring PES schemes.

Lessons Learned

The most important lessons to be learned from our work in developing and applying the approach outlined above include:

- **Importance of measurability:** To ensure buyers and sellers are comfortable with how their ‘transacted good’ is measured, considerable effort should be placed in developing innovative metrics for measuring the change in the level of an ES associated with a seller’s intervention.
- **Markets are uncertain:** Despite the best efforts to develop credible and well-func-

tioning markets, uncertainty will always remain given that markets are inherently dynamic. For example, consumer preferences (for the type and quality of ES) and technology (for providing ES) will change over time.

- **Additionality is critical to PES, but challenging:** The additionality criterion is particularly important given that the overarching goal of PES schemes is to improve long-term environmental outcomes. Measuring this criterion, however, involves inherent uncertainty related to the measurement of baseline conditions.
- **Inevitable trade-offs between criteria:** Our assessment criteria help policymakers identify the trade-offs in developing alternative PES schemes and, as discussed above, this may lead to improved PES designs.
- **Dependency in criteria:** Some of the criteria interact and are dependent upon one another. For example, there is a link between the ‘existence of sellers’ and the two criteria ‘technically feasible interventions’ and ‘defined property rights’. The

existence of a seller itself is not sufficient if that seller is not able to undertake technically feasible measures to improve the supply of ES and/or does not have the legal property right to do so.

- **Property rights:** Property rights need to be clearly defined and permanent. Temporary or uncertain ownership of ES reduces the incentive for long-term investment, which is required to ensure permanence in ES supply.
- **Monitoring is critical for conditionality:** To ensure the essential criteria of conditionality, PES designs must ensure funding for long-term monitoring, even if this raises transaction costs.
- **Challenge in avoiding free riders in wide-ranging PES schemes:** The goal of PES schemes is to include as many ES beneficiaries as potential buyers. Yet, inevitably, some beneficiaries can avoid paying and these are the so-called ‘free riders’. One way to avoid free-riding is for the State (or large NGO) to pay on behalf of beneficiaries and then collect payment via taxes or fees. Nonetheless, even this approach is chal-

lenging when a PES scheme covers multiple ES. Thus, there may be a trade-off between expanding the scope of ES covered by a PES scheme and the need for capturing as many beneficiaries as possible in a feasible payment scheme.

Looking forward

Our scoping assessment provides an important starting point for PES development, however, our analysis underscores the need for future technical development of PES schemes underpinned by further pilot studies. The following details may be useful when testing the PES schemes proposed in this scoping assessment:

- **Cultural and demographic information:**
To meet the needs of local participants, PES design should consider the diverse segments of society that are included as actors. This entails understanding that households are not a homogenous group, but vary with respect to demographics, cultural background, etc. The fact that many providers

are also users may make it complex to identify who is benefiting and who should pay for ecosystem services. We found that cooperation with local partners (i.e., households, NGOs, local authorities, researchers, and other experts) is critical for collecting relevant information. Our project has benefited from and is informed by interviews conducted during several field trips to the study area.

- **Data collection plan:** It is important to design, collect, and evaluate data from all major policy reforms. Through a stepwise, structured design that includes the randomisation of vital mechanisms, a pilot project can be evaluated and lessons learned can be gleaned to improve future implementation.
- **Scaling up:** Vietnam and other countries must consider how to scale up a single pilot approach to cover the vast and valued ES at risk both regionally and globally. Key questions include: Given the variability and complexities across human and ecological systems, when is PES a suitable policy instrument and which type of PES scheme seems the most promising? What type of alterna-

tive policy instruments may be relevant to meet a country's environmental goals?

- **Basic research:** There is an immediate need to fill the significant knowledge gaps necessary for successful PES development. For example, more information is needed on the types of interventions that providers can undertake to improve or sustain ES flow (e.g., What interventions are most effective? What are the quantifiable links between intervention and effect on ES provision?). Furthermore, more information is needed on how outside drivers affect the supply of ES (e.g., population growth, rising incomes in developing countries, land use changes, global carbon emissions, ecological processes, and economic damages related to climate change) and how this may affect the value of these services for society. In the absence of a seller's intervention, information on the baseline level of services is important for determining additionality resulting from the PES model.
- **PES funding:** Most PES models require 'kick-start' funding to assist with administration and monitoring, capacity building,

technical assistance, raising awareness, knowledge sharing, and so on (Cole et al., 2012). For example, awareness-raising activities among households is crucial in turning beneficiaries into buyers by explaining their dependence on ES and the potential welfare impacts if these ES become unavailable.

- **Governing institutions:** To ensure long-term success, PES schemes require effective, credible, and accepted governing institutions that can oversee and administer PES schemes. Going forward, taking measures to strengthen trust in existing governing structures will be critical.

We believe the work presented herein is generalisable and applicable in other contexts because it not only helps guide Vietnam's policy to expand PES³, but also more generally meets the needs of national policy makers, researchers, and consultants interested in structured approaches for assessing PES schemes. While the scope of this report focuses on suggestions for future PES schemes, further implementation will require more rigorous quantification and pilot study assessment.

3. In February 2014, based on recommendations from this project and other experiences, the Vietnamese government approved the Decision n°251/QĐ-UBND to pilot a PES-scheme for mangrove forest environmental services in MCMNP.

Sammanfattning på svenska

Beslutsfattare, policyskapare och civilsamhället uppmärksammar i allt högre utsträckning ekosystemtjänster och dess värde. Ekosystemtjänster avser de tjänster som naturen tillhandahåller, exempelvis livsmedel, rent och drickbart vatten, begränsning av och anpassning till klimatförändringar, men även rekreation och kultur. I takt med att värdet av dessa tjänster synliggörs, ökar intresset för politiska åtgärder som kan skydda och bevara ekosystemtjänster.¹

Betalning av, eller marknader för, ekosystemtjänster är ett av de verktyg som politiker intresserat sig för. Ekosystemtjänstmarknader skapar incitament för offentliga och privata aktörer att bevara eller öka utbudet av ekosystemtjänster (Wunder et al 2005). Biologisk mångfald, vattenkvalitet, vattenmängd, luftkvalitet, klimatförändringar och fiske är alla exempel

1. För en översikt av internationella ekosystemtjänstbetalningar se bakgrundsrapporten *Review of international case studies of Payment for Ecosystem Services (PES)* tillgänglig via: <http://fores.se/ekosystemtjanster-i-vietnam/> eller Cole et al. (2012).

på ekosystemtjänster som redan bevaras med hjälp av system för ekosystemtjänstbetalning.

Ett system för betalning av ekosystemtjänster utformas bäst så att den som drar nytta av ekosystemtjänster betalar för (köper) den, och att de som påverkar tillgången på ekosystemtjänster tar emot en betalning (säljer). Exempel: alla världens invånare tjänar på att koldioxid binds i växter. De som äger mark exempelvis med mangroveträd kan via utsläppsrätter sälja tjänsten bindning av koldioxid, och får därmed ett incitament att bevara skogen istället för att hugga ner den.

Begreppet ekosystemtjänster, och betalning för dem, är emellertid relativt nytt, varför kunskapen och utvärderingen av tänkbara verktyg är begränsad.

Rapporten du läser härrör från det Sida-finansierade projektet »Developing a piloting model on payments for coastal wetland ecosystem services in Mui Ca Mau National Park in the context of climate change contributing to poverty reduction in local communities«. Fores genomförde projektet i samarbete med Vietnams myndighet för bevarande av biologisk mångfald samt det vietnamesiska forskningsinstitutet FORWET.² Projektet pågick under 13 månader, mellan

2. Därutöver har vi också haft vietnamesiska samarbetspartner i Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE), som är en del av Vietnam's Ministry of Natural Resources and Environment (MONRE). Fores projektteam bestod av experter från Inclusive Business Sweden, EnviroEconomics Sweden, och Enveco.

November 2012 och December 2013, med fokus på en nationalpark i Mui Ca Mau, i södra Vietnam.

I rapporten beskrivs den ansats som användes för att utifrån vietnamesiska myndigheters intresse för att utveckla ett system för ekosystemtjänstbetalning för att bevara ekosystemtjänster i kustnära områden utvärdera lämpligheten i olika system. Genom att möjliggöra en jämförelse av olika system lyfter rapporten också fram några av de ofrånkomliga avvåganden som beslutsfattare behöver göra när de utformar system för betalning av ekosystemtjänster.

Den ansats som utvecklats och använts i projektet består av tre delar:

- **Genomföra en första undersökning av de lokala politiska, kulturella och institutionella förutsättningarna för att införa system för betalning av ekosystemtjänster, genom att besvara några grundläggande frågor:**
 - > Finns det stöd från regeringen för att införa en system för betalning av ekosystemtjänster?
 - > Vilka ekosystemtjänster finns i området? Är de hotade? Är de lokala eller globala. Vilka gynnas och vilka är de tänkbara köparna av områdets ekosystemtjänster.
 - > Finns det i området tillräcklig kompetens

och organisatorisk kapacitet för att delta i ett system? Om inte, finns det förutsättningar till adekvat utbildning?

> Finns det tillräckligt med rättsliga strukturer för att understödja ett system?

- **Utforma och föreslå system, utifrån vetenskap om vilka ekosystemtjänster som finns i området, de geografiska begränsningarna avseende tillgång och efterfrågan av ekosystemtjänsterna, samt vilka som gynnas av och tillhandahåller tjänsterna. Vår fallstudie visade att det finns åtminstone fem möjliga system som kan bidra till att bevara central ekosystemtjänster i Mui Ca Maus nationalpark.**

> **Alternativ 1a.** Vatten och jordbruk: Hushållen (köparna) betalar nationalparken (säljaren) för sin mark genom (gratis)arbete som syftar till att skydda och bevara mangroveskogen. Hushållen får sina inkomster från förbättrat vatten- och jordbruk.

> **Alternativ 1b.** Ekoturism: Turister (köpare) betalar nationalparken för sin rekreationsupplevelse och 90% av inkomsterna tillfaller hushållen (säljarna) som tar emot turisterna.

- > **Alternativ 2.** Staten köper kustlinjestabilisering: Staten, eller en miljöorganisation fungerar som köpare å det allmännas vägnar (som tjänar på att begränsa erosion av kustlinjerna) och betalar hushållen (säljare) för stabilisering av kustlinjen.
 - > **Alternativ 3.** Koldioxidmarknader: Civilsamhälle och näringsliv (köpare) kompenserar för sina utsläppsminskningar genom att köpa utsläppsrätter på en internationell utsläppsmarknad där hushållen (säljare) får betalt för att bevara områdets mangroveskog.
 - > **Alternativ 4.** Ekomärkning: Inhemska och internationella konsumenter (köpare) antas vara beredda att betala mer till hushåll (säljare) som odlar skaldjur på ett hållbart vis och därmed bidrar till att bevara ekosystemtjänsterna.
- **Utveckla kriterier för att värdera avvägningar vid val mellan olika system för ekosystemtjänstbetalning. För att få bättre insyn i för- och nackdelar med de föreslagna alternativen vägde vi dem mot nio centrala kriterier:**
 - > Mätbarhet
 - > Tillgång till köpare

- > Tillgång till säljare
- > Teknisk genomförbarhet
- > Tydliga äganderätter
- > Frivilligt deltagande
- > Direktbetalning till säljare
- > Additionitet (att mekanismen faktiskt bidrar till att bevara ekosystemtjänster utöver vad som redan görs)
- > Konditionalitet (att det finns ett samband mellan betalning och bevarande av ekosystemtjänsten)

Dessa nio kriterier möjliggör att jämföra de föreslagna alternativen och belysa nödvändiga avvägningar.

Slutsatser

Kriterierna ovan kan ligga till grund för att utvärdera föreslagna system för ekosystemtjänstbetalning. Kriterierna är framtagna utifrån vilka ekosystemtjänster som finns i ett område, vilka som är de möjliga köparna och säljarna, de rättsliga strukturerna inom vilken systemet ska fungera med mera. Att tillämpa dessa kriterier kan hjälpa beslutsfattare att utforma system som passar deras särskilda behov, och bidrar också till att belysa några av de nödvändiga avvägningarna:

- **Additionalitet vs totala tillgången till ekosystemtjänster:** ett system för ekosystemtjänstbetalning som är effektivt att öka tillgången till en ekosystemtjänst kan bidra till att flödet av en annan ekosystemtjänst i samma område minskar.
- **Additionalitet vs läckage av ekosystemtjänster:** Ett system som framgångsrikt främjar tillgången till lokala ekosystemtjänster riskerar i vissa fall leda till att utbudet av samma ekosystemtjänst minskar i ett annat område.
- **Budgetimplikationer vs tillgång till köpare:** Ett system som riktar sig mot icke-lokala köpare kan gynnas av extern finansiering som bidrar till ett effektivt genomförande, men kan också innebära minskad kontroll för den lokala myndigheten.
- **Transaktionskostnader vs konditionalitet/additionalitet:** Ett system för ekosystemtjänstbetalning som fokuserar mycket på att minska transaktionskostnader riskerar avsätta otillräckliga medel för att övervaka utbudet av ekosystemtjänsterna. Då blir det svårt att säkerställa att systemet verkligen ger avsedd effekt.

Givet de många, ofta subjektiva, avvägningar som krävs är det också svårt att tala om rätt och fel. Icke desto mindre är det nödvändigt att identifiera vilka de viktiga avvägningarna är för att kunna utforma ett system som når önskad effekt.

Några av de svåra avvägningarna kan underlättas om det finns bakomliggande principer, som nationella miljömål eller regionala handlingsplaner. Sådana principer kan hjälpa beslutsfattare att hitta lösningar som passar deras politiska mål.

I många fall är värdet av en ekosystemtjänst beroende av den geografiska platsen. Det är sannolikt att en beslutsfattare som utvecklar ett system för att bevara ekosystemtjänsten skydd mot stormar, ett i högsta grad lokalt värde, i första hand tänker på just den lokala vinsten. Om beslutsfattaren är medveten om risken för läckage kan vederbörande utvärdera ytterligare information i ljuset av detta och utifrån detta motivera varför det är viktigare att skydda ekosystemtjänsten i just det avsedda området. Således kan insikter om avvägningar leda till att värdefulla policyinsikter när system för ekosystemtjänstbetalning.

Viktiga lärdomar

Nedan listar vi några av de viktigaste lärdomarna från arbetet med att utveckla och tillämpa den ansats som beskrivits ovan.

- **Vikten av mätbarhet:** För att säkerställa att köpare och säljare har tilltro till hur deras »handlade varor« handlas är det viktigt att hitta metoder som kan mäta hur flödena av ekosystemtjänster förändras som en följd av systemet för ekosystemtjänstbetalning.
- **Marknader är osäkra:** Trots ansträngningar att skapa trovärdiga och välfungerande marknader kommer osäkerhet vara en del av alla marknader. Exempelvis kommer konsumenters preferenser att förändras över tid.
- **Additionalitet är centralt, och utmanande.** Additionalitetskriteriet är särskilt viktigt givet det överordnade målet att ekosystemtjänstbetalning ska förbättra det långsiktigt miljömässiga utfallet – ett större utbud av ekosystemtjänster. Att mäta additionalitet är svårt, inte minst på grund av osäkerheten kring hur utgångsläget var, det

vill säga hur stort utbudet var innan systemet sjösattes.

- **Avvägningar mellan olika kriterier:** Våra kriterier bistår policymakers i arbetet att identifiera de avvägningar som måste göras vid utveckling av system för ekosystemtjänstbetalningar, vilket kan leda till förbättrad utformning av systemen, vilket vi också diskuterar tidigare i sammanfattningen.
- **Kriterierna är beroende av varandra.** Några av kriterierna interagerar med varandra och är också beroende av varandra. Exempelvis finns det en länk mellan »tillgång till säljare« och »teknisk genomförbarhet« samt »definierade äganderätter«. Att det finns en säljare är i sig inte tillräckligt om vederbörande inte är förmögen att vidta genomförbara åtgärder eller inte har den juridiska rätten att så göra.
- **Äganderätter:** Äganderätter behöver vara tydligt definierade och bestående. Tillfälliga eller osäkra ägandeförhållanden minskar drivkraften till långsiktiga investeringar, vilket krävs för att säkerställa att ekosystemtjänsten består.

- **Övervakning är centralt för konditionalitet:** För att säkerställa att ekosystemtjänstbetalningen verkligen ger effekt, är det nödvändigt att det avsätts medel för långsiktig övervakning, även om det ökar transaktionskostnaden.
- **Undvika gratisåkare.** System för ekosystemtjänstbetalning syftar till att bidra till så många fördelar som möjligt. Likväl kommer vissa av de som gynnas att kunna undvika att betala och därmed bli så kallade gratisåkare. En möjlighet att undvika gratisåkning är att låta staten (eller stora civilorganisationer) betala å förmånstagarnas vägnar och sedan ta in betalning via skatt eller avgifter. Även denna ansats är besvärlig när ett system ska täcka flera ekosystemtjänster. Således kan det finnas en avvägning mellan att vidga omfånget av ekosystemtjänster i en ekosystemtjänstbetalning och behovet av att få så många förmånstagare som möjligt att bidra med betalning.

Nästa steg

Vår översyn tillhandahåller förhoppningsvis ett användbart verktyg vid utvecklingen av system för betalning av ekosystemtjänster. Vår analys pekar emellertid på vikten av vidare teknisk utveckling av systemen, som bör understödjas av pilotstudier. Följande aspekter kan vara centrala vid vidare utveckling och test av de föreslagna systemen.

- **Information om kultur och demografi.**

För att svara upp mot de lokala deltagarnas behov bör system för betalning av ekosystemtjänster utformas med hänsyn till de olika delar av samhället som involveras. Det kräver också en förståelse för att hushållen inte är en homogen grupp. Det faktum att många som tillhandahåller ekosystemtjänster också använder dem gör det komplicerat att identifiera vilka som tjänar och vilka som bör betala för ekosystemtjänsterna. För att samla in nödvändig information är det nödvändigt att samarbeta med lokala aktörer (hushåll, civilsamhälle, lokala myndigheter, forskare och andra experter). Vårt arbete och kunskap främjades av att vi genomförde flera intervjuer och fältresor till området.

- **Strategi för datainsamling:** Det är viktigt att samla och värdera data från alla stora policyrefomer, det gäller även ekosystemtjänstmarknader. Därför bör varje system för ekosystemtjänstbetalning också ha en strategi för att på ett strukturerat vis utvärdera systemet utifrån insamlad data, inklusive randomisering av systemet centrala element, för att på så vis dra lärdomar som kan förbättra framtida genomförande.
- **Uppskalning:** Vietnam och andra länder måste överväga hur pilotprojekt kan skalas upp så att de kan täcka de omfattande ekosystemtjänster som riskerar att utarmas. I en sådan process är det viktigt att diskutera under vilka förutsättningar betalning för ekosystemtjänster är lämpligt, och vilka typer av mekanismer som är mest lovande. Andra policyverktyg som kan vara relevanta för länder att nå sina mål bör också utvärderas.
- **Grundläggande forskning.** Det finns ett omedelbart behov av mer kunskap för att framgångsrikt utveckla system för ekosystemtjänstbetalning. Exempelvis behövs mer information angående vilka typer av

åtgärder som markägare och andra kan vidta för att bevara eller förbättra flödet av ekosystemtjänster (vilka åtgärder är mest effektiva, vilka är de kvantifierbara länkarna mellan åtgärd och inverkan på ekosystemtjänsten). Vidare behövs mer information om hur externa faktorer driver utbudet av ekosystemtjänster (befolkningsökning, ökade inkomster i utvecklingsländer, förändringar i markanvändning, globala utsläpp av växthusgaser, ekologiska processer, och ekonomiska skador från klimatförändringar) och hur de kan påverka ekosystemtjänsternas värde för samhället. I avsaknad av säljarens åtgärd är det nödvändigt med information om utgångspunkten för ekosystemtjänsten för att avgöra om systemet verkligen bidrar till additionalitet.

- **Finansiering:** De flesta ekosystemtjänstmarknader kräver snabbstarfinansiering för administration och övervakning, kapacitetsbyggande, tekniskt stöd, ökad medvetenhet, kunskapsutbyte med mera (Cole et al 2012). Finansiering behövs också för att öka kunskapen bland hushåll om deras beroende av ekosystemtjänsterna och vilka negativa effekter dess utarmning kan komma att få.

- **Styrande institutioner:** För att säkerställa långsiktig framgång är alla system beroende av effektiva och trovärdiga institutioner som kan övervaka och administrera ekosystemtjänstbetalningarna. Därför är det viktigt att även vidta åtgärder som stärker förtroendet för nuvarande institutioner.

Vi tror att arbetet som här presenterats är allmängiltigt och att ansatsen kan tillämpas i andra sammanhang där beslutsfattare vill inrätta system för ekosystemtjänstbetalningar, utöver Vietnam. Vår ansats kan användas för att möta de behov som policyskapare, forskare och konsulter som är intresserade av att utveckla PES har. Inom ramen för denna rapport finns förslag på ekosystemtjänstmarknader, men innan implementering krävs mer information, rigorös kvantifiering och utvärdering av pilotstudier.

Abbreviations

BCA	Biodiversity Conservation Agency
Co ₂	Carbon Dioxide
Daxam	Daxam Sustainability Services
EES	EnviroEconomics Sweden
Enveco	Enveco Environmental Economics Consultancy
ES	Ecosystem Services
FORES	Reforms, Entrepreneurship and Sustainability
FORWET	Vietnam's Research Centre of Forest and Wetlands
ha	hectare
HHs	Households
ISPONRE	Vietnam's Institute of Strategy and Policy on Natural Resources and Environment
MARD	Ministry of Agriculture and Rural Development

MCMNP	Mui Ca Mau National Park
MONRE	Ministry of Natural Resources and Environment
PES	Payment for Ecosystem Services
SIDA	Swedish International Development Cooperation Agency
ZER	Zone of Ecological Restoration

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Chapter 1

Introduction

Within environmental policy circles there is an increasing use and acceptance of the concept of Ecosystem Services (ES). This term denotes the benefits that nature provides society, namely: producing food; maintaining abundant and clean water, regulating the climate and diseases; provisioning recreational, cultural and spiritual benefits (MEA 2005). Given the recognition of economic value provided by these ES, there is an increased interest in developing policy instruments aimed at protecting or preventing the decline of such services.

One of the measures attracting significant attention from policy makers and researchers is the use of Payment for Ecosystem Services (PES-schemes). This is a policy instrument that creates incentives for public or private entities to conserve or increase the supply of ES (Wunder et al., 2005).

Today, so-called global 'ecosystem service markets' target biodiversity, water quality, water quan-

tity, air quality, climate regulation, and open-access fisheries.¹ A recent report by FORES (Cole et al., 2012) notes a rapid increase in the use of such markets to improve the cost-efficiency of environmental protection.

Ideally a PES system is designed so that those who benefit from an ES (i.e., beneficiaries or users) become the *buyers*. Furthermore, those who have influence over an ES become the *sellers* (i.e., suppliers or providers). Take for example global citizens who benefit from additional carbon sequestration. These people may buy carbon credits from local landowners, who have an economic incentive to supply this ES through forest restoration or protection.

Yet the concept of PES is rather new to policymakers and academic experts, and as a result, the development and evaluation of alternative PES designs based on experience remain limited. Therefore, there is an immediate need to further develop methods for assessing the suitability of PES schemes in different contexts. This report aims to contribute by developing an approach for making such assessments, which makes comparisons between different PES schemes possible. Importantly, the starting point for this report

1. For an overview of Asian case studies involving wetlands, see the background report *Review of international case studies of Payment for Ecosystem Services (PES)* available at: <http://fores.se/ekosystemtjnstler-i-vietnam/>. For a review of ES markets in general see Cole et al. 2012)

is an implicit need for more market-based instruments (see Figure 1).

This report stems from the project »*Developing a piloting model on payments for coastal wetland ecosystem services in Mui Ca Mau National Park in the context of climate change contributing to poverty reduction in local communities*«. The project, funded by the Swedish International Development Cooperation Agency (Sida), was undertaken by FORES in cooperation with partners at the Vietnamese Biodiversity Conservation Agency (BCA) and the research institute FORWET.² The project ran for 13 months and spanned from November, 2012 to December 2013, with a focus on Mui Ca Mau National Park (MCMNP) in Southern Vietnam.

The focus of the project was two-fold. Part one strove to pilot a livelihood model for MCMNP. The model, developed by Vietnamese partners FORWET and BCA, was aimed at alleviating poverty, protecting mangrove forest, and providing funds for households to invest in aquaculture, agriculture, and eco-tourism.

The second part, the phase at which FORES was involved, was to propose, develop, and assess alternative PES schemes to improve the quantity and quality

2. Vietnamese partners also included the Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE), which is situated within Vietnam's Ministry of Natural Resources and Environment (MONRE). FORES experts included Inclusive Business Sweden (contributions to the project were made through a different entity called Daxam), EnviroEconomics Sweden, and Enveco Consultancy.

of ES from mangrove forests in Vietnam. In February 2014, based on recommendations from this project and other experiences, the Vietnamese government approved the Decision n^o251/QD-UBND on piloting of a PES scheme for mangrove forest environmental services in MCMNP.

Setting up a PES scheme is a complex process that requires groundwork to ensure market benefits related to environmental protection are achieved. To do this, the FORES team's approach consisted of three parts:

1. **Conduct a preliminary scoping study to assess PES feasibility** by considering the political, cultural and institutional aspects in the local context. In this case, FORES relied on previous frameworks, as summarized in Table 1;
2. **Define and propose PES schemes** by identifying: key ES found in the study area; the potential geographic scale over which they are produced (supplied) and consumed (demanded); and the potential beneficiaries and providers of, these ES. For this study, FORES relied on previous frameworks as summarized in Table 2; and

- 3. Develop criteria to assess trade-offs among PES schemes.** The FORES team's main contribution relates to the development of these PES assessment criteria, their application to the case of MCMNP, and generating our suggested approach for connecting these PES..

This report synthesises the approach developed from the project carried out in the pilot. We illustrate the benefits of our approach by applying it to MCMNP.

In this respect our report is timely given increased global interest in the concept of ES and price-based approaches to environmental protection – an interest motivated by the recognition and importance of ES on humans' well-being. Recent analyses in Scandinavia have highlighted the importance of using an ES approach in environmental decision-making (SOU 2013; NOU 2013). Furthermore, a recent report by the EU about reaching the »No Net Loss« objective suggests, among other things, the need for price-based instruments like PES (IEEP 2014, p. 250).

We believe this study helps meet the increasing need of national level policy makers for a structured approach when assessing potential PES schemes in developing or developed countries. This report is of additional value for researchers, academics, and con-

sultants interested in the details of creating, defining, implementing, and evaluating PES schemes.

This report relies on a variety of information sources to support our ecological and economic analysis, including: workshops with Swedish and Vietnamese partners; extensive literature reviews related to coastal wetland and mangrove ES and PES case studies; three separate field visits to MCMNP; interviews with households in MCMNP; a consultative workshop to discuss preliminary project results; and input from international experts on draft versions of the project's background reports (The reports produced by FORES that support this synthesis can be found at: <http://fores.se/ekosystemtjnstler-i-vietnam/>).

Report structure

Section 2 reviews the literature related to the use of price-based mechanisms to protect ecosystem services, including the economic rationale of PES. Section 3 presents our approach for evaluating PES schemes. Section 4 provides background on Mui Ca Mau National Park (MCMNP), which is the pilot area where we apply our approach. Section 5 presents our application to assess PES schemes in MCMNP and Section 6 includes a synthesis of our key conclusions and lessons learned.

Chapter 2

Ecosystem Services and policy instruments

Ecosystem services (ES) are the benefits society derives from the ecosystems, such as the production of food, maintenance of abundant and clean water, regulation of climate and diseases, and provision of recreational, cultural and spiritual benefits. The deterioration of ecosystems affects the services offered, leading to negative consequences for human well-being (TEEB 2010).

Why pay for an Ecosystem Service?

Under certain conditions, market economies provide an efficient allocation of resources for production and consumption. In many cases, however, unregulated markets do not allocate resources optimally, which argues for governmental intervention. For example,

if natural resources and ecosystem services are not correctly priced or valued by society, they tend to be overused or exploited. This leads to environmental damage and the loss of ES. The most common types of market failure in the context of ecosystem services are due to: externalities and/or public good characteristics.

An externality arises when the production or consumption of a good or (ecosystem) service imposes a cost or a benefit to a third party not directly involved in the market. When the full cost or benefit is not reflected in the transaction, or market price, it may lead to circumstances that encourage the producer to over or under produce.

For example, by clearing mangrove trees in a wetland, an individual household may increase the size of a shrimp pond and thereby increase their shrimp production. Yet when mangroves are removed, the farmer is forced to rely to a larger extent on artificial feed, which imposes a private cost on the farmer. In addition to providing habitat and food, mangroves provide benefits to other parties such as: protecting local drinking water from saltwater intrusion (local level); providing protection against storm surges and erosion (national level); and carbon sequestration and biodiversity provisioning (global level). Thus human activities, like logging, that impact these ES can

impose costs on other individuals or the public, which are known as externalities.

Households tend to include private costs and benefits in the decision process. For instance when considering whether to cut down mangroves to increase the size of a shrimp pond, the shrimp feed cost is one of the decision criteria. All the same, there are no direct incentives for households to consider the effect of this decision on ES other than those that directly benefit the household such as habitat and feed for shrimp. In other words, many other ES such as saltwater intrusion protection, erosion control, climate regulation, biodiversity provision – which are considered public goods¹ – tend to be undersupplied because they are not sufficiently taken in to account by households. This provides important motivation for governmental intervention to help increase the supply (or prevent the deterioration) of these ES.

Payment for Ecosystem Services

Given the value of ES to society, and the impact of current and projected human activities, there is a need for different approaches aimed at protecting these val-

1. A mangrove forest in a wetland is a typical example of a public good that is vulnerable to overconsumption. Such goods are sometimes referred to as common goods or common pool resources).

uable flows. Today's mix of global environmental policies include a myriad of instruments for addressing environmental pressures, such as: direct regulations; taxes; subsidies; support for research and development; information; compensation requirements; etc. In very general terms, policy instruments for the environment can be separated into four different categories:

- Command-and-control – regulate the level of environmental impact (e.g., emissions) or other actions by law
- Information – provide information which has the potential to change the behaviour of individual producers or consumers by raising awareness
- Technology support - encourage the development of environmentally-friendly technology, which can help achieve environmental objectives
- Price-based instrument – changing behaviour of individual producers or consumers by pricing production and consumption so that it reflects the environmental value, e.g. by putting a tax on emissions.

PES falls under the fourth category – a price-based instrument – and its foundations will be elaborated below. A thorough overview of the aforementioned policy instruments can be found in Sterner (2003) and OECD (2012).

Price-based instruments – which are sometimes referred to as economic-based, incentive-based, or market-based instruments – affect consumers and producers by influencing how they experience the costs and benefits of their choices. When environmental assets like ES are given a price to reflect their value, it provides actors with incentives to choose production methods and consumption options and volumes that are more environmentally-friendly. For example, an environmental tax generally leads consumers to reduce their consumption of the taxed good or to consume other (substitute) goods.

Economists suggest that price-based policies provide at least two benefits that are not typically found in other types of policy instruments.² First, they are more cost effective than command-and-control approaches because the incentives found in markets lead actors to undertake the lowest cost measures first (Hanley et al., 2007). In theory, if policymakers have full infor-

2. In theory, all policy instruments can provide these benefits assuming that regulators have 'perfect information' when setting rules and limits. In reality, this is rarely the case in that regulators do not know what it costs an individual firm to reduce pollution.

mation, command-and-control approaches could achieve the same result. In reality this is unlikely given that policymakers need to adopt standards so that the marginal abatement cost equals the marginal damage cost for each emitter.

Second, the price mechanism, if set at the optimum level, creates an incentive for actors to 'go beyond' a command-and-control requirement if it leads to even better cost savings. For example, a firm facing a high enough carbon tax has an incentive to continue reducing its emissions until the costs of doing so exceeds the benefits it receives from production. This point may be lower than a limit set by a command-and-control approach and thus promote new technologies.

PES schemes are driven by the principle that beneficiaries (users) of ES pay those who can influence the supply of these valued benefits (providers). A PES scheme that functions well creates incentives that reward those who increase the supply of ES. Furthermore, it is made costly for those who damage the ES supply. In short, PES has the potential to induce a variety of local, national, and global actors to better recognise and incorporate the benefits of ecosystem services into environmental decision-making.

A commonly cited definition by Wunder et al. (2005) suggests that: a PES is:

- *a voluntary transaction where*
- *a well-defined ES (or a land use likely to secure that service)*
- *is being 'bought' by a (minimum one) ES buyer*
- *from a (minimum one) ES provider*
- *if and only if the ES provider secures ES provision (conditionality).*

Observers have noted that some ES may be better suited for the market than others due to their inherent characteristics (Bioclimate 2010, Cole et.al 2012). For example, the relatively quick development of carbon markets is likely related to the ability to measure and divide ES into units that can be valued, bought, and sold. The so-called 'carbon dioxide equivalents' (CDE) convert emissions of six greenhouse gases into a single currency for trade, which is connected to a change in ecosystem function (climate regulation). This is then linked to subsequent impacts on human well-being that are quantified in monetary terms (e.g., impacts of famine, potential wars, floods, and so on).

Another important prerequisite for an effective PES is the ability to assign and enforce property rights. Market participants must be clearly defined – who to pay, whom to buy from – and their actions need predictable legal protection. Finally, governments

play a crucial role in describing the need for markets, stimulating their development, and designing them efficiently. Governments also play a role in ensuring equitable and environmentally-desirable outcomes and enforcing agreed-upon market rules.

There are different types of PES, which are dependent on different market drivers. One such example is the compensation-driven markets. Here operators compensate for welfare losses associated with environmental damage (e.g., infrastructure development or accidental releases of chemical substances) by providing environmental improvements to similar resources or services. This compensation requirement can lead to habitat banking markets, where entrepreneurs invest in natural capital (e.g., habitat restoration) and sell the flow of ES over time to operators who demand them in order to be able to compensate for their damage. As in the cap-and-trade system, the government provides the key impetus for the market through the regulatory cap, but it does not mandate a market instrument. Rather, the market develops in response to the cap. The success of this type of market in reaching environmental objectives is highly dependent on the establishment and enforcement of compensation requirements by the government.

A large number of today's environmental markets are based on taxpayer-funded initiatives by the state,

which acts as a single buyer of ES from various providers. This is a traditional form of PES and is seen in the EU and US as agri-environment schemes. These schemes provide a voluntary government-funded conservation subsidy as a market-based incentive for farmers to take action such as leaving fields fallow.

Australia's BushTender programme is another example of a PES approach (Stoneham et al., 2005). Rather than simply paying landowners to undertake agreed upon actions to protect and improve the management of native vegetation on their land, landholders competitively tender for contracts, thereby enabling them to establish their own price for the management services they are prepared to offer to improve their native vegetation. This price forms the basis for their bid, which is compared to the bids from all other landholders participating in the process. The winning bids are those that offer the best value for money. The resulting transaction is efficient because it is assumed that the landowner – not the regulator – has better knowledge of the opportunity cost of offering their land for the subsidy (Hanley et al., 2007 Box 4.1).

Publicly-funded purchases of ES allow governments to target specific ES deemed to be undersupplied and/or of high value, such public goods like the water supply (TEEB 2010, Chapter 8). Much like how an emissions cap can be adjusted, this type of market

driver is flexible and can be adjusted depending upon the government's priorities. Yet because this measure is solely reliant upon public funding to reach environmental objectives, it may prove costly to the taxpayers.

In some PES schemes the drivers are voluntary,³ where different actors agree to trade ES. The motives behind these markets are usually ethics, philanthropy or profit driven (e.g., public relations, avoiding regulation through pre-emptive action, preparing for regulation, corporate responsibility and son on (see: EM 2012). One example is direct payments for conservation, where actors in developed countries provide payments to subsistence resource users in developing countries for carbon sequestration or rainforest management in return for the provision of ES (Ferraro & Kiss 2002; Milne & Niesten 2009).

Note that the voluntary nature of PES systems – one in which a user pays for environmental protection – is often contrasted with compensation-driven markets. Compensation-driven markets are those in which the person responsible for damage pays for this damage. This contrast is often expressed in terms of the 'polluter pays' principle, where the buyer is the actor who directly influences the supply of ES through damage. Alternately, the 'victim pays' principle operates so that

3. All transactions are voluntary in a PES (Wunder et al., 2005). Additionally, it is also important to note that the *driver* behind the creation of the PES can sometimes be voluntary rather than being driven by a regulatory requirement or a tax-funded initiative.

the buyer pays another actor to positively influence the supply of ES.

Voluntary markets provide the opportunity for agreements between parties that are mutually beneficial, which suggests possibilities for increasing the supply of ES. PES may be particularly powerful when buyers have the ability and willingness to pay for ES provision, but in other cases, this may be somewhat limited. For example the buyers are NGOs or private organisations, which have limited funds or a specific, private goal that diverges from the general public interest.

Schemes that tap into consumers' demand for 'green' products, such as 'ecolabelling' of food or other items, can also be considered a PES scheme. Consumers (buyers) pay a price premium to suppliers (sellers) to ensure an environmentally-friendly production process. As such we consider such schemes to fit the definition of PES suggested by Wunder et al. (2005), see above.

Chapter 3

An approach for developing and assessing Payment for Ecosystem Services (PES) schemes

Our approach for proposing, developing, and assessing alternative PES schemes – aim at improving the quantity and quality of ES provided by mangrove forests in MCMNP in Southern Vietnam – integrates three key steps:

1. Conduct a preliminary, scoping study to assess PES feasibility;
2. Propose and define PES schemes; and
3. Develop criteria to assess trade-offs among PES schemes.

The approach proposed in this report falls within a larger environmental decision-making context in which the government of Vietnam has already decided to pursue price-based policy instruments like PES

(Figure 1). Given this preference, the purpose of this report is to develop and implement an approach for assessing the advantages and disadvantages of PES in a local context like MCMNP, and to assess alternative PES designs. The highlighted areas in Figure 1, including steps five through eight, represent the work undertaken in this analysis. Suggested next steps are captured in steps nine through twelve.

Conduct preliminary scoping study to assess PES feasibility

Bioclimate (2010) was developed for practitioners aiming to develop PES schemes. The Bioclimate report, among other things, develops »a framework for assessing opportunities for PES and PES scheme feasibility in a given context« (p. 42). The report suggests a preliminary scoping of potential PES candidate sites to determine whether the cultural, political, economic, and institutional contexts are conducive to PES development. We rely on the Bioclimate approach, complemented by our own analysis and Smith et al. (2013), to identify scoping criteria (Table 1). These criteria help determine whether it is worthwhile to proceed to the next step of proposing and defining a PES scheme (which requires more detailed information).

Figure 1. The decision-making context (highlighted area indicates our approach, as applied to MCMNP)

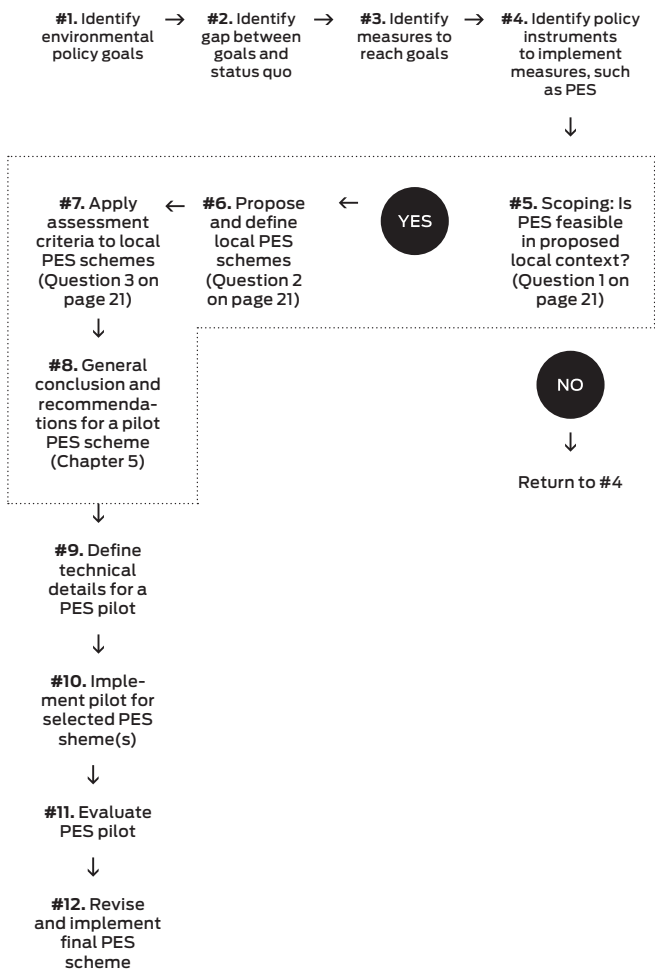


Table 1. Preliminary scoping criteria for PES feasibility at a particular site, including the cultural, political, and institutional contexts

Scoping criteria	Key issues to consider
Political context	<ul style="list-style-type: none"> • Is there government support for the PES program? • Are governance structures trusted and reliable?
Ecosystem Services (ES)	<ul style="list-style-type: none"> • What types of valuable ES are provided and are they at risk? • What is their importance on different regional scales? • Are there potential beneficiaries (i.e., potential buyers)? • Are there reasonable interventions known to increase ES?
Community	<ul style="list-style-type: none"> • Does the community have the organisational capacity to participate in a PES scheme? Trust-building and stakeholder meetings are essential to form cooperation and consensus on the technical issues to follow. • Can the community overcome challenges (e.g., seller holdouts, aggregated payments, transaction costs, etc.)? • Are there knowledge providers or intermediaries that can support the community?
Legal context	<ul style="list-style-type: none"> • Are reasonable legal structures in place to support PES? • Are there agreements or protection for property rights?

Source: p. 42 Bioclimate (2010); Smith et al. (2013)

Propose and define PES schemes

For PES candidate sites that meet the preliminary scoping criteria, we consider more detailed information needs for proposing and defining a PES scheme. Smith et al. (2013) identify five broad phases for implementing a PES scheme. We rely on the first two phases related to: (1) mapping relevant ecosystem services, buyers, and sellers and (2) defining basic guiding principles. We briefly summarize the key information needs and technical details required for defining a PES in Table 2.

The purpose of this step is to identify key information needs used in defining the proposed PES schemes. Table 2 further identifies technical details that need to be considered in the future development of pilot studies.

Table 2. Mapping key information needs and technical details for defining PES schemes.

Key information needs	
What types of Ecosystem Services (ES) are present?	<ul style="list-style-type: none"> • A key first step is to conduct field visits to map the types of ES that are of value to local users. This requires an understanding of ecosystem function and connectivity. • What types of economic goods and services may arise from such ES? (e.g., fish, recreation, etc.)
Who is benefiting (buyers)?	<ul style="list-style-type: none"> • Potential buyers may include those who benefit directly, or purchase on behalf of others who benefit (e.g., NGO), or the government • Is demand present or can it be created? Buyers are more likely to be attracted to a PES scheme when they are experiencing problems with the supply of a particular ES. • Capacity-building and outreach is often key to help inform buyers of the importance of certain ES that have hitherto been taken for granted
Who can influence ES flows (sellers)?	<ul style="list-style-type: none"> • Potential sellers may include landowners, businesses, environmental organizations, communities themselves, etc • Is the price buyers are willing to pay greater than the opportunity cost of the seller in providing the ES? • Is it clear whose actions have the capacity to increase the ES? Sometimes it is not clear whose action affects the delivery of the ES, (e.g., multiple upstream users impacting water quality) • Are interventions technically feasible to improve the flow of ES? A clear cause-and-effect relationship is needed to ensure that value can be provided to the buyer.
What is the geographic scale over which buyers/sellers may interact?	<ul style="list-style-type: none"> • The scale of a PES may vary depending on the characteristics of the ES and the buyers/sellers. For example, a PES may be Global if international buyers purchase e.g., carbon credits; Regional/national if beneficiaries purchase a tourism experience; or Local, e.g. if buyers/sellers exchange goods on a local market

Additional technical details to be defined and tested in pilot studies

<p>Interventions by seller</p>	<ul style="list-style-type: none"> • What type of management interventions will deliver increased ES? • Are there quantifiable causal links between the intervention and ES outcome? • Interventions should be continuous and not readily reversed. • Will training be needed?
<p>Payment by buyer</p>	<ul style="list-style-type: none"> • Is there demand for the ES and how much are the buyers willing to pay? • Will demand be continuous and stable?
<p>Intermediaries or knowledge providers</p>	<ul style="list-style-type: none"> • Several important actors should be identified in this phase including intermediaries (those who help facilitate trade), and knowledge providers who can facilitate scheme development (scientists, academics, interest groups, local experts, etc.).

Develop criteria to assess trade-offs among PES schemes

Given a set of defined PES schemes, the next step is to assess the comparative trade-offs from selecting any given scheme. Rather than pinpointing a single ‘optimal’ PES scheme, the goal is to assist policymakers in identifying the inherent and unavoidable trade-offs in designing price-based instruments that cover a broad and diverse set of ecosystem services, human activities, and actors (buyers/sellers).

The assessment criteria listed in Table 3 delineates the economic, social, and environmental merits of alternative PES schemes with respects to their alternative policy objectives. The list is based, in part, on the seven key issues identified in Smith et al. (2013), our own analysis, and specific criteria relevant to our project’s aims.

The chosen criteria will help us address several relevant questions for our subsequent analysis:

- What issues are important when comparing PES schemes?
- What are the differences between PES schemes?

- Are some PES alternatives more likely to succeed?
- What additional information is needed before proceeding with one of the PES alternatives?

Very few PES schemes will meet all the assessment criteria, but the goal for each alternative scheme should be to meet as many criteria as possible. Table 3 distinguishes between *essential* criteria (marked with a * in the Table) that must be fulfilled for a PES to develop (e.g., existence of buyers and sellers). Less critical criteria are important to strive for in the long-run, but are not as vital to the PES scheme (e.g., ensuring permanence and avoiding leakage). In addition, we identify *project-specific criteria* that are relevant for the MCMNP pilot project (marked with a ** in table 3).

In our case, the project-specific criteria refers to two specific project goals: poverty reduction and the need to reduce state and local expenditures (e.g., budget implications). These two specific goals run in tandem with the overall objective of improving ES flows. Although neither poverty reduction nor budget implications are theoretically necessary to develop a market, they are nonetheless relevant to this local decision making context and to PES application in developing countries more generally.

Table 3. Criteria for assessing trade-offs between alternative PES schemes

PES assessment criteria	Definition
Measurability*	It is challenging for buyers and sellers to make decisions about purchasing and selling a market good (e.g., ES within a PES) if it cannot be quantified and measured. ES in a PES scheme should, at least, be measurable such that we can be sure that a given action (by a seller) increases the supply of ES. Ideally, the increases in ES can then be qualitatively linked to improved human well-being.
Existence of a buyer(s)*	There must be an actor(s) that benefits from a valuable ES and will continue to demand it well in to the future. Ideally, all such actors should be included as 'buyers' (see 'beneficiary as buyer' below).
Existence of a seller(s)*	There must be an actor or actors who have the capacity and legal rights to increase the quantity/quality of ES.
Technically feasible interventions *	Interventions by sellers – defined as activities whose purpose is to improve the flow of ES – must be technically feasible and demonstrate a quantifiable and proven link between the intervention and the resulting impact on ES provisioning.
Defined property rights*	In order to have the right to sell a good, sellers must own (or at least have defined property rights over) that good. Without clear property rights, buyers may not believe that the seller can deliver the good. Thus, PES systems require clear definition and enforcement of property rights.
Voluntary participation*	For economic markets to be effective, buyers and sellers need to voluntarily seek out one another and mutually gain from the transaction.
Direct payment to providers*	Providers/sellers of ES must receive payment for their interventions in order to drive (incentivize) their actions such that there must be a predictable link between action and payment. ¹
Additionality*	Additionality refers to the requirement that a PES scheme provides ES 'in addition to' the current (baseline) level of ES provisioning and should be in addition to any existing regulatory requirement. Sellers should only receive payments for interventions that are 'over and above' this baseline. ²
Conditionality*	This criterion refers to the requirement that a seller's payment for ES is dependent (conditional) on the delivery of ES benefits (although in practice, payment is often conditional on undertaking some activity that is assumed to provide those benefits such as input-based payments). Conditionality requires effective monitoring over time and a credible threat that payment will not be provided without evidence of provision.
Ensuring permanence	PES interventions should be long-lived and not readily reversible. To avoid short-lived ES benefits, PES schemes should be designed to give sellers incentives for long-term interventions.

An approach for developing and assessing PES schemes

Beneficiaries as buyers	A PES scheme is most successful when all individuals (or organizations) that benefit from an ES are identified and included as buyers. So-called "free riders" are beneficiaries that avoid paying for an ES whilst enjoying its value. Too many 'free riders' may contribute to an under-provisioning of \ ES from a social perspective and lead to distrust among PES actors (see 'social acceptance' below).
Avoiding leakage of ES flows	A PES for one ES should not lead to the decline of that ES (or another ES) elsewhere. In such cases, a leakage of environmental benefits from the proposed PES scheme occurs that prevents a net global gain from such benefits.
Economic efficiency	To be economically efficient, a PES model should capture the true economic value of ES flows and their contribution to human well-being, including both use and non-use values. ³ In short, a PES should ensure that the provision of ES accounts for the social costs and social benefits.
Social acceptance	PES schemes are more credible when they are accepted and considered fair by participants, which often requires active efforts to build trust among actors. This can be challenging since the creation of markets has distributional consequences insofar as some buyers and sellers may 'win or lose' depending on how property rights are defined, how the scheme is developed, and how it is ultimately presented to participants.
Transaction costs	Compared to traditional markets for consumer goods, environmental markets often have high transaction costs associated with measuring, administering, monitoring, and evaluating. PES schemes that are able to reduce such costs are more likely to succeed.
Poverty reduction**	This project explicitly identifies poverty reduction as an additional goal in developing a PES model for the MCMNP study area. Although previous PES schemes in Vietnam have improved environmental outcomes and household incomes, these two criteria are not necessarily simultaneously satisfied.
Budget implications**	This project explicitly mentions the implications on government budget. Previous PES schemes for forest ES in Vietnam created sustainable financial resources for biodiversity conservation. For instance, the model in Lam Dong province successfully reduced expenses from the state budget. The funding was then used to pay for people to protect the forest instead of using annual investment from the state budget.

1. Payment may be made directly to the seller or go through an intermediary that facilitates the transition. In some cases, a small portion of the payment may be needed to cover PES administrative costs.

2. One challenge in assessing additionality is uncertainty in measuring environmental change through time, which includes both the baseline level of ES (i.e., what would have occurred in the absence of the PES scheme?) and the projected level of benefits resulting from the scheme.

3. See, for example, Pearce et al. 2006

* Essential criteria, see Section 3.3

** Project-specific criteria, see Section 3.3

Chapter 4

PES in Vietnam: The case of Mui Ca Mau National Park

The Socialist Republic of Vietnam is pursuing price-based mechanisms for environmental protection, with a strategic focus on Ecosystem Services (ES). The country's vision – identified through the Biodiversity Conservation Law adopted in 2008 – is to identify the benefits that people derive from ES and to seek a system where beneficiaries of such services pay service providers.

Vietnam has been one of the first countries in Southeast Asia to pass a national law promoting PES as a policy instrument (McElwee 2012).¹ In 2008, several small-scale PES pilot project were funded through the RUPES project (Rewarding Upland Poor for Environmental Services). The breakthrough for PES in Vietnam was however a large-scale PES program for

1. The Biodiversity Conservation law specifically requests that »Organisations and individuals using environmental services related to biodiversity shall pay charges to service providers« (see Article 74).



forest environmental services that ran from 2008 to 2012 and effectively identified and included a range of beneficiaries as PES buyers (Phuc Xuan et al., 2012). This project has reportedly improved living standards for local people, reduced illegal logging, provided forestry sector employment, and reduced state budget expenses (Phuc Xuan 2012).

Following the success of the Payment for Forest Ecosystem Services pilot, Vietnam's Environment Agency expressed interest in expanding PES pilots to cover ES from non-forest ecosystems (Huynh Thi 2011). For example, the Government of Vietnam issued Decree No. 99/2010/ND-CP which called for replicating the success of the Payment for Forest Ecosystem Services pilot and specifically stipulated five areas in which the government would support the use of PES payments for ES. The five stipulated areas include: land protection; watershed protection; carbon sequestration; landscape and biodiversity protection (e.g., for tourism); and spawning grounds and source of seed/feed for aquaculture.

In order to fulfil this ambition to increase the use of PES in the country, the Government of Vietnam has chosen Mui Ca Mau National Park (MCMNP) in Southern Vietnam as the place to implement pilot PES schemes.

Mui Ca Mau National Park (MCMNP)

MCMNP is located in the Nam Can and Ngoc Hien districts, approximately 100 km south of Ca Mau city. The study area includes the park's Zone of Ecological Restoration (ZER) in the commune of Dat Mui (Ngoc Hien district). The total area of the park is 41,802 ha, of which 9,362 ha are coastal wetlands. In 2012, 51,601 persons lived within the park's border.²

The ZER is managed by regulations issued by Ca Mau People's Committee and community participation. With a total of 3,900 people living in the ZER, Dat Mui Commune has the largest number of households out of the four communes. Of those, only 200 have been allocated land while the remaining 3,700 households have not been granted land use right and/or have a minimal land area to support dwelling. Since agriculture or aquaculture production is not possible to these households, and fishing is only possible from June to July when fish are plentiful, they depend on cutting mangroves and producing charcoal for a living. This creates another threat to the already vulnerable mangrove forests (IUCN 2013).

2. For further information, see *Ecosystem Services Assessment in Mui Ca Mau National Park*, available at: <http://fores.se/ekosystemtjnster-i-vietnam/>.

Ecosystem Services (ES) in Mui Ca Mau National Park (MCMNP)

MCMNP's mangrove forest and coastal wetland are rich in biodiversity and have several special designations that condition the use of land by the inhabitants of the park. The range of economic activities that can be developed in the park is limited since MCMNP belongs to the Special Use Forest system (Table 4). With land allocated to them, families living in the ZER are allowed to combine extensive shrimp farming with forest protection. The main source of livelihood in the area is aquaculture, agriculture, fishery and forestry, which implies that the households are largely depend-

Table 4. Main sources of livelihood for households within Mui Ca Mau National Park (MCMNP)

Location	Agriculture -fishery -forestry	Services	Industry and construction
Ca Mau Province	38%	25%	37%
Ngoc Hien district	83%	11%	6%
ZER of MCMNP	100%	0%	0%

Sources: District Survey (2011) and fieldwork in Ca Mau (2013)

ent on ecosystem services.

The ES provided by MCMNP benefit both those who live inside and outside the area. Using the classification system provided by the Millennium Ecosystem Assessment (MEA 2005), which divides services into *supporting*, *provisioning*, *regulating* and *cultural*, we identify a broad range of ES in Table 5.

In recent decades, MCMNP has followed the general trends in the Mekong Delta. This includes: the overexploitation of wetland ecosystems; resulting habitat loss/fragmentation and degradation; and pol-

Table 5. Ecosystem Services in the Mui Ca Mau National Park (MCMNP)

Provisioning	Regulating	Cultural
Food	Climate regulation (adaptation and mitigation)	Eco-tourism
Water (fresh and brackish)	Water regulation and purification	Educational
Fibre	Waste treatment	Cultural and spiritual
Timber	Shoreline stabilisation	
Firewood	Disease regulation	
Medicinal herbs	Pollination	
Genetic resources		

Provisioning

Soil formation
 Nutrient cycling
 Primary production

lution driven by the need for short-term economic gain. Several other factors, such as climate change, invasive species, and weak implementation of environmental regulations, have exacerbated these problems. For example, in 1965, mangroves covered 87,097 ha; in 2001 they covered 32,875 ha; and in 2010 they covered 18,585 ha (Vu Tien Dien et al., 2012).

While Table 5 identifies the full range of ES available in the area studied, the scope of our project limits its focuses to protecting mangrove forests and improving household incomes. Thus, given our focus on livelihood models related to aquaculture, agriculture and eco-tourism in MCMNP, we identify six project-relevant ES:

1. **Food provisioning:** Provisioning services are the products obtained from ecosystems. They may include food products derived from plants, animals, and microbes, or other products such as wood that is used for pulp and paper production, shelter, fuel or medicines (MA 2005).
2. **Carbon sequestration:** Carbon sequestration helps with climate regulation, which is defined as the regulation of greenhouse gases, temperature, precipitation, and other climatic processes (WRI 2005).

3. **Shoreline stabilisation:** The roots of mangrove trees keep the shoreline together, which protects the shoreline from erosion from wind and waves and provides a physical barrier that slows down storm surges and tidal waves. Together, these functions reduce the height and destructive power of ocean waves. According to the United Nations, »mangroves can absorb 70-90% of the energy of a normal wave« (FAO 2008).
4. **Protecting freshwater supplies from saltwater intrusion:** Coastal mangroves prevent salt intrusion into freshwater supplies, which is used for agriculture or direct human consumption.
5. **Biodiversity provisioning:** Biodiversity provisioning delivers several types of value to society. For example, it bolsters the resilience of ecosystems to help weather natural or man-made pressures such as storms, pollution, and exploitation. Biodiversity also contributes to the development of eco-tourism in areas like MCMNP (see 'Aesthetic quality/landscapes' below).
6. **Aesthetic quality/landscapes:** The existence of aesthetic quality and unique land-

scapes provides society with a variety of cultural values such as historic sites, cultural heritage, recreational opportunities, and eco-tourism. Eco-tourism has particular promise in a unique area like MCMNP. Yet, to realise these values managers need to balance accessibility with landscape preservation.

Chapter 5

Applying our approach to MCMNP

This section describes how we use the approach presented in Section 3 to assess the suitability of different PES schemes in Mui Ca Mau National Park.

Scoping study

Our preliminary scoping analysis considers whether PES may be a suitable policy instrument for managing coastal wetlands and mangrove ecosystems in MCMNP. Based on the scoping criteria set out in Table 1, page 22) we find that a PES scheme can be a potentially promising approach in this policy context given some of the characteristics of the are studied (see Table 6).

Table 6 Applying the preliminary scoping criteria to Mui Ca Mau NP (MCMNP)

Scoping criteria	Regulating	Cultural
Political context	<p>Government structures, although still in need of improvement, provide the basic infrastructure needed for implementing a PES programme and for helping to reduce transaction costs for private actors involved in the market. For example, MCMNP area benefits from:</p> <ul style="list-style-type: none"> • Strong government support: Thanks, in part to previous success with PES elsewhere in the country, support comes from high levels of government in Vietnam (e.g., Powell et al., 2011). • Support by local residents. An effective and gradual consensus-building approach has resulted in support by local residents. These residents recognise the private benefits of the livelihood model that underpins the PES system. • Reducing conflict: The pilot model has led to a reduction in the historic conflict between the national park and local residents in the area. This benefits overall social stability and builds trust in local governing institutions. • Stable governance: Although room for improvement exists, the foundations for a trusted and accepted governance system exist. Furthermore, this government is willing to incur costs to facilitate market conditions through training and investment support for land-users (sellers). 	Meets this criterion, but some additional work is required to continue to build trust and support for governing infrastructure
Ecosystem services (ES)	<p>The coastal wetlands and mangrove ecosystems that are at the centre of the proposed PES scheme provide significant value on global, national, and local levels (Section 2) because they are in high demand as inputs to aqua-culture and agricultural production. They are gaining increased value associated with climate regulation and shoreline stabilisation. Furthermore, Ecosystem services are at risk from population growth, climate change, etc.</p>	Meets this criterion

Community	<p>Local participants indicate a strong willingness to participate and have benefitted from continued capacity-building. For example:</p> <ul style="list-style-type: none"> • Organisational capacity of local participants: Successful livelihood model implementation proves that local stakeholders have the skills and interest in continual learning to provide the necessary input for a successful PES. Moreover, participants have demonstrated a technical understanding of the types of ES provided and their importance for production and social well-being. This helps reduce holdouts and facilitate the matching of buyers and sellers. • Strong engagement with other stakeholders: The use of PES in Vietnam ensures that there are intermediaries available to help facilitate transactions (e.g., WWF) and knowledge providers/experts that can assist in PES design (e.g., FORWET, ISPONRE, MONRE, BCA, SEI, FORES). • Local funding networks: Local funding networks like SIDA have provided important inputs to facilitate the establishment of markets. 	Meets this criterion
Legal context	<p>Although the clear identification of property rights in Vietnam provides a challenge for PES implementation (see background report Land Use Analysis), existing land use contracts between the MCMNP and the local land-users may provide the type of legal infrastructure needed for successful PES. For example, these existing contracts could be modified to reflect new PES agreements between buyers and sellers.</p>	Partially meets this criterion, but may pose some challenges

Defining PES schemes

Based on the conditions in MCMNP, and the methods developed in Section 3.2, we define and propose five alternative PES schemes.

To define alternative PES schemes in MCMNP, we address the key information needs identified in Table 2, page 26. We begin by identifying six key ES found in the study area and then, working left to right in Table 7, identify the economic goods that rely on these ES as inputs. Next, we consider the potential geographic scale over which these ES are produced (supplied) and consumed (demanded). Finally, we consider who benefits and who might be able to provide these ES.

Table 7 provides a key starting point in *defining* potential PES schemes. However, as noted in Section 3.3, this leaves several technical issues to be resolved through future pilot studies.

These six ES have been chosen for our specific study area for several reasons. First, they are critical for the development of the three main activities - extensive shrimp farming, agroforestry (combining mangrove conservation with fruit tree cultivation), and eco-tourism - that support households in the zone for ecological restoration. Second, the benefits of these ES flow to people living in the study area and society in general, either directly (e.g., provision of food) or

Table 7. Proposing and defining alternative PES schemes in Mui Ca Mau National Park (MCMNP)

Ecosystem services in MCMNP	Economic good provided	Possible PES Schemes in MCMNP		
		Geographic scale of benefits	Primary beneficiaries ¹	Providers
1. Food provisioning	Fish	Primary: Local Secondary: National	Households/food producers; national citizens due to food security; local consumers of forest products	Land user /manager or regional fishermen
2. Carbon sequestration	Climate regulation	Global	Global citizens, particularly those living in areas most vulnerable to the effects of climate change	Land user /manager
3. Shoreline stabilisation	Protection of buildings and infrastructure	Local, national	Local households; residents; Vietnamese citizens due to border protection	Land user /manager
4. Protection of freshwater supplies from saltwater intrusion	Protection of drinking water and irrigation supply; reduced treatment costs ²	Local	Local residents; farmers; water supply companies	Land user /manager
5. Biodiversity provisioning	Tourism; resilient ecosystems	Primary: Global Secondary: Local	Global citizens; tourist businesses in Ca Mau ¹	Land user /manager
6. Aesthetic quality/landscape	Tourism and cultural values	Primary: Local, global Secondary: National	Local residents; global citizens; tourist businesses in Ca Mau ¹	Land user /manager

1. Table 7 assumes that primary benefits go to those who produce a good or service (e.g., fish, food, tourism), even though it can be argued that consumers also benefit.

2. Residents in MCMNP currently rely on untreated groundwater and rainwater for water consumption. If mangrove ecosystem services were to be degraded, this may imply future costs associated with water treatment.

indirectly (e.g., climate regulation).

In the following section, we develop our proposal for the five alternatives PES schemes, which are summarized in Table 8, page 53

PES Alternative 1a and 1b – Aqua- and agriculture and Eco-tourism

In general, preservation of mangrove forests has an impact on all the relevant ES included in our project. For example, mangroves generate habitats for fish species, which benefits both local and non-local communities and businesses. Furthermore, they sequester Co₂, which is globally beneficial and creates opportunities for recreation. FORWET (2013) presents two alternative proposals to stimulate aqua-/agriculture and eco-tourism as a way of preserving the mangroves, which in turn, increases the opportunities for improved aqua-/agriculture and eco-tourism.

With regard to aqua- and agriculture, a PES contract would stipulate that households pay the national park for their allocated land in terms of labour (e.g., protecting mangrove forests from illegal logging and engaging in restoration efforts). This is an in-kind payment.¹ Furthermore, households would have to use

1. A strict interpretation of Vietnam's Biodiversity Conservation Law suggests that the government (e.g., the national park) cannot be a seller of ES. However, our economic interpretation of FORWET's proposed PES 1a assumes that the NP sells ecosystem services to the household, since the NP is the rightful owner according to property rights schemes in Vietnam. Our economic interpretation may differ from a legal interpretation.

water and soil in an environmentally-friendly manner.

In terms of eco-tourism, the users (tourists) pay the national park for their visits. Then, 90% of the revenue goes to the individual households that have hosted the tourists. The remaining 10% should cover the national park's expenditure for tourism promotion and quality assurance. The national park will further provide technical advice related to forest protection, aquaculture and tourism to improve productivity while maintaining environmentally-friendly production.

PES Alternative 2: State buyer for shoreline stabilisation

Mangroves provide shoreline stabilisation services by protecting coastlines against storm surge, which provides value in terms of protecting human lives, preserving infrastructure, and reducing the costly expenses of maintaining sea dykes. For example, mangroves dampen the effect of ocean storm surges along Vietnam's coasts. The reduction of this service has forced Vietnam to build costly sea walls (Tuan et al., in review). Moreover, the cost of post-storm reconstruction and the need for international disaster aid are both likely to increase as this ecosystem service declines (Lawrence 2012).

Rather than rely upon the continual (re)construction of man-made seawalls, one can turn to restora-

tion and rehabilitation of mangrove forests along vulnerable coastlines that have been previously damaged or destroyed. One possible market-based approach to protecting this ES is to rely on a traditional PES schemes, where the state (or another environmental organisation) buys the service of shoreline stabilisation from willing sellers on behalf of the general public (the beneficiaries). Around the world, there are many examples of traditional ‘state buyer’ PES schemes, and many of these schemes cover the types of ES provided by mangroves (FORES 2013a).

In our proposed scheme for shoreline stabilisation, the sellers might include coastal land-users who undertake feasible and proven interventions that improve damaged mangrove forests, or prevent further decline of existing mangroves, which ultimately improve shoreline stabilisation. Beneficiaries include not only those who live on the coast, but also those who live inland who depend on coastal agricultural production or those who own property along the coast.

PES Alternative 3: Carbon markets

PES alternative 3 focuses on the ES of carbon sequestration from mangrove forests. Mangrove forests have proven to be an important sink for global carbon emissions from internal combustion engines and

deforestation in other contexts (Laffoley and Grimsditch 2009; Lawrence 2012). Beneficiaries include global citizens who benefit from improved climate regulation, while buyers include a subset of these beneficiaries with a willingness to pay for this service. This subset may include actors taking part in international carbon trading schemes, but also NGOs or businesses that seek to: offset previous carbon emissions or voluntarily offset emissions as part of corporate social responsibility or as preparation for future compliance. Providers of the service include land-users/managers who sell carbon sequestration by protecting, planting, or enhancing mangrove forests. Payments could be 'input based' (i.e., where sellers receive cash for a certain area of protected or enhanced forest), where this area is linked to a quantity of assumed carbon sequestration. Alternately, it could be output-based, where sellers receive cash only after a certain amount of carbon has been stored in matured forests

PES in a mangrove wetland has some appealing benefits. It is straightforward to identify beneficiaries, sellers, and potential buyers of the ecosystem service. The sellers, such as land managers, have clear influence over the ES by restoring mangrove forests. In addition, mangrove forests have an advantage over other forest types in that they have a low timber value, and thereby low opportunity cost (McNally et al.,

2011). Despite being surrounded by policy uncertainty and instability, we are currently witnessing the growth of international and national carbon trading markets and these are beginning to be a well-established policy tool.

Moreover, a mangrove carbon market PES will accrue revenues to support continued conservation and improvement projects. Under the UNFCCC, developing countries may be compensated for maintaining the carbon sequestration functions of their forests and for enhancing carbon stocks within international and national programs to Reduce Emissions from Deforestation and Degradation (REDD+). By having polluters, and not the beneficiaries, it can be argued that this PES scheme falls in line with the polluter-pays principle.

PES Alternative 4: Eco-labelling

Extensive aquaculture farming in MCMNP - which relies more heavily on nature's inputs than intensive farming - is highly dependent on supporting and regulating ES provided by mangrove forests. For instance, this includes nutrient cycling where leaves from mangrove trees supply 'green manure' to shrimp ponds that promote natural food webs in an integrated system (Fitzgerald 2000). It also includes the provision of habitat, such as shelter against predators, shade for

Table 8. Summary of the five proposed alternative PES schemes

PES attribute	PES 1a Aqua- and Agriculture	PES 1b Eco-tourism	PES 2 State buyer	PES 3 Carbon	PES 4 Eco-labeling
Ecosystem Service	Food, habitat	Opportunities for tourism and recreation	Shoreline stabilisation	Climate regulation	Food provisioning; supporting services: nutrient cycling, habitat provisions, water purification, etc.
Buyer	Local households	Tourists & tourist businesses	State government (or environmental NGOs)	Private companies, environmental NGOs, etc.	Final consumers
Seller	MCM National Park	Local HHs	Local HHs	Local HHs	Local HHs
Geographical scale	Local	MCM National Park	National (affects all citizens)	International or national	National and international
Interventions by seller	Contributes money/materials for mangrove restoration	Constructs homestay building, improves scenery	Protecting, enhancing, or planting mangrove trees	Protecting, enhancing, or planting mangrove trees	Eco farming practices (e.g., reforestation)
Payment by buyer	In-kind 'labour hours' to protect forest	Cash payments to HHs	Input-based cash payments (based on actions taken)	Cash payments based on actual carbon stored (output-based) or actions taken (input-based)	Direct payment to the local HHs from buyer through higher price
Intermediaries or knowledge providers	NGOs and research institutes	NGOs and research institutes	Gov't authorities, NGOs, academics	NGOs and government authorities	Certified middleman, processor, certification agency, government authorities

breeding and spawning areas, and water purification. The main idea behind a PES scheme based on eco-labelling is that farmers receive a price premium for farming shrimp in a sustainable manner, thereby preserving ES while improving household incomes.

The proposed PES scheme entails a large geographic scale as it would match willing buyers – i.e., consumers in developed countries or in Vietnam that demand certification schemes and/or “buyer recommendation” lists for seafood products (Washington and Ababouch 2011) – with sellers in MCMNP (i.e., households). The buyers benefit from both the product itself and the sustainable land use practices that underlie its production. Additionally, sellers benefit from an increased price for shrimp carrying an eco-label. Service providers must undertake several interventions that secure an additional flow of ES relative to existing shrimp farming methods.

Applying assessment criteria

Table 9 illustrates the relative strengths and weaknesses of the proposed PES alternatives based on the assessment criteria (including essential, non-essential, and project-specific criteria described in Sec 3.3). The plus (+) and minus (-) assessments should be interpreted as a general indication of the advantages

and disadvantages of the proposed PES alternatives rather than ‘absolute scores’ for a particular scheme. These types of relative scores can be helpful when identifying and evaluating potential trade-offs among PES designs.

The analysis in Table 9 is based on desk studies and field visits to the study area in Vietnam, which consisted of interviews with local households and government agencies.

Below we highlight a few conclusions from Table 9 with respect to the proposed PES schemes in MCMNP. Importantly, the application of the assessment criteria is sensitive to local context.

PES 1a and b seemed to work well at a low scale, but they are dependent upon external funding and may not represent additional gains in ES.

PES 1a and 1b fit into the existing legal structures (e.g., HH contracts), land-use practices, and local culture, which is promising for achieving local acceptance of the system. A key challenge, however, is the need for external funding to keep the scheme sustainable over the long-run (in contrast, see PES 4 below). Furthermore, the link between tourism provisioning and the flow of ES is unclear, which raises concerns regarding

Table 9. Summary of five PES alternatives against the assessment criteria

+ Indicates the PES alternative would seem to meet this criterion in practice.

- Indicates the PES alternative is unlikely to meet this criterion in practice.

+/- Indicates uncertainty over whether the PES alternative will actually fulfil this criterion.

* Essential criteria, see Section 3.3.

** Project-specific criteria, see Section 3.3.

Criteria	Relative strengths and weaknesses of proposed PES scheme based on assessment criteria				
	PES 1a Aqua- and Agriculture	PES 1b Eco-tour- ism	PES 2 State buyer	PES 3 Carbon	PES 4 Eco-label- ling
	+/-	+/-	+/-	+	+/-
Measurability*	In the case of carbon, measurability is fairly well advanced given that there is reliable information on: (1) the link between sequestration activities and the impact on climate regulation and (2) the link between climate change impacts and human well-being (i.e., through the social cost of carbon). This is the exception, however, and not the rule. In our proposed PES schemes, measurability is uncertain and dependent upon the PES design itself. Therefore it is hard to generalise across proposed PES schemes. For example, in the case of eco-labelling, it depends upon the standards to which eco-producers are held, as well as how these standards ultimately influence the provisioning of ES.				
	+	+	+	+	+
Existence of a buyer(s)*	Based on our current research in MCMNP, all of the proposed PES schemes have potential buyers or actors who would benefit from improving ES provisioning. There is some uncertainty, however, related to whether buyer preferences may change and whether or not identified beneficiaries will be included as buyers in a future PES scheme. Note that PES 3 and PES 4 are also entirely dependent upon outside beneficiaries/buyers that are willing to pay for an ES. For example, carbon depends on global demand for forest credits, while eco-shrimp is dependent on global consumer preferences.				
	+	+	+	+	+
Existence of a seller(s)*	Based on our current research in MCMNP, all of the proposed PES schemes have potential sellers or actors with an economic incentive to deliver improved ES. As with buyers, there is some uncertainty related to the future PES design. For example, do sellers also have 'defined property rights' and are there interventions that are technically feasible and known to improve ES flow? In our case study, sellers are individual households (in 4 of the 5 PES schemes) or the national park (PES 1a).				

	+	+/-	+/-	+	+
Technically feasible interventions*	<p>There are some relative differences across the proposed PES schemes related to technical feasibility. For some activities there is a clearer link between intervention and resulting impact on ES. For instance, forest owners protecting forest clearly improves ES from mangroves in PES 1a, while the interventions of carbon sequestration and eco-labelling has been shown to improve ES or prevent further decline. Yet such links are less clear in PES 2, where it is difficult to quantify links between restoration activities and shoreline protection benefits. Similarly, tourism interventions in PES 1b like improving forest biodiversity are positive, but difficult to quantify. Furthermore, building tourist facilities may in fact conflict with the goal of improving ES.</p>				
	+	-	-	-	-
Defined property rights*	<p>Although most of these proposed PES schemes operate under contracts (e.g., Land Use Rights, LUR) that closely resemble land ownership, it is not entirely the same thing (McElwee 2012). One potential concern is that without long-term, permanent property rights a household may not have the strong incentives for the type of long-term ES investment that is needed to ensure continuous improvement in ES flows. In our case, property rights are well defined for PES 1a, where MCMNP is the clear owner of the land.</p>				
	-	+	+	+	+
Voluntary participation*	<p>Based on our research, four of the PES schemes are founded on voluntary transactions where both parties mutually benefit from said transaction. For example, even PES 2, where the state is the (only) buyer, there are market mechanisms at work to ensure cost efficiency in that the seller can decide whether to participate at a given price. In contrast, PES 1a is built on a forced transaction through existing contracts such that households are required by the government to protect the forest for a given price. Rather than an 'arms-length' transaction between seller and buyer, the demands on the seller (household) are stipulated in a contract.</p>				
	+/-	+/-	+	+/-	+/-
Direct payment to providers*	<p>Although part of a payment may reasonably include administrative costs, we find variation in how providers are paid across the PES schemes. In three of the schemes there is uncertainty about the strength of the payment incentive for the provider because payment is indirect, which means the link between a supplier's action and subsequent reward is weak (e.g., PES1b provides payment to tourist operators and/or the MCMNP rather than directly to the household provider). Alternately, the payment is proportioned between a provider and a middleman, which also weakens the link between intervention and payment (e.g., the price premium in eco-labelling is shared by the wholesale buyer and the shrimp producer). Note the exception is PES 2, where the state pays the households and sellers directly).</p>				

<p>Additionality*</p>	-	-	+	+	+
	<p>We find variation in whether a proposed PES scheme provides ES flows that are additional to what would have been provided in the absence of that scheme, which questions the environmental benefits of the scheme itself. For example, PES 1a does not appear to change the status quo because there is already an existing contract between households and the Park. Similarly, PES 1b may generate incentives for sellers to improve biodiversity, thus improving the quality of the 'tourist product' they are selling. Yet, there is concern that the tourist facilities themselves may reduce rather than improve ES flows. In contrast, existing and proposed carbon schemes are very stringent about the additionality requirement (e.g., the CDM regulatory framework) and eco-labelling standards explicitly require improved aqua-culture practices. (e.g., Naturland standards).</p>				
<p>Conditionality*</p>	+	+	+	+	+
	<p>In general we find that the proposed PES schemes will be able to include some aspect of conditionality, which means that the payment to suppliers is conditional upon those parties meeting certain activities or criteria. For example, an input-based payment for PES 3 might be made after a seller has planted a tree, which is assumed to provide a certain level of carbon sequestration. Alternatively, conditionality may be assured through an output-based payment where the seller receives payment only after a documented improvement in ES provision. In practice, the former is more feasible and more common.</p>				
<p>Ensuring permanence</p>	+	+	+	+	+
	<p>Permanence is likely to exist as long as the contracts for forest protection are upheld. In general, all proposed PES schemes have potential for permanence.</p>				
<p>Beneficiaries as buyers</p>	+/-	+/-	+/-	-	-
	<p>While both PES 3 and 4 represent growing markets with increasing demand from buyers who value carbon storage and environmentally-friendly food production, they nonetheless suffer from free-riding (e.g., regular seafood consumers can still benefit from ES protection if a sufficient number of other consumers buy eco-labelled shrimp in PES 4). PES 2 reduces free-riding because the state pays on behalf of coastal protection beneficiaries and requires payment via taxes. Note, however, that carbon sequestration is also protected here, which may create global free riders who fail to pay taxes to support PES 2. In PES 1a and 1b, households and tourists, respectively, pay for ES that inevitably benefit others groups. For instance, the forest and biodiversity protection measures they provide (via labour) for tourists, also benefits other local farmers.</p>				

Applying our approach to MCMNP

	+/-	+/-	+/-	+/-	+/-
Avoiding leak- age					
	Leakage of ES benefits are likely if costly measures to increase the flow of ES cause production, or other damaging activities, to increase in other areas. For example, PES schemes that protect forests in MCMNP may cause logging to increase in areas outside the park. However, leakage is unlikely to be significant because the price of mangrove timber is relatively low. For aquaculture, however, the effect might be more prominent. This suggests that sufficient measures should be taken to protect mangroves in other locations.				
Economic ef- ficiency	-	-	-	+/-	-
	Despite recent improvements in our ability to value the benefits that ES provide society, environmental economists are not able to capture all of these values in monetary terms. Thus these are not reflected in the price of a PES scheme. PES 3 (carbon) is perhaps closest to the ideal of capturing full social value, since there is a potentially large, global market of buyers and sellers that could, in theory, bid the price up over time to reflect the full social value of sequestering carbon.				
Social accep- tance	+	+	+	+	+
	All PES alternatives actively involve local households as sellers or buyers. Strong local involvement alongside good awareness among participants makes it reasonable to believe that social acceptance will be high. Possible challenges to social acceptance could relate to uncertain land use rights, but not to any specific PES attributes.				
Transaction costs	+	+/-	+/-	-	-
	Local markets, like PES 1a and PES 2 on a national level, are likely to have lower transaction costs compared PES 3 and 4. This is due to the fact that compliance and monitoring of international markets like carbon and eco-labelling require more time and resources.				
Poverty reduc- tion **	+	+	+	+	+
	All PES schemes contribute to poverty alleviation by directly increasing households' revenue. For example, under PES 1b, household will be paid for eco-tourism services or indirectly through PES 2 where maintenance of houses and ponds towards climate change effects will be smaller if the shoreline is stabilised.				
Budget implica- tions **	+	+	+	+	+
	Based on previous experiences in Vietnam, it could be expected that PES 1a, PES 2, PES 3, and PES 4 will reduce state budget expenses for biodiversity conservation. PES 1b will directly increase the National Park budget insofar as households carrying out eco-tourism activities will pay the National Park Management Board between 5%-10% of the benefits to cover promotional and administrative work.				

additionality. Tourism in itself may put pressure on the environment. While healthy ecosystems are a factor in attracting tourists, other attributes such as infrastructure and tourism facilities are required. This begs the question of whether a PES scheme based on an expanding tourism industry will in fact lead to *additional* ES in MCMNP.

PES 2 is a proven concept that provides much needed income to land-users, but like PES 1a and 1b, it may suffer from a lack of funding.

The proposed state buyer of PES schemes provides an income opportunity for land-users and thus meets the poverty reduction criterion. It is also attractive from a comprehensive budget implication perspective in the long-run, as paying landowners to protect mangroves will be significantly cheaper than continuing to build and maintain expensive sea dykes (Othman 1994).

PES 3 and 4 appear more economically feasible at a large scale because they incorporate external funding, but they may be sensitive to changes in future demand for these ES.

Eco-labelling and carbon markets both capture beneficiaries from outside the study area who are willing

to pay for ES delivery. This is critical from a funding perspective, as it relieves stress on local government budgets for environmental protection, but future demand is inherently uncertain. Despite projection by Jonell et al. (2013), who point to continued expected growth in environmentally-conscious seafood consumers, currently growing by 5-7% a year in Europe, consumer preferences can be unpredictable. The development of international carbon markets is increasing, however, carbon prices have fluctuated dramatically over time and the markets are surrounded by policy uncertainty. Aside from general regulatory uncertainty, carbon markets are also subject to a variety of additional external factors such as the price of oil, the cost of abatement technology, weather, economic development, international climate negotiations, and so on.

The price premium in the proposed eco-labelling scheme is crucial as it provides an economic incentive that: (1) supports more costly, environmentally-friendly shrimp production methods and (2) improves the likelihood that households will undertake effective mangrove forest protection activities (e.g., preventing illegal logging, improving forest cover through re-planting). The design is somewhat different in PES 1a, where households are *buyers* of ES, who are paid 'in-kind' to the National Park via mangrove forest

protection activities, which are then used as inputs in shrimp production. Although households face a *different* incentive structure in PES 1a and PES 4, they *both* lead to *similar* mangrove forest protection activities aimed at improving ES flows. Is the end result similar though? According to economic theory, the efficiency of a price-based mechanism like PES is independent on property rights assignment (e.g., Coase Theorem in Hanley et al., 2007), but in practice, we believe the incentive structure of PES 4 may lead to improved outcomes for both environmental protection and poverty reduction.

- Under PES 1a, the government provides one shrimp production input (land) while households provide the other (ES via land protection). Each household's economic incentive is to provide a basic level of protection that ensures they do not lose their land use right contract. Although the livelihood model may reduce poverty through training and investment support for impoverished households, this model is costly for local governments.
- Under PES 4, households' economic incentive are to provide a level of forest protec-

tion that ensures optimal profits from their shrimp production. Given that international labelling standards provide a strict mandate on required activities in order to receive the price premium – and because households themselves may see the economic benefits of eco-labelled production – households are more likely to undertake effective forest protection measures. Furthermore, if consumer demand remains high, thus ensuring a price premium, household poverty may be reduced over time without burdening local budgets.

Conclusions and recommendations for Mui Ca Mau National Park

Coastal wetlands and mangrove forests deliver valuable ES in MCMNP such as food provisioning, carbon sequestration, shoreline stabilisation, protection of freshwater supplies from saltwater intrusion, provision of biodiversity, and aesthetic quality/landscapes. These provide valuable inputs to a host of valuable economic goods and services: seafood, wood, fruit,

climate regulation, protection of drinking water, protection of real estate, and tourism. However, many of these ES are threatened by overexploitation, pollution and other global and local economic drivers.

By viewing these ES as ‘natural capital’ inputs, it is possible to develop price-based approaches to improve the quality and quantity of these ES. We find that the cultural, political, and economic context of the MCMNP makes a PES approach feasible given: the support from the national government for PES approaches; the existence of local institutions to help implement agreements between buyers and sellers; and the strong engagement by local stakeholders (e.g., intermediaries, knowledge providers, buyers, sellers) all of whom demonstrate a willingness to participate in capacity building activities. Moreover, funding for initial start up costs is available through local funding networks.

In applying our assessment approach, we find that carbon markets and eco-labelled shrimp production may have the greatest potential for use in future pilot studies. As noted in Section 5.3, PES 4 relative to PES 1a, is particularly attractive from a local government budget perspective as it may provide a less costly way of reducing poverty and improving ES flow. PES 3 also scores high on budget implication criteria. Additionally, if eco-labelling of seafood products proves suc-

cessful in a future pilot study, it could be expanded to include other agricultural products carrying an eco-label (e.g., dragon fruit and bananas).

One policy recommendation that arises from our analysis is the potential for combining or ‘layering’ PES 3 (carbon) with PES 4 (eco-labelling). Mangrove habitat restoration undertaken by providers in PES 4 to deliver eco-labelled shrimp also delivers value to beneficiaries in PES 3. This presents an opportunity for multiple buyers to pay the same household provider for delivering several ES stemming from mangrove restoration (i.e., (1) improved biodiversity and food provisioning (PES 4) and (2) carbon sequestration (PES 3)). Although layering provides additional income for households and reduces poverty, there may be concerns about meeting the *essential* criterion of additionality, since it will be difficult to track exactly which PES mangrove restoration stems from.

An important next step in MCMNP is to test these alternate PES schemes in a pilot study that covers a larger area (MCMNP covers approximately 41,000 ha). Such testing will be critical for scaling up future PES schemes, given the vast extent of coastal wetlands and mangrove ecosystems in Vietnam (160,000 ha). In order to accomplish this, enhancing knowledge and capacity building is crucial to ensure these ideas have an environmental impact on a larger scale.

Cole, Aponte, Hasselström, Stavlöt, Stenson

Chapter 6

Synthesizing our PES assessment approach

This report aims to synthesize an approach for assessing alternative PES schemes that arose from a one-year project on PES development for coastal wetlands and mangrove ecosystems in Mui Ca Mau National Park, in Southern Vietnam. Our approach, which is a screening assessment aimed at proposing and assessing alternative PES schemes, is based in part on previous PES literature as well as our own methodological contributions. We contribute by developing a set of assessment criteria that highlights the strengths and weaknesses of proposed PES schemes based on a number of inherent characteristics, such as: the ES being bought and sold; the attributes of the buyers and sellers; the legal structure within which the PES model would operate, etc. Applying these criteria in our approach assists decision-makers in designing an optimal PES scheme for their needs by helping to expose a number of trade-offs, such as:

- **Additionality vs overall ES supply:** A PES scheme that focuses on ensuring additionality for one ES may inadvertently lead to the decline of a different ES within the same area.
- **Additionality vs Leakage of an ES:** A PES scheme that successfully increases the supply of a local ES may actually lead to the decline of that ES in another area (leakage).
- **Budget implications vs Existence of a buyer:** A PES scheme that targets non-local buyers may benefit from critical external funding to ensure an effective PES implementation, but this may come at the cost of giving up local control and administration of the PES scheme.
- **Transaction costs vs Conditionality/additionality:** A PES scheme that focuses on reducing transaction costs may have insufficient funds to monitor ES flows, which makes it difficult to ensure conditionality and additionality.

Assessing these trade-offs is challenging as they pose many difficult policy questions, some of which may require subjective value judgments. However, iden-

tifying trade-offs is a critical first step in designing an optimal PES scheme, as it can assist decision makers in making some of the necessary judgments. For example, information about trade-offs can be combined with guiding principles, such as national environmental objectives or regional management plans, and help design a PES scheme that suits policy needs.

For example, in many cases ES value is a function of location. A locally valued ES, such as storm surge protection, may allow for some regional leakage in order to protect this locally valued ES. If policy makers are first informed of this trade-off, they can assess it in light of other information (e.g., environmental strategy document that may, for example, identify locally valuable ES) and motivate the protection of that ES even if it implies a negative impact elsewhere through leakage. Thus, the identification of trade-offs can lead to valuable policy insight in designing PES schemes.

Accordingly, our analysis should be viewed within a broader decision making context – one in which the government of Vietnam has decided to pursue price-based policy instruments like PES (see Figure 1). We consider our work to be pertinent given the increasing global interest in the concept of ES and priced-based approaches to environmental protection. Our work is generalisable and applicable in other contexts that not only helps guide Vietnam’s policy to expand PES

to cover ecosystems in other parts of the country (see e.g., Huynh Thi, Mai 2011) but also more generally helps to meet the needs of national level policy makers, researchers and consultants for a structured approach for assessing PES schemes.

Lessons learned from developing our PES assessment approach

Below we provide a synthesis of lessons learned from developing our approach for assessing PES schemes.

- **Importance of measurability:** To ensure buyers and sellers are comfortable with how their ‘transacted good’ is measured, considerable effort should be placed in developing innovative metrics for measuring the change in the level of an ES associated with a seller’s intervention. This ensures social acceptance and long-term sustainability of the PES scheme.
- **Markets are uncertain:** Despite considerable efforts to develop credible and well-functioning markets, uncertainty will

always remain due to the fact that markets are inherently dynamic. For example, consumer preferences (for the type and quality of ES) and technology (for providing ES) will change through time. Our assessment of available buyers and sellers for each of the proposed PES schemes is based on today's best estimate, but these conditions may evolve over time. Consequently, flexibility should be considered when developing PES schemes.

- **Additionality is critical to PES, but challenging:** The additionality criterion is particularly important given that the overarching goal of PES schemes is to improve long-term environmental outcomes. Measuring this criterion, however, involves inherent uncertainty related to the measurement of baseline conditions. In our assessment, we assume that the baseline level of ES can be measured, but in some cases this may be far from trivial. Another important consideration is that while an individual PES may meet the additionality criterion, this assessment may become less clear when combining different PES schemes (see Section 5.3).

- **Inevitable trade-offs between criteria:** Our assessment criteria help policymakers identify the trade-offs in developing alternative PES schemes and, as discussed above, this may lead to improved PES designs.
- **Dependency in criteria:** Some criteria interact and are dependent upon one another. For example, the ‘existence of buyers’ criteria is perhaps more meaningful when considered in the context of the ‘beneficiaries as buyers’ criteria. When combined, these criteria speak to a more relevant issue of whether or not a PES scheme will succeed in getting all beneficiaries to become buyers. There is a similar and parallel link between the ‘existence of sellers’ and the two criteria ‘technically feasible interventions’ and ‘defined property rights’. The existence of a seller alone is not sufficient if that seller is not able to undertake technically feasible measures to improve the supply of ES and/or does not have the legal property right to do so.
- **Property rights:** Property rights need to be clearly defined and permanent. Temporary or uncertain ownership of ES reduces the incen-

tive for long-term investment that is required to ensure sustainability in ES supply.

- **Monitoring is critical for conditionality:** To ensure the essential criteria of conditionality, PES designs must ensure funding for long-term monitoring, even if it raises transaction costs. Given that output-based payments are difficult to implement in practice, input based payments are more likely in future PES schemes. This underscores the importance of monitoring to ensure ‘input activities’ actually provides the expected ES flow over time.
- **Challenge in avoiding free riders in wide-ranging PES schemes:** The goal of PES schemes is to include as many ES beneficiaries as potential buyers, but some beneficiaries can avoid paying. These are so-called free riders. One way to avoid free-riding is for the State (or large NGO) to pay on behalf of beneficiaries and then collect payment via taxes or fees. Yet, even this approach is challenging when a PES scheme covers multiple ES. For example, some of the other ES protected via PES 2 (State buyer for shoreline stabilisation)

may provide additional global benefits (e.g., carbon sequestration). This creates a group of global free riders who do not pay taxes to support PES 2 (see ‘additionality’ in Section 6). Thus, there may be a trade-off between expanding the scope of ES covered by a PES scheme and the need for capturing as many beneficiaries as possible within a feasible payment scheme.

Looking forward

Our scoping assessment provides an important starting point for PES development, but our analysis underscores the need for further technical development of proposed PES schemes through future pilot studies. We believe the ‘devil is in the detail’ when it comes to testing and implementing PES models. Thus, it is essential to plan pilot studies carefully, and to include proper ‘pilot assessment criteria’ for evaluating this next phase. The following details may be useful when testing the PES schemes proposed in this scoping assessment:

- **Cultural and demographic information:**
To meet the needs of local participants,

PES design should consider the diverse segments of society that are included as actors. For instance, ‘households’ are not a homogenous group, but vary with respect to demographics, cultural background, etc. The fact that many providers are also users may make it difficult to identify who is benefiting and who should pay for ecosystem services. We found that cooperation with local partners (e.g., households, NGOs, local authorities, researchers/experts), is critical for collecting relevant information and our project benefited from interviews conducted during several field trips to the study area.

- **Data collection plan:** It is important to design, collect, and evaluate data from all major policy reforms. Through a stepwise and structured design, including the randomisation of vital mechanisms, a pilot project can be evaluated and lessons can be learned to improve future implementation.
- **Scaling up.** Vietnam and other countries must consider how to scale up a single pilot approach to cover the vast and valued ES at risk both regionally and globally. Key ques-

tions concerning scalability include: Given the variability and complexities across human and ecological systems, when is PES a suitable policy instrument and which type of PES scheme seems the most promising? What type of alternative policy instruments may be relevant to meet a country's environmental goals?

- **Basic research:** Significant knowledge gaps need to be filled for successful PES development. For example, more information is needed on the types of interventions providers can undertake to improve or sustain ES flow (e.g., What interventions are most effective? What are the quantifiable links between intervention and effect on ES provisioning?). Furthermore, we need more information on how outside drivers affect the supply of ES. Outside drivers such as population growth, rising incomes in developing countries, land-use changes, global carbon emissions, ecological processes, economic damages related to climate change, etc. It is also necessary to know how this may affect the value of these services for society. Information on the baseline

level of services in the absence of a seller's intervention is important for determining additionality resulting from the PES model.

- **PES funding:** Most PES models require 'kick-start' funding to assist with administration, monitoring, capacity building, technical assistance, awareness-raising, knowledge sharing, etc. (Cole et al., 2012). For example, undertaking awareness-raising with households is crucial for turning beneficiaries into buyers. One such method is by explaining these households' dependence on ES and the potential welfare impact if these ES become unavailable.
- **Governing institutions:** To ensure long-term success, PES schemes require effective, credible, and accepted governing institutions that can oversee and administer PES schemes. Going forward, measures to strengthen trust in existing governing structures will be essential.

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Ecosystem Services (ES) denotes the benefits that nature provides society, such as producing food, maintaining clean water, regulating the climate, and provisioning recreational benefits.

Payment for Ecosystem Services (PES-schemes) is a policy instrument that creates incentives for public or private entities to conserve or increase the supply of ES. Today, so-called ‘ecosystem service markets’ across the globe target biodiversity, water quality, water quantity, air quality, climate regulation, and open-access fisheries.

Yet the concept of PES is rather new to policymakers and academic experts, and the development and evaluation of alternative PES designs based on experience remain limited. This report aims to shed light onto the issue of when and how to use PES-schemes by developing an approach for assessing the suitability of PES-schemes in different contexts and develop criteria to compare PES schemes, to help policy makers design PES-models that best fit their policy needs.