

Experiences and lessons learned in payments for ecosystem services (PES) in East Africa

January 2018



The experiences and lessons learned in payment for ecosystem services (PES) in East Africa report was produced by the United States Agency for International Development (USAID) East Africa Planning for Resilience in East Africa Through Policy, Adaptation, Research, and Economic Development (PREPARED) Program

The report was prepared by Tetra Tech and Land Trees and Sustainability Africa (LTSA).

Tetra Tech
159 Bank Street, Suite 300
Burlington, Vermont 05401 USA
Telephone: (802) 658-3890
Fax: (802) 658-4247
E-Mail: international.development@tetrattech.com

LTS Africa Ltd,
Lavington Shopping Complex,
PO Box 25496-00603, Nairobi , Kenya.
Telephone: +254.735 780 973
Email: africa@ltsi.co.uk
Web Site: www.ltsi.co.uk



PLANNING FOR RESILIENCE IN EAST AFRICA THROUGH POLICY, ADAPTATION, RESEARCH, AND ECONOMIC DEVELOPMENT (PREPARED)

Experiences and lessons learned in payment for
ecosystem services (PES) in East Africa

January 2018

DISCLAIMER

The views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government

Acknowledgements

Tetra Tech and LTSA thanks all those who participated in preparation of this report. Special thanks goes to Lucy Emerton, the consultant who authored the report.

Contents

1	INTRODUCTION: documenting regional PES knowledge & implementation	1
	Background to the assignment.....	1
	Objective and scope of the report.....	1
	The rationale for PES.....	1
	PES definition and characteristics	3
	Distinguishing PES from other conservation interventions and markets	4
2	REVIEW OF EXPERIENCE: PES opportunities & applications in East Africa	5
	Evidence to identify and justify PES potential	5
	Examples of research to guide and inform PES.....	8
	Examples of attempts to develop PES.....	10
	Examples of currently-functioning PES schemes.....	11
3	CONCLUSIONS: insights & lessons learned for PES in the Lake Victoria Basin	14
	The rationale for PES.....	14
	The current state of PES in the region.....	14
	Key success factors and barriers to PES development	16
4	REFERENCES: literature on PES in East Africa	21

List of Figures

Figure 1: Ecosystem services and human wellbeing.....	1
Figure 2: The logic to PES.....	3

List of Acronyms

ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
AWF	African Wildlife Foundation
CSWCT	Chimpanzee Sanctuary and Wildlife Conservation Trust
DAWASCO	Dar es Salaam Water and Sanitation Company
EAC	East African Community
EPWS	Equitable payments for watershed services
FAO	Food and Agriculture Organization of the United Nations
FoNNP	Friends of Nairobi National Park
ICRAF	World Agroforestry Centre
IIED	International Institute for Environment and Development
ISRIC	World Soil Information Centre
IUCN	International Union for the Conservation of Nature
KWS	Kenya Wildlife Service
LANAWRUA	Lake Naivasha Water Resource Users Association
LVB	Lake Victoria Basin
LVBC	Lake Victoria Basin Commission
MWCT	Maasai Wilderness Conservation Trust
NEMA	National Environment Management Authority
NGO	Non-governmental organization
PES	Payments for ecosystem services
PREPARED	Planning for Resilience in East Africa Through Policy, Adaptation, Research, and Economic Development
PRESA	Pro-poor Rewards for Environmental Services in Africa
RDB	Rwanda Development Board
TWF	The Wildlife Foundation
UNEP	United Nations Environment Program
USAID	United States Agency for International Development
WCS	Wildlife Conservation Society
WRUA	Water Resource Users Association
WWF	World Wide Fund for Nature

1 INTRODUCTION:

documenting regional PES knowledge & implementation

Background to the assignment

This report contributes towards the USAID-funded Planning for Resilience in East Africa Through Policy, Adaptation, Research, and Economic Development (PREPARED) project result “economic valuation methods and Payment for Ecosystem Services (PES) approaches analyzed and piloted in the EAC”. The report seeks to feed into work that is currently being carried out by the Lake Victoria Basin Commission (LVBC). In 2015, LVBC initiated a process to develop regional guidelines to support the implementation of PES in the Lake Victoria Basin. This includes a review of the current status of PES in the region and a toolkit of practices that the Secretariat can provide to Partner States for the introduction and testing of PES within their own respective countries. It is also expected to involve the demonstration of a PES framework in selected sites within the Lake Victoria Basin.

The report was based on a desk review of available literature and the consultant’s experience of designing and implementing payments for ecosystem services (PES) schemes in East Africa and elsewhere.

Objective and scope of the report

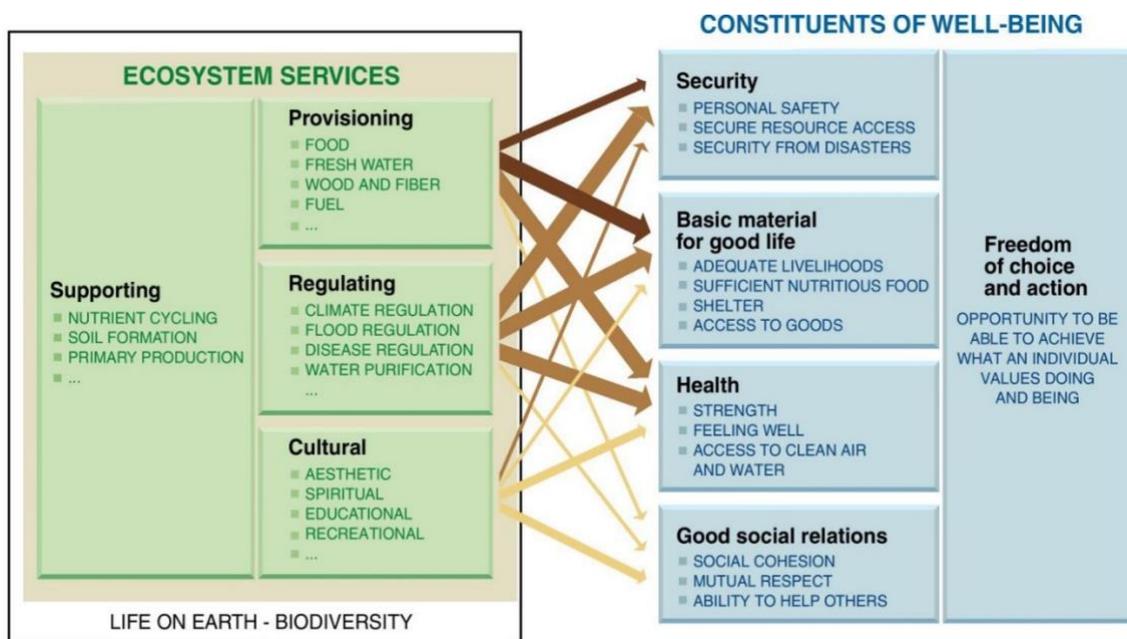
The objective of the report is: *to review PES knowledge and implementation in the East Africa region, so as to document experiences and lessons learned that might be relevant for the development of PES initiatives in the Lake Victoria Basin.* To these ends, it contains four chapters:

- Chapter 1. Describes the **background to the assignment** and lays out the objective and scope of the report. It also defines basic PES terms and concepts;
- Chapter 2. Reviews the **current state of knowledge** about PES opportunities in East African countries, including research carried out to guide and inform PES as well as on-the-ground experiences of developing and implementing PES schemes;
- Chapter 3. Draws conclusions about the **main lessons learned** on PES in the region, and reflects on the insights that these provide for the Lake Victoria Basin; and
- Chapter 4. Provides a **reference list** of published and unpublished documents on PES in Burundi, Kenya, Rwanda, Tanzania and Uganda, and in East Africa and Africa more broadly.

The rationale for PES

Before going on to describe what payments for ecosystem services (PES) are, it is important to clarify the term *ecosystem services*. As defined in the Millennium Ecosystem Assessment, ecosystem services are “the benefits people obtain from ecosystems” (Millennium Ecosystem Assessment 2005). These include provisioning services such as food and water, regulating services such as flood and disease control, cultural services such as spiritual and recreational benefits, and supporting services such as nutrient cycling that maintain the conditions for life on earth. In turn, changes in ecosystem services affect multiple constituents of human wellbeing, including basic material for a good life, freedom and choice, health, good social relations and security (Figure 1).

Figure 1: Ecosystem services and human wellbeing



Source: Millennium Ecosystem Assessment 2005.

This anthropogenic focus of the ecosystem services approach is fundamental to the concept of PES, which is targeted towards securing economically, socially or culturally valuable ecosystem services. PES have emerged as a response to the fact that many ecosystem services, even though they generate high economic values, do not have a market or a price. This means that the groups and agencies who are responsible for conserving the land and resources that generate them remain largely unrewarded and uncompensated. For example, there is little profit to be made from maintaining a forest to generate watershed protection services, safeguard the wild insects and mammals that pollinate surrounding crops or secure endangered species. Meanwhile, the market returns to clear-cutting timber and turning the forest land over to agriculture would usually be expected to be substantial. Most landholders would not choose forego these earnings in order to generate ecosystems services for other groups and sectors – and many would also not be able to afford to do so.

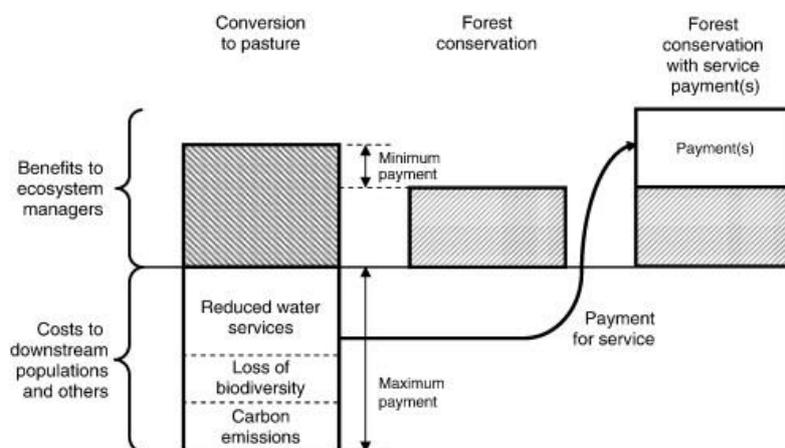
There is no reason why one group should have to bear the costs or subsidize the provision of ecosystem services for off-site beneficiaries. This is especially the case when the landholders and organizations that manage ecosystems already face severe financial and economic constraints. Many of the populations that live in key ecosystems are poor rural communities, with insecure livelihoods and few opportunities for income and employment. Government conservation agencies, too, are typically severely under-resourced. At the same time, the groups and sectors that benefit from ecosystem services are often generating high profits from doing so (or saving considerable expenditures and cost): for example, hydropower producers, urban dwellers and large-scale industries.

The net result is a critical lack of incentives and finance for ecosystem conservation and, ultimately, the degradation and conversion of natural ecosystems, and loss of ecosystem services. If left to the market, ecosystem services will tend to be under-supplied. Clearly there is a need to find additional ways of generating funds to cover the costs of conservation for the people who manage ecosystems, and ensuring a sufficient level of returns to enable conservation to compete with other, more destructive land and resource uses.

PES are one mechanism for doing this. They involve efforts to develop systems under which the providers of ecosystem services (mainly landholders or conservation authorities) are rewarded or compensated by the users of these ecosystem services (for example urban water consumers or hydropower schemes). The logic of

PES is therefore based on effecting transfers from ecosystem service beneficiaries to ecosystem managers; the level at which these payments are set would usually be expected to lie somewhere between the value of the ecosystem service and the costs of providing it (Figure 1).

Figure 2: The logic to PES



Source: Engel et al. 2008.

PES definition and characteristics

Although both the interpretation and the form of PES vary widely, the most widely-accepted definition is “a voluntary transaction for a well-defined ecological service, with at least one buyer, at least one provider, and based on the condition that the buyer(s) only pay if the provider(s) continue to deliver the defined ecosystem service over time” (Wunder 2005). There is now a general consensus that at least four key elements are essential to the principle and practice of PES:

- Most basically, PES must involve at **least one buyer (user) of an ecosystem service, and at least one seller (provider)**;
- **Neither buyers (ecosystem service users) nor sellers (ecosystem service providers) can be forced to enter into a PES arrangement.** The agreement between these parties is voluntary and the levels of both ecosystem service provision and payment, and the terms and conditions under which this takes place, is negotiated between them. However, once this agreement has been entered into, it is mutually binding to each party;
- PES must involve a **clearly-defined ecosystem service (or bundle of services) and specify a land use that is known to provide that service.** Payment is tied to the continuous provision of that service over time. This also means that the service, or the land use which is known to provide it, must be able to be monitored and measured; and
- PES must also involve **some kind of payment or benefit flow** from the buyer to the seller. This is most commonly a cash payment, but may also sometimes involve other in-kind benefits.

In addition to these characteristics, PES schemes require a **supporting institutional infrastructure**. They must be enabled by laws which allow payments to be charged and channelled to ecosystem managers (be they communities, private landholders, government authorities or non-governmental organizations). Secure and clear resource and land tenure regimes are essential. Systems also need to be in place for monitoring (and enforcing) both the provision of ecosystem services, and the functioning of PES schemes. Finally, it is also important that both buyers and sellers have access to accurate and sufficient information on the ecosystem service that is being provided.

Distinguishing PES from other conservation interventions and markets

Over the last two decades, references to PES have become increasingly widespread around the globe, including in East Africa. There is now a large body of literature describing PES schemes in the region. It is however worth noting that, while a large number of current conservation efforts are termed “PES” (probably reflecting the current popularity of the term and approach among conservation planners and donors) it is less certain that all can, strictly, be considered to be so. Many are, in reality, just new ways of communicating and packaging traditional donor and international NGO project interventions, local benefit-sharing, sustainable livelihood support or the provision of subsidies to communities who live in or around high conservation value landscapes.

Much of the literature is, in reality, merely describing environmental conservation actions or natural resource markets which involve no element of reward for the generation of explicit and clearly-defined ecosystem services. Reviewing these types of activities does not make much contribution towards extending knowledge, learning and lessons on PES, or addressing their specific characteristics and conditions for success. Although opinions vary, the term PES would usually not be applied to commodities and products for which a market already exists (for example timber, fish or tourism). Although efforts are often needed to improve the functioning of these markets, and especially to secure a premium for ‘green’ products or sustainable production, they tend to involve quite different approaches and mechanisms.

Instead, PES are usually considered to refer to services which have no market, and for which it is therefore necessary to introduce new reward and compensation systems. For the most part, they involve non-extractive regulating and cultural services that are not currently captured via markets and prices, such as maintenance of water quality and flow, flood control, nutrient retention, micro-climate stabilization, fish spawning and nursery, pollination, habitat for rare and endangered species, landscape beauty and so on.

Although it is of course impossible (and not particularly helpful) to rigidly define what are and are not “PES”, the current report focuses on reward and/or compensation mechanisms that are based on establishing cash and/or in-kind payment systems where none currently exist, and which are clearly (and conditionally) targeted towards encouraging specified land and resource uses which will generate well-defined and agreed ecosystem services. It excludes consideration of more conventional conservation projects involving benefit-sharing, alternative livelihoods, community-based management or co-management, direct payments, grants and credit which are not explicitly linked to the provision of agreed ecosystem services. The report focuses mainly on water and biodiversity/landscape-related PES schemes. Ecosystem-based carbon and climate payment schemes (such as REDD+) are not the major emphasis of the report, because they tend to conform to fairly specific requirements which have been developed largely in response to global markets, and which are not directly transferrable to other types of PES.

2 REVIEW OF EXPERIENCE:

PES opportunities & applications in East Africa

Evidence to identify and justify PES potential

A substantial body of literature now exists which identifies PES to be a promising mechanism for use in East Africa, highlighting a range of potential advantages and benefits such as raising new finance for landscape management, improving the efficiency of conservation interventions, securing ecosystem services and benefiting poor rural communities (AfDB 2015). The evidence base that is presented to justify and advocate for PES commonly involves four lines of reasoning and argument: the high economic value of ecosystem services, the willingness of ecosystem service beneficiaries to pay for these benefits, willingness of landholders to accept rewards or compensation in order to modify their land and resource use practices, and the ability to generate sufficient funds to provide the levels and types of payment that would be acceptable and effective in achieving these goals. A brief review of this literature is provided below.

The economic importance of ecosystem services

Studies have now been carried out in all East African countries which underline the importance of ecosystem services to the economy in order to argue for the need to develop systems of PES. For example, in Burundi, it has been pointed out that many companies and industries that benefit in economic terms from ecosystem services currently make no contribution to their maintenance – a situation that must be remedied if these values are to be sustained (Nzigidahera 2014). In Kenya, calls to mainstream the use of payment for ecosystem services into forest planning and management are justified by the high value-added and costs-avoided they generate for many different sectors of the economy (UNEP 2012). A similar line of reasoning is used to identify the opportunities that PES affords to finance and motivate the conservation of catchment forest reserves in Tanzania (Malimbwi and Ngaga 2005). PES has also been advocated as a means of alleviating poverty among smallholder farmers of Rwanda as well as securing key services – such as water regulation – for the broader economy (Andrew and Masozera 2010, Berttram 2011, Braybrook 2016, Karangwa 2011, Willetts 2008). The high dependence of Uganda's population and economy on natural resources, combined with the imbalances in benefit and reward systems that currently exist for environmental services, are used to argue for the potential of PES to be used to improve sustainable land management, biodiversity conservation and rural livelihoods (Ruhweza and Masiga 2016).

This kind of logic has also been carried through to the micro-level, in order to highlight PES needs and opportunities at specific sites. Many of the attempts to initiate PES that are described in later sections of this chapter are based on these studies. For example, several of the PES schemes developed in Tanzania's Eastern Arc Mountains were initiated with scoping studies carried out to establish the links between ecosystem services and the economy (see Burgess et al. 2009, 2014). Work in both the Pangani and Rufiji Basins revealed the wide range of water users who have a stake in ensuring that watersheds are conserved and, potentially, in contributing payments (ERB 2006, Fisher et al. 2010, Lalika et al. 2011). Likewise, the arguments for developing PES mechanisms in Lake Naivasha, the Mara Basin and the Tana River Basin were supported by studies which demonstrated the high value of ecosystem watershed protection services in the face of growing water scarcity in downstream areas (Bhat et al. 2006, Bryant 2015, Hunink and Droogers 2015, Mulatu 2014, Onduru and Muchena 2011, WWF 2011, 2015). In Amboseli, the importance of traditional grazing grounds as elephant corridors was argued to justify the development of a PES scheme to compensate pastoralists for undertaking land uses that are compatible with wildlife conservation (Bulte et al. 2006). Similar arguments for

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

PES, based on the findings of ecosystem valuation studies, have also been presented for Burundi (Nzigidahera 2014) and Rwanda (Karangwa 2011), and for Kenya's Chyulu Hills watershed (Mwaura et al. 2016), Mau Forest (Government of Kenya 2009, Kipkoech et al. 2011b), Mount Elgon (Kipkoech et al. 2011a), Vihiga District (Emily et al. 2013).

Willingness to make payments

Many studies also go on to show that people are also willing to pay for the ecosystem services they receive. This kind of ecosystem valuation is often used as evidence to demonstrate the feasibility of developing PES mechanisms. For example, PES been proposed as a mechanism to counteract deforestation around the Kilombero wetlands catchment area in Tanzania, based on surveys which demonstrate that rural and urban water users would be willing to contribute funds to forest conservation (Mombo et al. 2014). Farmers around Mount Elgon in Kenya were found to be willing to pay between USD 0-18 to support the protection of forest for watershed management (Kipkoech et al. 2011) while, in five provinces of Rwanda, three quarters of the population agreed in principle to the idea of paying for the conservation of forest ecosystem services, with particularly high values for erosion control and sediment retention (Kalisa and Habiyaemye 2015).

Many of the PES schemes that are described below involved preliminary studies to ascertain ecosystem service beneficiaries' willingness to make payments. For example, a scoping study carried out to inform the development of a payment for watershed services mechanism to link the water towers of the Eastern Arc Mountains (particularly the Udzungwa range) with the Rufiji Basin involved establishing the willingness to pay of urban households, irrigators and power generators for improvements in the quantity, quality and reliability of water supplies in the face of dwindling and unreliable water flows (ERB 2006, Fisher et al. 2010). In the Mara Basin, too, PES development was justified partly on the basis of residential water users' stated willingness to pay for improved water services (Hashimoto 2008). In the Lake Naivasha watershed in Kenya, a study to assess the willingness of large scale farms, hotels, ranches, water and energy utilities to invest in a water fund (in this case, to the tune of some USD 110,000 a year) informed the development of a water-related ecosystem services scheme (Mulatu et al. 2015). Surveys carried out to assess Nairobi water users' willingness to pay for increased and reliable water supply via catchment management (on average around USD 40 per household per year on top of their water bills) were used as part of the basic information used to guide the design of payments to capitalise the Nairobi Water Fund (Balana 2011, Namirembe et al. 2014).

Willingness to accept payments

Efforts to identify PES potential also typically involve some kind of assessment of landholders' willingness to be paid (or otherwise rewarded or compensated) for modifying their land and resource use practices so as to secure ecosystem services. Around Mount Elgon in Kenya, farmer surveys were used to show that there was local willingness to enter into contracts to manage their land watershed protection services (Kipkoech et al. 2011, Sumukwo et al. 2011). Similarly, surveys among farmers living around the Kikuyu Escarpment forest which show a willingness to accept cash and in-kind rewards for sustainable land management were used to present the case for developing PES (Kariara 2009).

As is the case for evidence of ecosystem beneficiaries' willingness to pay, most of the PES schemes described below involved some kind of survey of landholders' interest in engaging and expected payment levels. Surveys to demonstrate farmers' willingness to be compensated for implementing water conservation practices were an integral part of the arguments used to justify the development of the Mara Basin PES scheme (Hashimoto 2008). Similar evidence of landholder interest in receiving incentives for sustainable land management were

used to strengthen the case for developing PES schemes in the Pangani Basin, Ulunguru and East Usambara Mountains in Tanzania (Fisher et al. 2010, Kaczan et al. 2012, Lopa et al. 2012, Mwanyoka 2006). In Lake Naivasha, information on farmers' willingness to accept compensation to implement land conservation practices were used in the initial stages of the PES scheme to determine appropriate payment levels (Mulatu et al. 2014) and then, at a later stage, to justify its continuation (Nyongesa et al. 2016). A wide range of research was carried out in the Upper Tana catchment to make the case for establishing the PES mechanism which eventually evolved into the Nairobi Water Fund, including analysis of willingness of communities to accept payment (Namirembe et al. 2014) and detailed farm-level cost-benefit analyses to establish financial and economic viability (Porras et al. 2007).

Levels and types of payment

There remains a great deal of debate on the most appropriate, and effective, PES transfer mechanism. In most cases it is assumed that some form of payment (be it cash or in kind) provides the main motivation for landholders to participate in PES. For example, a study in Bushenyi District Uganda argues that payments are clearly the main incentive for local involvement in PES in all sites except one, where people are more motivated by the aesthetic and existence value of trees (Fisher 2012a). There is also general agreement that considerable care needs to be taken when setting the level of payment. In Mount Kenya, it is argued that where payments are overvalued the buyers (payers) are reluctant to pay, where they are undervalued the sellers (resource providers) are unwilling to conserve the forest (Omondi et al. 2011). The low level of payment offered to farmers participating in PES in the Uluguru Mountains has also been argued to have been a key factor in the very low rates of participation that were registered (Mussa and Mjemah 2017).

Many authors argue for the importance of using valuation as a tool to inform the level of payment that is offered in PES schemes. Various methods are used, ranging from the opportunity cost of land and resource uses foregone, through the physical costs of undertaking conservation activities, to the economic value of ecosystem services generated. In the Rwanda ReDirect project, for example, valuation was used to determine payment levels based on estimated opportunity costs, by calculating average forest-based income for households living near Nyungwe National Park (Masozera and Alvapati 2004, Gross-Camp et al. 2012). Opinion however remains divided as to whether or not payments should be standardised across all PES participants. In some case (such as the ReDirect project), payment levels are the same for all villagers, whether or not they are land owners and regardless of the actual opportunity cost of conservation to them (Gross-Camp et al. 2012, Martin et al. 2014). In other cases, it is argued that if payments are to be effective, they need to be varied between different recipients. For example, work carried out in relation to the Wildlife Conservation Lease Program in Kitengela shows pastoralists' willingness to accept payments for wildlife conservation is higher in parts of the ecosystem that are key breeding and habitat areas, although remains lower in areas closer to towns and roads – suggesting that the flat fee of USD 10/hectare being offered by the program may need to be varied in different areas if the whole length of the wildlife corridor is to be kept open (de Leeuw 2012). In the Lake Naivasha watershed, farmers were willing to accept compensation, but vary greatly in their preferences for different actions and attributes, suggesting that PES schemes should offer payments which are not uniform for all users (Mulatu et al. 2014). In the East Usambara Mountains, too, the required payment amounts were found to be highly variable between landholders (Kaczan et al. 2012).

PES schemes also vary in the methods used to channel payments to landholders. In the ReDirect project in Rwanda, in addition to household-level payments, a certain percentage of funds is paid directly to the village or commune to be spent on community activities (Bertram 2011). However, in the Usambara mountains of Tanzania, individual payments were a very important condition for farmers to be interested in PES – the

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

possibility of group payments was found to exert a strong disincentive to participation (Kaczan et al. 2011, 2012). The Wildlife Conservation Lease Program in Kitengela, too, is based around individual payments (de Leeuw 2012).

Several studies suggest that it is not just the amount of payment that matters, but also its timing. For example, research carried out in Masindi District, Uganda found that, although standard economic models predict that farmers will participate in conservation programs so long as they are profitable, in reality time preferences are very important – farmers need and want benefits upfront, over a quick time span (Clot and Stanton 2014). Similarly, in the Usambara mountains of Tanzania, the factors most likely to attract participation were advance payments, and stable and predictable income each year (Kaczan et al. 2011, 2012). Upfront support for the initial costs of adoption was also found to be a key factor influencing farmer participation in the Uluguru EPWS (Kwayu et al. 2013).

Most studies also find that, although cash payments are an important incentive (and may be a necessary condition) for local participation in PES schemes, other forms of reward and compensation must also be considered. For example, the evaluation of the Rwanda ReDirect PES scheme showed that more than half of participants felt that the non-pecuniary aspects of the PES (such as participation and education) were just as important as the money (Gross-Camp et al. 2012, Martin et al. 2014). In the Sigi catchment, Tanzania, farmers mentioned a range of incentives that would be desirable components of a PES scheme, including assistance with finding new markets for their agricultural products, soft loans, improvements in social infrastructure such as schools and dispensaries, permission to harvest forest products, local recruitment of forest guards and prizes and recognition for excelling in environmental conservation activities (Mwanyoka 2006). In the Uluguru EPWS, the most preferred incentive package was found to combine sustainable land use, access to forest goods and services, improved extension services, improved inputs and agricultural commodity markets (Mussa and Mwakaje 2013). Work carried out among farmers in the Kikuyu Escarpment, Kenya, similarly indicate that expectations of reward are fairly evenly distributed between cash income, better markets for farm produce and improved infrastructure (Kariara 2009).

Examples of research to guide and inform PES

One of the most consistent sources of support to the development of PES in the region has come from the East and Southern Africa Katoomba Group. Working together with a range of regional institutions and experts, as well as international organisation such as Forest Trends, International Institute for Environment and Development (IIED) and United Nations Environment Program (UNEP), the Katoomba Group has for more than a decade been providing a forum to develop a shared understanding of PES in the region, and address key challenges related to developing markets for ecosystem services. A series of studies have also been carried out by the East and Southern Africa Katoomba Group which investigate the potential for PES in the region, looking in detail at enabling institutional, policy and legal frameworks (see, for example, Bond et al. 2008, Mutunga and Mwangi 2006, Mwangi 2008, Ruhweza and Waage 2006, 2007, Ruhweza and Masiga 2016). Over the course of several years, the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) has also supported a large number of site-level PES studies, under the auspices of its Natural Resource Management and Biodiversity Program. An ASARECA conference held October 2010 in Jinja, brought together the findings of this research (see Mogaka et al. 2011).

Between 2008 and 2011, the World Agroforestry Centre (ICRAF) ran the “Pro-poor Rewards for Environmental Services in Africa (PRESA)” project, which sought to build a community of practice to generate and share lessons, tools and experiences to support PES. This included studies in Kenya, Tanzania and Uganda, looking

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

at watershed PES in Sasumua, Upper Tana, Nyando and Yala River Basins in Kenya, carbon markets in Uganda's Albertine Rift, and water and carbon payment in the Uluguru and Usambara mountains in Tanzania (see ICRAF 2011). At least two of these research projects fed into the development of actual PES schemes (both of which are discussed further below). The work carried out in the Tana River Basin, carried out alongside the Green Water Credits project of the World Soil Information Centre (ISRIC) and Jomo Kenyatta University of Agriculture and Technology (JKUAT), fed into the development of what eventually became the Nairobi Water Fund (see ISRIC 2017, Kauffman et al. 2014, Namirembe et al. 2013, PRESA 2017). The studies carried out in the Uluguru and Usambara mountains directly supported the implementation of the "Equitable Payments for Watershed Services" project, which emerged largely as a result of research conducted under the "Valuing the Arc" project, carried out between 2007-2012 by Sokoine University of Agriculture, University of Dar es Salaam, the World Wide Fund for Nature (WWF) and Cambridge, York, East Anglia, Leeds and Cranfield Universities (see Burgess et al, 2009, 2014). This mapped, modelled and valued the ecosystem services of the Eastern Arc Mountains (see Fisher 2012b, Fisher et al. 2010).

Two other interesting projects have taken place over recent years which sought to generate learning about the on-the-ground effectiveness of PES in an East Africa context. Both provide extremely useful insights about participant motivation to become engaged in PES, as well as the operations and impacts of these schemes.

ReDirect ran between 2009-2013 in Nyungwe National Park, Rwanda as an EU-funded collaborative project of the Rwanda Development Board (RDB), Wildlife Conservation Society (WCS) and University of East Anglia, UK. It sought to investigate whether PES are a legitimate, equitable and effective means of conserving natural resources and biodiversity. A scheme was set up which involved four forest-adjacent communities containing approximately 3,675 households, who were provided with financial incentives to reduce hunting, tree cutting and mining and to participate in tree planting. The amount paid to each household was based on the opportunity costs of abandoning the use of park resources and adopting sustainable land uses, which had earlier been calculated to average USD 25 (Masozera and Alavalpati, 2004). In addition, a certain share was paid at the cell/commune level, at a level decided by community members, and each community was also provided with an annual fixed budget of USD 845 to be spent on monitoring and other activities (Bertram 2011). The research involved trials comparing 'before and after' and 'with and without' project scenarios, assessing effectiveness in terms of conservation impact, efficiency in terms of cost-effectiveness and equity in terms of distribution and impacts on household wealth (Gross-Camp et al. 2012, Martin et al. 2014).

Between 2010-2014, Uganda's National Environment Management Authority (NEMA) received financial support from the Global Environment Facility (GEF) through UNEP to implement a project entitled, "developing an Experimental Methodology for Testing the Effectiveness of Payment for Ecosystem Services to Enhance Biodiversity Conservation in productive landscapes in Uganda". The project was implemented with a local NGO, the Chimpanzee Sanctuary and Wildlife Conservation Trust (CSWCT), around Hoima and Kibaale Districts in the west of the country. The aim was to come up with a valid statistical field methodology that could be used to test the effectiveness of PES as a viable means for financing biodiversity conservation outside protected areas, focusing on private forests managed to supply a bundle of ecosystem services including the maintenance of wildlife corridors (especially for chimpanzees), watershed protection and carbon sequestration. Randomized trials were conducted which compared participating and non-participating communities (see Jayachandran et al. 2017). The PES system that was tested involved a mixture of cash and in-kind payments to individual landholders in return for contractually agreed activities such as maintaining forest cover and reforestation with indigenous tree species. After consultations, 413 landowners expressed interest in joining the scheme, with 338 (managing around 1,500 hectares in total) ultimately signing PES

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation contracts. The payment rate was set after reviewing other similar PES schemes, at USD 28 – an amount which was comparable with what landowners might earn for selling timber from a large tree.

Examples of attempts to develop PES

This section looks at efforts to develop PES in East Africa which appear to have not, in the end, resulted in permanent, lasting arrangements. They are distinguished from examples of functioning PES (discussed in the next section of this chapter) because of the different lessons learned they yield. It is as important to consider the kinds of circumstances and factors that have served as barriers or constraints to PES as it is to identify the conditions for successful schemes.

In 2005, the Food and Agriculture Organization of the United Nations (FAO) commissioned a series of studies to explore possibilities for establishing a PES scheme around Kenya's Amboseli National Park. These concluded that PES could be a powerful tool in the Amboseli ecosystem to support conservation, stabilize pastoralist income and alleviate poverty – although would likely have only limited impact in areas that have already been turned over to irrigated horticulture (see Bulte et al. 2006, 2008). The results were used to develop a project "Payment for Ecosystem Services in the Amboseli Ecosystem", which aimed to develop bioeconomic models that are linked to Maasai decision-making for pastoralism, agricultural expansion and wildlife conservation. In the event, this project was never implemented, although it is possible that it may have fed into the development of other PES-like initiatives in the Amboseli buffer zone (these are described below, in the next section).

The "Equitable Payments for Watershed Services" Program in Uluguru Mountains, Tanzania was supported by WWF and CARE Denmark. This project sought to safeguard the Ruvu River's water supplies to Dar es Salaam and elsewhere. It was designed to roll out over a 5-year period from 2006, and was divided into two distinct phases: initial design, feasibility and building a business case (2008-2007), followed by the development of a trial market (2008-2011). The assumption was that, at the end of this second phase, an operational, self-sustaining PES scheme would have been established (Lopa and Mwanyoka 2011). The scheme intended to support farmers to engage in sustainable land management practices, financed through payments from downstream water users (Berttram 2011). While two large water users (the Dar es Salaam Water and Sanitation Company (DAWASCO) and Coca Cola Ltd) signed a memorandum of understanding, in the event only DAWASCO made any payments. By 2010, just over USD 1,600 had been received and paid to the initial 144 participants. Each farmer received between USD 8-48, according to the area of land converted to improved farming technologies. (Lopa and Mwanyoka 2011, Lopa et al. 2012). Yet, in the event very few farmers joined the scheme, only a small amounts of funds were forthcoming, and DAWASCO remained the only beneficiary to make payments (Mussa and Mjemah 2017). The scheme now appears to be defunct.

Funded under the USAID "Trans-boundary Water for Biodiversity and Human Health in the Mara River Basin" Program, the WWF project "Assessment and analysis of costs and benefit to guide development of an equitable payment for watershed services scheme (EPWS) in the Mara river basin" ran between 2007 and 2011. A detailed scoping and planning phase was carried out, consisting of socio-economic, legal and policy studies as well as community consultations and stakeholder workshops (Bhat et al. 2009). The aim was to assess the value of water resources, establish water users' willingness to pay, and design a functional PES scheme. These studies found that most small scale farmers in the upper catchment in Kenya and lower catchment in Tanzania were willing and ready to participate in the PES project by planting trees and undertaking soil and water conservation technologies (Wakibara et al. 2011). It also concluded that several commercial water users (for example horticultural farms, mines and tourist facilities) would be willing to

contribute ecosystem service payments (WWF 2011). In 2011, recommendations were made for the design of a PES scheme to be piloted in Kenya and Tanzania, which was handed over to LVBC so that the process of final design and implementation of PES mechanism could be initiated (GLOWS 2012, WWF 2012). To date, the PES scheme has not yet been rolled out.

Examples of currently-functioning PES schemes

One of the longest-functioning 'PES-like' payment mechanisms in East Africa, initiated in 2000 and still running today, is the Wildlife Conservation Lease Program in Kitengela, adjacent to Nairobi National Park. This is termed 'PES-like' because it has not, as yet, evolved into a scheme which takes payments directly from ecosystem service beneficiaries. This scheme, initiated by Kenya Wildlife Service (KWS) and Friends of Nairobi National Park (FoNNP), is managed by The Wildlife Foundation (TWF), a locally-incorporated NGO established specifically for this purpose. On signing a contract with TWF, landholders are compensated for not fencing, developing or selling their land, while continuing to be permitted to graze their livestock. Feasibility studies determined that a standardized payment of USD 10 per hectare per year would be an acceptable level to compensate landholders for foregone economic opportunities. To date the Program has been funded entirely by external contributions, from local organizations (such as FoNNP) and international donors (de Leeuw 2012). Currently around 25,000 hectares of land have been leased, involving more than 400 households; this is considered a sufficient area to allow the seasonal migration of wildlife into and out of the National Park (Matiko 2014).

A similar scheme (although one that is directly funded by ecosystem service beneficiaries) operates through the Simanjiro Conservation Easement, located adjacent to Tarangire National Park (see Nelson 2008, 2009, Sachedina and Nelson 2012). One of the interesting features of this project is that – unlike most PES schemes in the region – it does not directly involve either government or international NGOs (although it did emerge from earlier international NGO Programs, and does receive funding from the international community). Private sector photographic and hunting tourism operators, working in collaboration with local NGO the Ujamaa-Community Resource Trust, have contributed funding to create a "community concession" in Terat Village. Villagers have agreed to protect a 9,300 hectare portion of the short grass plains by controlling cultivation, charcoal production, and illegal hunting, in return for an annual fee of USD 4,500 (Nelson 2008, Nelson et al. 2010, Sachedina and Nelson 2012). An international conservation NGO, the Wildlife Conservation Society (WCS), contributes supplementary funding which is used to pay local game scouts, purchase equipment and provide training.

A third example of a land lease scheme operates beside Amboseli National Park in Kenya. Its financing base has gradually evolved from international, external funding base to payments from beneficiaries themselves, although the overall management role continues to be filled by an international conservation NGO the African Wildlife Foundation (AWF). The Program has since 2009 leased around 8,500 hectares of land from 340 households. Payments were set at an initial level of around USD 6/hectare/year, planned to increase by 2.5-3 per cent a year (Fitzgerald et al. 2013). Money is transferred electronically to each landholder, through their individual bank accounts. The conservation lease prohibits all land developments, fencing, logging, mining, dredging, agriculture, resource extraction, non-tourism related commercial activity and illegal hunting of wildlife. Grazing is however permitted in compliance with a management plan. The initial finance for the Program came from AWF's own funders, mainly private US-based foundations and development donors. A tripartite agreement was also signed between AWF, the community and a new ecotourism facility, Tawi Lodge, which agreed to finance the full costs of the scheme on the conservancy on which the lodge operates, after its fifth year of operation. KWS also accepted to take over part of the payments from 2014 (AfDB 2015).

There are also several regional examples of watershed-based PES schemes. One is the Lake Naivasha PES scheme, led by WWF and CARE Kenya. A series of scoping and feasibility studies were initiated in 2006, the implementation phase commenced in 2008, and activities were scaled up starting 2010. The goal was to develop a viable financial mechanism for payments for watershed services that would deliver sustainable natural resource management and improved livelihoods, at the same time as serving as a pilot and learning model for further expansion and replication (Boonstra 2010). Under the scheme, Lake Naivasha Water Resource Users Association (LANAWRUA), on behalf of its ecosystem service-dependent members (most notably commercial floriculture and horticulture farmers) agreed to compensate small-scale land users in the upper catchment. Payments are channelled through the Upper Turasha-Kinja and Wanjohi Water Resource Users Associations (WRUAs), which have a combined membership of about 500 farmers. Payments are made on an annual basis via vouchers for agro-inputs that can be redeemed at specified stores, at sum fixed at USD 17 per participant for the first three years (Chiramba et al. 2011, Nyongesa 2011). In return, farmers commit to rehabilitate and maintain riparian zones, plant grass strips, build terraces on steep slopes, reduce the use of agrochemicals, plant indigenous trees and grow cover crops.

Perhaps the largest and most sophisticated example of a PES scheme currently operating in East Africa is the Nairobi Water Fund. Launched in 2015, the fund collects payments from public and private donors and major downstream water consumers (such as East African Breweries Ltd, Coca-Cola, Nairobi City Water and Sewerage Company, and electricity provider KenGen). As currently conceived, the fund is structured to include both a revolving fund and an endowment component. The money in the revolving fund is to be spent directly on conservation projects, and is periodically replenished through the fees collected and other contributions. The money in the endowment will be invested to generate interest, which will then be re-invested in upstream conservation projects. These will provide nearly 15,000 farmers in the Thika-Chania, Maragua and Sagana catchments with training, resources and equipment to undertake sustainable land management (see Huninks and Droogers 2015, TNC 2015, Vogl and Wolny 2015).

One of the interesting features of the Nairobi Water Fund was that it emerged gradually over time, emerging from earlier research on the potentials for a green water credit scheme to be introduced in the Upper Tana Basin (see above). Several other examples exist of sites in the region where PES (or PES-like) activities have gradually evolved over time as the combined result of various different initiatives, pilots and projects. Mount Elgon is one. The Mount Elgon Regional Ecosystem Conservation Program, initially developed by the International Union for the Conservation of Nature (IUCN) and then implemented under the auspices of the EAC, carried out a number of activities between 2006-2012 which aimed to reward conservation by local communities. One of these involved the piloting of a system of performance-based cash payments to local households for the provision of forest ecosystem services. Although payments were made to individual landholders, they were channelled through community-based organizations, and set at a level of USD 50 per hectare per year for the protection of intact forest patches, and an additional USD 20 per hectare bonus payments for tree planting (Okurut 2011, Okeyo-Owuor et al. 2011).

Subsequent activities in the area, led by IUCN, introduced a Community Environment Conservation Fund model that had already been piloted in other parts in Uganda in Kapchorwa and Kween Districts. The aim was to provide funding and incentives for restoring and enhancing environmental services and natural resources management (Kakuru and Masiga 2016). The revolving funds were disbursed to community members as micro-credit, conditional on active participation in management of natural resources (Egaru 2013). Building on these and other experiences, in March 2015, it was reported that Uganda's first Payment for Environmental Services Fund had been launched, and would commence activities in Sironko and Bulambuli Districts. The PES

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

fund was initiated under the auspices of the UNDP-GEF “Ecosystem Based Adaptation to Climate Change Project”, and will be managed by the Environmental Conservation Trust of Uganda, and is planned to provide cash payments to promote the conservation and restoration of natural resources (UNDP 2015). Initially, the payments are being made from project funds, and it is not clear how they are planned to be sustained over the long-term.

Another example of PES design which has evolved over time in response to changing donor interests and market opportunities is associated with the UNDP/GEF project “Enhancing Wildlife Conservation in the Productive Southern Kenya Rangelands through a Landscape Approach”. This initiative commenced in 2014 and is due to run until 2018. The project document includes a series of activities to be carried out in collaboration with the Maasai Wilderness Conservation Trust (MWCT) on the development of green water credits. These are envisaged as a PES mechanism to provide incentives for landholders in the Chyulu Hills to restore key water catchments. Although no water-based PES scheme has emerged, the MWCT and other partners have developed at least two PES-like schemes in the Chyulu landscape over the last few years. One is the MWCT Wildlife Pays project, which compensates herders for livestock lost to predators with funds provided by surcharges of between USD 100-150 per bed night levied on tourists at the trust’s ecotourism partner, Campi ya Kanzi (Norton 2017, UNDP 2013). The other is a forest carbon project that is currently under development by KWS, Kenya Forest Service, MWCT, Big Life Foundation, David Sheldrick Wildlife Trust and Conservation International (Wildlife Works 2016). It is intended that the revenue from the sale of carbon credits will generate sustainable financing for conservation projects, as well as provide payments to local households.

Although carbon finance and REDD+ are not considered in detail in this report (due to their rather specific characteristics as a distinct sub-category of PES that is based largely on international funding), it is worth mentioning that there is a growing number of land-based carbon market offset projects in East Africa, almost all of which involve afforestation, reforestation or forest conservation (Namirembe et al. 2014, Ruhweza and Waage 2007). These include five pipeline and operational projects in Kenya¹, eight in Tanzania² and eleven in Uganda³ (Ecosystem Marketplace 2017). One example which is particularly interesting, both because it is actually operational and because it relates to mangrove ecosystem services (which tend to be particularly under-represented in PES) is Mikoko Pamoja (“mangroves together”) in Gazi Bay, Kenya. This community-led project is generating payments for carbon offsetting, and is among the first coastal REDD+ initiative in the world to receive accreditation. It involves reforesting and protecting mangroves, and establishing a Casuarina plantation to provide an alternative source of firewood and timber for local people. The scheme is expecting to capture about 3,000 tonnes of carbon a year, providing income of just under €10,000 from the sale of carbon credits on the global market (Huxham et al. 2012).

¹ Mikoko Pamoja, Gazi Bay; Forest Again Kakamega Forest; Aberdare Range/Mt. Kenya Small Scale Reforestation Initiative; Tree Flights, Bore; Kasigau Corridor REDD Project, Taita Taveta

² Mikoko Pamoja, Gazi Bay; Forest Again Kakamega Forest; Aberdare Range/Mt. Kenya Small Scale Reforestation Initiative; Tree Flights, Bore; Kasigau Corridor REDD Project, Taita Taveta

³ Bukaleba Forest Project, Mayuge District; Kachung Forest Project: Afforestation on Degraded Lands, Dokolo; Uganda Nile Basin Reforestation Projects No. 1-5; Kikonda Forest Reserve Reforestation Project, KiBaale; Forestry for Climate Adaptation and Carbon Storage; Trees for Global Benefit, Mt. Elgon & Albertine Rift Uganda; Natural High Forest Rehabilitation Project Kibale National Park.

3 CONCLUSIONS:

insights & lessons learned for PES in the Lake Victoria Basin

The rationale for PES

Both the research literature and the documentation of practical experiences in the region make it clear that the basic rationale for PES is of great relevance to the Lake Victoria Basin (LVB), as it has been demonstrated to be for other parts of East Africa.

- The LVB contains a **wide range of natural ecosystems which generate services that are of immense importance** to local livelihoods and income, sectoral production and earnings, national, regional and even global economies;
- Many of these ecosystems are **critically under threat due to changes in land use and land cover**, compromising the supply of economically valuable services;
- Multiple stakeholders, including government, the private sector and local communities **stand to incur considerable costs and damages** if ecosystem services are degraded or lost;
- Both government conservation agencies and civil society environmental groups across the region are **critically under-funded**, and landholders currently have **few economic incentives or financial rewards** for managing land and resources so as to generate ecosystem services – and, in many cases, cannot afford to do so;
- Many **ecosystem services are received free or at minimal cost**, often by consumers and industries that make considerable money or avoid significant losses from them, and are **well-able to afford to pay** for them (and may also be willing to do so).

Many of the documented applications of PES in other parts of Burundi, Kenya, Rwanda, Tanzania and Uganda would seem to have potential for replication. Considerable opportunities exist to test these approaches in the LVB. The particular situation of the LVB should however be noted. In addition to some of the national and local-level constraints to PES that have already been identified for other parts of the East Africa region (and are elaborated below), such as policy and legal gaps, limited institutional capacity, poorly-developed market mechanisms and business models, the cross-border nature of many of the ecosystems, their providers and beneficiaries poses a particular challenge to the development of PES in the LVB. As yet, there is no experience of implementing transboundary PES schemes in Africa, and only very limited success in other parts of the world. Although there are argued to be adequate provisions for initiation and implementation of transboundary PES in the policy, legal and institutional arrangements of the East Africa Community (Okurut 2011), it is not entirely clear how payments between countries could be administered, managed or enforced. While the development of a regionally-coherent and consistent PES approach in the LVB is likely to be both essential and achievable, the main current opportunities for PES are likely to lie within national boundaries.

The current state of PES in the region

This report has described a wide range of PES research and practice in East Africa. It is clear that, as in other parts of the world, PES have emerged as a popular topic among government conservation agencies, development donors, NGOs, research institutes and academics. The main interest in the region has been in watershed protection, biodiversity, habitat and carbon services, mainly from forests and grassland savannahs, and the primary focus is on channelling payments to smallholder farmers and pastoralists. This situation is

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

similar to other parts of Africa, and is likely driven partly by the preponderance of these ecosystems, as well as the presence of high demands and well-developed markets for water, wildlife tourism and carbon both within and outside the continent (AfDB 2015). All of these services and stakeholder groups have relevance to the LVB. There is, however very little knowledge or experience in marine, coastal and (non-watershed) freshwater wetland ecosystems. While marine and coastal PES are obviously not pertinent to the LVB, the absence of information on wetland PES remains a key gap.

The interest in PES in East Africa has emerged mainly over the last decade. In 2005, 45 PES projects were reported in Kenya, South Africa, Tanzania and Uganda, including eighteen biodiversity projects (of which two were making some kind of cash or in-kind payments), seventeen carbon projects (of which five were making payments), and ten water projects (of which two were making payments) (King et al. 2005, Mutunga and Mwangi 2006, Ruhweza and Masiga 2006, Scurrah-Erhart 2006). By 2008, almost 70 PES initiatives had been identified in Eastern and Southern Africa, of which 27 focused on carbon, 19 on biodiversity and 16 on water services (Bond 2008).

Not all of these schemes fulfil the criteria which would define them as strict PES: most would be more accurately defined as “PES-like” schemes. Many of the PES activities that have been proposed or are under implementation in the region are not, in fact, based on funding from ecosystem service beneficiaries, and very few are conditionally tied to the provision of specific ecosystem services or clearly-agreed land and resource uses that have been demonstrated to result in ecosystem service generation. A high proportion of payments are not “commoditized” (i.e. monetized) but involve co-investment in stewardship alongside land or resource rights (Namirembe et al. 2014), or seek to channel external (often international donor or NGO) funding to communities in order to support broad livelihood improvement activities.

Several authors (see for example Van Noordwijk et al. 2007) argue that, in fact, this kind of ‘softer’ and more generalised PES paradigm that is based on livelihood development and poverty alleviation as well as ecosystem service provision is in fact a more appropriate and realistic one for developing countries. Even at the global level, a multiplicity of PES models coexist, and no single one has so far emerged as the standard approach. It should however also be noted that several authors draw attention to the trade-offs and possible dilution of impact that may result by combining conservation and poverty alleviation goals, as well as to the highly nuanced question of whether it is possible to balance socio-economic development with ecosystem conservation (Engel et al. 2008, USAID 2007, Wunder 2005, 2007). It is argued that the implied social targeting that comes with a focus on poverty alleviation will likely increase the transaction costs and decrease the level of ecosystem services provided by PES in Africa (Ferraro 2007). Similar complexities have been noted at the site level. For example, potential trade-offs are identified in the case of Tanzania’s Eastern Arc mountains, where targeting PES to either poverty reduction or landscape conservation in order to deliver water regulation services gives two different outcomes and therefore suggests different prioritisation strategies (Fisher 2012b).

Another feature that characterises the development of PES in East Africa is that – unlike many of the schemes which are now operational in other parts of the world – they tend to depend heavily on external subsidies, either from central government or from development donors and international NGOs. This was apparent, for instance, in the Uluguru PES scheme, where both the institutional and financial framework had been provided by NGOs and development assistance agencies (Lopa et al. 2012). As yet there is very little private sector involvement or direct payments from ecosystem service beneficiaries (Ferraro 2007, Dillaha et al. 2008). One of the reasons for this reliance on public and donor sources is the still low demand and willingness to pay for ecosystem services (Namirembe et al. 2014). For example, low buy-in from water users was noted as a constraint to the Lake Naivasha PES scheme (Chiramba et al. 2011, Nyongesa 2011). It is uncertain that many

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation of the PES schemes which are currently under development or implementation will ever be truly sustainable as market-based mechanisms – and, at the extreme, it has also been argued that one of the reasons that many initiatives do not go beyond the inception phase is that donors’ top-down push for the development of PES schemes does not represent the interests or realities of the on-the-ground situation (AfDB 2015).

Key success factors and barriers to PES development

It is useful to conclude by synthesizing learning on the key success factors and barriers to development. Experience to date in East Africa provides many useful insights and lessons which should be kept in mind when identifying, designing and implementing PES in the LVB.

PES schemes must often go through several iterations (and even failures) before they take off

One overarching conclusion is that, despite the great interest in PES that has emerged in the region, **very few schemes have actually taken root and continue to be operational**. The fact that many PES schemes stall at the development phase has already been noted by several authors (AfDB 2015, Ferraro 2008, Masiga 2011). For example, a review of PES schemes in Eastern and Southern Africa carried out in 2006 found that only a fifth of those developed had reached the point of implementation (Ruhweza and Waage 2007). While this situation may have improved slightly over time, it still remains an issue today. It is not realistic to expect that every PES scheme that is identified as having potential, or even that is piloted on the ground, will endure.

It is however not always the case that stalled projects constitute a ‘failure’ as regards PES development. In many cases, the schemes which have eventually emerged as operational in the region are in fact built on a number of earlier efforts which did not themselves take off as planned, but formed a key step in the development of successful PES models. In other cases, **PES evolved over time to take quite a different form from that originally envisaged** – usually due to a combination of technical, political and market factors. For example, the Nairobi Water Fund was originally envisaged as a green water credits scheme, and evolved as the result of a long research process involving several different institutions and study processes (see Huninks and Droogers 2015, ISRIC 2017, Kauffman et al. 2014, Namirembe et al. 2013, PRESA 2017, TNC 2015, Vogl and Wolny 2015). In the Chyulu Hills, although the envisaged water-based PES never came to fruition, there are now two operational schemes based on forest carbon and tourism payments (Norton 2017, UNDP 2013, Wildlife Works 2016). Similarly the Simanjiro Conservation Easement scheme underwent major changes in scope and institutional backing before it emerged as a workable model (see Nelson 2008, 2009, Nelson et al. 2010, Sachedina and Nelson), while current PES activities around Mount Elgon are the cumulative result of several prior pilot schemes, not all of which persisted (see Egaru 2013, Kakuru and Masiga 2016, Okurut 2011, Okeyo-Owuor et al. 2011, UNDP 2015).

More review and reflection is required

Most of the research on PES in East Africa focuses on potential and opportunities for PES, or seeks to identify areas where schemes should be implemented and how they might be designed. There have been relatively few efforts to review successes and challenges, or to draw lessons learned. Practical learning remains limited, although the few attempts which have been made to assess the validity and impacts of on-the-ground PES experiences provide extremely valuable lessons (see, for example Bertram 2011, Boonstra 2010, de Leeuw 2012, Fisher 2012a, Gross-Camp et al. 2012, Jayachandran et al. 2017, Martin et al. 2014, Namara 2015). There remains an urgent need to **build review and learning processes into project implementation** – both to test the

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

applicability of PES models to an East Africa context and build regionally-appropriate approaches. This is the case even for PES schemes which have failed to get off the ground.

High ecosystem values do not automatically translate into PES potential

While it is relatively easy – and tempting – to identify that there is PES potential, it is much harder to bring schemes to an operational level. Most PES research studies and project identification and design documents make the **assumption that the high value of ecosystem services in a given situation, combined with a stated willingness to accept payment (on the part of landholders) and stated willingness to pay (on the part of ecosystem service beneficiaries), automatically translates into a viable PES scheme.** In reality, this is not always the case.

On the one hand, landholders' expectations of reward are typically far more complex than the prospect of being provided with cash payments at a level that compensates them for their level of effort or economic opportunities foregone. Money, alone, may not be sufficient to persuade (or enable) farmers to manage their land and resources sustainably. There is always a **need to understand better the conditions, circumstances and motivations of (potential) PES sellers.** For example, in Masindi District Uganda, it was necessary to devote a considerable amount of time to understanding farmers' needs and preferences, not just to assume that the size of payment would be all that mattered (Clot and Stanton 2014). There is also a need to investigate how these vary. Several PES schemes have found that PES motivations, expectations and needs vary greatly between different landholders, even at the same site (de Leeuw 2012, Fisher 2012a, Kaczan et al. 2012, Mulatu et al. 2014).

In most instances **it is extremely difficult to identify buyers and to maintain their interest in PES** – even when ecosystem service beneficiaries state that they are willing, in principle, to contribute funds. Yet, without a buyer, no PES scheme is possible. The lack of market demand for ecosystem services, combined with a low willingness and ability to pay on the part of beneficiaries, has been identified as a major barrier to the development of PES across sub-Saharan Africa (AfDB 2015, Ferraro 2007). Similar findings emerge in East Africa. In Uganda, for example, the absence of willing and able buyers of environmental services is highlighted as one of the most pervasive major constraints to PES (Ruhweeza and Masiga 2016). In the Sigi Catchment in Tanzania, it was found that the vast majority of downstream water users had no interest in paying upstream farmers for the provision of watershed services (even though most thought that the upper catchment land and forests should be conserved for waterflow) – yet PES was still proposed as a way forward (Mwanyoka 2006). Surveys carried out to inform the development of PES in the Uluguru Mountains, Tanzania found that most water users expressed a wish to be part of a payment for watershed services scheme, even though it means paying for something that is usually provided for free (Schösler and Riddington 2006). However, in the event, only one water user (DAWASCO) was willing to contribute funds for watershed protection.

Evidence of causality and impacts is required

Although it might seem self-evident that PES schemes should result in improved ecosystem services and that payments should motivate landholders to change their land and resource use practices, this **causality is very rarely tested or proven** (USAID 2007). Yet the concept of PES is founded on a clear and scientifically-proven link between particular land uses and the provision of specific ecosystem services. Establishing a biophysical and economic evidence base and business case is important in developing PES schemes and getting buy-in from participants and decision-makers. If a buyer is being asked to pay for a particular ecosystem service, then the PES scheme must guarantee that this will be provided. At the same time, if a landholder is being rewarded

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation or compensated for providing this service then payments should be conditional on their actually doing so. Demonstrating these links requires significant data and information, rather than the unsubstantiated assumptions and unverifiable hypotheses that are often used as the basis of PES schemes.

Many PES schemes in East Africa **have been designed without ever having generated this evidence**. For example, even though the Uluguru EPWS scheme paid farmers to deliver land-use improvement technologies that were expected to reduce run-off and hence improve water quality, neither the direct link between land-use changes and water quality improvement nor a system of conditional payments was established; this was seen as a potential problem for scaling the pilot into a full PES scheme (Lopa et al. 2012). Similarly, the Lake Naivasha PES scheme has been criticized for omitting to investigate whether, in reality, land use change on farms in the upper watershed would provide downstream water flow and quality (Boonstra 2010). The Nairobi Water Fund was unusual in that it did consider these aspects rigorously and in detail, a factor that proved critical in it being accepted by water users and managers (Kauffman et al. 2014, Namirembe et al. 2014). The business case drew on both economic and biophysical evidence of the efficacy of given land uses in the Upper Tana catchment resulting in improved water supplies to Nairobi (TNC 2015, Vogl and Wolny 2015, Hunink and Droogers 2015).

There also tends to be very little emphasis on investigating the **impacts of payments on land use practices, landholder motivations and socio-economic status**. This is obviously required in order to be able to gauge compliance and ensure conditionality in the release of payments, and becomes particularly important when PES seeks to contribute towards livelihood improvement (as is the case with many of the schemes being implemented in East Africa). In this case, if PES are not leading to measurable improvements in community welfare then they are not achieving one of their fundamental goals. There are few documented efforts to measure these impacts, although those that do exist present extremely useful methods and results that could be scaled up elsewhere. randomized trials were used to measure the impact of PES in both Nyungwe National Park in Rwanda and Hoima and Kibaale Districts in Uganda. In Nyungwe, the trials employed a 'before and after' and 'with and without' design. These returned generally good indicators of effectiveness in terms of reduced human activities (although raised some questions about bias), efficiency in terms of cost-effectiveness and equity between participants (Gross-Camp et al. 2012, Martin et al. 2014). The surveys carried out in Uganda, found that even though PES uptake was relatively low at 32 per cent, it was possible to discern clear changes in land use patterns. Participating landowners cleared 4 percent of forested land as compared to 9 percent in villages where the program was not offered (see Jayachandran et al. 2017).

Participation, negotiation and trust are key to developing workable PES models

Sound science and 'hard' data are often important for establishing the basic justification and business case for PES as a means of delivering certain outcomes. However, technical information only goes so far in informing the actual design of on-the-ground schemes. At a practical level, many aspects of PES design (including payment levels, distribution mechanisms and management arrangements) are **founded on a process of negotiation and participation which involves both landholders and buyers, as well as other key stakeholders in the sectors and landscapes in which the project is operating**. Whether PES schemes actually take off – and in what form they are implemented – is largely down to buyers and sellers negotiating an agreement that they are both happy with, and willing to abide with. The amount of time that such negotiations take is typically substantial, as is the effort that must be made to ensure broad consensus among all of the buyers and all of the sellers in a particular scheme. Considerable care is required to ensure the equal, informed participation of all stakeholders (Kwayu et al. 2013).

There is ample evidence that these considerations hold for many of East African PES projects. It is interesting to note that the business case drawn up for the Lake Naivasha PES scheme establishing the opportunity costs that farmers would undergo as a result of setting aside land for conservation was not, in the event, used to determine payment levels. These rates were unacceptable to buyers, and agreement was eventually reached after a rigorous negotiation process between the buyers and sellers (Berttram 2011). A review of schemes in the Upper Tana River Basin and Sasumua Watersheds in Kenya, Morogoro Watershed in Tanzania and Olare Orok conservancy in Kenya also found that **trust between participants was a key factor in determining the success and sustainability of PES** (Sorg et al. 2015). Similarly, the Simanjiro Conservation Easement PES scheme only became workable at the local level when the international NGOs that had originally been driving the process withdrew and took a more indirect role (Nelson 2008).

PES must be designed to be financially feasible and sustainable

While it might appear obvious that there is a need to ensure that PES are cost-effective, financially feasible and sustainable (both at the Program level, and for the participants involved), these considerations are often ignored when schemes are designed. One consideration is that **payments to landholders should be set at a high enough level to cover the costs of ecosystem conservation and/or to provide a sufficient reward**. While the concept of opportunity costs is generally well-understood in most PES schemes (and often forms the basis for calculating payment levels), the high transactions costs of participating in PES schemes in terms of reporting, attending meetings and participating in studies and surveys are often under-emphasized. If landholders are not earning sufficient returns, or if procedures are too cumbersome and time-consuming, then the scheme is unlikely to be sustainable. For example, one of the reasons cited for the poor performance of the Uluguru EPWS pilot was the low compensation received by farmers as compared to their expectations and the high transactions costs of participating in the scheme (Mussa and Mjemah 2017). Several authors make the point that payments often need to be stacked or bundled⁴ in order to make PES worthwhile to landholders (USAID 2007). For example, it has been suggested that although it may not be possible to establish PES in the Sasumua watershed based on water utilities as the sole source of financing, embedding the scheme (and the soil conservation actions involved in it) in a wider climate adaptation framework creates an opportunity to enhance its viability and sustainability (Van de Sand et al. 2014).

PES must also be financially viable and sustainable at the whole-scheme level. Just as with landholder payments, it is important to consider carefully the full costs of implementing a PES scheme. These typically extend far beyond the actual payments involved. Institutional support, management and monitoring costs are often substantial, especially when the project involves large number of remote landholders. **Long-term financial sustainability poses a major challenge**. This is particularly the case because many of the PES schemes that are currently operating in East African countries were first established under donor-funded projects or at the behest of international conservation NGOs, typically with large external subsidies or grant funding. Sometimes the PES payments themselves are funded from external sources. This means that, all too often, once the project ends or external funding ceases, the PES scheme also breaks down.

There is a need to build capacity to design, implement, manage, enforce and evaluate PES

PES require a supportive regulatory and institutional framework which enables payments to be made and received, protects the rights of buyers and sellers, and provides the necessary safeguards to monitor and

⁴ Stacking occurs when payment is received from more than one source (for example both a watershed PES and sharing of tourism revenues). In contrast, bundling refers to of a single payment covering the provision of multiple ecosystem services (for example via a land lease or easement).

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

enforce compliance. A dedicated law is not necessarily required, but existing regulations must enable PES, and certainly should not contradict or disallow them. Several authors argue that, even though national policy, legal and institutional frameworks in East African countries were not designed for PES, they can be adapted to accommodate them (Biryahwaho et al. 2011, Okurut 2011). At the same time, it is clear that significant policy and legal barriers do remain, which need to be addressed (ERB 2006, Ruhweza and Masiga 2016). The clarification of land and resource tenure, in particular, is highlighted as a key aspect of the enabling framework for PES (AfDB 2015, Ferraro 2007). For example, one of the major challenges to the Lake Naivasha PES scheme was complex land ownership arrangements, making it difficult to design effective payment collection and distribution systems (Nyongesa 2011). In a similar vein, a review of PES schemes in Morogoro, Sasumua and Upper Tana watersheds and Olare Orok conservancy found that well-defined property and user rights were one of the most important conditions for success, and can be an insurmountable barrier if absent (Sorg et al. 2015).

Institutional, organisational and technical capacity aspects are repeatedly flagged as another critical condition for success. Most authors point to the need to build capacity at all levels – in the research institutes and universities that conduct ecosystem service research, the government bodies that regulate and coordinate PES, the organisations that undertake the development and management of PES schemes, the groups and sectors that become engaged as PES buyers, and the communities that manage landscapes in order to generate ecosystem services (AfDB 2015). In the Uluguru EPWS scheme, for example, one of the main areas of work in developing the PES scheme was increasing capacity of local communities and government bodies (Schösler Riddington 2006).

With few exceptions, **PES require a neutral and independent third party mediator, negotiator or coordinator.** If organisations and institutions do not exist which have the capacity to deliver this support, PES runs the risk of failing. In several cases, this has involved the establishment of a new or dedicated body to manage the PES scheme. For example, The Wildlife Foundation, a locally-incorporated NGO, was established specifically to manage the Kitengela Wildlife Conservation Lease Program (Matiko 2014). The structure of the Nairobi Water Fund is designed to be run as a Trust registered under Kenyan law as a charitable organisation, governed by Board of Trustees (comprising 9-15 representatives from major stakeholders) to manage the overall operations of the funding mechanism, and assisted by a set of committees as well as a Technical Secretariat which will be responsible for the day-to-day management of the fund (TNC 2015). In other instances, these roles have been fulfilled by a local, national or international NGO (for example in the Mara and Uluguru EPWS schemes, the Amboseli land lease and Chyulu PES schemes). It should be noted that, as yet, there are no functioning examples of PES schemes in the region that are being managed solely by government.

Once pressing concern is **how to build local capacity to manage and deliver PES.** Many of the PES projects currently operating in the region depend on outsourced expertise or international organizations, due to lack of local capacity (Lopa et al. 2012). This can undermine the financial viability and sustainability of these schemes. This often results in higher start-up and transaction costs, which may render the PES scheme unprofitable (Ruhweza and Masiga 2016). It can also raise questions about ownership and control of the scheme. For example, in the Kibaale and Hoima PES scheme in Uganda, NGOs have provided the main management and implementation support to forest-related PES and REDD+ interventions, even though local government authorities hold the key mandate. Depending on how these roles are dealt with, the activities of these NGOs can either strengthen or obstruct local government capacity, and may serve to increase or decrease forest owners' influence in decision-making processes (Namara 2015).

4 REFERENCES:

literature on PES in East Africa

- Aboud, A., Kisoyan, P.K., Said, M.Y., Notenbaert, A., de Leeuw, J., Gitau, J.W., Manzano, P., Davies, J.M., Roba, G.M., Omondi, S.O. and M.O. Odhiambo (2012) Natural Resource Management and Biodiversity Conservation in the Drylands of Eastern and Central Africa. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.
- AfDB (2015) Payment for environmental services: a promising tool for natural resources management in Africa. AFDB CIF Knowledge Series, African Development Bank Group, Abidjan.
- Andrew, G. and M. Masozera (2010) Payment for ecosystem services and poverty reduction in Rwanda. *Journal of Sustainable Development in Africa* 12(3): 122-139.
- Balana, B. (2011) The Willingness to pay (WTP) of water users for increased and reliable water supply via catchment management in Sasumua: Results from a contingent valuation survey in Nairobi city, Kenya. *Pro-poor Reward for Environmental Services in Africa (PRESA)*, World Agroforestry Centre (PRESA/ICRAF), Nairobi.
- Bhat, M., Ombara, D., Kasanga, W., McClain, M. and G. Atisa (2009) Starter Document to Facilitate the Development of a PES Mechanism to Preserve and Protect Freshwater Flows in the Mara River Basin of Kenya and Tanzania. Report submitted to The US Agency for International Development Under the Cooperative Agreement EPP-A-00-04-00015-00.
- Biryahwaho, B., Agasha, A., Omondi, H., Kairu, G., Makokha, M., Okwousa, E. and H. Mogaka (2011) Policy, legislation and institutional frameworks governing payment for ecosystem services in Uganda. In Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) *Case studies from Eastern and Central Africa*. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.
- Bond I., Waage S. and A. Ruweza (2008) *Payments for Ecosystem Services (PES) in East and Southern Africa: assessing prospects and pathways forward*. East & Southern Africa Katoomba Group, IIED and Forest Trends.
- Boonstra, M. (2010) *Sustaining and enlarging the Payment for Watershed Services (PWS) program in the Naivasha Catchment: an analysis for developing sustainability mechanisms to sustain the PWS program*. Institute for Environmental Studies, VU University, Amsterdam.
- Braybrook, R. (2016) *Payment for environmental services: sustainable development of water resources in Rwanda*. Capstone submitted in conformity with the requirements for the degree of Master of Arts in Public Management, Johns Hopkins University, Baltimore.
- Bryant, B. (2015) *Ecosystem Services Assessment and Valuation of Proposed Investments for the Upper Tana-Nairobi Water Fund: A Technical Appendix to the Upper Tana-Nairobi Water Fund Business Case*. The Natural Capital Project, Stanford University.
- Bulte, E., Boone, R., Stringer, R. and P. Thornton (2006) *Wild Life Conservation in Amboseli, Kenya: Paying for Nonuse Values*. Roles of Agriculture Project Environment Services, Agricultural and Development Economics Division (ESA), Food and Agriculture Organisation of the United Nations (FAO), Nairobi.
- Burgess, N., Balmford, A., Platts, P., Schaafsma, M. and N. Doggart (eds) (2014) *Special Edition: Valuing the Arc*. The Arc Journal, Tanzania Forest Conservation Working Group, June 104 edition.
- Burgess, N., Mwakalila, S., Madoffe, S. and T. Ricketts (2009). *Valuing the Arc: a Program to map and value ecosystem services in Tanzania*. Mountain Research Initiative Newsletter 3: 18-21.

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

- Chelang'at, S., Sulo, T., Kipkoech, A., Kipsat, M., Adano, W., Mwima, P., Osano, O. and B. Nsombo (2011) Analysis of factors affecting the implementation of payment for environmental services in Eastern and Central African region. In Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) Case studies from Eastern and Central Africa. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.
- Chiramba, T., Mogoi, S., Martinez, I. and T. Jones (2011) Payment for Environmental Services pilot project in Lake Naivasha basin, Kenya – a viable mechanism for watershed services that delivers sustainable natural resource management and improved livelihoods. Paper presented at UN-Water Conference 'Water in the Green Economy in Practice: Towards Rio+20, Zaragoza.
- Clot, S. and C. Stanton (2014) Present Bias in Payments for Ecosystem Services: Insights from a Behavioural Experiment in Uganda. DR n°2014-3, Laboratoire Montpellierain d'Economie Théorique et Appliquée, Montpellier.
- de Leeuw, J. (2012) Spatial variation in the willingness to accept payments for ecosystem services: A case study on payments for wildlife conservation in the Kitengela plains, Kenya. Bachelors thesis, Wageningen University.
- Dillaha, T., Ferraro, P., Huang, M., Southgate, D., Upadhyaya, S. and S. Wunder (2008) Payments for watershed services regional syntheses. USAID PES Brief 7, Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program, Virginia Tech, , Blacksburg.
- Ecosystem Marketplace (2017) Forest Carbon Portal Project Inventory <http://www.forestcarbonportal.com/>, accessed December 15, 2017.
- Egaru, M. (2013) Community Environment Conservation Fund (CECF) as a tool to catalyze Water Resources Management in Upper Aswa Sub Catchment, Uganda. IUCN Uganda Office, Kampala.
- Emily, A., Kironchi, G. and S. Wangia (2013) Willingness to pay for improved water supply due to spring protection in Emuhaya District, Kenya. International Journal of Education and Research 1(7): 1-14.
- Engel, S., Pagiola, S. and S. Wunder (2008) Designing payments for environmental services in theory and practice: An overview of the issues. Ecological Economics 65(4): 663-674.
- ERB (2006) A Study to Establishing Mechanism for Payments for Water Environmental Services for the Rufiji River Basin in Tanzania. Report to Ministry of Natural Resources and Tourism Forest and Beekeeping Division by Economic Research Bureau, University of Dar es Salaam.
- Ferraro, P. (2007) Regional Review of Payments for Watershed Services: Sub-Saharan Africa. Working Paper No. 08-07, Office of International Research, Education, and Development (OIREd), Virginia Tech, Blacksburg.
- Fisher, B. (2012b) Poverty, Payments, and Ecosystem Services in the Eastern Arc Mountains of Tanzania. In Ingram, J., DeClerck, F. and C. Rumbaitis del Rio (eds.), Integrating Ecology and Poverty Reduction: The Application of Ecology in Development Solutions. Springer.
- Fisher, B., Kulindwa, K., Mwanjyoka, I., Turner, R.K. and N. Burgess (2010) Common pool resource management and PES: Lessons and constraints for water PES in Tanzania. Ecological Economics 69: 1253- 1261.
- Fisher, J. (2012a) No pay, no care? A case study exploring motivations for participation in payments for ecosystem services in Uganda. Oryx 46(1): 45-54.
- Fitzgerald, K. (2013) Community Payment for Ecosystem Services in the Amboseli Ecosystem: Leasing Land for Livelihoods and Wildlife. AWF Technical Paper Series, African Wildlife Foundation, Nairobi.

- Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation
- GLOWS (2012) Trans-boundary Water for Biodiversity and Human Health in the Mara River Basin. Project Summary Report. Global Water for Sustainability (GLOWS) program report to USAID, Florida International University, CARE, WaterAid America, Winrock International, World Vision, and the World Wildlife Fund.
- Government of Kenya (2009) Report of the Prime Minister's Task Force on the Conservation of the Mau Forests Complex. Government of Kenya, Nairobi.
- Gross-Camp, N., Martin, A., McGuire, S., Kebede, B. and J. Munyarukaza (2012) Payments for ecosystem services in an African protected area: exploring issues of legitimacy, fairness, equity and effectiveness. *Oryx* 46(1): 24-33.
- Hashimoto, K. (2008) Study on willingness to participate in the payment for environmental services scheme in the Mara Basin. Thesis submitted in partial fulfilment of the requirements for the degree of Master of Science in Environmental Studies, Florida International University.
- Hoffman, C. (2009) Geospatial Mapping and Analysis of Water Availability, Demand and Use within the Mara River Basin. AWRA 2009 Spring Specialty Conference "Managing Water Resources Development in a Changing Climate", Anchorage.
- Hunink, J. and P. Droogers (2015) Impact Assessment of Investment Portfolios for Business Case Development of the Nairobi Water Fund in the Upper Tana River, Kenya. Report 133, FutureWater, Wageningen.
- Huxham, M., Kairo, J., Skov, M., Hillams, T., Nunan, F. and M. Mencuccini (2012) Marketing the mangroves: can carbon payments make conservation work? Paper presented at Meeting on mangrove Ecology, Functioning and Management, Galle.
- ICRAF (2011) Pro-poor Rewards for Environmental Services in Africa 2008-2011. World Agroforestry Centre (ICRAF), Nairobi.
- ISRIC (2017) Green Water Credits Pilot in Kenya. ISRIC - World Soil Information, Wageningen. <http://www.isric.org/projects/green-water-credits-pilot-kenya>, accessed 1 November 2017.
- Jayachandran, S., de Laat, J., Lambin, E., Stanton, C., Audy, R. and N. Thomas (2017) Cash for carbon: A randomized trial of payments for ecosystem services to reduce deforestation. *Science* 357(6348): 267-273.
- Kaczan, D., Swallow, B. and V. Adamowicz (2011) Payment for Ecosystem Services (PES) program design in Tanzania: Farmers' preferences for enforcement and payment options. Paper presented at Agricultural & Applied Economics Association Joint Annual Meeting, Pittsburgh.
- Kaczan, D., Swallow, B., Adamowicz, V. and H. Vihemäki (201w) Payment for Ecosystem Services (PES) program design in Tanzania: Farmers' preferences for enforcement and payment options. Designing an incentive Program to reduce on-farm deforestation in the East Usambara Mountains, Tanzania. ICRAF Working Paper No. 145, World Agroforestry Centre, Nairobi.
- Kakuru, W. and M. Masiga (2016) Implementation of the Community Environment Conservation Fund (CECF) to enhance Forest Landscape Restoration in Uganda: Emerging lessons and recommendations for scaling up. Report to IUCN Uganda Country Office, Kampala.
- Kalisa, E. and Habiyaemye (2015) Rwandan Population's Willingness to Pay Ecosystem Services Provided by Forest Ecosystems. *East African Journal of Science and Technology* 5(2): 22-31.
- Karangwa, C. (2011) Payment for ecosystem services for social welfare enhancement at community level, the case of Rwanda. In Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) Case studies from Eastern and Central Africa. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

- Kariara, J. (2009) Prospects and Challenges of Developing Payment For Ecosystem Services in Kenya Local Community Perspectives in Kikuyu Escarpment, Aberdare Region. University of Klagenfurt.
- Kauffman, S., Droogers, P., Hunink, J., Meaniki, B., Muchena, F., Gichere, P., Bindraban, P., Onduru, D., Cleveringa, R. and J. Bouma (2014) Green Water Credits – exploring its potential to enhance ecosystem services by reducing soil erosion in the Upper Tana Basin, Kenya. *International Journal of Biodiversity Science, Ecosystem Services & Management* 10(2): 133-143.
- Kauffman, S., Droogers, P., Hunink, J., Meaniki, B., Muchena, F., Gichere, P., Bindraban, P., Onduru, D., Cleveringa, R. and J. Bouma (2014) Green Water Credits – exploring its potential to enhance ecosystem services by reducing soil erosion in the Upper Tana Basin, Kenya. *International Journal of Biodiversity Science, Ecosystem Services & Management* 10(.2): 133-143.
- King, N., Damon, M. and G. Forsyth (2005) An Inventory of Current Ecosystem Service Payments, Markets, and Capacity Building in South Africa. *Forest Trends*, Washington DC.
- Kipkoech, A., Mogaka, H., Cheboiywo, J. and D. Kimaro (2011b) The Total Economic Value of Maasai Mau, Transmara and Eastern Mau Forest Blocks of the Mau Forest, Kenya. *Environmental Research and Policy Analysis (K)*, Nairobi.
- Kipkoech, A., Roba, A., Mogaka, H., Okeyo-Owuorm J., Cheserek, G., Omondi, H., Msombo, B. and M. Makokha (2011a) . Assessing the economic value of forest: is it a prerequisite for payment for the environmental functions in Mt. Elgon? In Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) *Case studies from Eastern and Central Africa*. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.
- Kwayu, E., Sallu, S. and J. Paavola (2013) Farmer participation in the Equitable Payments for Watershed Services in Morogoro, Tanzania. Sustainability Research Institute Paper No. 42, Centre for Climate Change Economics and Policy Working Paper No. 123, School of Earth and Environment, University of Leeds.
- Lalika, M., de Deckere, E. and Y. Ngaga (2011) Payment for water services as basis for natural resource management: experience from Pangani Basin, Tanzania. In Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) *Case studies from Eastern and Central Africa*. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.
- Lopa, D. and I. Mwanyoka (2011) Equitable Payments for Watershed Services (EPWS) Program: a practical experience of an innovative approach in delivering conservation and poverty reduction in Ulugurus, Tanzania. In Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) *Case studies from Eastern and Central Africa*. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.
- Lopa, D., Mwanyoka, I., Jambiya, G., Massoud, T., Harrison, P., Ellis-Jones, M., Blomley, T., Leimona, B., van Noordwijk, M. and N. Burgess (2012) Towards operational payments for water ecosystem services in Tanzania: a case study from the Uluguru Mountains. *Oryx*, 46(1): 34 – 44.
- LVBC and WWF (2010) Biodiversity Strategy and Action Plan for Sustainable Management of the Mara River Basin. Lake Victoria Basin Commission of the East African Community (EAC) and WWF Eastern & Southern Africa Regional Program Office (WWF-ESARPO), Nairobi.
- Malimbwi, Z. and Y. Ngaga (2005) Payments for Environmental Services as Incentive Opportunities for Catchment Forest Reserves Management in Tanzania. Paper presented at the Tanzania Association of Foresters Meeting, Dar es Salaam.
- Martin, A., Gross-Camp, N., Kebede, B. and S. McGuire (2014) Measuring effectiveness, efficiency and equity in an experimental Payments for Ecosystem Services trial. *Global Environmental Change*. 28: 216–226.

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

- Masiga, M. (2011) Payments for environmental services in Sub-Saharan Africa: taking stock and generating evidence for increased investment and development of PES. In Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) Case studies from Eastern and Central Africa. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.
- Matiko, D. (2014) Wildlife Conservation Leases are Considerable Conservation Options outside Protected Areas: The Kitengela - Nairobi National Park Wildlife Conservation Lease Program. *Journal of Ecosystem and Ecography* 4:146.
- Millennium Ecosystem Assessment (2005) *Ecosystems and Human Well-Being: Synthesis*. Island Press, Washington DC.
- Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) (2011) Case studies from Eastern and Central Africa. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.
- Mohammed, E. (2012) *Payments for Coastal and Marine Ecosystem Services: Prospects and Principles*, International Institute for Environment and Development (IIED), London.
- Mombo, F., Lusambo, L., Speelman, S., Buysse, J., Munishi, P. and G. van Huylenbroeck (2014) Scope for introducing payments for ecosystem services as a strategy to reduce deforestation in the Kilombero wetlands catchment area. *Forest Policy and Economics* 38: 81- 89.
- Mulatu, D. (2014) *Linking the economy to the ecosystems: land use change and ecosystem services valuation at basin level*. Doctoral dissertation, ITC, University of Twente, Enschede.
- Mulatu, D., van der Veen, A and P. van Oel (2014) Farm households' preferences for collective and individual actions to improve water-related ecosystem services: the Lake Naivasha basin, Kenya. *Ecosystem Services* 7: 22-33.
- Mulatu, D., van der Veen, A and P. van Oel (2015) Firms' willingness to invest in a water fund to improve water-related ecosystem services: the Lake Naivasha basin, Kenya. *Water International* 40(3): 463-482.
- Mussa, K. and A. Mwakaje (2013) The impact of equitable payment for watershed services scheme on livelihoods in Tanzania: The case of Uluguru Mountains. *International Journal of Development and Sustainability* 2(2): 1031-1051.
- Mussa, K. and I. Mjemah (2017) Participation of Ecosystem Service Providers in a Watershed PES Project in Tanzania: Connection with the Coasean Perspectives. *Journal of Ecosystem & Ecography* 7:2.
- Mutungu, C. and S. Mwangi (2006) *Inventory for Ecosystem Service Payment in Kenya*. March. Forest Trends, Washington DC.
- Mwangi (2008) *Payments for ecosystem services (PES) in East and Southern Africa: assessing prospects & pathways forward*. Report to East & Southern Africa Katoomba Group, National Museums of Kenya, Nairobi.
- Mwanyoka, I. (2005) *Payment for water services as a mechanism for watershed management: the case of the Sigi River catchment, Tanga, Tanzania*. Research report submitted to WWF Tanzania Program Office, Dar es Salaam.
- Mwaura, F., Kiringe, J., Warinwa, F. and P. Wandera (2016) Estimation of the Economic Value for the Consumptive Water Use Ecosystem Service Benefits of the Chyulu Hills Watershed, Kenya. *International Journal of Agriculture, Forestry and Fisheries* 4(4): 36-48.
- Namara, A. (2015) *At the Expense of Democracy: Payment for Ecosystem Services in Hoima District, Uganda*. Responsive Forest Governance Initiative (RFGI) Series, Council for the Development of Social Science

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

Research in Africa (CODESRIA), University of Illinois at Urbana-Champaign (UIUC) and the International Union for Conservation of Nature (IUCN).

Namirembe, S., Leomona, B., van Noordwijk, M., Bernard, F. and K. Backwayo (2014) Co-investment paradigms as alternatives to payments for tree-based ecosystem services in Africa. *Current Opinion in Environmental Sustainability* 6: 89-97.

Namirembe, S., Mwangi, J. and J. Gathenya (2013) Case studies on Remuneration of Positive Externalities (RPE)/ Payments for Environmental Services (PES), Food and Agriculture Organisation of the United Nations (FAO), Rome.

Nelson, F. (2008) Case Study. Developing Alternative Frameworks for Community-based Conservation: Piloting Payments for Environmental Services (PES) in Tanzania's Simanjiro Plains. Report prepared for TransLinks Program, USAID and Wildlife Conservation Society.

Nelson, F., Foley, C., Foley, L., Leposo, A., Loure, E., Peterson, D., Peterson, M., Peterson, T., Sachedina, H. and A. Williams (2010) Payments for Ecosystem Services as a Framework for Community-Based Conservation in Northern Tanzania. *Conservation Biology* 24(1): 78 – 85.

NIRAS (2011) Feasibility Study for Integrated Watershed Management and Preparation of Investment Project Proposal for the Mara River Basin Draft Interim Report. Annex 4: Thematic Report on Watershed and Wetlands Characterization & Assessment. Report prepared by Niras for Nile Basin Initiative NELSAP, Nairobi.

Norton, E (2017) Hope from the hills. *Our Planet* September 2017, UN Environment.

Nyongesa, J., Bett, H., Lagat, J. and O. Ayuya (2016) Estimating farmers' stated willingness to accept pay for ecosystem services: case of Lake Naivasha watershed Payment for Ecosystem Services scheme, Kenya. *Ecological Processes* 5: 15.

Nyongesa, M. (2011) Payment for environmental services: An integrated approach to natural resource management and livelihood improvement, a case of lake Naivasha-Malewa river basin sub-catchment, Kenya. *African Crop Science Conference Proceedings* 10: 479 – 484.

Nzigidahera, B. (ed.) (2014) *Sauvons les services ecosystemiques pour la survie de la population et la croissance de l'economie nationale*. Institut National pour l'Environnement et la Conservation de la Nature (INECN), Bujumbura.

Okeyo-Owuor, J., Masese, F., Mogaka, H., Okwuosa, E., Kairu, G., Nantongo, P., Agasha, A. and B. Biryahwaho (2011) Status, challenges and new approaches for management of the trans-boundary Mt. Elgon ecosystem: a review. In Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) *Case studies from Eastern and Central Africa*. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.

Okurut, T. (2011) Policy and institutional framework for transboundary payment for environment services. *Payment for environmental services: Laying the ground work*. In Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) *Case studies from Eastern and Central Africa*. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.

Omondi, H., Yabban, W., Roba, A., Okeyo-Owuor, J., Matere, S. and P. Mwima (2011) Difficulties and limitations in implementing payment for environmental services (PES) schemes in watersheds: a case study of the valuation of Mt. Kenya forest. In Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) *Case studies from Eastern and Central Africa*. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.

- Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation
- Onduru, D. and F. Muchena (2011) Cost Benefit Analysis of Land Management Options in the Upper Tana. Kenya. Green Water Credits Report 12, ISRIC – World Soil Information, Wageningen.
- Porras, I., Grieg-Gran, M. and G. Meijerink (2007) Farmers' adoption of soil and water conservation: potential role for payments for watershed services. Green Water Credits Report 5, ISRIC – World Soil Information, Wageningen.
- PRESA (2017) Upper Tana Basin: Caring for Kenya's largest river. Pro-poor Rewards for Environmental Services in Africa (PRESA), World Agroforestry Centre (ICRAF), Nairobi. <http://presa.worldagroforestry.org/where-we-work/kenya-mt-kenya-east/> accessed October 1 2017.
- Robinson, E., Albers, H., Lokina, R. and C. Meshack (2015) Allocating Community-Level Payments for Ecosystem Services: Initial Experiences from a REDD Pilot in Tanzania. Environment for Development Discussion Paper Series EfD SP 15-27, University of Dar es Salaam and University of Gothenburg.
- Ruhweza A. and S. Waage (2007) The State of Play: Payments for Ecosystem Services in East and Southern Africa. Ecosystems market place, Forest Trends, Washington DC.
- Ruhweza, A. and M. Masiga (2006) An Inventory of Initiatives/Activities and Legislation Pertaining to Ecosystem Service Payment Schemes (PES) in Uganda. Forest Trends, Washington DC
- Ruhweza, A. and M. Masiga (2016) Institutions for Payments for Environmental Services; Challenges and Opportunities in Uganda. Paper presented at 9th BIOECON Conference, Cambridge.
- Sachedina, H. and F. Nelson (2012) The Development of Payments for Ecosystem Services as a Community-Based Conservation Strategy in East Africa. In Ingram, J., DeClerck, F. and C. Rumbaitis del Rio (eds.), Integrating Ecology and Poverty Reduction: The Application of Ecology in Development Solutions. Springer.
- Schösler, H. and C. Riddington (2006) Developing a market for watershed services in Tanzania: a scoping study. Institute for Environmental Studies, Vrije Universiteit Amsterdam.
- Scurrah-Ehrhart, C. (2006) Tanzania Inventory of Payments for Ecosystem Services. Forest Trends, Washington DC.
- Sorg, S., Wehrli, A., Wostry, A. and M. Sonneveld (2015) Farmers' Perspective on Incentives for Ecosystem Services – Insights from Kenya and Tanzania. Paper presented at Conference on International Research on Food Security, Natural Resource Management and Rural Development, Berlin.
- Sumukwo, J., Kipkoech, A., Roba, A., Mwima, P., Omondi, H., Kairu, G., Osano, O. and S. Matere (2011) Financing provision of environmental services in Mount Elgon region for the protection of watersheds. In Mogaka, H., Okeyo-Owuor, J. and A. Kipkoech (eds) Case studies from Eastern and Central Africa. Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), Entebbe.
- TNC (2015) Upper Tana-Nairobi Water Fund Business Case. The Nature Conservancy (TNC), Nairobi.
- UNDP (2013) Maasai Wildlife Conservation Trust, Kenya. Equator Initiative Case Study Series, United Nations Development Program (UNDP), New York.
- UNDP (2015) Uganda's first Payment for Environmental Services Fund launched. <http://www.ug.undp.org/content/uganda/en/home/presscenter/articles/2015/03/27/uganda-s-first-payment-for-environmental-services-fund-launched-.html>, accessed November 1 2017.
- UNEP (2012) The Role and Contribution of Montane Forests and Related Ecosystem Services to the Kenyan Economy. United Nations Environment Program (UNEP), Nairobi.
- USAID (2007) USAID PES sourcebook: lessons and best practices for pro-poor payment for ecosystem services. Report prepared for USAID through the Global Assessment of Best Practices in Payments for Ecosystem

Support to the PREPARED project on economic & financial aspects of biodiversity & ecosystem conservation

Services Programs project, Office of International Research, Education, and Development Virginia Tech, Blacksburg.

Van de Sand, I., Mwangi, J. and S. Namirembe (2014) Can payments for ecosystem services contribute to adaptation to climate change? Insights from a watershed in Kenya. *Ecology and Society* 19(1): 47.

Van Noordwijk, M., Leimona, B., Emerton, L., Tomich, T., Velarde, S., Kallesoe M., Sekher, M. and B. Swallow (2007) Criteria and indicators for environmental service compensation and reward mechanisms: realistic, voluntary, conditional and pro-poor: CES Scoping Study Issue Paper no. 2, ICRAF Working Paper no. 37. World Agroforestry Centre, Nairobi.

Vogl, A. and S. Wolny (2015) Developing cost-effective investment portfolios for the Upper Tana-Nairobi Water Fund, Kenya. The Natural Capital Project, Stanford University.

Wakibara, J., Mwakaje, A., Mung'ong'o, C. and D. Ong'are (2011) Assessment and analysis of livelihoods trends to guide development of an equitable payment for watershed services scheme in the Mara River Basin. WorldWide Fund for Nature, Eastern and Southern Africa Regional Program Office, Nairobi.

Wamalwa, I. (2009) Prospects and limitations of integrated watershed management in Kenya: a case study of Mara Watershed. Thesis submitted in partial fulfilment of the requirements for the degree of Master of Science, Lund University.

Wildlife Works (2016) Chyulu Hills REDD+ Project Monitoring & Implementation Report. Document prepared for Chyulu Hills Conservation Trust by Wildlife Works, Nairobi.

Willets, E. (2008) Watershed Payments for Ecosystem Services and Climate Change Adaptation Case Study: Rugezi Wetlands, Rwanda. Masters project submitted in partial fulfilment of the requirements for the Master of Environmental Management degree in the Nicholas School of the Environment and Earth Sciences of Duke University.

Wunder, S. (2005) Payments for environmental services: some nuts and bolts. CIFOR Occasional Paper No. 42, Center for International Forestry Research (CIFOR), Bogor.

Wunder, S. (2007) The Efficiency of Payments for Environmental Services in Tropical Conservation. *Conservation Biology* 21(1): 48–58.

WWF (2011) Assessment and analysis of costs and benefits to guide development of equitable payment for watershed services scheme in the Mara River Basin. WWF – Eastern and Southern Africa Regional Program Office, Nairobi.

WWF (2012) Workshop Report: An Equitable Payment for Watershed Services Model for the Mara River Basin. World Wide Fund for Nature, Eastern and Southern Africa Regional Program Office, Nairobi.