

Modalities for innovative financing mechanism for participatory natural resource management in the Bale Eco-Region, Ethiopia



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ABOUT THE SHARE BALE ECO-REGION PROJECT

Conservation of Biodiversity and Ecosystems Functions and Improved Well-being of Highland and Lowland Communities within the Bale Eco-Region (BER) is one of the European Union (EU) funded projects that stands for Supporting Horn of Africa Resilience (SHARE). In Ethiopia, the project covers 16 districts (Districts) in West Arsi and Bale Zones of Oromia Regional State, around 22,000 km², with a population of about 3.3 million. The project life span is 42 months starting July 2014 and ending in November 2017. Five partners are implementing the project: Farm Africa, SOS Sahel, International Water Management Institute (IWMI), Frankfurt Zoological Society (FZS) and Population Health and Environment (PHE).



Location of the Bale Eco Region (BER) in Ethiopia

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1 Abstract

This study reviewed the status of the natural resources and driving forces for change, as well as past and ongoing approaches in natural resource management at the watershed scale in Ethiopia. First reviewed established environmental policy tools and the legal and policy framework, and indicated if innovative financing mechanisms are working in other areas with a similar context. It undertook stakeholder analysis and mapping to identify key stakeholders, and assessed their possible roles in the implementation of a sustainable financing mechanism for watershed rehabilitation. It also determined if opportunities exist for finance mechanisms involving hydropower, urban water supply in payment for ecosystem services (PES) and the global community in carbon development mechanism (CDM) in the context of the Bale Eco-Region. The study identified major constraints for designing appropriate financing mechanism. Finally, the study drew important conclusions and key policy implications that are relevant for Ethiopia and perhaps other areas in a similar context.

2 Introduction

Soil erosion, nutrient depletion, and deforestation are common environmental problems in the Ethiopian Highlands (Hagos et al., 1999; Desta et al., 2000; Awulachew et al., 2008), not least in the Bale Eco-Region (BER). Hurni et al., (2010) report evidence of high incidence of vegetation degradation in the past and the present. The Global Mechanism (2007) estimated that over 85% of the land in Ethiopia is moderately to very severely degraded.

The highlands of the BER are under strong anthropogenic pressure caused by fast population growth and consequent interrelated forms of land degradation mainly overgrazing, soil erosion, deforestation (IWMI 2016). FAO (1986) has reported rates of soil loss, in the range of 51–200 t ha⁻¹ yr⁻¹ in places in the Bale highlands.

The proximate drivers of land degradation, in Ethiopia in general and BER in particular, include forest clearance and soil surface exposure (high removal of vegetative cover); detrimental cultivation practices with emphasis on small-seed crops that require a fine tillage; and overgrazing (IWMI 2016). Due to land shortage and lack of alternative livelihoods, farmers cultivate lands and grow annual crops on slopes exceeding 30%. According to the latest Ethiopian Policy on Land (FDRE, 2005), slopes steeper than 30% should not normally be used for agricultural purposes, but rather allocated to natural vegetation or forestry. However, strong local land use directives with supporting land use maps are absent and meticulous implementation of the land policy is still missing.

Several factors including poverty, land fragmentation, tenure security, weak extension and lack of credit services, as well as high human and livestock population pressure act as driving forces for land degradation (Hagos et al., 1999). Pressure from human and livestock leads to huge removal of vegetation cover to meet increasing crop, grazing and fuel wood demand. Policies and strategies

relating to securing tenure rights, building the capacity of land users through access to extension services, and improving access to inputs, output and financial markets should be considered in order to incentivize sustainable land management (Gebreselassie et al., 2016).

One of the major efforts made to address land degradation, since the 1970's, is the implementation of soil and water conservation (SWC)¹ measures, both physical and biological measures, through mass mobilization campaigns, including incentive-based programs like the Productive Safety Net Programs (PSNP) and/or Food-for-Work (FFW). In the early 2000s, community-based integrated watershed development was introduced to promote watershed management as a means to achieve broader integrated natural resource management and livelihood improvement objectives within prevailing agro-ecological and socioeconomic environments (Gebregziabher, et al., 2016). However, many of the watershed management programs undertaken in Ethiopia in the past were ineffective in either triggering voluntary adoption of conservation practices among farmers or conserving the structures constructed (Tesfaye et al., 2014). The factors that contribute to the success of watershed management are multidimensional (for details see Gebregziabher, et al., 2016), and benefits require a long-time to materialize. But farmers' focus more on short-term gains than the long-term investment in land and water management (Gebreselassie et al., 2009).

The on-site effect of soil erosion is the removal of essential plant nutrients with the sediments (Lal, 1998) with an attendant loss in land productivity and subsequent farmers' income. Based on data from selected watersheds in the Blue Nile Basin, Erkossa et al. (2015) estimated the on-site financial

¹ Studies by Gebremedhin et al., (1999) show the benefit of these measures on crop productivity and profitability and another study by Kassie et al., (2008) indicated that the performance of stone bunds varies by agro-ecology type, suggesting the need for designing and implementing appropriate site-specific technologies.

costs to be equivalent to over half of farmers' average annual income. Reliable country level estimates are lacking.

Off-site impacts of land degradation include enhanced productivity downstream, sedimentation of water ways and reservoirs, deterioration of water quality and increasing risk of flooding with adverse effects on properties and human life and health. Sediment generated from the highlands shortens the lifespan of reservoirs, thereby, reducing irrigation land and hydropower generation capacity. For instance, Haregeweyn et al. (2006) reported that reservoirs in the northern part of Ethiopia lost 0.18-4% of their total capacity per year due to sedimentation. Extreme sedimentation has reduced water availability from the Angereb reservoir thereby undermining the water supply to Gondar Town, in the Lake Tana sub-basin, after only half of the design life of the reservoir (Haregeweyn et al., 2012). The storage capacity of the Rosaries Reservoir on the Blue Nile in neighboring Sudan, has reduced by nearly 40% over a period of 30 years as a result of sedimentation (Bashar and Khalifa, 2009).

Within a given watershed there are land holdings under individual (private) use rights and there is land which is collectively owned (so called *common property resources*). A study by Awulachew et al., (2008) in Blue Nile reported that about 66% of eroded soil emanate from non-cultivated land. However, another study, indicated that sediment mobilization from rain-fed agricultural fields has been noted as being one of the main contributors to land degradation, with average sediment concentration up to 45 kg m⁻³ in Ethiopia's highlands where rainfed agriculture dominates the land use (Guzman et al 2013). In recent years, low-cost land certification has increased tenure security and enhanced conservation investment because farmers have incentives to conserve land under (not fully) private use (Holden et al, 2009; Hagos, 2012). Designing compatible incentives for users of land under collective ownership land holdings is not straight forward and requires innovative financing mechanisms. .This is major gap in available literature: identifying options for financial mechanisms for sustainable watershed management in Ethiopia. The focus of this study was exploring financing

mechanism for undertaking watershed management to minimize sedimentation of reservoirs used for both hydropower and urban water supply and promoting better forest management as carbon sinks to reduce greenhouse gasses (GHG).

The main objective of the study was to explore sustainable financing mechanisms for participatory natural resources management in the Bale Eco-Region (BER). The research questions addressed in this study were the following:

1. How well have past and present financing mechanisms worked and what can be improved?
2. What innovative and sustainable finance mechanisms 'are working' in other areas with a similar context?
3. What opportunities exist for piloting PES in the context of BER?
4. What policy framework is needed to enable these finance mechanisms to be effectively tested (and implemented)?

The organization of this paper is as follows. Following the introduction of the problem in section one, section two presents a description of the study site and study approaches. Section three presents an overview of the policy framework in Ethiopia followed by presentation of the legal and institutional context in section four. Section five presents stakeholder analysis and mapping in the BER followed by an outline of global experiences in PES and carbon offset schemes respectively in sections six and seven. Section eight presents suggestions on a finance mechanism for the BER. The final part (section nine) draws conclusion and policy implications.

3 Description of study site and study approaches

The BER is located in Bale and West Arsi Zones of Oromia Region, south eastern Ethiopia. The BER consists of sixteen districts (locally called *woredas*²) and some 980,000 people live within the area, which hosts an estimated 500,000 ha of natural forest (Farm Africa and SOS Sahel, 2013). The BER is the major source of water related ecosystem services (ES) that benefit about 12 million population in Ethiopia in downstream areas in Somalia and Kenya.

The BER covers a total land area of 38,036 km², geographically, the BER lies within the coordinates of 38N5118.21 Longitude and E5.332.5 Latitude, to 41N.233.9 Longitude and 5.2339 Latitude. The BER consists of three distinct traditional agro-ecological zones; namely, highlands, midland and lowlands (see Fig. 1). The altitude range of these agro-ecologies is as follows: highland is above 2300 m.as.l. (Including cool climate locally called *Wurch* exceeding 3200 m.a.s.l.), midland ranges between 1500-2300 m.a.s.l. and lowland is below 1500 m.a.s.l. (Chamberlin and Schmidt, 2011).

² Second lowest administrative unit, next to kebele or peasant association, in Ethiopia.

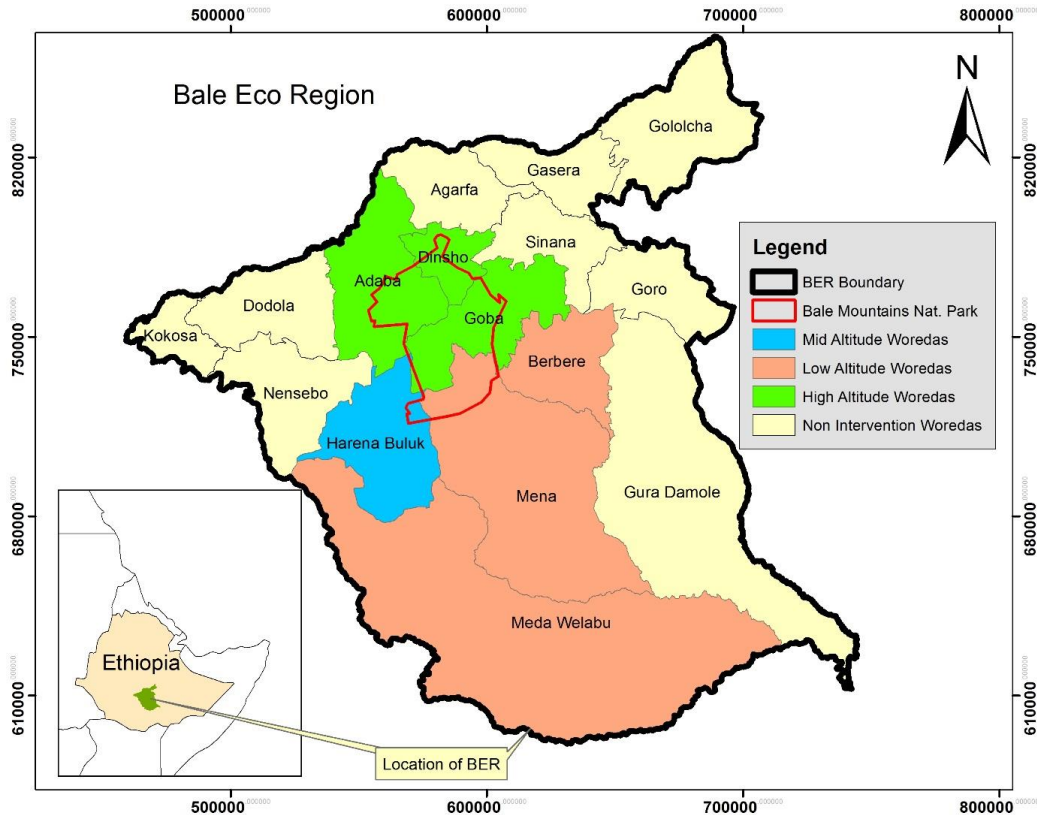


Figure 1. Location of the Bale Eco-Region in Ethiopia, Woreda and altitude

Source: Farm Africa unpublished.

The BER is a source of two rivers (Genale and Wabi Shebele), which are main source of water, hydropower, irrigation and other ES to upstream and downstream areas, which has important implications on people’s livelihoods.

In the highland and midland districts of the BER, mixed crop-livestock farming system and lowland agro-pastoralism are dominant source of livelihoods. From a recent survey by Wennie consult (2015) 45.7% and 47.5% of the households practiced mixed farming and agro-pastoralism respectively. Due to increasing population and livestock pressure, converting forest land into agricultural land, overgrazing and migration of livestock from the lowland to the highland and midland aggravates

reduction in vegetable cover and soil erosion. Activities such as deforestation, conversion forest land to crop land, overgrazing, natural factors (like fire), unsustainable harvesting of fuel wood and timber and non-timber forest products (NTFP), unplanned and unrestricted settlement, lack of land use management plan and control of resource use are the major threat to BER (Wennie Consult, 2015). The major source of livelihood in the lowland areas of the BER being livestock production, shortage of feed and water are reported to be very critical in these areas. Due to overgrazing and high run-off (because of high forest clearance in the high and midland areas of the region), flooding and soil erosion has become very serious. Increasing soil erosion in the BER reduces crop and livestock productivity, and thereby, exacerbating household food insecurity and poverty. More severe flood events have been reported particularly in the lower sections of the Wabe Shebelle basin causing major emergency situation (IWMI, 2016). Another consequence of high soil erosion could be high siltation rates in water bodies and reservoirs causing reduction of water infrastructure functions (Wolancho, 2012; Guzman et al 2013).

Various measures are promoted by government organizations and NGOs, primarily through mass mobilization and FFW programs, to minimize the effect of these land degradation problems. A recent study by Kefale (2016) in Harena Buluk district of the BER, comprising midland and lowland kebeles, reported that 93 percent of the respondents participated on-going interventions in NRM (physical and biological SWC measures, reforestation/afforestation, exclosure, etc), potable water supply, road development, and expanding electricity services. The same study reported that 17.5 percent of the households in the midland practice on their private farm physical SWC measures like soil/stone bunds, terraces, and cut-off drain, 10 percent practiced biological (tree planting, agro-forestry and grass planting), while the remaining 53.5 percent respondents practiced both. 76 percent of respondents claimed that reforestation/afforestation was practiced in their area and 34 and 42

percent of respondents respectively suggested that reforestation took place using single species and diverse species. In the lowland, 88 percent of the respondents indicated that area enclosures are practiced, only 47 percent of respondents confirmed area enclosures being practiced with enrichment, planting such trees as *Moringa Oliefera*, Nim tree (*Melia Azedarach L.*), Wachu (*Acacia seyal Del.*), etc. The same study indicated that 98% of the households, in both mid- and lowland, still think NRM interventions are necessary to conserve ecosystems services in BER.

The BER holds enormous potential for development in a number of sectors. In the area of food security, a high potential exists for agricultural intensification and expansion. In the BER there is also a large potential to promote and expand tourist attractions in which local communities can be involved. Promoting non-timber forest products such as honey production, forest coffee do provide another opportunities for the local population. Moreover, conserving water and forest resources in the region will enhance water-related ES that could benefit both upstream and downstream population, and this is closely linked to benefit and cost sharing between the two groups. Thus, exploring alternative financing mechanisms are for sustainable rehabilitation of the watershed is important in BER.

The study was mainly qualitative focusing on literature review and analysis of secondary data from the Ministry of Water Irrigation and Energy (MoWIE), stakeholder analysis and mapping and in depth key informant interviews (KII) with experts previously and currently involved in watershed management or broadly in natural resource management (NRM).

4 Overview of environmental policy instruments

Sterner (2003), Kerr et al. (2007) and OECD (2007) outline the environmental policy instruments (EPI's) and their features that are applied to address different environmental problems. Table 1 outlines the essential elements of EPIs that are particularly emphasized in the various national policy documents such as Environment Policy (FDRE, 2002a; 2002b), Land Use and Land Administration (FDRE, 2005), Integrated Watershed Guideline (Desta et al., 2005), and Water Resources Management Policy and regulation (FDRE, 1999; FDRE, 2002; FDRE, 2005c). OECD (2007) indicates the reasons why instrument mixes are important in effectively addressing specific environmental problems is because many environmental problems are of a multi-aspect nature and if properly designed and implemented different instruments can complement each other.

A study which examined the type of EPIs chosen to address major land, water, and environmental pollution issues, and their effectiveness in addressing major environmental problems in Ethiopia, concluded that all emphasized the traditional strategy of command and control rather than the use of economic or market-based instruments (Hagos et al., 2011). The emphasis in the policy documents is on collective action and management of watershed. This focus on command and control instruments is a major challenge in suggesting sustainable financing mechanisms for integrated watershed management. Only the green growth strategy of Ethiopia (FDRE, 2012), which aims to foster development and sustainability while limiting GHG emissions, indicates that incentives, without listing the types, are important for conservation, including watersheds.

Table 1. Main policy instruments in environmental (land and water) management

Policy instruments	Description	Challenges	Environmental issues
Information and education	Labels, awareness creation and education	Labels and capacity building measures	Energy efficiency, SWC
Direct regulations/standards	Set regulations based on environmental standrads	Regular M & E	Environmental pollution

Economic instruments: Subsidies/Taxes Charges, and Penalties	Optimize farm input use, pollution tax pollutant technologies and subsidies for adoption of clean technologies or undertaking clearance	Market conditions, elasticity of demand of policy instruments	Farm inputs, energy (carbon) tax, waste collection, forest mgt
Economic instruments: tradable permits	Emission permit, marketable mechanism of transfer of costs and benefits	Baseline data – forest	PES, carbon trading (e.g. REDD ⁺)
Patenting & Certification (property rights)	Defining property rights of resources, innovation	Costly	R&D, Cadastral (low cost) land registration and certification, innovation
Public programs (PSNP, FFW, CFW/Free labor contribution, etc.)	Mobilizing People to annual SWC	Not sustainable	Conservation of cultivable land, Watershed management

Source: Adopted from Awulachew et al., 2012, slightly modified by the authors.

This study gave special attention to economic instruments, mainly payment for ecosystem services (PES) and global market mechanisms. These instruments are potentially the most relevant and sustainable financing mechanisms, since incentives are given for upstream stewards to maintain upstream ecosystems through effective land management, which will generate benefits for people and ecosystems downstream (Greiber, 2009) or the global community at large. PES are innovative, direct and promising compensation mechanisms; creating appropriate economic incentives that enable the transfer of financial resources from the beneficiaries of ES to those who provide them (FAO, 2014). The compensation is generated by downstream users or the society as a whole. PES could be an appropriate tool to internalize externalities, both positive and negative. Externalities are internalized if individuals are made accountable for the effect of their actions on others. Imposing costs on others requires compensating them, and providing benefits for others requires being compensated for them (Sterner, 2003; Kerr et al., 2007). More description of the mechanism of PES, the global experiences, and carbon mechanism are given below.

5 Legal and institutional context

A PES scheme can only work with good governance in place, comprising an effective political, legislative as well as institutional system. PES may work either in a country (Greiber, 2009) or transeboundary context (Tesfaye and Brouwer, 2016). Greiber (2009) emphasizes the importance of the legislative and institutional requirements for effective and efficient implementation of PES schemes.

What makes a PES successful is that in any payment arrangement those who pay are aware that they are paying for an ES that is valuable to them or to their constituencies – and those who receive the payments engage in meaningful and measurable activities to secure the sustainable supply of the ES in question (Greiber, 2009). In terms of legal framework, PES schemes could be private (self-organized) or it could be a trading schemes (private-public scheme) or public (government driven). Hence, the legal personality of the parties involved in the PES deal, the objective behind the use of PES as an instrument, as well as the scale at which the PES scheme is established has to be well formulated and established in law (Greiber, 2009).

Relevant to Ethiopia and/or the BER is private-public partnerships and public PES scheme (see Table 2 for details). Experiences in the BER show that so far schemes have mostly evolved on an ad-hoc basis due to initiatives by NGOs and overseas development corporations, which brought together different parties. One example is a project, initiated by two NGOs Farm Africa SOS Sahel, engaged in reducing emissions from deforestation and forest degradation and enhancement of carbon stocks (called REDD+) to protect forests in the BER. Such schemes can be highly fragmented and mainly limited to the local scale.

Greiber (2009) indicated the importance of legal framework that regulates PES in a comprehensive and coherent way, and this increases the real potential of PES as an innovative instrument that might be applied more often, more efficiently and at a larger scale to combat prevailing land and water problems. A clear and coherent legal framework will ensure that good governance is taken seriously in public PES schemes (Greiber, 2009). This is entirely appropriate, since a public entity participating as a purchaser or seller of ES either invests public funds or uses public goods (land or natural resources held by the public authorities as custodian) (Greiber, 2009). PES related legislation is a means to create legal certainty and consequently trust among the parties. An appropriate legislative framework which regulates public PES schemes has the potential to stimulate the development of trustworthy markets and to ensure good governance (Greiber, 2009).

Table 2. Types of PES schemes and related legal frameworks

Type of PES scheme	Need for legal frameworks	Importance of legal frameworks
Private PES scheme	Medium to low	Promote a nested approach Upscale from local to regional/national level
Private-public partnership	High	Create trading scheme involving the private with partnership with the public Regulate complexity of trading system 'Control' the market
Public PES scheme	High	Promote PES development Create legal certainty Ensure good governance

Source: Adopted from Greiber (2009).

The adoption of specific laws related to PES has advantages and disadvantages. It can draw the attention of the government as well as the public to the institutionalization of PES as a policy instrument to ensure the future provision of water-related ES. However, establishing a specific law on PES has a danger of fragmenting or complicating the existing environmental legal framework. Hence, if PES is regulated in a specific PES law, attention must be paid to its integration in the existing legal and institutional frameworks, in particular those laws that regulate the different ecosystems (Greiber, 2009).

World Bank (2008) indicates that the following organizations could be involved in PES: (a) public institutions responsible for environmental management, (b) community-based organizations and NGOs involved in the management of natural resources, and (c) public/private financial institutions providing resources for the improvement of natural resources management. The institutional framework should be inclusive, with broad engagement of local communities in the design and implementation of the plan.

Moreover, the legal framework for the implementation of a PES instrument should clarify land and resource tenure, provide specific rules and transaction mechanisms, and determine compliance and enforcement mechanisms. These requirements include (a) the rights over the resources in terms of ownership and access to the resources, (b) the payment of fees, and (c) the use and sharing of benefits among the stakeholders (Greiber, 2009).

A review of policy and legal frameworks in Mekong and Volta Basin is given by de Silva (2014) where ES is expressly recognized, incorporated into policy and regulatory frameworks, and put into practice. According to de Silva (2014) the legal and policy framework in the Volta countries, practices are extensively and explicitly dealt with, though their strategic importance especially with respect to supporting human well-being remains largely unrealized.

6 Results from the key informant interviews and group discussions

Major stakeholders in the BER are bureaus of Agriculture (BoA) , Land Use and Land Administration (LULA), Oromia Institute of Agricultural Research (OIAR), Hydropower Operators in the Wabe Shebele and Genale Basin, Urban Water Supply Authorities, the local communities, Oromia Forest and Wildlife Enterprise (OFWE), and NGOs. Key informant interviews were conducted at the Melka Wakana Hydropower Plant, potential buyer, West Arsi (Adaba District) and Bale Zone's BoA, LULA, as potential intermediaries, Goba Urban Water Supply Authority, potential buyer, and OFWE, potential intermediary.

Group interviews were carried out with members of the Weshu Watershed Committee, representative of potential seller. Weshu micro watershed is part of Malka Wakana catchment (because of lack of GIS layers with catchments it was not possible to show it in Figure 1). The interview aimed to understand the severity of ecosystem problems in BER, all the past and current watershed interventions, identify the roles of the important stakeholders in the eco-region, and to find out whether the existing land and water policies adequately addressed incentives of the local community and whether market policy instruments, like PES, have good prospects of being institutionalized in the BER.

6.1 Potential intermediaries in West Arsi Zone

The major ecosystem-related problems in the BER are: soil erosion, deforestation, and water shortage causing recurrent food insecurity. The proximate causes of these ecosystem problems are lack of awareness of the local population about the use of natural resources and consequences of ecosystem degradation, lack of material, finance, and technical expertise to undertake required NRM measures. The absence of incentives is the underlying factor for not making conservation efforts in a

sustainable manner. Current policy measures to ensure that the local population undertakes NRM measures are focused on mass mobilization, experience sharing and awareness creation.

There are on-going watershed management interventions in eight kebeles³ in Adaba District (indicated on Figure 1). These interventions focus on area closure, physical and biological SWC, and reforestation/afforestation. However, data are missing on areas of reforestation and exposures, and what specific SWC measures are being implemented and the status and impact these measures on the ecosystem. The specific measures were implemented through mass mobilization, training of experts - development agents (DAs) and support farmers, and providing seedlings to farmers.

The interviewees reported that the District BoA works closely with district office of LULA and OFWE.

There is also support from Farm Africa, SOS Sahel and Frankfurter Zoological Society (FZS).

The challenges of watershed management in the area could be addressed if the ecosystem problems are clearly identified, attitudes of farmers towards the benefit of watershed management are changed, physical and biological SWC measures were taken, farmers are trained on how to sustain forests, incentives are provided for the community (compensating farmers) through Food-for-Work (FFW), and rules and regulations of OFWE are changed, etc. The roles and responsibilities of OFWE is given below.

Interviews with staff from the Adaba district office of LULA revealed that the role of their office is to identify the major problems in the district, recommend interventions, develop land use maps of selected watersheds, conduct monitoring and evaluation (M&E) of the interventions, and provide feedback to the implementer, the district Bureau of Agriculture.

The main ecosystem problems in the BER region are deforestation, soil erosion and soil acidity in the highlands, soil erosion in the midland, and soil erosion in the lowlands. According to the District office

³ Kebele is the lowest administrative unit next to district in Ethiopia.

of LULA, the main causes of deforestation is agricultural expansion because of population pressure. The office indicated that there are ongoing interventions such as SWC and reforestation/afforestation by participatory forest management (PFM) to address these problems through community mass mobilization. REDD+ project, being responsible with reforestation and better forest management, is implemented in three kebeles in the District. They indicated that there are watershed technical teams both at the District and Kebele level. These teams are composed of staff from LULA, BOA, Pastoral and livestock Bureau, Cooperatives, and OIAR. The main responsibilities of these technical teams is creating awareness, providing technical support, M & E of the activities and assessment of their impact. However, this research team couldn't find data on the interventions taken in the past and their impacts, although it was mentioned that around 80% of the seedlings planted survived in enclosed areas, contrary 20 % or low survival rate in non-enclosed areas.

To improve the quality and quantity of the aforementioned interventions, staff from the District office LULA suggested improving community's awareness on the importance of watershed management, changing current land use management, giving training to agricultural experts and some members of the community, compensating farmers by means of FFW, expanding infrastructure, like roads and social facilities like schools and medical centers, among others. Provision of technical equipment to both agricultural experts (such as laptop, GPS, etc), provision of financial support, and involving farmers in training are important to enhance the success of the interventions. Finally, LULA understands that providing incentives to farmers in the form of FFW (since many people in the area are food insecure) and by expanding infrastructure could sustain watershed interventions.

6.2 Potential intermediaries in Bale zone

Likewise in Bale zone (indicated on Figure 1) the main ecosystem problems reported are deforestation – caused by agricultural expansion and Illegal settlement in the forest area by those coming from

other areas (from Harar, Sidama, etc), growing cash crops in the forest area and overgrazing especially in the lowland area.

To reduce problems in the ecoregion the following interventions were implemented: reforestation and afforestation, prohibiting people from cutting existing forest, SWC (both physical and biological measures mentioned above) in degraded areas, area enclosures and range management especially in the lowland areas. Area enclosures are reported to be most successful in rehabilitating the environment and supply feed resources for livestock. Support was given through training and awareness creation on the importance of area enclosure to extension experts and segment of the local population.

The major issues reported in Bale zone in relation to watershed management is that the BOA, LULA and OFWE do not work together. The collaboration between BOA and LULA exists only in theory; the land use office focuses on distributing land certificates to users. Both offices have just started working jointly in delineating watershed and preparing their maps, including enclosed areas, etc. probably fostering the effectiveness working together in future. Forest fire protection and management is entirely the responsibility of BoA. Moreover, OFWE provided seeds for seedling development.

Lack of incentives to the local community to sustainably rehabilitate watershed is a major challenge. Free grazing and destruction of SWC by livestock structures is a critical challenge in the region. There is also conflict of interest on sharing benefits in the area enclosures between members of communities.

To improve the quality and quantity of interventions in the area, the following recommendations were made: support the physical measures by biological measures, starting from regional office, the government should give attention to watershed management, creating awareness, protection of the

existing forest from the risk of fires, illegal settlement, encroachment, provision of training and material support for community participating in watershed management, and strengthening community based organization such as forest dwellers association to protect illegal settlement in the forest area.

Future interventions are planned in the areas of: SWC and gully rehabilitation, strengthening forest guarding through training and material support, training of PFM on leadership and financial management, legal settlement, forest fire management and promoting fruit and fodder trees.

6.3 Group discussion with potential sellers and stakeholder analysis in the BER

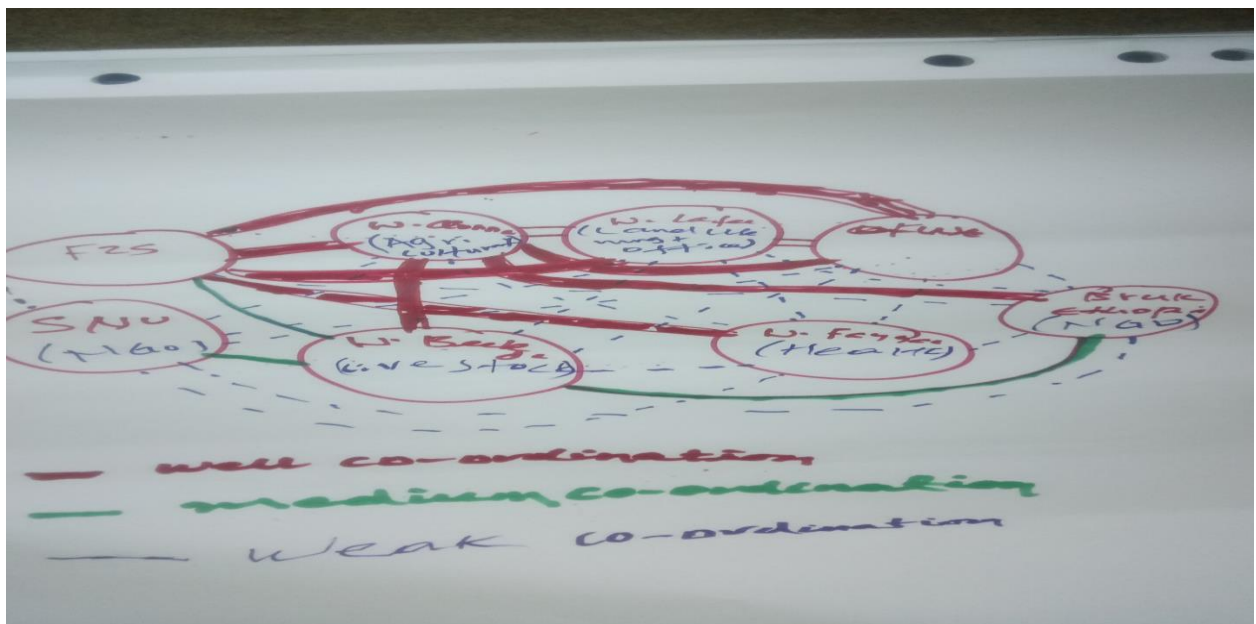
The interviews were followed by focus group discussions in Weshu Kebele. In this Kebele a watershed committee was established in 2015 after training in Participatory Watershed Management (PWSM) by the Water and Land Resource Center (WLRC), Farm Africa and IWMI as part of the SHARE project in 23 Nov. - 4 Dec. 2015. In the focus group discussion seven Weshu watershed committee members participated, three women and four men. We asked how the committee was organized. According to the focus groups, the committee was selected by the community and took training. The total number of weshu kebele watershed committee is fourteen (including ten men and four women). The main responsibilities of the committee are:

1. Creating awareness to the community on the importance of participating in watershed rehabilitation,
2. Identifying peoples who participated and do not participate in the watershed program,
3. Protecting forest from cutting,
4. Reporting on the work done to the concerned bodies, and
5. Planning and monitoring watershed management works.

Members of the committee indicated erosion and deforestation as the main features of ecosystem degradation in their Kebele. Productivity of land is reported to be very low due to high soil erosion in the area. They also added that due to recent instability in the area deforestation is increasing (people are cutting forest illegally). They reported that in order to reduce problems in the area there are ongoing interventions such as SWC and reforestation/afforestation though community mass mobilization, even if it is perceived to be insufficient. The focus groups reported that the impact of those interventions is high after current Weshu watershed management committee was organized, however, there is no tangible evidence on the ground to substantiate that report. Nonetheless, it is good start for watershed management in the catchment.

Moreover, the group suggested the quality and quantity of watershed management could be improved if all institutions work together, incentives are provided, awareness and training programs are offered for the watershed committee, etc. In Figure 2, the group showed the size, importance and interrelations of institutions and organizations providing services in the area by Venn and flow diagram.

Figure 2. Stakeholder involvement in Weshu watershed



Accordingly, BOA, LULA, OFWE, Office of livestock, Office of health and NGOs like FZS and Bruk Ethiopia have a stronger link, all working on watershed management and agricultural development. FZS, SNO, Bruk Ethiopia, Office of livestock and Office of health have weak link among each other. Other relevant institutions were not mentioned, like Oromia Agricultural Research Institute, EEP and Urban Water supply Authorities as they are appraised to have little role in watershed management.

6.4 Discussion in Malka Wakena hydropower station - potential buyer

The MOWIE has an institutional structure which integrates the areas of water and sanitation, irrigation development, basin management and electricity. This is a good institutional basis for promoting PES as financial mechanism for sustainable watershed management, considering Ethiopian Electric Power (EEP) and urban water supply agency as potential buyers. But the integration is more structural than functional, as we shall see below.

Discussion with EEP operation and maintenance head, in the central office, on EEP's scope and role in watershed management, indicated that EEP generates and sells power to consumers, mainly from hydropower plants but does not theoretically own the dams it uses to generate energy. The dams are owned by MOWIE who is responsible for their safety. MOWIE, which collects data related to inflow including sediment load, is responsible for maintaining the health of the dams. However, watershed management in particular and NRM in general is the responsibility of Ministry of Agriculture and Natural Resources (MOANR) (FDRE, 2005b). Although EEP could be keen to be involved in a PES scheme, MOANR being responsible for undertaking watershed rehabilitation and MOWIE for dam safety could pose a problem of EEP's involvement in such PES scheme.

In the Malka Wakena scheme, we conducted a key informant interview with Melka Wakena hydro dam plant manager engineer and his Deputy. The Malka (also spelt as Melka) Wakana hydropower plant, which is located at the upper part of the Wabi Shebelle river basin of Ethiopia, is a single purpose scheme (Bosona and Gebresenbet, 2010). Although the hydropower potential of the basin is estimated at 5,400 GWH/year, the Melka Wakana scheme is the only existing hydropower plant under operation in the river basin (Bosona and Gebresenbet, 2010). This hydropower plant was commissioned in the year 1988 to produce 153 MW of electric power. The plant has four units of 38.25 MW, designed to produce annual firm energy of 434 GWh and annual average energy of 543 GWH. Power generated from the dam is mainly determined by the water level of the reservoir. The dam continues to generate power until the water level is 2,520 meters. However, according to some sources, the power plant still produces about 12% below its design capacity (Bosona and Gebresenbet, 2010).

The total reservoir capacity of the dam is 765,106 m³ with a live storage capacity of 500,106 m³ (IEG, 1973). The design life of the Malka Wakana hydro dam is 50 years. Currently, the dam has been operational for 30 years. The Malka Wakana watershed has a catchment area of 5,300 km² with 5 tributaries flowing into the dam. The sediment load entering the dam and its effect on the dam life is not known (in section 7.1 a quantification of sediment load based on secondary data is presented). In terms of design, a bottom structure is in place to flush sediments accumulated. However the outlet has never been opened out of fear of that it would not close again. There are concerns now for more sediments, sourced from the buffer zone, zone set up to protect the dam, entering the dam as more households are settling and cultivating the area. Farmers demand land compensation from the government. As it is known, land in Ethiopia is not privately owned. The government can confiscate land under use by farmers when that land is needed for developing infrastructure with or without adequate compensation. The development of Malka Wakana was done in this fashion Discussions are

right now ongoing to explore if land could be acquired from a neighboring state farm. Malka Wakana have started, by its own right, to address, partly, farmers' demands by providing electric power to social institutions like schools, clinics and mosques. During the discussion it was understood that sediments have little impact on the wear and tear of blades of turbines because mesh wire is used, below the dam and above the powerhouse, to filter water before it enters the turbines.

Nonetheless, the authorities in Malka Wakana understand the importance of watershed management in reducing the sediment inflow to the reservoir. To make this effort sustainable, a PES scheme could be designed in Malka Wakana watershed by involving all the relevant stakeholders, including EEP. The EEP is also operating another dam in the BER (Genale Dawa III) and could be a partner in exploring the viability of PES, since the reservoir may experience high siltation rates that are typical for most reservoirs in Ethiopia (Guzman et al 2013). High siltation rates may reduce life storage capacity and associated operational power generation capacity of the dam and revenues for EEP. Given this scenario, the EEP may be interested in initiatives in catchment conservation that would increase the financial returns in their dam operation. They argued that protecting dam from siltation is the responsibility of MOWIE and there are ongoing interventions by this ministry, by providing money to another close ministry, MOANR, responsible for watershed management. However, as far as EEP in general and Malka Wakana in particular are concerned, there is no budget to finance watershed programs. The power generation and operation department head has to forward this additional responsibility of EEP, which MOWIE and higher bodies would need to make decision on.

6.5 Discussion in Goba City of Water supply Authority - potential buyer

The main source of water supply for Goba town (indicated on Figure 1) is from the diversion of Togona River and stored in reservoirs. After water treatment (using sand filter system and chemicals) it is distributed to the community in the town which currently has an estimated population of 430,000.

The reservoir holds 2,000 m³ at a time, and daily 1,555 m³ water is delivered to consumers. An additional three deep wells have been dug to cater for the growing water demand of Goba town, according to the discussion with authority, while water supply from Togona river is becoming more unreliable due siltation caused by deforestation and climate change.

The Togona River emerges from the Togona watershed located in the Bale highlands. The Garbra Gurach Lake which lies at 6_520N, 39_490E; altitude at 3,950 masl occupies a glacial cirque at the head of the northeast-facing Togona valley, and is the source of Togona River (Kebede, 2013).

The head of water supply indicated that successful watershed management is very important for the improvement of water supply for the town. In the past, siltation was not a serious problem because the upper watershed feeding the Tagona River was well protected by forest. But “now siltation is becoming serious due to high deforestation in the upper Togona watershed”. To overcome the emerging problem of siltation of the reservoir and to maintain a stable and reliable flow of the Togona River, which is in turn is affected by climate change and variability, sustainable watershed rehabilitation is important. Besides increasing and stabilizing the water supply, maintaining or rehabilitating forest cover in the watershed reduces the cost of water treatment (Stolton and Dudley, 2008; TNC, 2015). The Goba town water supply authority, hence may contribute to watershed rehabilitation in the Togona watershed by being potential buyer in PES scheme. This may require overcoming the institutional hurdles described below.

6.6 Discussion with Oromia Forest and Wildlife Enterprise (OFWE)

A summary of findings of key informant interviews carried out with staff from Oromia Forest and Wildlife Enterprise (OFWE), Bale branch, is provided in this section.

According to OFWE, the BER has 450,000 hectares of forest excluding woodland. OFWE was established to conserve forests in the region. It is managed by the board and has nine branches. The main activities of OFWE are aimed at conserving forest for next generation, including: teaching how

community use forest (how community live with forest), engaging in reforestation/afforestation programs and enrich plantation, and distributing seedlings to the community. Moreover, OFWE supports the local community in organizing and empowering community based organizations (CBOs). Finally, OFWE protects the cutting of forest and combats illegal settlement in the forest.

OFWE is an independent organization. There is no budget provided by government for the enterprise. The source of finance for the enterprise is through harvesting timber and hunting old wildlife species. They also harvest exotic species and replace it with local plant varieties.

The major ecosystem problems in the BER, according to OFWE, are agricultural expansion due to population growth, illegal settlement in forest by people coming from Harar, Sidama, and from other Districts within the BER, and increasing forest clearance and soil erosion due to, partly, limited awareness of people on how to live with forest. OFWE closely works with community through participatory forest management (PFM), a kind of local forest management group, to conserve forest in the ecoregion. PFM (also called community-based forest management (CBFM) are expected to create the appropriate incentives and behavioral change required for appropriate forest management. Forest area is demarcated and enforcement measures are devised to punish people who cut forest in demarcated areas. CBFM aim of prohibiting people from cutting forest and settling illegally in the demarcated forest area. OFWE provide seedlings for communities in reforestation/afforestation programs to enrich plantation in the ecoregion. OFWE closely works with community, with government organizations, with NGOs such as Farm Arica and a project engaged in reducing emissions from deforestation and forest degradation and enhancement of carbon stocks (called REDD+). REDD+ is a mechanism being developed by parties of the United Nations Framework Convention on Climate Change (UNFCCC) which seeks to reward developing countries for reducing emissions from deforestation and forest degradation through better management of forest areas.

Reducing emissions from deforestation and forest degradation and enhancement of carbon stocks (REDD+) projects are also expected to deliver significant co-benefits, such as improved hydrological functioning, support for forest-dependent livelihoods, and the control of soil erosion. This is usually done through reforestation measures and improved forest management.

The role of REDD+ in watershed management is training of farmers, improving benefits from forests (honey, coffee, etc), support farmers in credit availability, promote multipurpose trees/crops, strengthen initiative in introducing fodder trees (in Dinsho and Chamo watersheds), scale up experiences by PFM in selected watersheds and water harvesting in the lowlands to minimize outmigration of livestock to the forest area.

To protect natural resources in a sustainable manner in the area, OFWE sees a number of activities that can work well. Implementing projects such as REDD+ (especially in the forest area), promoting non-timber forest products such as honey production, forest coffee, facilitating credit service for farmers, strengthening and empowering forest dwellers association, expanding water harvesting technology, especially in the lowland area, increasing productivity through use of modern technology and working with stakeholders such as Mada Welabu University and REDD+ are some of the activities that need to be strengthened.

7 Global Experiences in PES

From a watershed perspective, various forms of land degradation have, as indicated in section 1, onsite and offsite effects. To minimize those effects and promote water-based ES, it is critical to undertake sustainable watershed rehabilitation measures, which may need some financing mechanism like PES. Through these mechanism, benefits of the rehabilitation measures, as positive externalities, to service users (e.g. hydropower plant or water supply authority) are generated. PES aims at internalizing these benefits and channel it to the service providers (e.g. the upstream communities) as an incentive to pursue their watershed conservation practices sustainably.

Nowadays there are various global experiences in PES and climate financing projects which could provide useful lessons that help to understand what is important in designing new schemes.

According to Wunder (2005; 2015), the specific features of PES are:

- a. Transaction is voluntary and legally-binding,
- b. Ecosystem services and/or land use changes needed to deliver the intended services are well-defined/valued,
- c. Minimum of one service buyer/user,
- d. Minimum of one ecosystem service seller/provider, and
- e. Payments are conditional on continued provision of the ecosystem service by the seller/provider.

The scale of the project, how benefits will be measured, the stakeholders, the drivers, and the payment structure dictate the ways in which an effective payment scheme for water-related ES are structured (Greiber, 2009).

PES was successfully implemented in Latin America, Asia and there are some cases of PES (e.g. carbon market related and water fund in Nairobi (TNC, 2015) in Africa. Various examples of PES on water

related services in Latin America and Asia for improvement of hydrological services, protection of biodiversity, the landscape, carbon sequestration, and other reasons, have been documented (Porrás et al., 2013; Kauffman, 2014; Li et al. 2011). From the review of experiences of payment mechanisms, the system structure and scale of application are heterogonous. PES also requires enforcing the obligation of appropriate land use and grants incentives to ecological service providers to follow the conditions recommended and agreed upon. Below is a summary of PES experiences in Costa Rica, Ecuador (both Latin America) and China (Asia) which help us to draw important lessons to design PES scheme in BER, Ethiopia.

7.1 Key lessons from global experiences

These experiences could provide lessons for BER in designing finance mechanisms like PES by targeting the local community upstream and water infrastructure downstream and the main actors involved in drinking water and hydropower generation and through introduction of revised water and energy fees. Based on the successful PES experiences discussed, key requirements are summarized in Table 4.

PES could be initiated by the government (see Box 3), private sector (see Box 1) or other stakeholders (see Box 2) (see all in Annex 1). PES could be implement at micro-watershed or basin scale (Table 3). The interventions required to rehabilitate ES has to be clearly defined and the changes due the rehabilitation process monitored. All PES actors, suppliers, buyers and intermediaries clearly know their role and information flow between those actors are coordinated. Successful PES requires ensuring that what is required is achieved; service providers are required to make all the changes required. Maintaining and monitoring data is critical. Moreover, the availability of sufficient financial benefits to farmers and the distribution of these benefits are important to ensure that land users will gain from the benefits and have incentives to actively participate in the maintenance of the ES (Chamma and Asale, 2014; de Silva, 2014; Dirix et al., 2016.).

Table 3. Summary of requirements of workable PES

Scale of application	Information flow	Definition of the services	Clear role of actors	Conditionality
Micro-watershed, watershed, national or Basin	Coordinated	Interventions and targets clearly defined and monitored	Clear definition of role: Seller, Buyer and intermediaries	Technical capacity of service provider (or third party) and service user

Source: Summarized by the authors

7.2 Carbon offset schemes

Widespread concern about global climate change has led to an interest in reducing emissions of carbon dioxide (CO₂) and, under certain circumstances, in counting additional carbon absorbed in soils and vegetation as part of the emissions reductions (UN, 2015). One option for slowing the rise of GHG concentrations in the atmosphere, and thus possible climate change, is to increase the amount of carbon removed by and stored in forests (Gorte, 2009).

Carbon sequestration has been the focus of substantial controversy in international negotiations subsequent to the Kyoto Protocol⁴. Protecting forests in developing countries to earn credits has already started under the Kyoto Protocol. Mitigating climate change by enhancing forest carbon sequestration may be a relatively low-cost option and would likely yield other environmental benefits. However, forest carbon sequestration faces challenges, including difficulties in: measuring the additional carbon stored (over and above what would occur naturally); monitoring and verifying the results; and preventing leakage (Gorte, 2009). As trees and other woody plants become established, carbon stored on the site increases as woody biomass increases and as annual vegetation (e.g. tree leaves and herbaceous plants) typically grows faster than it decomposes (Gorte, 2009). Carbon

⁴ In the Kyoto Protocol developed nations agreed to specified reductions in emissions of greenhouse gases and initiated global carbon trading. The latest United Nations Framework Convention on Climate Change (UNFCCC) is signed in Paris 2016.

sequestration and release vary substantially by forest, nonetheless, some generalizations are possible (Gorte, 2009) (Table 4).

Table 4. Average Carbon Stocks for Various Biomes (in tons per acre)

Biome	Plants	Soil	Total
Tropical forests	54	55	109
Boreal forests	29	153	182
Croplands	1	36	37
Tropical savannas	13	52	65
Wetlands	19	287	306
Weighted Average ⁵	14	59	73

Source: Intergovernmental Panel on Climate Change (cited in Gorte, 2009).

There are experiences in Ethiopia, such as REDD+ (Watson 2013) and growing of wild forest coffee and wild honey in BER and forest-based PES in Humbo CDM project, which help us to draw lessons. Several challenges were reported in the experience in Humbo including: managing local community expectations as income generated by carbon sales was lower than expected; the CDM registration process taking a long time to complete; the project costs being beyond the means of the local community (and thereby requiring external assistance); as well as complications in the land tenure system and land fragmentation meaning that part of area had to be dropped thereby reducing the size of the forest and the emission reduction credits significantly (Chamma and Asale, 2014).

⁵ The table summaries for all forest cover in the world including temperate and tundra (Grote, 2009).

8 Suitable financing mechanism for the BER

8.1 Introducing PES in Malka Wakana watershed

Evidence on rates of soil erosion in the study area is relatively scarce, with most data generated in Northern Ethiopia and the Central Highlands (Haregeweyn et al., 2015). In relation to the effect of siltation on the dam, the management of Walka Wakana hydropower plant view that sediment from the upstream areas may not pose a major problem, although there is no supporting data on this. No quantified effect of siltation on power generation of the dam is currently available. There was no bathymetric survey to quantify the volume of the dam occupied by sediments.

We calculated soil erosion rates, as indicated in Table 5, based on the data from Wabe Shebelle Basin master Plan. The figures indicate that about 73,000 m³ per year of the dam is filled by sediments. This amounts to about 15 % of the live storage capacity. Assuming that the annual sediment load entering the dam remains the same throughout the dam's life span, it implies about 100 percent of live storage capacity is occupied by sediments by the end of 7th year life. According to this data, since Malka Wakana is found in its 30 year's life, its live storage capacity must have been fully silted up aggravating siltation of the whole reservoir. The estimated sediment load decreases the live storage capacity overtime, it may affect the dam's life and energy generating capacity (Darde, 2016). It is important to note that, this estimate doesn't account the degree of changes of erosion overtime, the effects of ongoing interventions, if any, in the watershed and the current effect of people's settlement and cultivation within the buffer zone.

Table 5. Mean annual suspended load sediment transport at selected sites in the Wabi Shebele Basin.

River	Location	Watershed area km ²	Annual suspended sediment transported (million ton)	Volume	Volume per unit area	Tonnes per km ²
				(S = 1.5)	(m ³ /km ²)	<i>calculated</i>
				(Million m ³)		
Wabi Shebele at Malka Wakana	Longitude, 39,4, Latitude, 7,2166,	4,388	0.11	0.073	17	25
Wabi Shebele at Hamero Hedad	Longitude, 42,28333, Latitude, 7,36666	63,644	8	5.33	83	126
Dakata at Hamero Hedad		15,188	5	3.33	220	329
Wabi Shebele at Gode		127,300	15	10	78	118
Wabi Shebele at Burkur		144,000	0.75	0.5	3	5
Fafen at Kebri Dahar		25,600	2.5	1.66	65	98

Source: MoWIE 2005

It is believed that watershed management is necessary to minimize the sediment inflow to the dam. This may entail designing watershed financing mechanism to ensure that watersheds are rehabilitated and protected in the future. This may require introducing a new price regime of energy per kwh to the consumer by accounting for the cost of watershed management. It is possible to imagine that energy consumers will be willing to pay for PES provided that the watershed intervention alleviates their problems, less siltation and reliable energy availability. Once that is done, creating a mechanism of resource transfer from EEP, to the umbrella ministry, MOWIE, then to MOANR or another intermediary agency, where the MOANR is responsible for NRM including watershed management. The latter, or a research organization, could be responsible for establishing the baseline and regularly monitoring the changes as a result of interventions planned to improve the ES, as necessary. Regular monitoring of the sediment load transported by all tributaries of Malka Wakana dam is also important. In this respect, establishing a sediment monitoring station at key points in the watershed is important.

8.2 REDD+ project and forest management

Forest resources degradation is severe in Ethiopia and recent figures (World Bank, 2015) indicated that forest cover reduced 28% from 167,350 km² in 2007 to 120,144 km² in 2012. In the BER, Ethiopia, average annual deforestation rate was estimated at 0.25%, based on remote sensing imagery (Farm Africa and SOS Sahel, 2008). More recent data show a reduction in forest area (forest, woodlands, Erica forest) of about 2.3% during 2010-2014 (IWMI, 2016). Ethiopia is ranked as the ten countries where wood removal is registered in 2011 (FAO, 2016).

Proposals were developed in Bale on reducing emissions from deforestation and forest degradation and enhancement of carbon stocks (REDD+) focusing on conservation, sustainable management, and forest enhancement activities. Voluntary carbon markets (VCM) are the main platform through which emission reductions from forestry are currently traded (Diaz et al. 2011). The environmental integrity of REDD+ requires the generation of real, permanent, and verifiable emission reductions (UNDP, 2009).

In the BER, the REDD+ project emerged from a participatory forest management project started in 2007 by two NGO's, Farm Africa and SOS Sahel Ethiopia. The participatory forest management project ended in 2012, with the REDD+ component of the project due to start in 2013. However, new REDD+ is designed covering 500,000 ha, surrounding the Bale National Park which is one of the 34 global biodiversity hotspots. It is expected to run for 20 years and, according to the project feasibility study, will secure an estimated 18 million tons of CO₂ emissions reductions along with wider co-benefits such as the protection of biodiversity and provision of support to livelihoods dependent on non-timber forest products (NTFP).

Some studies indicate that there were uncertainties on the amount of emission reduction because substantial uncertainty as a result of forest carbon stock estimates (Watson et al., 2013) affecting revenue estimates. This basically shows the importance of having reliable baseline data and properly monitor changes as a result of reforestation and improved management.

8.3 Introducing PES in Goba urban water supply

At the moment local people are involved in clearing up the silt from reservoirs, although data are not available on how many people are involved and how many times/year and, how many tons of silt is cleared up from the reservoir to quantify the costs of silt clearance. Moreover, besides general statement of water shortage, no data was available how many times a year and for what period is water not delivered.

To improve the quality of interventions the following points were raised during the interview. Watershed management through mass mobilization is very important; protecting forest from deforestation by the community; creating awareness of community about the impact of deforestation and proving incentives to the community for sustainable watershed management.

With regard to PES for urban water supply, there are experiences in the world (New York, Quito, Nairobi, etc.) where the catchment of the water source is treated sustainably through a PES scheme and the urban consumers are also contribute to the cost of watershed management through payment of increased water fees. We believe that PES could be applied in Goba town, because the idea could be attractive to consumers and the intervention will improve the quality and quantity of water. The challenge will be in identifying the source and quantifying the siltation load in the reservoir. In general, it requires an estimate of cost of intervention vs the benefits that would arise (i.e. return on investment). Monitoring the impact of the intervention is necessary because effective implementation of PES are dependent on the principle of conditionality. It is possible to imagine that

water consumers will be willing to pay for PES provided that the watershed intervention alleviates their problems, less siltation and limited water shortage. The head of the authority reiterated that the office will be active if PES is implemented. He indicated that the Goba Urban Water Supply Authority is accountable to the Regional Bureau Energy and Water, which is linked with MOWIE at the federal level. Those offices have to endorse the idea before the local authority would allocate any budget and incorporate costs into water bills for consumers. Unlike the experience in Upper Tana-Nairobi Water Fund (TNC, 2015), water fund is not a feasible option in BER because no industries/large farms are available to be involved in such a scheme underscoring the importance of finding PES buyer.

9 Major challenges in institutionalizing market financing mechanism in watershed management in the BER

Although NRM and watershed rehabilitation has been practiced in Ethiopia since the mid 1970's, there are limitations in the policy environment, implementation and control, lack of cross-sectoral collaborations and general gaps in capacities across government institutions responsible for the management of natural resources. The technical capacity of the interviewed experts is lacking. The availability of guidelines is important (e.g. Hurni et al., 2016) to ameliorate limitations of regional and district-level experts.

Financing mechanism for sustainable watershed management in the BER should go beyond agriculture. However, when issues of watershed management and financing mechanism is raised, the perspectives from the experts is limited to stakeholders from the agricultural sector. The stakeholder mapping basically underlines this perspective. This point is important in the light of thinking of introducing PES or participating in global climate finance schemes.

Another observation is the lack of data on bio-physical processes at the watershed level (soil erosion) and its impact on siltation rates in the reservoir. Data on deforestation rate, area deforested... The existing data are not adequate to support the sustainable rehabilitation of watershed though designing appropriate financing mechanisms that minimize the siltation of reservoirs or to involve in global climate finance. The existing data may not support the establishment of PES in the hydropower, water supply, carbon trading, etc. This could be partly addressed with some modelling using SWAT provided that some baseline data is available. Continuous monitoring of the offsite impact of land degradation on water bodies such as reservoirs siltation including the establishment of hydro-sediment monitoring stations at key river sites are a prerequisite for an information-based watershed

financing scheme. Moreover, incentives could mean lack of direct material rewards to participation, and wage in kind on FFW programs, however, it could go beyond direct material rewards, for instance establishing a well-defined and secure property system, not necessarily private holding and establishing infrastructure that could benefit the community as a whole. This could be important in the light of institutionalizing PES and participating in global climate financing schemes.

Scanning the institutional framework in Ethiopia underlines the importance of institutional reforms to support PES. The policy framework should stipulate the importance of incentives and market mechanisms for sustainable financing and organizational structures that are conducive for undertaking interventions for watershed rehabilitation. The Regulatory organ, the environment agency, now within the Ministry of Environment, Forest, and Climate Change (MoEFCC), has an important role to play in enforcing what is stipulated in the land and water (generally the environment) policy.

Establishing PES scheme in BER or elsewhere requires, addressing the institutional gaps just indicated, clearly define service providers and their roles, commitments and type and level of compensation, buyers role and contribution (payment) to PES and intermediaries role in data monitoring and fund management. Clear definition of the PES actors are crucial alongside establishing favourable policy and legal frame work for market mechanism in watershed management.

10 Conclusions and policy implications

Land degradation, taking forms of soil erosion, nutrient depletion and deforestation, has been a growing policy and academic concern in Ethiopia for the past five decades or so. Several research outputs were on developed on the subject of land degradation, most the literature focused on investigating factors for adoption of conservation measures (World Bank, 2007), impacts on crop yield (Kassie et al., 2008) and the impact of watershed intervention on the hydrology, vegetation and peoples' livelihoods (Gebregziabher, et al., 2016). Exploring alternative financing mechanism for sustainable watershed management and quantifying the onsite and offsite effects of land degradation, however, has been given little attention to date.

Past NRM and watershed management interventions were done using mass mobilization and FFW programs. Designing financing mechanism requires looking beyond these mechanisms and beyond just the agricultural sector (e.g. hydropower, urban water supply, climate financing, etc). If it is to be sustainable it requires the introduction of market mechanisms (such as water-based PES/forest-based PES) and the involvement of climate finance. However, institutionalizing these marketing mechanisms requires establishing the baseline data and evidence of changes (requiring regular monitoring) as a result of the interventions. Establishing hydrological and sediment monitoring stations in the main rivers feeding water reservoirs, sources of irrigation, hydropower, and water supply is, thus, critical. When looking into the existing policy framework, it seems that EPIs have largely focused on command and control mechanisms instead of incentives and market mechanisms in ensuring sustainable watershed management. This study does not discount the role of collective management in watershed rehabilitation. It is argument of this study that collective action is necessary but not a sufficient condition for sustainable watershed rehabilitation. New water and forest policies are recommended that make conversion of established forests into agricultural land punishable by law,

introduce the offer of payments for reforestation, protecting forest or managing existing forest, and conservation of land through required land use change. Involving the community through forest management platform (Robinson et al. 2013) is in the right direction but awarding formal land titles on forests to local communities can advance forest conservation (Blackman et al., 2017), providing additional incentives to local communities in the BER.

EEP uses water infrastructure to draw benefits (like producing and selling power) but it is not directly responsible for the safety of its dams. The MOWIE owns the water infrastructure and is responsible for its maintenance. However, the MOANR is responsible for NRM and watershed rehabilitation in the country, which are directly important for the safety of dams. Dam safety requirements and promotion of future PES schemes in selected watershed calls for fostering stronger partnership between MOWIE and MOANR. It is crucial to undertake the required institutional/policy changes to create a more conducive environment for successful implementation of a PES scheme in the BER.

Finally, MoEFCC could be an important stakeholder, together with MOWIE and MOANR, in water-based or forest-based PES scheme in Ethiopia. PES schemes can work in the long-run, provided that hydrological and sediment monitoring capacities are in place so that data provides the necessary evidence for (positive) changes due to land use change or watershed rehabilitation. Water related or forest-based PES may also require developing business model about the impacts of such investment on water quantity and quality, increase in energy generation and crop productivity on-site long-term investments in watershed conservation and management, and action plans which detail the key steps to be undertaken to move towards the next stages. Developing these action points and the steps to be taken that are necessary for water related or forest-based PES in the BER is thus important. Once

the action points are clearly defined and undertaken piloting PES in selected micro watershed is necessary. But Piloting PES in BER, as it stand now, is not possible.

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Annex 1**Box 1****Experiences in Costa Rica**

Costa Rica's PES program is one of the best known examples of its kind. The program was created in 1996, along with the initial governance structure allocating responsibilities and funding (Porrás et al., 2013). In the national Costa Rica's PES (PESA) program, forest owners are compensated for the following services: protection of water for rural, urban or hydroelectric use; mitigation of greenhouse gases; and protection of bio-diversity for conservation and landscape beauty for tourism.

PES have been predominantly financed by receiving 3.5 percent of revenues from a sales tax on fossil fuels (there are voluntary deals from private and semi-public companies and global funding from the world Bank through Global Environment Facility (GEF) and individual countries like Norway), but the objective is that all beneficiaries of environmental services eventually pay for the services they receive. The relevance of this example to Bale Eco-region, Ethiopia, is that the government's role in provision of seed money, whatever the source is, which is important to kick start selected schemes and gradually involve all relevant stakeholders.

There has been some success charging water users for upstream watershed management services, although there has been limited success charging for biodiversity and carbon (Porrás et al., 2013).

Outdated and ineffective laws and policies were changed, like the Forestry Law 7575 in 1996 Biodiversity 7788, Presidential Decree, which made conversion of established forests punishable by prison sentences and introduced the offer of payments for reforestation, protecting forest or managing existing forest in private properties outside national parks (Porrás et al., 2013). The Forestry Law also provided the institutional framework required to implement the PES, as well as the initial funds to kick-start the process. Promulgating new law in forest, land and water and establishing the required institutional framework could be necessary in the case of BER, also another important lesson from PESA.

Costa Rica's PES program acknowledges that owners of forests are entitled to apply for payments for the vital services that these ecosystems provide. A detailed framework defines these ecosystem services. The program is a mix of rules, regulations and rewards that invite stakeholders to respond to incentives and disincentives (Barton et al., 2013). This policy mix is a combination of policy instruments, which has evolved to influence the quantity and quality of biodiversity conservation and ecosystem service provision in public and private sectors. The legal underpinning establishes the structure by which the PES program secures funding, how it is managed, and who is eligible to participate. The National Forestry Fund (FONAFIFO) is the primary intermediary, another lesson for BER to identify organizations who could serve as intermediary, charged with administering the PES program. It signs legal contracts agreeing land use with forest owners, and monitors their compliance through local forestry technical facilitators (regentes forestales). In exchange for the payments, the landowners transfer the 'rights' of the ecosystem services to FONAFIFO, where they make up the wider portfolio of approved ecosystem service (ES) credits. FONAFIFO then sells some of these credits to its buyers.

The program has had concrete positive impacts since its inception on forest through protection, reforestation and agroforestry systems (TEEB 2009; Porrás et al., 2013). Looking forward, the program managers expect to increase its environmental effectiveness by defining and using 'priority criteria' for allocating payments, targeting the areas that most need protection and/or regeneration. Other challenges include managing trade-offs, attempts at using better indicators for monitoring ecosystem services (Porrás et al., 2013), another important lesson for BER and beyond in Ethiopia.

The experiences in Costa Rica show that PES evolves overtime as new requirements and challenges emerge. For examples see (Porrás et al., 2013).

Box 2

Experiences in Ecuador

The PES experience in Ecuador is relevant for Bale Eco-region because the problems are similar i.e. there is high deforestation as result of agricultural expansion but the use of a combination of government fund and innovative, voluntary and decentralized financing mechanism for watershed management, the financial security achieved there in, the introduction of drinking water fee, management of the water fund as trust could be good lesson for Ethiopia in designing PES. A brief description of the experience is given below.

Deforestation and burning of high Andean grassland (Paramo), to expand agriculture, and use of agro-chemicals were major ecological problems in Ecuador. The conservation and sustainable use of forests and Paramo in the upper areas is crucial to ensuring an adequate quantity and quality of water available to downstream users (Kauffman, 2014). This section summarizes the experiences in two pioneering models; namely, Pimampiro's payment for environmental services (called Pimampiro model) and Quito's water trust fund (FONAG).

Rather than turning to private markets or relying on the central government, in the Pimampiro model Ecuadorian community developed innovative, voluntary and decentralized mechanism for financing watershed management. This independence, contractual arrangement, sustainable revenue stream and long-term horizon provided a level of political and financial security present in the water trust fund model, in contrast to typical payment for environment services, where service users 'buy' these service from the 'providers', who enact land use practices to ensure that the services continue. In the FONAG model the principal government act as "buyer" of environmental services on behalf of the city's water users. In the Pimampiro model, the municipal government acts as "buyer" of watershed environmental services on behalf of the city's water users. The municipal Environment and Tourism Unit (UMAT) manages the program, which negotiates voluntary agreement with farmers in the catchment to conserve and sustainably manage the forest on their land in exchange for cash compensation. The payment for farmers is made through ordinance levy of 20 percent on drinking water fee.

On the other hand, in Quito's water trust fund, where it is one of Ecuador's water funds, is managed as trust by financial institutions that are independent, have several advantages as Kauffman (2014) indicated: 1) The trust managers invest the fund's assets i.e. money collected from watershed users, in financial markets and distribute the resulting interest income to service providers, money which could be used to finance a variety of watershed management and conservation activities specified in the contract, 2) decisions on how to use the interest income is made by fund's board of directors, 3) water trust funds are contractual arrangements that define the role of the stakeholders and how to use the money, 4) water trust funds do benefit from a wider variety of funding sources for watershed management activities, and 5) water trust funds have contracts which are of long time planning horizon, example 80 years in FONAG.

One of the achievements of the water trust fund is developing participatory institutions incorporating a greater number of stakeholders, involved in identifying needs to developing and implementing projects funded by the fund and monitoring and providing oversight. The details of the institutional arrangements and their modalities is given in Kauffman (2014).

Through the fund, more than 65,000 ha of watersheds are now under improved management. Upstream farmers receive support in watershed management activities, as opposed to cash payments. More than 1,800 people are estimated to be receiving increased economic benefits associated with watershed management and conservation. FONAG and its later developments in water trust fund has served to inspire the development of similar schemes elsewhere in Latin America and beyond. For example, in South Africa, where water forms one of the greatest constraints on development, a recently-launched initiative in the Maloti Drakensberg Mountains aims to implement a payments for watershed services program, with support from UNEP and the BASF Social Foundation (UNEP, 2010). This initiative will use payments from downstream users to support the restoration of dongas, and the improvement of grazing and veld fire management regimes in order to reduce sedimentation and increase the quality and quantity of water flows. In so doing, employment generated the productive potential of agricultural activities increased for local households.

Box 3

Experiences in China

China's experience is also unique in the region being more endogenous than driven by external intervention, and perhaps explains the adaptation of the conventional PES approach into the Chinese 'eco-compensation' method, which accommodates a diverse range of PES-like and other market and non-market mechanisms, all with the unifying objective of conserving and enhancing specific ecosystem types as providers of ESs (de Silva, 2014). We particularly review China's Sloping Land Conversion Program.

The similarity of the legal and policy frameworks, particularly the dominance of the state in the economic affairs, land property regimes, implementation approaches in watershed rehabilitation, between China and Ethiopia is the reason the revision of this case.

The most notorious example of PES to combat land degradation is China's Sloping Land Conversion Program (SLCP). It was initiated by the central government in 1999 with the goal of reducing water and soil erosion, by converting agricultural land on steeply sloping and marginal lands into forest. The SLCP is one of the largest PES schemes in the world (Li et al. 2011). This experience is relevant to BER because SCLP was a public scheme and similarity of land degradation. In BER farmers use steep sloping and marginal lands as crop land, contrary to the existing land policy and the government's high involvement in watershed management and probably expected government's role in PES scheme in Ethiopia

The Chinese government initiated the SLCP to limit water and soil erosion by afforestation in three provinces in 1999 and formally launched it nationwide in 2002. The program was designed to convert 14.67 million hectares of farmland to forest or grassland (4.4 million of which is on land with slopes above 25 degrees) and an additional "soft" goal of afforesting a roughly equal area of denuded mountains and wasteland by 2010 (Liu, 2014). The program is a public scheme, as compensation of farmers is fully paid for by the central government. However, the economic incentives of PES schemes were well designed in order to ensure sustainability and to avoid 'leakage' (i.e. tradeoffs) of the negative effects to other regions. Therefore, besides direct compensation of the farmers, the Chinese government has also created favorable tax conditions for forest products, in order to make the conversion of farmland to forested land economically sustainable (Li et al. 2011).

The State Forestry Administration (SFA) charged by the State Council and provincial and sub-provincial forestry bureaus are primarily responsible for targeting areas of land for enrollment in the program as well as in setting and distributing enrollment quotas to local government (Zuo, 2002). Local governments were in charge of evaluating land plots. Households whose land plots fell into the planned project area