

Watershed-based payment for ecosystem services in Liberia:

Examining prospects and challenges for implementation in the St.
Paul River Basin

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Abstract

Payments for watershed services (PWS) are intended to provide incentives to land users to adopt sustainable land management practices. They are also increasingly viewed as having positive impacts on the livelihood of local communities around protected areas. The St. Paul River, located in the St. Paul River basin, is the main source of potable water and hydroelectricity to Monrovia, a city with about 25% of the population of Liberia. As this area is currently encumbered with degradation, the key question is what measures could motivate landholders to adopt sustainable land use practices that would protect the basin. The main purpose of this thesis is therefore to assess the potential for PWS as a sustainable financial tool for the protection of the basin, as well as helping to fill the gaps between the theoretical concept of PWS and the practical implementation of a PWS scheme. A qualitatively driven mixed research approach is applied for this research, using a combination of literature review, desk-based ex-post evaluation of PWS schemes in two African countries, and an ex-ante evaluation of the potentialities of the establishment of PWS in the St. Paul River Basin. Results show that there are factors favourable for a PWS scheme such as a high willingness to accept payments for the adoption of sustainable land use practices, high incidence of land tenure security, a high recognition of the importance of the watershed to the local communities, and identified potential buyers, amongst others. Unfavourable conditions for the establishment of a PWS in the basin include no knowledge of PWS in the area, low trust in NGOs and public authorities, low technical capacity amongst landholders, knowledge gaps and lack of training at the local level regarding the adoption of new technologies, establishment and maintenance costs, opportunity costs, low levels of pre-existing organisation, lack of scientific data on the environmental health of the watershed, amongst others. Based on the analysis of both the favourable and unfavourable conditions, three possible models for a proposed PWS are recommended for the watershed: (1). Direct payments from potential buyers (2). Establishment of a local watershed fund, (3). Establishment of a national watershed fund. Lastly, addressing the excessive dependence on fuel wood and charcoal in Liberia, which is a major contributing factor to the degradation of the watersheds, should be part of the discourse on the protection of the watershed.

Keywords: payments for watershed services; ecosystem services; land-use practices;

Executive Summary

- 1) The St. Paul River, located in the St. Paul River basin, is the main source for the supply of potable water and hydroelectricity to Monrovia, a city with about 25% of the population of Liberia. This area is currently encumbered with degradation. Because the watershed is supporting competing functions such as charcoal production, fuel wood supply, agriculture, mining, hydroelectricity, potable water, amongst others, there is a need for a mechanism that can reconcile these conflicting functions and protect the watershed from degradation so as to maintain the flow, timing and quality of the river and curb the degradation of the watershed. The key question is how to motivate upstream landholders to adopt sustainable land use practices that would protect the watershed. One program that is known to provide incentives for the adoption of sustainable land use practices is payments for watershed services (PWS), an offshoot of payment for ecosystem services (PES).
- 2) Although PWS have been applied to varying degrees of success in different parts of the world, it has never been applied in Liberia. Furthermore, there is a lack of detailed studies on the feasibility and applicability of PWS in Liberia and uncertainties regarding which factors could contribute best to a successful PWS mechanism in the context of Liberia.
- 3) The study is intended to help fill the gaps between the theoretical concept of PWS and the practical implementation of PWS in an area where it has hitherto not been implemented. The main purpose of this thesis is therefore to assess the potential for PWS as a sustainable financial tool for the protection of watersheds in Liberia, drawing from the experiences and insights from PWS implementation in two African countries: Kenya and Tanzania.
- 4) To achieve the research purpose and objectives, the research was conducted in two main parts. The first part was a desk-based ex-post evaluation of the PWS schemes in the Lake Naivaisha Basin in Kenya and the Ruvu River Basin in the Uuguru Mountains in Tanzania while the second part was an ex ante evaluation of the potentialities of PWS in the St. Paul River Basin in Liberia. The aim of the desk-based evaluation of PWS schemes in the 2 countries was to identify key success factors for effective PWS implementation in a developing country. Additionally, results from the desk-based evaluation of the schemes in Kenya and Tanzania were used to compare success factors from those schemes to the context of the St. Paul River Basin in Liberia. The second part was an ex-ante evaluation of the potentialities of PWS in the St. Paul River Basin in Liberia was intended to assess the prospects of the PWS establishment as a sustainable financing tool for environmental conservation. Additionally, the ex-ante evaluation delved into possible PWS frameworks for Liberia watersheds.
- 5) The two research questions this study addresses and the methods used to answer them are stated below:
 - a) How does PWS work in Africa in relation to the current situation and from the experience of PWS in Tanzania and Kenya with emphasis on the environmental effectiveness and the distributional considerations?

The methods applied to answer this research question was a desk-based multi-criteria evaluation of the PWS scheme in Lake Navaisha, Kenya and the PWS scheme in the Uluguru Mountains, Tanzania with focus on 4 criteria (environmental effectiveness, distributional considerations, poverty alleviation and technological improvement) and content analysis of findings from fieldwork.
 - b) What is the potential for PWS as a sustainable financial tool for environmental conservation and poverty alleviation of local communities surrounding protected watersheds in Liberia?.

The methods and materials applied to answer this question included structured interviews with 82 land users from 6 villages in a survey; semi-structured interviews with experts from 6 NGOs and 5 government entities; and content analysis of literature and findings from fieldwork as well as analysis of the results of the desk-based evaluation of the PWS schemes in Tanzania and Kenya.

- 6) Results from the desk-based evaluation of PWS schemes in Tanzania and Kenya indicates that the positive land use changes induced by a PWS scheme can lead to positive environmental outcomes. Additionally, participants in both schemes recorded improvements in their livelihoods due to the compensation they received from the scheme and improved yields as a result of adopting sustainable land use practices that trigger better agricultural outputs. However, there were challenges also. For example, the PWS scheme in Tanzania automatically excluded land users without titles to land while there were reports of inconsistencies in payments to participating farmers. Additionally, both PWS schemes in Tanzania and Kenya reported low buyers buy-in. In terms of local institutions, the PWS scheme in Kenya had better organised local institutions when compared to the scheme in Tanzania. Downstream buyers in the Kenyan scheme were organised in two formal entities (Lake Naivasha Water Resource Users Association and the Lake Naivasha Growers Group) and upstream sellers of ES were also organised into two formal entities (Upper Turasha-Kinja Water Resource Users Associations and the Wanjohi Water Resource Users Associations). While the PWS in the Ulugurus in Tanzania is more dependent on the NGOs, there seem to be a greater level of local ownership of the PWS in Lake Naivaisha, Kenya. Both schemes did not, however, have a corresponding counterfactual, that is, what the environmental outcomes would have been if the scheme did not exist in both areas.
- 7) The fieldwork in Liberia was divided in two parts: the first part was survey interviews conducted with 82 land users from 6 villages in the St. Paul River Watershed. The second part was interviews conducted with 11 individuals from 6 NGOs and 5 government entities.
- 8) Up to 46% of the interviewed land users stated that their land had undergone some level of degradation, with the major causes attributed to unsustainable charcoal production, illegal logging, mining and agriculture. The majority of land users participating in the interviews, 54%, stated that they had full titles to their land while another 22% asserted that they shared titles with other family members. The majority of the participants recognised the importance of the watershed to their livelihood with 44% stating that the watershed was a major source of water for their household and agricultural activities while 16% stated that the watershed importance to them is the provision of environmental goods such as timber. Only 3% recognised the watershed for its biodiversity and tourism potential. When respondents were specifically asked if environmental conservation was important to them, the majority (60%) stated that it was very important to them while the rest attached different levels of importance to environmental conservation.
- 9) None of the participants in the survey were familiar with the concept of PWS. Despite their lack of knowledge or experience with PWS, they tended to show interest in the scheme after it was explained to them. Of the respondents surveyed, 74.3% stated that they will accept a PWS for the implementation of sustainable land use practices if they are offered compensation. 17% stated that they are reluctant to participate in a PWS citing distrust in NGOs and public authorities. Individual contract was the preferred choice for the majority of the participants in the survey with 58% of them have a preference for contracts with individual terms while 21% preferred collective agreements with other farmers. The majority of those who preferred collective contracts are those who shared land titles with other family members. When landholders were asked what compensation type of compensation they

would prefer, 41% they said that they would prefer payment in kind while 59% preferred payments in cash.

- 10) About 38% of the interviewed participants did not belong to any formal organisation, while 62% of the respondents had participated in self-help initiatives and worked with community based organisations (CBOs). But the technical capacity of land users in the basin is low as only about 12% of the sampled respondents had been involved in an environmental project.
- 11) Results from the expert interviews indicated that PWS can trigger the adoption of sustainable land-use practices which may be extremely difficult to adopt without an incentivising program. There were, however, suggestions from some interviewees that there can be sufficient incentives to trigger the adoption of sustainable land use practices by farmers without a PWS. The expert interviewees also pointed to some barriers to PWS implementation such as knowledge gaps and lack of training at the local level regarding the adoption of new technologies, establishment and maintenance costs, opportunity costs amongst others. Another issue raised from the expert interviews was how to generate demand for ES in a PWS market. Potential buyers that were identified include the Mount Coffee hydroelectric plant, the Liberia Water and Sewer Company (LWSC) and the Monrovia Club Breweries, all of which have a presence in the St. Paul river Basin while potential sellers of ES were farmers who were willing to participate in a PWS scheme in the watershed.
- 12) Major actors in the basin, including LWSC, Mount Coffee Dam, Environmental Protection Agency (EPA), Environmental/conservation NGOs, and the land users were identified along with their possible roles, interests and the levels of influence they have on the watershed. For example, LWSC interest in the watershed is the continuous supply of water to Monrovia while the Mount Coffee Hydroelectric Dam interest is to have a stable supply of water for the generation of electricity. On the other hand, conservation NGOs are more concerned with the protection of the environment while land users are more interested in their economic activities. In terms of power and influence, power is unevenly distributed with LWSC and Mount Coffee Dam possessing powers emanating from government while land holders have limited powers and resources.
- 13) Based on the results from the interviews, a matrix of institutions and their roles in the establishment of a PWS in the St. Paul River Basin was established. Conservation and environmental organisations like Green Advocates and the Sustainable Development Institute (SDI) can play a key role in the development stage where they can participate in baseline studies, development of business case, and identification of buyers and sellers. The environmental and conservation NGOs can also serve as the brokers by facilitating the negotiations between the local communities (Sellers) and downstream users of ES (buyers). Institutions like the Ministry of Agriculture, Environmental Protection Agency, and the Forestry Development Agency can provide technical support for the scheme while the likely buyers would be LWSC, Mount Coffee Plant, and Monrovia Club Breweries.
- 14) For the factors favourable for the establishment of a PWS scheme, there exists clearly identified buyers that are reliant on the watershed for their operations. Both the Mount Coffee Hydroelectric plant and LWSC have their plants in the watershed. Even though these institutions do not have a direct willingness to pay, new regulations could be introduced that would obligate them to do so. Furthermore, the majority of the land users in the watershed, up to 74%, expressed their willingness to adopt sustainable land use practices in the watershed. There is also a high potential for self-regulation with about 48% of the respondents preferring it with an additional 24% preferring participatory monitoring. Self-

monitoring is cost-effective and can actually reduce transaction costs. Lastly, the high level of land tenure, with 54% having a title and another 22% sharing titles, is also a distinct advantage as the majority of land users will have control over the land use changes due to their defined property rights.

- 15) Unfavourable conditions for a PWS establishment includes the low level of pre-existing organisation in the watershed, in contrast to the PWS scheme in Lake Navaisha, Kenya which has high levels of organisation amongst both the buyers and sellers. Additionally, there is a lack of scientific data on the basin clarifying the current status of land use practices. Lack of knowledge on PWS is also a potential problem with none of the interviewed landholders having any knowledge about what the scheme is.
- 16) There are other relevant issues that can affect the success of PWS schemes and it is important that they be considered in the planning stages of any scheme. First, eligibility criteria, which in most cases inhibits land users' participation in PWS should be addressed. Second, transaction costs, which in some cases can exceed the potential benefits of a scheme should also be considered from the design stage of a scheme. There is also a need for an established process of providing technical support for the negotiation of the PWS. It is important to reflect on balancing equity with efficiency, given that the majority of the land users in the basin are very poor people. A focus on equity considerations would trigger greater participation in the scheme. To solve the issue of having a corresponding counterfactual for evaluation purposes, it is also important that at the beginning of the scheme, there should be a selected control group that is similar to the treatment group. The controlled group can be established on a tributary in an area in the basin that is outside of the boundaries of the scheme. Policy issues to consider include developing enabling policies to work in tandem with existing environmental laws with the aim of promoting PWS. The credibility of intermediaries is also very important, given that a sizeable number of interviewed land users stated their distrust for NGOs and public entities. Finally, addressing opportunity cost is important to ensure that the scheme is attractive enough for participating land users to not opt out of the scheme and continue with business as usual.
- 17) The excessive dependence on fuel wood and charcoal in Liberia is a major contributing factor to the degradation of the watersheds. There is a need for a national push in Liberia to seek alternative energy sources with the aim of reducing the huge dependence on charcoal and fuel wood through the promotion of innovative and sustainable energy alternatives and policies that would incentivise the shift from fuel wood and charcoal to more sustainable energy options.
- 18) Three possible scenarios for a proposed PWS structure were recommended for the establishment of a PWS in the basin. The first option is direct payments from potential buyers like LEC, LWSC, Club Breweries to the land users with NGOs acting as intermediaries. The second scenario is the establishment of a local watershed fund for the basin by the county authority where the fund is managed by the county authorities along with the buyers. The third and final scenario is a national watershed fund managed by central government and funded through taxes.

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Abbreviations

AfDB	African Development Bank
CARE	Cooperative for Assistance and Relief Everywhere
CBO	Community-based organisations
CSR	Corporate Social Responsibility
DANIDA	Danish International Development Agency
EPWS	Equitable Payment for Watershed Services
ES	Ecosystem Services
FAO	Food and Agriculture organization
LWSC	Liberia Water and Sewer Corporation

LEC	Liberia Electricity Company
MBI	Market-based Instrument
MEA	Millennium Ecosystem Assessment
NGO	Non-governmental organisation
SDI	Sustainable Development Institute
TEEB	The Economics of Ecosystems and Biodiversity
PES	Payment for Ecosystem Services
PWS	Payment for Watershed Services
WWF	World Wildlife Fund
WS	Watershed Services

1 Introduction

1.1 Background

Societies are reliant on ecosystem goods (e.g. timber) and services (e.g. water purification) for the functioning of their economies and livelihoods. While the exploitation of ecosystem goods and services is the bedrock of economic prosperity, market failures that lead to degradation or overexploitation of ecosystem services are outstripping the global social optimum (Engel et al., 2008). The Millennium Ecosystem Assessment (MEA) asserts that two thirds of the world's ecosystem are deteriorating due to degradation (MEA, 2005). The general perception that environmental services (ES) are public goods (non-rivalrous and non-excludable) may have provided the basis for the neglect of assigning monetary values to ES in the past and this inevitably created ground for the tragedy of the commons (Dalhousie et al., 1999). The MEA broadly classifies the world's ecosystem services into 24 groups (MEA, 2005). These ecosystem services were estimated to have an economic value of 33 trillion dollars per year in 1997 (Constanza et al. 1997) while a 2014 reassessment using slightly modified methodology increased the global aggregate estimates of the economic value of ES to between 125-145 trillion dollars (Constanza et al, 2014). The study also indicated that the estimated annual loss of ES due to unsustainable land use is 4.3 to 20.2 trillion dollars (Constanza et al, 2014). The new methods employed to get to the new figure included an update of estimates of the value of global ecosystem services based on new data from the TEEB study; comparison of the results with earlier estimates using alternative methods; an estimation of the global changes in ecosystem service values from land use change over the period from 1997–2011; and revision of some of the objections to aggregate ecosystem services value estimates with provision of responses to criticisms from (Constanza et al, 2014).

The problem of water scarcity is huge in Africa. According to AfDB & WWF (2012), “nearly 400 million people living in Africa's 36 largest river basins experienced some level of water scarcity for at least one month each year and only 60% of the population of sub-Saharan Africa had access to safe water in 2010 (AfDB, 2015). Access to water in Liberia tend to be extremely limited due to the absence of infrastructure and the destruction of existing infrastructure as a result of decades of civil strife. The supply of water and the supply of hydroelectricity to the capital city, Monrovia, and its environs are both reliant on one source: The St. Paul River Catchment. The St Paul River, however, is experiencing high levels of pollution while the quantity and flow of the river cannot be predicted with any level of certainty due to the increasing deforestation and degradation of the St. Paul River Basin (WASH, 2013).

Liberia, is located in the tropical rainforest belt of West Africa. It is a post-conflict developing with low level of industrialisation and the economy relies heavily on the extractive sectors. The majority of Liberia's population relies on environmental goods and services for a significant portion of their livelihood (World Bank, 2016). Liberia's environment is also under considerable threats from logging, mining and agriculture (Goll et al, 2014). For example, between 1990 and 2010, Liberia lost 12.2% of its forest cover due largely to illegal and uncontrolled logging, illegal mining and weak oversight of the forest sector (Drakenberg et al, 2014).

There is no record of the application of market-based instruments for conservancy purposes in the country. The application of market-based instruments (MBIs) for the preservation of ES with the aim of sustaining economic growth and development is gaining traction in some parts of the developing world, especially in Latin America where it has been increasingly applied in Mexico, Costa, Colombia and other countries (Pagiola, 2014). An MBI, Payment for

Environmental Services (PES), is being used increasingly for climate change mitigation, biodiversity conservation, and watershed services (FAO, 2014). PES provides a market where downstream ES users negotiate with upstream land users with the aim of internalizing negative externalities as a result of the production activities of upstream land users, whereby, downstream users of ES pay the landowners who guarantee a continuous supply of such services by undertaking sustainable land management practices at a cost.

This thesis will address the challenges and opportunities of developing and sustaining a Payment for Watershed Services (PWS) program in Liberia. PWS evolved out of the concept of Payments for Ecosystem Services (PES). The focus area is the St Paul River watershed, which supplies the Liberia Water and Sewer Corporation (LWSC) Monrovia piped water system and also supplies the hydroelectric power station at White Plains. Additionally, this thesis will provide insights on how such a PWS scheme may become self – sustainable without relying on donor funding in the future and how, if possible, be enlarged. To this end, the thesis will therefore evaluate the main positive and negative aspect of the PWS in the context of Africa, using case studies from Tanzania and Kenya, in order to contribute to the establishment of similar initiatives in Liberia. By evaluating the impacts of the PWS schemes from the case studies in Tanzania and Kenya, this thesis will also contribute to the development, use and integration of evaluation practices concerning PWS schemes; contribute to the establishment of similar initiatives in Africa; and contribute towards the body of knowledge in securing sustainable financing for PWS schemes in Africa.

1.2 Problem Definition

Monrovia, with a population of approximately 1 million people, is faced with low access to water due to decades of civil wars, corruption, and poor management (WaterAid, 2016; WASH Liberia, 2014). Liberia's first post-war Poverty Reduction Strategy (PRS1) stated that between 1990 to 2003, safe drinking water coverage declined from a coverage of 37% of the population to about 7% in 2003 (IMF, 2008). The Government of Liberia, along with international partners have been undertaking measures to solve the water shortage problem. The St. Paul River is the main source of supply for pipe-borne water to Monrovia and hydroelectricity to the city but is encumbered by degradation. There is, however, no in-depth study on the levels of pollution in the watershed or whether or how the pollution is affecting the quality, quantity or flow of the river.

The mangrove forests and rainforests in Montserrado county, where the St. Paul River Basin is situated provides charcoal for the population (FAO, No date). About 95% of Liberia's population use charcoal (Jones, 2015) and this situation is placing a huge strain on the watersheds. Along with charcoal production, there are multiple and sometimes conflicting functions that the watershed is supporting including logging, mining and agriculture and the need for a mechanism that can reconcile these conflicting needs and protect the supply of water in the basin cannot be overemphasised. The institution of command-and-control regulations in the past only led to illegal and unregulated activities in the basin that had further degraded the area (WASH Secretariat, 2014). The key question is how to motivate upstream land users to adopt sustainable land use practices that would protect the watershed.

Although PWS have been applied to varying degrees of success in different parts of the world, it has never been applied in Liberia. Liberia lacks a detailed study of the feasibility and applicability of PWS in the country's specific context. Further knowledge gaps include the uncertainty regarding which factors contribute best to a successful PWS mechanism in a developing country like Liberia, given that circumstances in Liberia is different from other areas where PWS have been successful. The study will eventually help to fill the gaps between

the theoretical concept of PWS and the practical implementation in the field. At the end of the thesis, the author will provide practical recommendations for the design of PWS schemes for conservation organizations in Liberia.

1.3 Objectives and Research Focus

The main purpose of this thesis is to assess the potential of PWS as a sustainable financial tool for the protection of watersheds in Liberia. To this end, the thesis will evaluate the main positive and negative aspects of the PWS in order to contribute to the establishment of similar initiatives in Liberia, precisely the St. Paul River Catchment. Watersheds plays an important role in the provision of water and hydroelectricity and the protection of watersheds are important in achieving the dual objectives of sustainable water supply and hydroelectricity in Liberia. This thesis therefore addresses the need to apply an environmental policy instrument that would be effective in ensuring that the externalities that are created by upstream landholders in the St. Paul River catchment area that affects the quality and quantity of water for downstream uses can be eliminated.

The objective of this research study is to analyse the applicability of PWS for the conservation of watersheds in the St. Paul River Basin in Liberia. This study assesses an African experience of PWS implementation with insights from Kenya and Tanzania; identifies success factors for effective PWS implementation; compares these success factors in the context of Liberia watersheds; and develops a possible PWS framework for Liberia watersheds.

1.3.1 Specific objectives:

Task 1

An ex-post evaluation of how PWS works in Africa, using case studies from Kenya and Tanzania, with emphasis on environmental effectiveness, distributional considerations, and co-benefits. The specific task will include analysing the impact of the Equitable Payments for Watershed Services (EPWS) schemes in Tanzania and Kenya on the modification of land use to conserve and improve watersheds for reliable supply and quality of water in the treatment area; evaluating how does the design of the EPWS address the issue of equity; and evaluating how the co-benefits of the scheme have contributed to improved quality of life of the communities.

Task 2

An ex-ante analysis of the potential of PWS as a sustainable financing tool for environmental conservation and poverty alleviation of local communities surrounding protected watersheds in Liberia. This phase will concentrate mainly on distributional considerations, environmental effectiveness, and the potential for poverty alleviation in Liberia

1.4 Relevance and Audience

Considering the need to protect watersheds and the fact that only few schemes exist at the moment in Africa, this study will help to provide knowledge on whether or not PWS can be an effective tool for ecosystem conservation, within the geographical context of Africa. Additionally, this thesis will provide insights into how the design of PWS may have positive co-benefits on poverty alleviation. Furthermore, this research will aid in driving the setting up of other PWS schemes in Africa by suggesting sustainable financing mechanisms that would not be reliant only on overseas donor funding. The PWS schemes in Tanzania and Kenya, which will be evaluated as case studies will provide valuable insights regarding technical and market information, institutional experience, business models, equity concerns, amongst

others. This study is relevant to policy makers, public authorities, researchers and consultants who can learn about the prospects, barriers and challenges of designing PWS schemes, evaluating its impacts, monitor or evaluate the effectiveness of the schemes, and obtain valuable insights such as lessons learned, good practices, gaps and needs.

1.5 Ethical Considerations

The works of all authors that are used to prepare this research are adequately cited and referenced. All of the participants in the survey and the semi-structured interviews were fully informed about the nature of the research. Furthermore, each participant was required to give consent and were adequately informed about their right to withdraw from the research at any point without consequences. Individuals who provided documents were also informed that all information gathered will be confidential and used only for the purpose of this research.

The research was conducted in a risk-free manner for all participants. The reporting and interpretation of data were done honestly. No fabrication, falsification or misrepresentation of information was allowed. Objectivity was guaranteed by avoiding any form of bias in data analysis or interpretation. There was informed consent from all participants. Confidentiality was upheld and the anonymity of participants was assured. Participants were informed about their right to withdraw at any stage of the research.

1.6 Background of Research Area

1.6.1 St. Paul River Catchment

Liberia has 6 main watersheds: Cavalla, Cestos, Lofa, Mano, St. John and St. Paul. The St Paul River supplies the hydropower plant that provides electricity to Monrovia and also the plant that provides water to Monrovia and its environs. Activities affecting the quality and quantity of water in the St. Paul River includes, among others; logging, mining, and agriculture (WASH, 2014). While the aforementioned activities may be the cause of pollution in the river, the current available data are inadequate to determine the main causes of pollution in the river. The St. Paul River and its major tributaries (the Via, Wuni, and Tuma) drain a basin of 8,460 square miles (21,900 square km) in Liberia and Guinea.

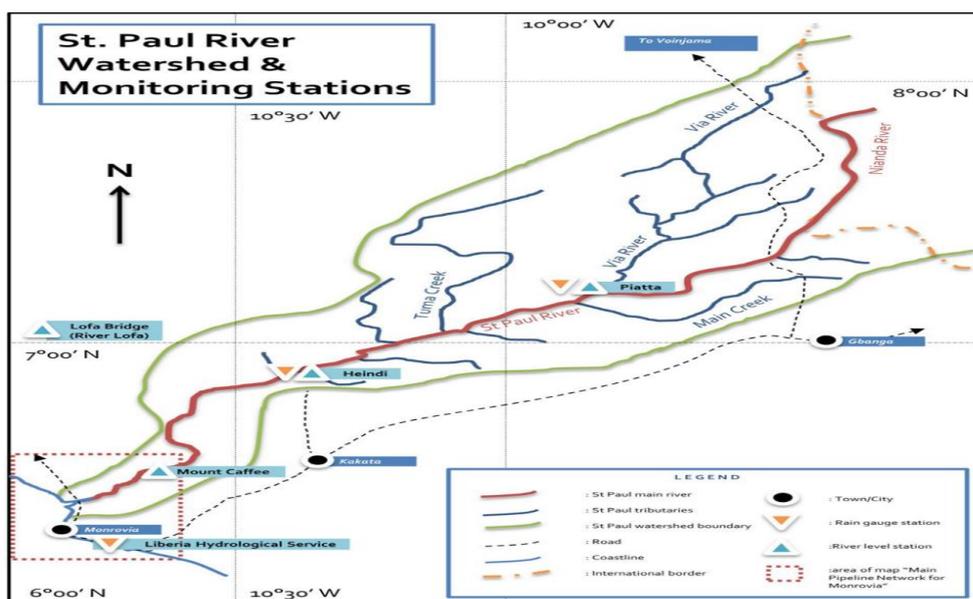


Figure 1-1: St. Paul River Catchment (Source: Liberia WASH Secretariat, 2014)

A watershed, or catchment, is an area that supplies water to a river through tributaries. The timing, quantity, and quality of the flow of water from the watershed to streams or rivers are tempered by landscape, geology, vegetation cover, land use and other anthropogenic activities. Along the path of the water flows, there will be loss of water through evaporation from the soil surface, waterway surfaces, and wetlands, and via transpiration by vegetation, amongst others. The quality of water from watersheds is also modified by the amount of sediments, nutrients, chemicals or contaminants that it carries as it moves down slopes or stream channels to the main river bodies. Therefore, the quality and quantity of water available to downstream users are largely dependent on the manner how land is used and managed in addition to factors such as vegetation, landscape, amongst others. The table below is a summary of the major ES provided by watersheds, as categorised by the Millennium Ecosystem Assessment.

Table 1-1: The main water -related services provided by ecosystem in a typical watershed, adapted from Millennium World Assessment (2005)

<p>Provisioning services Services focused on directly supplying food and non-food products from water flows</p> <ul style="list-style-type: none"> • Freshwater supply • Crop and fruit production • Livestock production • Fish production • Timber and building materials supply • Medicines • Hydroelectric power 	<p>Regulating services Services related to regulating flows or reducing hazards related to water flows</p> <ul style="list-style-type: none"> • Regulation of hydrological flows (buffer runoff, soil water infiltration, groundwater recharge, etc) • Natural hazard mitigation (e.g. flood prevention, peak flow reduction, landslide reduction) • Soil protection and control of erosion and sedimentation • Control of surface and groundwater quality
<p>Supporting services Services provided to support habitats and ecosystem functioning</p> <ul style="list-style-type: none"> • Wildlife habitat <p>Flow regime required to maintain downstream habitat and uses</p>	<p>Cultural and amenity services Services related to recreation and human inspiration</p> <ul style="list-style-type: none"> • Aquatic recreation • Landscape aesthetics • Cultural heritage and identity <p>Artistic and spiritual inspiration</p>

1.6.2 Liberia's Environmental Profile

Liberia, a West African nation founded by emancipated slaves from North America, became one of the two independent nations in Africa (the other being Ethiopia) in 1847. The country has a coastline of 350 miles, with coastal lagoons and mangroves, rain forest and mountainous plateaus. Liberia's rainforest covers about 45% of its land area (Drakenberg et al, 2014). The prevailing environmental issues in Liberia include degradation of natural resources (forestry, land and water) and loss of biodiversity (forests, ecosystems, marine, wetlands and mangroves). Additionally, the country is vulnerable to climate change and external shocks and crises (Drakenberg et al, 2014; UNDP, 2014). The environmental challenges are often intertwined and mutually reinforcing. For example; loss of forest cover is connected to loss of ES and loss of biodiversity, climate change, land degradation and reduced resilience to environmental shocks or natural disasters. If this situation is not properly managed, the environmental problems could aggravate food insecurity, vulnerability and health problems, increase resource scarcity, and reduce livelihood opportunities and resilience (Drakenerg et al, 2014). Other factors contributing to the destruction of the environment is Liberia's reliance on the extractive sectors (mining and timber) and agriculture. Furthermore, the lack of electricity has resulted in a massive increase in the use of charcoal for energy. Forests, including mangrove forests in wetlands and coastal zones are under severe pressure (UNEP, 2005).

The country's population is however growing and the need for a stable source of water cannot be overemphasised. In 1986, the population of Monrovia was estimated at around 572,000 inhabitants, but at the height of the civil war between 1990 – 2004, the population of Monrovia peaked at about 1,000,000 (LISGIS, 2008). As of 2014, Liberia's population is estimated at 4.4 million, in contrast to the 3.4 million of the 2008 (CIA Fact book, 2014). The general state of access to water in urban areas in Liberia, including Monrovia, is challenging. The 2014 Liberia Water, Sanitation and Hygiene report (WASH, 2014) found that only 3.4% of the Liberian urban population obtains their water from piped water, and that another 63.7% obtain their drinking water from protected dug wells.

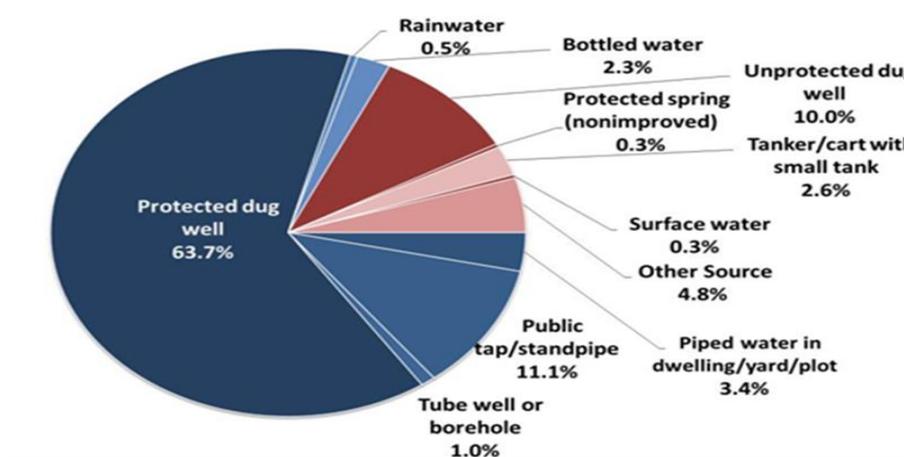


Figure 1.2: Distribution of Liberia's population by drinking water source in urban areas (Source: Liberia WASH Secretariat, 2011)

1.7 Disposition

Chapter 1 provides an introduction of thesis and that includes the problem definition, research objectives and questions and a background of the study area

Chapter 2 presents the Literature Review and it discusses the impacts of PWS, financing of PWS, monitoring and evaluation of PWS, targeting strategies for PWS schemes, the logic for PWS, PES versus other policy instruments, amongst others.

Chapter 3 discusses the methods and materials that are employed in this thesis to answer the research questions, the methods and materials for data collection and data analysis

Chapter 4 presents the findings from the desk-based evaluation of the PWS scheme in Kenya and Tanzania with the aim of providing a global and African experience on the implementation of PWS.

Chapter 5 gives the results of the fieldwork conducted in Liberia regarding the feasibility of the establishment of a PWS in the country

Chapter 6 is the discussion and analysis of findings from the desk-based study and the fieldwork while Chapter 7 presents the conclusions and recommendations

2 Literature Review

2.1 Introduction

The adoption of sustainable land management practices is geared towards sustaining the provision of various environmental services, including watershed services, through measures aimed at protecting ecosystems, or the restoration of ecosystems that have been subject to degradation. Several different instruments are applied to achieve these efforts and they may range from direct regulation, information and capacity building, market-based instruments, or a hybridized approach that may be a combination of market instruments alongside regulatory authorities such as cap-and-trade. Payments for watershed services (PWS), a market-based instrument which is a form of payments for ecosystem services (PES), is now used increasingly to address the management of watersheds and there is an increasing replication of the scheme in many parts of the world (Porras et al, 2013).

2.2 Overview of PES and PWS

PWS emanates from the broader concept of PES. The concept of PES is based on the idea that ecosystems are being degraded due to the unsustainable management of the ES. PES schemes are, therefore, geared towards the creation of economic instruments that attempt to internalize the externalities that are associated with the degradation of ecosystem services such as carbon sequestration, biodiversity conservation, and watershed services (Pagiola,2005). The most widely used definition of PES is provided by Wunder (2005) and have 5 conditions:

- A clear environmental service that is defined;
- There must be at least a buyer of the environmental service;
- There should be at least a seller of the environmental service;
- There should be a voluntary transaction between the seller and the buyer;
- The conditionality is that payments will be made based on the delivery of an environmental service.

PES schemes can complement command-and-control measures by providing incentives for land users to adopt sustainable land management practices. Due to high transaction costs and information asymmetry, most of the poor rural landholders in developing countries are unable to facilitate a market for PES. Many PES implementation in Africa is facilitated by NGOs that serve as intermediaries acting on behalf of land users and beneficiaries of ES. This is the case in Tanzania and Kenya, where CARE International and WWF act as intermediaries between the buyers and sellers. The influence of intermediaries is captured in the AfDB definition for PES which states that PES is “a contractual agreement between at least an ES beneficiary and an ES producer (or an intermediary acting as one of them), by which the former transfers resources to the latter, providing the ES producer adopts specific practices on the land or resource he controls or possesses, in order to enhance the production of specific ES” (AfDB, 2015).

In establishing watershed-based payment for ecosystem services market, different authors have set conditions that must be met. Prominent amongst those conditions are:

- The environmental goods and services provided within a watershed must be clearly recognized (Smith et al., 2008).
- There has to be a determination of the value and price of the environmental goods and services in the watershed (Dillaha et al, 2007).
- There must be at least one buyer and one seller (Wunder, 2005)

- Property rights must be established (Engel et al, 2008; Ferraro & Pattanayak, 2006; Salzman, 2010)
- Access and usage rights related to land tenure and water use must be established and defined (Dillaha et al, 2007).
- The arrangement must also be transparent and reliable with clear identification and understanding of the risks involved, appropriately negotiated agreements between buyers and sellers, established standards and norms for governance and transactions, and financing mechanisms that enable the completion of transactions between buyers and sellers (Smith et al., 2008).

2.3 The Logic for PES

Payments for Watershed Services (PWS) is a PES for watershed services and its objective is to connect downstream beneficiaries of a watershed services with upstream land users in a watershed on a platform where they can negotiate to eliminate the externalities resulting from land users' activities. PWS aim is to attain economic optimum in the management of watersheds by lessening the cost of mitigating an externality for the beneficiary of ES when compared to any other solution available to the beneficiary. The underlying logic of PES is that the downstream ES users should compensate upstream land users, so that conservation can become a more attractive option for landholders, thus inducing them to adopt more sustainable land management practices. The overriding aim is that PES would internalise what would otherwise have been an externality (Pagiola and Platias, 2005).

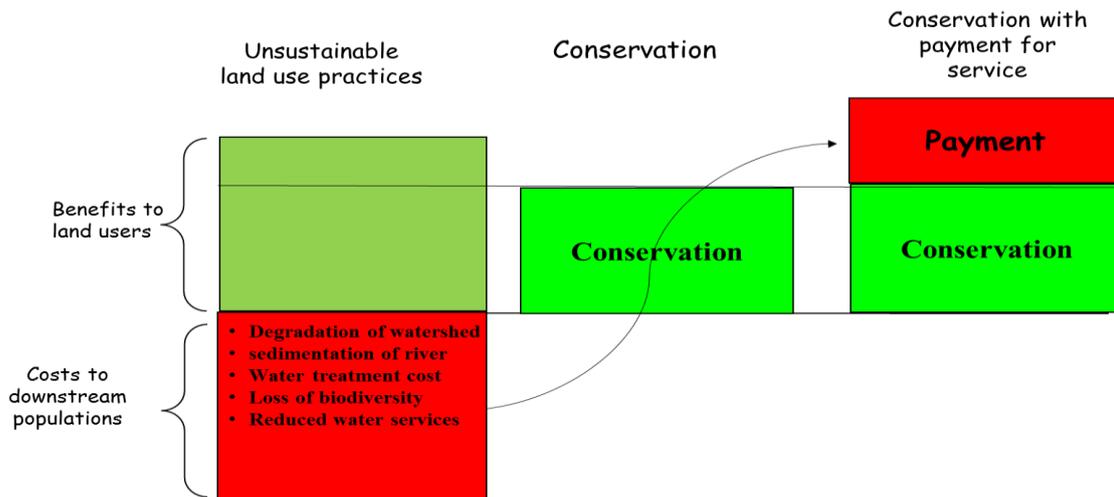


Figure 2-1: The Logic for a PWS, adapted from Pagiola and Platias (2005)

The PWS scheme, therefore, presents the platform where upstream farmers and downstream users of ES can negotiate with the aim of internalizing the externality so as to reach a Pareto efficient outcome. The PWS scheme, by attempting to internalize externalities, is putting into practice a Coasean type agreement, with the assumption that if property rights are established and transaction costs are absent or low, the parties will engage in private negotiation to bargain an efficient resolution to the externality.

2.4 PES Research Trends

The theoretical literature on PES has taken different dimensions. Some studies have focused on the different views on how to define PES (Tacconi, 2012) while other researchers have focused on the comparisons of PES to other environmental policy instruments for conservancy (Engel et al, 2008). PES literature also focuses on the impacts of existing schemes on land use changes (Lopa et al, 2011; Pagiola 2008). Some studies are geared towards providing an understanding of the potentials and limitations of PES in different parts of the world (Dillaha et al, 2007; Ferraro, 2009). Literature on PES also provides guides and information on PES implementation and its key design characteristics and elements (Katoomba Group, 2009; Engel et al, 2008; Kosoy et al, 2007). There have been studies on PES that are dedicated to analyzing the impacts of the scheme on poverty alleviation, especially its impacts on low income sellers of ES (Wunder, 2008; Kosoy et al, 2007; Pagiola et al, 2005). Some studies have addressed equity issues in PES (Pascuel et al, 2009) while others have been concerned with the factors that are needed for successful PES design (Wunder, 2007)

2.5 Impacts of PWS

PWS is constructed on the premise that the scheme should engender a change in land use management practices. This premise elevates the concept of additionality. Additionality is determined based on the practices that would not have occurred if the payments had not taken place. This presents the biggest challenge in evaluating PWS because to determine what would have happened if the scheme was not in place can be difficult due to the absence of any available counterfactual (Ferraro and Pattanayak, 2006). Several studies have pointed to the varying impacts of PES on land use, water quality and water quantity. The table below includes examples of how PWS schemes had impacted land use, water quantity and water quality in different parts of the world.

Table 2-1: Impacts of PWS on land use, water quality and water quantity

Scheme	Impact of PWS scheme
Indonesia, Hutan Kamasyarakatan (HKM) in Sumber Jaya,	Recorded an enrollment of 70% of the forests under protected forest in 2010 as opposed to a mere 7% in 2004 (Suyanto, 2010)
Mexico, National Program for Hydrological Environmental Services	Reduction in deforestation rate from 1.6 % to 0.6 % between 2000 to 2007 (IIED, 2016). There was, however, little effect on the reduction of largely due to the fact that majority of the enrolled land was under little or very low deforestation risk. (Muñoz-Piña et al., 2005).
Ecuador, FONAG	About 65,000 hectares was enrolled by 2008 with 2,000 hectares already forest plantations. It is still difficult to estimate impact as the plantations are still young (Cannon <i>et al.</i> , 2010; IIED, 2016).
Mexico, Valle del Bravo	While water declined in lower areas of the watershed, the water quality was good for the forested areas. (IIED, 2016).
Nicaragua, San Pedro del Norte	More permanent water sources with permanent springs increasing from 8 prior to 2005, to 13 in 2005 and 2006 (IIED, 2016) Attribution to the scheme is, however, difficult because of the lack of an in-depth hydrological study and relatively small size of the scheme (Porrás et al, 2013)
Colombia, Cauca Valley	The status of forests does not influence rainfall trends or the irregular fluctuations of the availability of water from upstream sources; rather, it is the results of other geographical causes. (Kosoy <i>et al.</i> , 2005).
Bolivia, Los Negros	No relationship was found between forest cover and streamflow (Le Tellier <i>et al.</i> , 2009)
South Africa, Working for Water program	Approximately 48 to 56 million cubic metres of additional water per annum was generated for the (Swallow <i>et al.</i> , 2009).

2.6 Financing of PWS

PES financing models are more developed in Latin America, especially in Costa Rica and Mexico. Africa has few PES initiative, notably, in Kenya, Tanzania, South Africa, and Uganda. PWS financing is crippled in Africa by limited technical and market information, insufficient legal framework and institutional experience, and limited business models. Willingness to pay for water services is also difficult due to the high levels of poverty and high transaction costs (Payments for Watershed Service Regional Synthesis, 2007). As a result, there is very low private sector involvement in PES schemes in Africa. For example, the EPWS in Tanzania has only two buyers. The PES schemes in South Africa are largely funded through government budget allocation. Latin America, on the other hand has developed a variety of financing mechanism. The table below is an example of how some PWS schemes are being financed in Latin America and Europe.

Table 2-2: Examples of financing methods for PWS

Scheme	Financing method
Program for Hydrologic-environmental Services (PSAH), Mexico	Government financed with funds coming mainly from water charges paid by water users (IIIED, 2016)
Sierra de las Minas Biosphere Reserve Water Fund, Guatemala	Water fund that manages the revenue from the payments (WWF, 2009)
Payments for Watershed Protection, Costa Rica	The fund is managed by the National Forestry Financing Fund (FONAFIFO) with funds obtained from national fossil fuel tax and international donations (Russo and Candela, 2006).
The Water Protection Fund (FONAG), Quito, Ecuador	An endowment fund with funding from monthly water bills received from all water users in Quito (The Nature Conservancy, 2016)
The Vittel (Nestlé Waters) watershed protection program, France	Users pay fees through a buyer-created entity called Agrivair (Nestle Global, 2013)
Payment for Hydrological Services in Coahuila, Mexico	Users pay a voluntary fee for the conservation of the Reserve and the water protection services it offers (Buric & Gault, 2011)

2.7 Compensation to landholders under a PES

When opportunity costs are overlooked in the design stages of a PWS scheme, this may lead to a situation where alternative land uses could become more attractive due to costs being passed over to the farmers (Porrás et al, 2013). Engel et al (2008) is much more ambitious and optimistic when he argues that compensation to land users should exceed the opportunity costs to the landowners or at least meet the opportunity costs. This argument by Engel et al (2008) is geared toward ensuring the adequacy of the payment and enhance the environmental efficiency through distinguishing payment based on opportunity costs so as to avoid the situation faced by the Fundacion Natura scheme in Bolivia where it was revealed in a study that higher levels of payments were made for about 75 per cent of the land enrolled in the PWS scheme (Hoffman, 2009).

The two main forms of payments are: (1) cash and (2) in-kind compensation. In-kind compensation can be the provision of training or provision of tools or seedlings. Wunder and Vargas (2005) argues that in-kind payments can be useful in instances where cash payments may be deemed culturally inappropriate or when large numbers of suppliers render per capita

cash payments too small to be meaningful, but Currie and Gahvari, (2007) suggests that cash payments tend to have a much more positive impact overall because of the way it may affect the receiver's behaviour. In-kind, one-off compensation may provide immediate benefits, but is very difficult to withdraw from in the case of non-compliance. Smaller, continuous payments may encourage long-term compliance, but will be insufficient to encourage people to make expensive initial investments on their lands if they are too low (Porrás et al, 2013).

The periodicity of payment varies from scheme to scheme. Some PWS carries out monthly payments (e.g. Pamampiro in Ecuador) while some are one-off payments or annual basis (Los Negros in Bolivia).

2.8 Monitoring and Evaluation of PWS schemes

2.8.1 Criteria for performance

Financing a PWS scheme entails several costs, including transaction costs and uncertainties in outcome and returns on investments can be potential deterrence for private sources of finance. It is therefore important that funds are channelled for conservancy purpose should ensure value for money. Monitoring the effectiveness of PES is, therefore, very important. For a PWS scheme to be effective, its monitoring and evaluation must take into consideration the principles that are discussed below.

- **Additionality:** where a landholder is compensated to adopt sustainable land use practices, the land use changes are considered “additional” only if it would not have occurred if the PWS was not implemented (Bennet, 2010). Additionality is established by evaluating whether a change is distinct from its baseline and if changes are directly attributable to the scheme (Gillenwater, 2012). The baseline is generally the estimation of what would have happened in the absence of the of the intervention of the environmental intervention, holding all other factors constant. The lack of additionality, or “money for nothing (Ferraro and Pattanayak, 2006) arises when the PWS is compensating land users for activities that would have happened in the baseline scenario.
- **Conditionality:** The stipulations in a PWS agreement that are intended to prompt behavioural changes in land use management is referred to as conditionality. For a PWS to be effective, this will mean that payments are only made to landholders after there is adequate confirmation of adoption and maintenance of the stipulated conditions of the agreement (Lipper & Neves, 2011; (Kerr et al, 2014; Fripp, 2014).
- **Permanence:** the positive outcomes of an environmental intervention like a PWS should not be easily reversible once the payment ends (Fripps, 2014). Long-term improvements in the provision of ES should last beyond the payment period (Engel et al, 2008). The sufficiency of compensation plays a key role in permanence because if they cannot cover or exceed the opportunity costs, landholders may revert to business as usual.
- **Perverse Incentives:** there is a risk for some environmental policy interventions to unintentionally propel perverse incentives, wherein the intervention which is intended to resolve a problem inadvertently lead to motivation for behaviour that would further degenerate the problem (Gordon et al, 2015). An example is when the landholder engages in perverse actions, such as intentionally degrading their land, so that they can get selected to participate in a PWS.

- **Leakage:** Landholders could shift their environmentally-damaging activities from the area a PWS is being implemented to another area that is not enrolled in the scheme.

2.8.2 Monitoring

Monitoring a PWS can take three forms:

- Self-monitoring
- Participatory monitoring by sellers of PWS or other parties that are interested
- Third-party audits or the use of modern measurements and remote sensing

There is no consensus on what method of monitoring is the most appropriate. There are, however, suggestions that there can be incentives to engage in self-monitoring and reporting on one's own actions (Laffont and Martimort, 2002). Participatory monitoring can either be through monitoring by sellers of ecosystem services or through multi-stakeholder groups comprising of buyers of ecosystem services. Where land users (sellers of ES) monitor each other, the buyers (users of ES), the government and the intermediaries can still monitor compliance. The limitation of this method is that where the voluntary bodies are weak, there will be limited options to enforce compliance (Porrás et al, 2013).

Monitoring of PWS schemes can be effective if compliance and enforcement mechanisms are applied at the beginning of the scheme. The challenge typically is that if there is inadequate funding or lack of institutional capacity, compliance monitoring may be weakened (Echavarría *et al.*, 2004). Some measures for non-compliance include temporary exclusion from the scheme, termination of payments, or threats of civil legal action if contracts are breached (Echavarría *et al.*, 2004; Wunder and Albán, 2008; Porrás et al, 2013). Wunder and Albán (2008) argues that the awareness of threats of sanctions by participating land users is an effective method that can actually reduce costs of monitoring, especially in smaller communities. Because PWS schemes is usually tinged with voluntary participation, there is always a limited range of sanctions that can be used, which invariably leads to a situation where landowners might have an incentive to breach their contractual responsibilities (Pattanayak et al., 2010; Wunder, 2005). The payments themselves can be an effective instrument for fostering compliance, especially in cases where the payments are conditional on the provision of a service and the level of payment properly compensates for the services provided (Claassen et al., 2008; Kosoy et al., 2007).

2.8.3 Baselines for evaluation

Baselines express how, over a period of time, ES provision in a specific locale would develop in the absence of an environmental payment scheme. Baselines are determined after a protracted period of monitoring of ES provision in an area and should be established before PES implementation; but for most PES schemes, baselines are not established thus valuable data is usually absent (Molenaar, 2013). A PWS scheme which established baselines was the Working for Water programme in South Africa, which instituted baselines for land use changes and hydrology prior to the inception of the PWS scheme (Turpie et al., 2008).

2.8.4 Targeting strategies

There are instances where lands enrolled in a PWS scheme are areas with low risks of degradation or areas with little significance for hydrological changes (Lipper & Neves, 2011;

Asquith and Wunder, 2008;). It is therefore important that the appropriate location and resources to deliver the desired outcome is carefully selected. While detailed targeting may lead to fewer participations as many land users may be excluded, it would lead to more effective and efficient outcomes (Wedland et al, 2012; Lipper & Neves, 2011). Lack of targeting would weaken the possible advantages of a PWS scheme. For example, the Sloping Land Conversion program in China included areas that had little risk of causing erosion (Bennett and Xu, 2008). Similarly, in 2003 only 11% of the land covered in Mexico under the PES scheme was classified as being at high or very high risk from deforestation, although this increased to 28% in 2004 (Munoz-Pina et al, 2005).

2.9 Challenges of PES Schemes in Africa

Dillaha et al (2007) asserts that attracting financing for PWS in African countries is a challenge due to many factors including high poverty levels, lack of technical and market information, limited institutional experience, inadequate legal framework, limited successful business models, suspicion of markets for public goods, equity concerns and the lack of resources of central authorities. There is little private involvement in PES schemes in Africa with the very few existing schemes being funded largely through assistance from overseas development assistance, international conservation organizations and governmental agencies (Lipper & Neves, 2011). The need to engage the private sector has been emphasised over and over again, but there still exists substantial information asymmetry on the part of the private sector largely due to the fact that they are unaware of the value of the ES to their operations and there may be little business case evident (Lipper & Neves, 2011).

There may be several factors that influence why PES schemes for water is practiced more widely in Latin America and not practiced in Africa. The need to protect watersheds for hydroelectricity is much more understood in Latin America with hydroelectricity companies playing a key role in PWS schemes. In Africa, the hydroelectric power generation is lower than Latin America. For instance, Africa's installed hydropower capacity is said to be about 13.6 GW accounting for about 1.5% of the global percentage (World Energy Council, 2011). In contrast, the installed hydropower capacity in Latin America and the Caribbean is more than 139GW accounting for 14.8% of global percentage. Therefore, hydropower companies as well as hydroelectricity consumers that can be charged for watershed services in Latin American are larger and more while in Africa, they are smaller and fewer.

Sub-Saharan Africa has the fewest public water systems and the lowest number of citizens connected to public water systems with 40% of approximately 783 million people without access to an improved source of drinking water (UNDESA, 2014). Therefore, those who can be charged for domestic water in a PWS scheme is very low while the pervasive poverty levels are a constraint. This is in contrast to Latin America, which has a higher percentage of access to public pipe borne water. The level of industrialisation is also lower in Africa than it is in Latin America. More than 80% of the Latin American population are urban. In contrast, only 40% of Africa's population are urban (UNDESA, 2014).

The implementation of PWS schemes in Africa is particularly affected by the level of priority given to watershed management nationally. Investing in watershed management does not seem to be an obvious priority for many African countries. Urban water systems are struggling in most countries with poor quality of service, low investment, low financial returns, low coverage areas, high levels of unaccounted-for water and unpaid bills, and inadequate commercial management (World Bank, 2001; 2004). Additionally, tax revenues, which is one of the sources of funding for WS tend to be lower in Africa than in Latin America (World Bank, 2015). The national budgets for most African countries are too small while their populations are larger or

growing at a faster rate than Latin American countries. Though Liberia and Costa Rica have similar populations, Liberia's revenues for 2015 was estimated at \$681.5 million, while expenditure was estimated at \$809.2 million; In Costa Rica's budget, revenues for 2015 were projected at \$7.5 billion while expenditures were estimated at \$10.64 billion (CIA, 2015).

The Bellagio Conversations (2007) also lists high transaction costs and uncertainties in property rights as other challenges faced in implementing PES programs.

2.10 PES versus other policy instruments

2.10.1 PES vs. Environmental taxes

Environmental taxes are examples of Pigouvian taxes that are imposed on private parties, for example land users, with the objective of environmental management. Unlike environmental taxes, PES primarily acts as environmental subsidies with the aim of encouraging environmentally beneficial actions (Engel et al, 2008). In contrast to environmental taxes, PES is bedevilled by numerous possible inefficiencies (Engel et al, 2008). Inefficiencies that PES are susceptible to include the lack of additionality, leakage and perverse incentives. A positive for PES in developing countries is that it imposes the cost of environmental protection on service users rather than land users. This is important because in developing countries, land users are generally thought to be worse off than service users, thus creating a strong equity preference for environmental subsidies rather than environmental taxes (Engel et al, 2008). On the other hand, in developed countries, land users such as large agricultural firms tend to be more powerful, so in the event where environmental subsidies are in place, it tends to be favourable to those powerful firms (Pagiola and Platais, 2007).

2.10.2 PES vs. command-and-control regulation

In many instances, PES schemes are operated in tandem with various command-and-control regulations. PES may exist in areas that already have command-and-control measures such as bans, and as such, the PES and the pre-existing command-and-control instrument can complement each other. For example, if there is already a ban on the harvesting of timber, a PES scheme will increase the value of that forest to local communities, which in turn will increase the local community's incentives to self-enforce the ban on timber harvesting, thereby helping to save costs for monitoring or enforcement or in most cases overcoming the lack of state enforcement mechanism (Engel and Palmer, 2008). Highlighting the complementary nature of PES and command-and-control instruments, Pagiola (2008) asserts that PES provide a carrot that makes the stick of regulations more palatable.

2.11 PES and Poverty Alleviation

There is much debate about how and if PES schemes can also be a poverty reduction mechanism (Fisher, 2012; Engel et al, 2008; Pagiola et al, 2005). Engel et al (2008) argues that PES was not initially created as a poverty alleviation mechanism, but was instead conceptualised to improve the management of ES. This view is buttressed by Huang et al (2009) who proposed that poverty alleviation should not be the foremost criterion for the selection of PES participants. However, the reality is that many government-funded PES schemes consider poverty alleviation a key objective (Wunder et al, 2008; Engel et al, 2008). Maximizing the benefits of two policy objectives, conservation and poverty alleviation, with a single policy instrument is also debated. The 'Tinbergen Rule' named in honour of Dutch economist Jan Tinbergen, states that there should be a single mechanism for each policy target (Knudson, 2009). If there is an intent to combine PWS scheme with poverty alleviation, then

there must be a primary policy goal: either conservation or reducing the poverty levels in that area (Fisher, 2012). Prioritising both at the same time raises questions of efficiency.

The role that PES can play in poverty alleviation is largely context specific. For example, in some places, the poor communities are already living on degraded lands which is providing them very few ecosystem services. So in effect, the degraded land may be contributing to the existing poverty levels. In other cases, communities have very low income levels, but the people could be experiencing a higher standard of living due to favourable local environmental conditions which mean they are provided higher levels of environmental services.

Even though PES may reduce poverty through the payments to landholders, the extent of such an impact will depend largely on how many participants are actually poor, whether poor farmers can participate easily in the scheme, and how much or what type of compensation is being made. But generally, there is still a considerable gap in knowledge in linking ES to poverty and how pathways out of poverty may be achieved based on the sustainable utilisation of ES (Suich et al, 2014).

Some authors have argued that PES actually has semblances of the resource curse and may further keep participants in a poverty trap (Kronenberg & Hubacek, 2013; Karsenty, 2007). Karsenty (2007) indicates that PES might keep poor communities in a poverty trap and make them lose dynamism and innovation as a result of their reliance on compensation from the scheme instead of engaging in economic endeavours with their lands that would have been more beneficial for them; howbeit detrimental to the maintenance of ecosystem services. Similarly, Kronenberg & Hubacek (2013) suggests that PES design can be plagued by rent seeking, unequal bargaining power of buyers and sellers, volatility of payments and other factors that would negatively impact the poor communities. Karsenty (2007) also attacks the idea of 'lower cost of conservation' which is promoted for poor countries and make large scale conservation projects attractive and affordable for conservation investment in poor countries; this, he argues, raises ethical issues because landholders are usually paid at their current poverty level (Karsenty, 2007).

2.12 Participation of Poor Households in PWS schemes

While there are different factors that motivate landholders to participate in a PWS scheme, there are also barriers that tend to prevent many landholders from participating in PWS schemes. Pagiola et al (2005) categorises factors that can determine farmers' participation in a PES scheme in the following: households' eligibility to participate; households desire to participate; and, households' ability to participate.

A major equity concern for PWS schemes is the ease at which poorer households can participate in the scheme. Pagiola et al (2010), in a study of poor household participation in PES Silvopastoral Project in Quindío, Colombia, found that poorer households are able to participate at levels that are broadly similar to those of better-off households. An earlier evaluation of Mexico's national PES program found that 78% of participants lived in areas with high or very high levels of poverty, but the "poorest of the poor," were hampered in their participation either due to the manner of targeting participants or due to hindrances related to poverty (Munoz-Pina et al., 2008). On the other hand, Bremer et al (2013), based on a study of household participation in Ecuador's SocioPáramo PES scheme, found that a number of factors, such as land tenure requirements or legal requirements, favour larger and wealthier land owners. This is in line with previous studies which have shown that existing conditions tend to favour wealthier landholders over small and poorer landholders. For example, evaluations of Costa Rica's national PES program found that some of the participants were

comparatively well-off and well-educated with alternative sources of incomes; therefore, they did not rely upon farm income and they generally live in the cities (Zbinden & Lee, 2005).

Poorer households' participation in PWS schemes is affected by factors such as their inability to meet the eligibility, as most eligibility criteria automatically eliminate landless and the most vulnerable landholders (Pagiola et al., 2005; Landell-Mills and Porrás, 2002; Wunder, 2008); the low financial capital to enable them complete entry requirements (Pagiola et al., 2005; Zbinden and Lee, 2005); and low incentive payments for lands that are smaller (Zbinden and Lee, 2005; Wunder, 2008) or high transaction costs (Pagiola et al., 2008).

3 Methodology

3.1 Introduction

This research study is oriented to get insights into the PWS approach. It explores the applicability of PWS for the conservation St. Paul River Basin Watershed.

3.2 Framework for addressing research questions

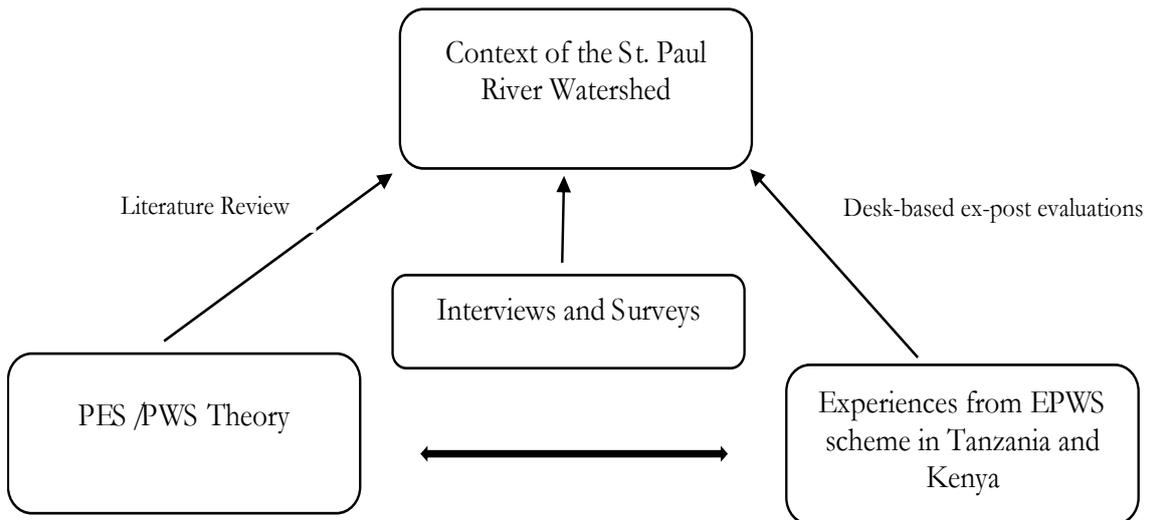


Figure 3-1: Conceptual Representation of the thesis

Systematic steps were adopted to carry out this study scientifically which is presented logically below:

1. The concept of PWS and its working definition was developed for the clear understanding in on the literature review
2. The global experience in PWS schemes was reviewed with concentration on South America and two African case studies: Tanzania and Kenya. The aim was to identify the success factors for PWS schemes implementation.
3. The Context of Liberia's St. Paul River watershed was analysed and PWS framework is discussed for the watershed
4. Finally, the comparative study with global experience drew up opportunities, challenges and delineations of the necessary precursors for success in Liberia.

3.3 Tools and Methods

3.3.1 Research Approach

Even though this research is qualitatively driven, it adopts a mixed research approach by combining qualitative and quantitative data and methods. A qualitatively driven research is a

research which is qualitative at its core, but also employs quantitative data to supplement or improve the study (Johnson et al, 2007). A qualitative approach implies that the emphasis of the research is tilted towards understanding the meaning of events, contexts and processes that are not experimentally examined or measured in terms of quantity, intensity, or frequency while quantitative research emphasises quantification on the collection and analysis of data (Bryman & Bell 2007).

3.3.2 Research questions

The table below is a summary of the methods and materials that were used to answer the two research questions. A more detailed description of the methods and materials will follow this section.

Table 3-1: Research Questions and Methods

Research Questions	Methods and Materials
<p>How does PWS work in Africa in relation to the current situation and from the experience of EPWS in Tanzania and Kenya with emphasis on the environmental effectiveness and distributional considerations?</p> <ul style="list-style-type: none"> • What is the impact of the Equitable Payments for Watershed Services (EPWS) schemes in Tanzania and Kenya on the modification of land use to conserve and improve watersheds for reliable supply and quality of water in the treatment area? • How does the design of the EPWS address the issue of equity? • What co-benefits of the scheme have contributed to improved quality of life of the communities? 	<p>-Multi-criteria analysis using 4 criteria (environmental effectiveness, distributional considerations, poverty alleviation and technological improvement),</p> <p>-content analysis of interviews and literature review</p>
<p>What is the potential for PWS as a sustainable financial tool for environmental conservation and poverty alleviation of local communities surrounding protected watersheds in Liberia?</p>	<p>-content analysis of literature</p> <p>-content analysis of interviews</p>

3.3.3 Literature Review

A literature review was used to gather information and critically appraise the theoretical concept and global experience of PWS. Various journal articles, reports and publications of various organizations, and reports prepared by researchers with experience of PWS schemes in different countries are reviewed and synthesized in the literature review, and the key topical issues surrounding PWS implementation are analysed.

The selected data sources are based on their relevance to addressing the objectives and research questions of the thesis. Data was collected on the theories and practices of PWS with the aim of getting relevant global experience of PWS implementation, with specific emphasis on PWS implementation in developing countries in Latin America and Africa. Further justification of data choices is explained in 4.2.1 and 4.3.1. Furthermore, experiences of PWS schemes

3.3.4 Desk-based ex post evaluation

An ex-post desk-based evaluation of how PWS works in Africa, using case studies from Kenya and Tanzania was conducted. The evaluation of the case studies is limited to the following:

- Environmental effectiveness (participants ex-post compliance level regarding environmental targets and the resulting induced land use changes),
- Distributional considerations (the idea of fairness and equal chances for all to participate in the program) and
- Co-benefits/side effects (the added local benefits of the scheme above and beyond the direct benefits of the EPWS, especially on poverty alleviation).

3.3.5 Expert Interviews and interviews with villagers

The interviews were conducted in two parts. The first part was a survey of 82 land users in the St. Paul River Basin user structured questions. The second part was the interviews of 11 experts from NGOs and government entities using semi-structured interviews. The interviews were carried out in confidentiality. Confidentiality was adopted basically due to the way the interviewees responded when asked whether or not the information gathered should be attributed to them. When interviewees working for oil companies and government entities in Liberia were asked whether they can be specifically quoted in this research, they were not forthcoming with any useful information that could address the research purpose. However, they were more willing divulge information once their anonymity was ensured.

Notes were kept on the interviews conducted, but the interviewees are quoted anonymously in order to safeguard their confidentiality. Interviews with the experts were recorded, with their consent, in order not to lose information while the survey for the land users were written manually.

The expert interviewees were selected from NGOs and government institutions that are involved in conservation in Liberia and officials from relevant public entities. Their selection was influenced by the work they are involved with either from a policy making perspective (government) or involvement in local communities (NGOs) with work that are related to environmental conservation. The expert interviewees were initially contacted through emails. Interviews were conducted through skype and in person. The interviewees from the local communities were contacted through their community leaderships and through an official of the Liberian WASH Secretariat.

Interviews are an appropriate tool to capture information about people's personal experiences, their perception and thoughts. Therefore, personal interviews have been adopted as a method for an intensive investigation of the current context of the St. Paul River Basin Watershed. Conservation experts in Liberia have been interviewed personally using a set of predetermined open-ended questions. The interview guideline is presented in annex 1 and Annex 2. The interview guideline was used in a flexible way, i.e. the interviewer allowed some freedom to change the sequence of questions, omit certain questions and add supplementary questions if the interview situation required to do so. The interviews were recorded with the agreement of interviewees in order to avoid losing information.

3.3.6 Discussion and analysis

An ex-ante analysis of the potential of PWS as a sustainable financing tool for environmental conservation and poverty alleviation of local communities surrounding protected watersheds in Liberia. This phase will concentrate mainly on distributional considerations, environmental effectiveness, and the potential for poverty alleviation in Liberia

3.4 Justification

The qualitative approach adopted for this study provided an opportunity to get in-depth information on PWS and the potential for its applicability in Liberia. The review of national and international literature as well as the case studies helped to provide a clear concept about PWS and provided the basis for the formulation of the conceptual framework for the research. The qualitative method also provided the room for critical arguments from experienced conservation experts. PWS is a broad approach, which links ecological aspects with economic and social aspects within watersheds. Therefore, to obtain more information in greater depth within a limited time period, methods such as personal interviews was appropriate.

3.5 Limitations

There are only few experts with adequate knowledge in PWS in Liberia. Furthermore, those experts were not easily approachable for interviews Hence, the research study included only a limited number of experts for interviews. These research findings came from a broad range of experience from different countries. Therefore, it required reviews of a large amount and diverse range of literature, which has been a time consuming task. The lack of information on Liberia’s environmental situation and specifically the lack of previous studies on the St Paul River Basin hampered the study.

3.6 Data Collection

Data was collected through the Literature review and interviews. Literature review relied on grey literature, scientific articles and journals, NGO reports, policy documents and other electronic sources. The specifics of the documents for analysis are stated in the table below:

Table 3-2: Data collected to answer research questions

Research Question 1	<ul style="list-style-type: none"> • Peer reviewed journal articles • grey literature on the implementation of PWS schemes. Grey literature is research produced by organizations such as government bodies, civil society, non-governmental organisations outside of the traditional academic research that are usually published in academic journals and would typically include annual reports, technical reports, research, white papers, working papers, etc. • Baseline study conducted prior to the start of the EPWS project in Tanzania and Kenya • Reports prepared annually for the EPWS projects in Kenya and Tanzania • Relevant data collected at the study site CARE and WWF or other partner organisations • Literature review of Government documents and reports of the project partners • Case studies of evaluation of PES schemes in other developing countries such as Costa Rica and Bolivia
Research questions 2	<ul style="list-style-type: none"> • World Bank PES learning papers

	<ul style="list-style-type: none"> • Interviews with relevant individuals from the following institutions in Liberia: <ul style="list-style-type: none"> ○ Environmental Protection Agency (EPA) ○ Ministry of Agriculture ○ Ministry of Lands, Mines, and Energy, ○ Ministries of Public Works ○ Green Advocates • Interviews from individuals from CARE International, DANIDA, and WWF (financiers and implementers of PWS schemes in Tanzania and Kenya) • Grey literature • Peer reviewed journal articles
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Primary data were collected mainly through expert interviews and interviews of landholders in the watershed during the fieldwork. Secondary data were obtained from different sources, including peer-reviewed journal articles and grey literature.

3.7 Data Analysis

The collected data was analysed primarily through content analysis and multi-criteria policy evaluation. The justification for the selection of these methods are explained below

3.7.1 Content Analysis of literature and interviews

Due to the fact that data for this thesis is basically collected through documentary analysis and interviews, content analysis was utilised for the evaluation and analysis. Content analysis is a procedure for categorisation of verbal or behavioural data for purposes of tabulation, classification, or summarisation (University of Surrey, 2016). The data collected through literature review and interviews were analysed at two levels:

- Basic Level: this is essentially a descriptive account of the data
- Latent level of Analysis: this is the more interpretative analysis and it is concerned with the descriptive account along with what is inferred or implied.

Coding and classification of data was used for the content analysis for this thesis. The aim of this coding and indexing is to analyse and make sense of the data collected so as to highlight the important findings, messages and features.

The content analysis of the literature review involved an analysis of different PWS schemes in Kenya and Tanzania as well as other PES schemes around the world with the aim of obtaining a global perspective on PWS and its environmental effectiveness, distributional considerations, and co-benefits/side-effects. PES is a relatively new approach to rouse environmental conservation by using market-based incentives, therefore, it has not been implemented in many places on the African continent. As a result of this, the literature available in the African context is limited. However, PES schemes have been widely implemented throughout developing countries in Latin America and Asia and could potentially provide useful information on how to enlarge and sustain PES schemes in an effective and efficient way in Africa.

The data collected from interviews were also analysed using content analysis method. As mentioned before, every PES scheme has unique features; it is therefore crucial to get insights

from primary sources of the scheme. The second part of the analysis will focus on the sustainability of the current financing of the scheme with the aim of providing an opinion on whether or not the scheme can be self-sustainable in the absence of overseas donor funding

3.7.2 Multi-criteria analysis

The research study also utilised multi-criteria policy evaluation of the PWS schemes in Tanzania and Kenya. The EPWS in Kenya and Tanzania were selected because they are amongst the few PWS schemes that have been successfully established on the African continent. Additionally, they are amongst the few African PWS schemes whose impacts have been evaluated.

The selected criteria for evaluation were environmental effectiveness, distributional considerations, technological effectiveness and side-effects of the EPWS scheme. The theoretical framework for the analysis of the EPWS was developed based on the multi-criteria analysis adapted from the EVALSED source-book, the EU guide and source-book for the evaluation of socio-economic development tools while insights from Mickwitz (2003) and Mundaca and Neij (2009) is utilised.

Table 3-3: Selected evaluation criteria

Criteria	Definition
Environmental effectiveness	The extent to which the EPWS scheme meets its intended environmental objective or realizes positive environmental outcomes
Distributional considerations	The incidence or distributional consequences of a policy, which includes dimensions such as fairness and equity, although there are others.
Side-effects/co-benefits	The additional benefits of the EPWS scheme beyond the intend land use changes
Technological improvements	Whether the scheme leads to the improvement or development of the system (thus contributing to the ongoing acceleration of learning and productivity

The multi-criteria analysis applied here is grounded on the principle that that combination of different criteria is needed to fully evaluate an environmental policy intervention and the use of various criteria is preferred to the use of a single criteria. Given that the evaluation is normative, it is important that some specific and clearly defined criteria are employed to serve as the foundation for the normative conclusions (Mickwitz 2003). There exists an array of evaluation criteria, and they have been applied differently by different authors to assess environmental policy interventions. (Mundaca & Neij, 2009; Konidari & Mavrakis, 2007; Mickwitz, 2003;). There are no specific guidelines for what criteria to use for the evaluation of PWS. Generally, there exist very few guidelines to actually utilise the most appropriate criteria for evaluating environmental policy instruments (Mundaca & Neij 2009). The IPCC (2007) suggests some important criteria for evaluating environmental policy instruments while Mundaca and Neij (2009) applied a set of evaluation criteria based on the attributes of Tradable White Certificates (TWC) schemes for the evaluation of the TWC scheme in the EU. Both documents give valuable insights on how and why specific criteria can be chosen for an environmental policy evaluation.

4 Desk-Based Evaluation: Results and Findings from Case Studies

4.1 Introduction

A wide range of experiences for exploring and testing PWS schemes has been gained in different sites around the world, especially in developed countries. Nevertheless, the PWS concept is relatively new and still evolving. Therefore, a key step to analyse the applicability of PWS in Liberia is to be informed about the current status of knowledge and practice in Africa. Therefore, this chapter will present the findings from an analysis of PWS schemes in Tanzania and Kenya. The aim is to draw up valuable lessons on how PWS work in Africa and what Liberia can learn from these experiences. This chapter is an ex-post evaluation of case studies of PWS implementation in Tanzania and Kenya. This study employs a multi-criteria analysis framework for the evaluation of the case studies. The criteria for evaluation are listed below:

- Environmental effectiveness
- Distributional considerations
- Poverty alleviation
- Co-benefits
- Technological improvement

4.2 The Equitable Payment for Watershed Services (EPWS) in the Uluguru Mountains in Tanzania

4.2.1 Materials

Material used for this analysis is based largely on the work of Lopa et al. (2012) which discusses the development, operationalisation, payment mechanism and sustainability of the EPWS programme. Further knowledge of the EPWS is drawn from Branca et al. (2011) who used the EPWS as a case study to explore key challenges for PES programmes in supporting the adoption of sustainable land management practices in developing countries. Further sources include Mussa et al (2013) who investigates the outcome of the scheme; Kwayu et al (2014) who investigates the determinants for farmers' participation in the EPWS; and Lopa & Mwanjoka, 2010 which discusses lessons learned from the scheme. This paper also uses reports on the EPWS from CARE and WWF.

4.2.2 Background

The scheme is implemented in four villages (Kibungo, Lanzi, Nyingwa and Dimilo) in the Uluguru Mountains. The scheme is concentrated on the Kibungo sub-catchment of the Ruvu River and its tributaries. The Ruvu River is the main source of water to the city of Dar es Salaam and its environs. The Uluguru Mountains provide a wide range of ES including water supply, water purification, filtration, etc. Because of a greater concentration of communities residing in or near the watershed and are reliant on its ES for their livelihood, the incidence of degradation and deforestation is high (Lopa et al, 2012; Branca et al, 2011). Residents had previously engaged in unsustainable agricultural practices, illegal mining activities, clearing and fragmentation of forest cover, etc. This has led to a decline in the quality and quantity of water flow with the hydrological assessment by CARE/WWF in 2007 indicating that water turbidity in the Ruvu River was increasing at an average of 5 NTUs per year and this degradation meant higher water treatment costs for the Dar es Salaam Water Company (DAWASCO) and

increased water tariffs for domestic and industrial consumers of water (Mussa et al, 2013; Lopa et al, 2009). Furthermore, forest cover had reduced significantly as cultivated land in the Kibungo sub-catchment area had increased by 300% since 1995 (Mussa et al, 2013; Lopa & Mwanyoka, 2010). Examination of annual volume flows of the Ruvu were also showed substantial variations in water flows (Mussa et al, 2013).

The implementation phase of the scheme employed a partnership approach which involved the local community landholders on one hand and the main buyers: DAWASCO and Coca Cola Kwanza Limited on the other hand (Branca et al, 2011). An MOU was established and the conditions included, among others, that the ES providers change their land use activities in order to restore the ecosystem and therefore its capacity to provide watershed services and that the downstream users of the ES (buyers) would compensate the ES providers for their efforts (CARE/WWF Project Proposal, 2007). The activities carried out by the landholders as part of the conditions of the MOU include improved terracing, afforestation and reforestation, agroforestry, and other sustainable land management practices (Mussa et al, 2014; Lopa et al, 2012). The payment mechanism is in-kind payments with farmers given vouchers which are calibrated to compensate for the costs associated with implementation and maintenance of the sustainable land practices (Lopa et al, 2012).

4.2.3 EPWS structure and stakeholders

The market is facilitated by two main NGOs: CARE International and WWF (IIED, 2015). The main buyers of ES are DAWASCO and the Coca-Cola KL while the sellers are subsistence farmers in the Kibungo sub-catchment of the Ruvu River Basin in the Uluguru Mountains. By 2008, more than 450 farmers had reportedly adopted improved land use practices (CARE, 2009; Stanton et al 2011). One particular buyer, DAWASCO, was influenced to buy ES due to the rising costs in water treatment because of the sedimentation in the river and was reportedly spending up to US\$2 million annually for water treatment (Branca et al, 2009). Prior to the start of the scheme, DAWASCO was spending nearly USD 2 million annually on water treatment and further degradation of the watersheds could lead to increase water treatment cost for DAWASCO (Lopa et al, 2010).

Payments from the buyers are channelled through CARE. The structure of the EPWS allows the Village authorities to ensure the compliance through signed agreements between the village authorities and CARE by making sure that farmers implement the conditions set in the MoU and to pass payments from CARE to participating farmers. Additionally, CARE provides materials to implement soil conservation measures and makes an annual payment of USD 1.50 for each acre (USD 0.6 per ha) of land under improved land-use practice. These funds are used to purchase materials to facilitate communication, namely stationery and mobile phone credit (Lopa et al, 2012). The number of farmers participating in the project increased within 1 year of the project's inception in July 2009 from 144 to 544 participants, largely due to the payments and also due to the fact that participating farmers were noting increases in crop production (Lopa et al, 2012).

4.2.4 Multi-criteria Analysis

Environmental Effectiveness

The environmental aim of the EPWS scheme was to establish long term financial investment for the modification of land use to conserve and improve watersheds in the Uluguru Mountains for reliable flow and quality of water (Lopa et al, 2012). By 2012, major improvements in land cover and reduction of sediment load in the Ruvu River and its tributaries were recorded, with

the Mfizigo River, a tributary of the Ruvu River is experiencing a reduction in sedimentation load from 416.66 to 274.9mg/L in 1.982m³/s from March 2010 to March 2011 (Lopa et al, 2012). Significant agroforestry and reforestation activities were adopted with up to 106,000 trees planted by 2010 with grass strips also planted (Lopa et al, 2012).

Table 4-1: Number of farmers engaged in tree planting by May 2010 (Lopa et al, 2014)

Village	Population	No. of Trees planted	No. of participating farmers
Kibungo	1,116	35,000	108
Nyingwa	1,734	19,000	157
Dimilo	909	22,000	68
Lanzi	1,101	30,000	52
	4,860	106,000	385

Terraces were adopted based on the terrace categories *fanya juu* (soil from trench on upper edge) and *fanya chini* (soil from the trench on lower edge). Mussa et al (2013) reported that about by 2011 (three years after the introduction of the scheme), 60.3% of the participants practiced bench terracing while 31.9% were reportedly engaged in *fanya juu* terracing. Mussa et al (2013), in their study found that afforestation and reforestation activities dropped from 13.3% before 2009 to 7.8% in 2011 amongst participants due to a preference for bench terracing as a result of higher financial incentives when compared to afforestation/reforestation.

Table 4-2: Number of farmers engaged in terracing by May 2010

Village	Population	No. of participating farmers
Kibungo	1,116	40
Nyingwa	1,734	57
Dimilo	909	29
Lanzi	1,101	33
Total	4,860	159

Poverty Alleviation

The farmers' adoption of practices such as terracing has increased yields for crops while new crops such as onions, tomatoes, and cabbages which had not previously been grown in this area were introduced (Lopa et al, 2012; Camilla, 2011). The revenue generated from the sale of crops between 2009 to 2012 by the farmers who previously did not have enough to sell amounted to an equivalent of US\$ 16,200 (Lopa et al, 2012).

The income that farmers received from the payments have been used to buy iron sheet roofing for their homes, clothes while some farmers also purchased livestock as well as increased levels of school goers among families as the extra income have been used to also pay for school fees (Lopa et al, 2012). The baseline income levels prior to the inception of the scheme were too low to make these investments (Lopa et al, 2012). Farmers have also used the money they have received to purchase extra agricultural inputs, namely better seeds to improve agricultural yields.

Distributional considerations

At the beginning of the scheme, CARE International and WWF engaged the local communities to ensure their participation. The organisations also use several other means to get local communities involved, such as, using of letters, village authorities, notice boards, visits to schools, visiting individual landholders as well as engaging in focus group discussions.

Table 4-3: Household participation in the EPWS (Kwayu et al, 2010)

Village	Households joined in 2009	Households joined in 2010
Nyingwa	30	85
Lanzi	53	82
Kibungo juu	24	129
Dimilo	26	60
Total	133	356

While one of the main objectives of the EPWS was to achieve equity, the participation of some farmers in the scheme was limited by factors such as farm size. Farmers with small farms were reluctant to participate because they were unable to adopt some of the conditions of the scheme, such as the construction of terraces, because it would affect their ability to produce enough food in the short term when concentration is on the construction of terraces (Kwayu et al, 2014). This is an indication that farmers with more land were more likely to participate than farmers with less land. Land ownership and distribution are very important if a PES scheme will achieve its poverty alleviation and equity objectives (Wunder, 2008b).

The study by Mussa et al (2014) revealed that there were issues with the consistency of payments from the buyers; 28% of the respondents who are participants in the scheme stated that they are yet to receive any payment since the scheme started. Furthermore, according to the same study, the amount paid as compensation was lower than the average household monthly income with only 3.4% of the scheme's participating respondents stating that they have received payments from the project above their average monthly income (Mussa et al, 2014)

Co-benefits

The EPWS brought several other benefits other than the protection of the watershed for the sustained supply of ES services from the watershed. Amongst the co-benefits includes climate change mitigation measures, livestock promotion, and women empowerment (Lopa et al, 2012). According to Lopa et al (2012) Climate change adaptation measures that have instituted which helped to reduce the environmental problems while also improving community livelihood include;

- Mulching (to improve soil moisture, texture, and structure).
- Agroforestry and reforestation.
- Cover crops and mixed cropping
- Zero grazing of animals (livestock is now raised in enclosures and stall-fed)
- Improved food security: through improved agricultural yields
- Female empowerment was prioritised. One of the implementing NGOs, CARE International, is involved in the empowerment of marginalised and vulnerable rural women (Kwayu et al 2014).

Technological improvements

The EPWS, which started in 2007, instigated various technological shifts such as bench terracing, grass strip farming, contour farming, and riparian zone restoration (Lopa et al, 2012). Terraces significantly reduced erosion and runoff. Historically terraces were resisted by Kibungo Juu communities due to its perception as a colonial imposition on local farmers, but through the EPWS, there was large-scale adoption of terracing on the steep slopes (Kwayu et al, 2014; Lopa et al, 2012).

4.2.5 Lessons learnt from the EPWS in Tanzania

Despite the fact that the scheme affected the livelihood of the participating farmers, the report issued by the program coordinator of the scheme in 2012 (Lopa et al, 2012) suggests that the EPWS programme failed to involve a large portion of the poorest of the poor in the scheme because they were landless. Further studies on the motivations for the farmer's participation in the scheme (Kwayu et al, 2014) and the impacts of the scheme (Mussa et al, 2013) also indicate that some farmers did not participate in the scheme because their lands were considered too small for the project. Others did not participate because they could not implement the land use changes because it would have affected their crop production and created food insecurity for their families (Mussa et al, 2013; Kwayu et al, 2014; Lopa et al, 2012).

Additionally, the reports of inconsistency in the payments to farmers (Mussa et al, 2013). Violations of the stipulations of the MoU suggests that legal enforcement is a problem.

The sustainability of financing is also an issue. The continuation of the scheme is reliant on funds from DAWASCO or Coca Cola, donors, or NGOs. If the business case for paying for ES by the buyers is not realised, the companies may pull out of the scheme, which would lead to farmers reverting to their old practices. Currently, there is no law that enforces beneficiaries of ES from watersheds to pay for watershed services. Due to the reliance of the scheme on finance from just NGOs and just two buyers, there is no certainty that this scheme can be sustainable in the long term or that it can be scaled up to get more buyers. The program was unsuccessful in influencing more buyers to join in EPWS mechanism other than DAWASCO and Coca-Cola.

As per the conditionality of the EPWS, farmers were supposed to receive compensation based on the delivery of sustainable land use practices that would improve water quality (Lopa et al, 2012; van Noordwijk & Leimona, 2010). With respect to additionality, some of the land use changes, especially bench terraces, would not have occurred without the presence of the scheme in the area due to historical reasons (Mussa et al, 2013; Kwayu et al, 2014; Lopa et al, 2012). However, for the rest of the land used changes, it is not clear whether the changes are only due to the presence of the scheme or whether there may be another rival explanation for the improvements. Considering an observable controlled group along with the treatment group at the beginning of a scheme can provide valuable insights on eliminating rival explanations.

4.3 Equitable Payment for Watershed Services (EPWS) in Lake Naivasha Basin, Kenya

4.3.1 Materials

Materials used for this case study are based on previous evaluations of the EPWS programme in the Lake Naivasha Basin. Chiramba et al (2011), Mulu et al (2015) and Nyongesa (2011) discusses how the EPWS program can be a viable mechanism for sustainable natural resource

management and improvement of livelihoods. Njenga & Muigai (2013) also provides an overview of the implementation of the PES with concentration on engaging local businesses for participation in the scheme.

4.3.2 Background

Kenya's Water Resources Management Authority had developed a water allocation plan for users of water from Lake Naivasha in 2010. This plan is intended to control the use of water from this area as there was no agreed limits to the total abstraction from the lake, aquifers or rivers within the Naivasha Basin while the abstraction of water was continuing to increase with significant impacts on the flow and quality of water (WRMA, 2010).

The Lake Naivasha watershed, which comprises an area of about 3,400 km², is recognised by The Ramsar Convention on Wetlands (2011) as a 'wetland of international importance'. The Basin supports different economic activities which include tourism, fisheries, and pastoralists (Willy et al, 2012). The water users are, however, faced with water shortages, eutrophication and siltation and these activities negatively affect the Basin and reduce its ES (Willy et al, 2012). Significant environmental degradation due excessive use of water for commercial, agricultural and domestic use affects the watershed (Chiramba et al, 2011). Activities in the watershed that are contributing to the degradation include small-scale and large-scale agriculture and horticulture with approximately 50 square kilometres of land in this area subjected to intensive commercial horticulture and flower farming (Chiramba et al, 2011). Other additional economic activities in the catchment area include ranching, tourism, fishing, geothermal power production as well as grazing from pastoralists. Overall, these activities provide livelihoods for over 500,000 people living within the basin (Nyongesa, 2011; Chiramba et al, 2011).

The area of the PWS pilot project is the Malewa River basin (a sub-catchment of Lake Naivasha basin) which is located in the Rift Valley and Central Provinces of Kenya. The specific interest of the project is the two the major tributaries of the Malewa River, Turasha-Kinja and Wanjohi Rivers, which supplies 80% of the water that flows into Lake Naivasha (Njenga & Muigai, 2013; Chiramba et al, 2011). The project is jointly implemented CARE and WWF. The downstream buyers of the ES had organised themselves into the Lake Naivasha Growers Group (LNGG) with the aim of addressing the environmental challenges faced by a deterioration of the lake Naivasha Basin and they are the main financiers of the scheme (Mulu et al, 2015). The goal of this project was to create a PES scheme that would compensate upstream farmers for their delivery of ES to downstream users of ES (Chiramba et al, 201; Njenga & Muigai, 2013).

4.3.3 Structure and stakeholders

This project is one of many initiatives by WWF/CARE to promote Equitable Payments for Watershed Services (EPWS) around the world with support from the governments of Canada, the Netherlands and USA (Njenga & Muigai, 2013). Downstream buyers for the ES include the Lake Naivasha Water Resource Users Association and the Lake Naivasha Growers Group. Their payment to upstream farmers is contingent on the farmers adopting sustainable land use measures to improve soil and water conservation that would benefit the downstream users. The buyers include water companies, horticultural growers, ranchers and the tourism industry. The annual payment is \$10,000 and is based on the amount that the involved buyers were willing to pay. Each farmer is paid approximately \$17 (Njenga & Muigai, 2013). The upstream sellers are Upper Turasha-Kinja Water Resource Users Associations and the Wanjohi Water Resource Users Associations.

4.3.4 Multi-criteria analysis

Environmental effectiveness

Prior to the commencement of the scheme, changes in water turbidity had been detected in rivers flowing into the lake while water shortages, eutrophication and increased siltation had been reported in the area (Willy et al, 2012; Nyongesa, 2012)

According to Chiramba et al (2011), the conditions of the scheme included the restoration, rehabilitation and conservation of riparian zones. In 2012, 785 farmer households in the upper catchment had become sellers of the environmental service. They make up roughly 4% of the total number of farm households in the upper catchment PES sites (Njenga & Muigai, 2013).

Soil and water conservation measures were implemented by participating farmers. (Nyongesa, 2011). By 2010, 470 out of 565 farmers had implemented the soil and water conservation measures with the figure rising to 504 farmers by 2011 (Nyongesa, 2011). Forest cover measures included the planting of trees to protect the riparian land and farmers who participated in this recorded lower levels of erosion when compared to the baseline (Nyongesa, 2011).

Poverty Alleviation

The farmers recorded additional sources of income from their farms as a result of joining the PES scheme as a result of increased output in their yields, with some reporting that crop and milk production were doubled as a result of implementing the conditions of the scheme (Nyongesa, 2011). Additionally, community members' skills were enhanced as there were trained in soil and water conservation practices (Nyongesa, 2011). This can be attributed to the improved soil fertility. Other direct benefits that the farmers obtained includes farming tools or chemicals, plant seedlings, and tree and fruit tree seedlings. Generally, farmers reported high levels of satisfaction with their participation in the scheme (Nyongesa, 2011).

Technological improvement

New innovation introduced includes construction of terraces, introduction of grass strips, agro-forestry and riparian zone protection. Reduction in the use of fertilizers and pesticides was also recorded.

4.3.5 Lessons Learnt from the EPWS in Kenya

Given that the Kenya's Water Resources Management Authority had already instituted a water allocation plan for users of water from Lake Navaisha in 2010, it may not be easy to attribute all of the positive changes in the lake to the PWS. Therefore, eliminating rival explanations for effectiveness may be more difficult than assessing the impacts of the scheme on the livelihoods of participants. From the various reviews of the scheme, there are indications of improvement in the livelihood of participants as well as positive environmental changes (Nyongesa, 2011; Njenga & Muigai, 2013; Chiramba et al, 2011). What is not clear is a corresponding counterfactual, that is, what the outcome would have been for program participants if they had not participated in the PES program. Based on the available evaluations of the scheme, it would seem that the scheme is effective when compared to the absence of the scheme.

On the issue of the sustainability of the project, the PWS in Kenya has a superior organisation to the EPWS in Tanzania. While the Tanzanian scheme is reliant on CARE and WWF for facilitating the scheme, the Kenyan scheme involves government agencies such as the Ministry of Agriculture, Ministry of Livestock, and Water Resources Management Authority (WRMA).

Furthermore, the downstream buyers (LANAWRUA) and upstream sellers (the two WRUAs), are legally formed institutions through Water Act 2002 under WRMA and their mandate and governance will ensure continuity of PES schemes (Nyongesa, 2011).

Like the Tanzanian scheme, the Kenyan scheme is also bedevilled by low buyers buy-in as convincing potential buyers to join the scheme is a challenge, most of them arguing it will be additional cost to the already statutory water fees they pay to the government water regulatory agencies, with only a few members of LANAWRUA committed to paying for the service (Willy et al, 2012; Nyongesa, 2011).

An important feature of the scheme that other new PWS schemes can learn from is the element of self-organization. LANAWRUA, comprising downstream farmers, companies and other businesses, had already organised themselves to improve the management of the basin's water resources. LANAWRUA and the upstream WRUAs in the upper catchment provided a valuable structure for the implementation of the scheme. The type of self-organisation exhibited here can easily compensate for the weaknesses of formal water institutions and, at the same time, create adaptive capacity to new problems through the building of mutual trust between heterogeneous user groups.

5 Fieldwork: Results from Survey and Interviews

5.1 Introduction

The fieldwork was conducted from June 14 to July 2, 2016. The first set of interviews was conducted with landholders from six villages located in the St. Paul River catchment. The six villages were: Whiteplains, Wukai, Walker Town, Millsburg, Jiro Town and Robertsville. An official of the WASH Secretariat of Liberia served as the liaison between the researcher and the village authorities. The interviews with the landholders were all conducted face to face. The second part of the interviews were conducted with experts from government entities and NGOs. Prior to the interviews, emails were sent out to the potential interviewees. Some interviews were conducted face to face while other interviews were conducted via skype.

5.2 Methods and Material

In this section, two different sets of interviews were conducted. Firstly, rural landholders from four villages located in the St. Paul River Basin was interviewed. The individuals interviewed were from the following villages: Whiteplains, Wukai, Walker Town, Jiro Town, Robertsville and Millsburg. The total participants in the interview were 82 household heads. The six towns are all located in the St. Paul River Basin, in the St. Paul River District of Montserrado County.

Participants of the survey were randomly selected from the four villages. The interviews were conducted in a face-to-face mode. In a few cases, an interpreter was used where the respondents could not speak English or Liberian Pidgin English. The survey interviews were structured (See Appendix I) and included data on socioeconomic characteristics, land use practices, property rights, their understanding of PWS, their willingness to accept payments for PWS, amongst others.

The second part of the fieldwork was the expert interviews. The semi-structured interviews were conducted with experts from government entities in Liberia and NGOs. Individuals from a total of 11 institutions were interviewed (6 NGOs and 5 government institutions) and it included questions on relevant stakeholders in the watershed, institutions, policies, amongst others (See Annex 3)

5.3 Results of Interviews of participants from Villages

In order to understand the perceptions of landholders in the St. Paul River Catchment regarding the possible development of a PWS for the area, a survey was carried out for selected landholders from 6 villages in the St. Paul River Basin. The willingness of landholders to adopt sustainable land-use practices is vital to the success of any PWS scheme. Therefore, this study sought to gauge the perceptions of farmers regarding their willingness to participate in a PWS because if landholders reject a PWS, even if the lure of a financial incentive will be irrelevant.

5.3.1 Targeting

Six villages in the St. Paul River Basin was targeted. The survey targeted only heads of households. A total of 82 persons participated in the survey. The targeted villages are located in the St. Paul River basin and their selection were based on the fact that they are essential agricultural areas that rely on the river basin for environmental services.

5.3.2 Sample Description

The six villages combined has approximately 111 households. 82 respondents participated in the survey. All 82 respondents were heads of households. Some household heads decided not

to participate in the survey while others were absent on the days that the survey was conducted either due to farming activities or for market purposes.

Table 5-1: Interviewees from local communities in the St. Paul river Basin

Towns/Villages	Males	Females	Total
Whiteplains	13	3	16
Wukai	10	7	17
Millsburg	6	2	8
Walker Town	9	6	15
Jiro Town	16	2	18
Robertsville	5	3	8
Total	59	23	82

5.3.3 Socio-Economic Characteristics of Interviewees

Demographic characteristics

Of the interviewed household heads, 39% were above 50 years old. 45.2% of the interviewees had not had any formal education while 22% had attended up to secondary school level. The literacy level of the sampled farmers (54%) in this area is slightly higher than the national average, which is about 47.6%, according to the UNESCO Institute for Statistics (2016). The predominant ethnic group in the area is Kpelle, followed by Gola, Vai and Americo-Liberians (Descendants of freed slaves from North America). The average family size is 5-6 persons.

Economic Characteristics

The main occupation for the inhabitants of the villages is subsistence farming. Some landholders have a secondary occupation, such as teaching or business, but farming is the predominant occupation. Most of the farm produce is consumed by households. Production of cassava, rice, palm oil and vegetables is widespread. Livestock breeding is very low with only few farmers engaging in animal husbandry. Other economic activities include trading with the wives of most of the farmers been traders. Poverty is widespread in the area with the average monthly income between \$40-\$80, which is largely obtained from sales of farmed produce. With the exception of palm oil production, all of the crops are seasonal, which means when they are out of season, households' income is severely affected. Some respondents, especially the farmers engaged in charcoal production, which is sold. Charcoal is the popular source of energy for cooking in the area. Timber production is also occurring in the area with

Table 5-2: Demographic characteristics of respondents from local communities

Characteristics	Male-		Female	
	Frequency	Percent	Frequency	Percent
Age				
18-30	6	7.3%	1	1.2%
31-40	8	9.7%	3	3.6%
41-50	14	17.1%	9	10.9%
51-60	24	29.3%	8	9.7%
60-above	8	9.7%	1	1.2%
Total	59	71.9%	23	28.1%
Occupation				
Farming	45	54.8%	10	12.2%

Business	4	4.8%	6	7.2%
Teaching	4	4.8%	2	2.5%
Clergy	2	2.5%	0	0%
Civil Servants	2	2.5%	2	2.5%
Others	2	2.5%	3	3.7%
Total	59	71.9%	23	28.1%
Education	Frequency	Percent	Frequency	Percent
Primary	21	25.6%	5	6.1%
Secondary	14	17.1%	4	4.9%
Tertiary	1	1.2%	0	0%
None	23	28.0%	14	17.1%
Total	59	71.9%	23	28.1%
Average Monthly Income	Frequency	Percent	Frequency	Percent
\$0-\$20	14	17.1%	2	2.5%
\$21-\$40	13	15.9%	4	4.8%
\$41-\$80	14	17.1%	4	4.8%
\$81-\$100	12	14.6%	5	6.1%
\$100-Above	6	7.2%	8	9.7%

5.3.4 Land characteristics

The majority of the respondents stated that they owned land sizes between 5-8 acres of land. Land degradation threats were widely reported on the respondents' farms. Up to 46% of respondents stated that their land has undergone degradation. Threats reported included deforestation due mainly to logging activities and the production of charcoal for energy. Other degradation reported included biodiversity loss.

Table 5-3: General land characteristics of local communities in the St. Paul River Basin

Farm Size (in acres)	Frequency	Percentage
0-4	28	34.1
5-8	44	53.6
9-12	7	8.5
12-above	3	3.6
Land Degradation	Frequency	Percentage
Yes	38	46.3
No	7	8.6
Partial	37	45.1
Land Tenure	Frequency	Percentage
Title	44	53.6
Shared Title with Family	18	21.9
No Title	20	24.3

5.3.5 Property Rights to land

The majority of landholders, about 54%, stated that they had official titles for the land they are cultivating. Ownership of cultivated land was also shared with about 22% of the respondents asserting that they share land titles with other relatives. A sizeable number of farmers had no

title to the land that they occupied. Of those interviewed, 24% stated that they did not have title to land but instead rent the land or are occupying the land with the consent of original owners, or that the land is deemed communally owned by the village and they are allocated it to farm by village authorities.

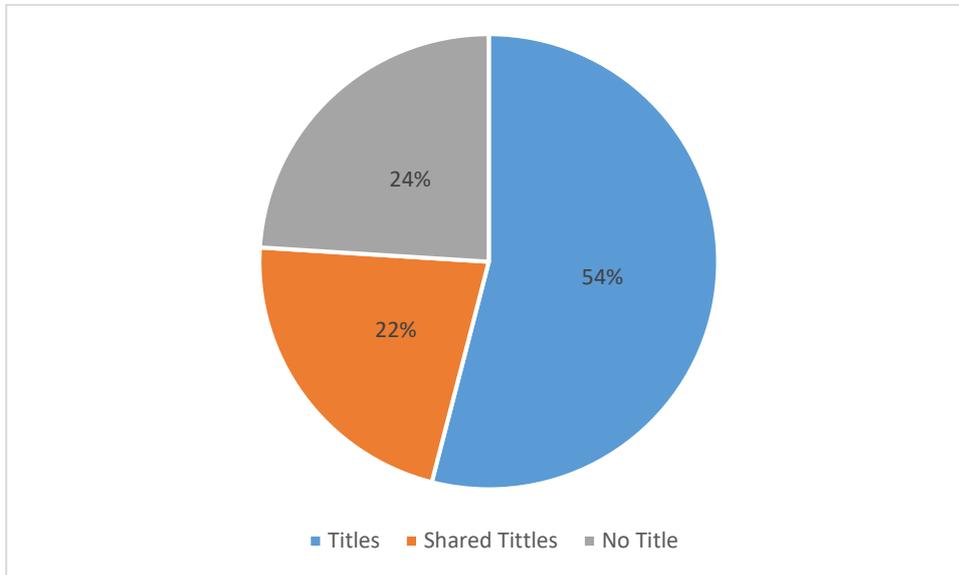


Figure 5-1: Land Ownership of sampled land users

5.3.6 Perception of the Importance of the watershed

The majority of the interviewed farmers recognises the importance of the watershed to their livelihood. 44% of the interviewed farmers stated that the watershed was a major source of water for their household and agriculture activities. Respondents also stated that the watershed as a source of environmental goods such as timber and that it provides environmental services such as water purification. Only 3% recognised the watershed for its biodiversity and tourism potential. This low recognition is partly due to the fact that Liberia is not a tourism hub. There was also low recognition for the watershed role in climate change mitigation (2%).

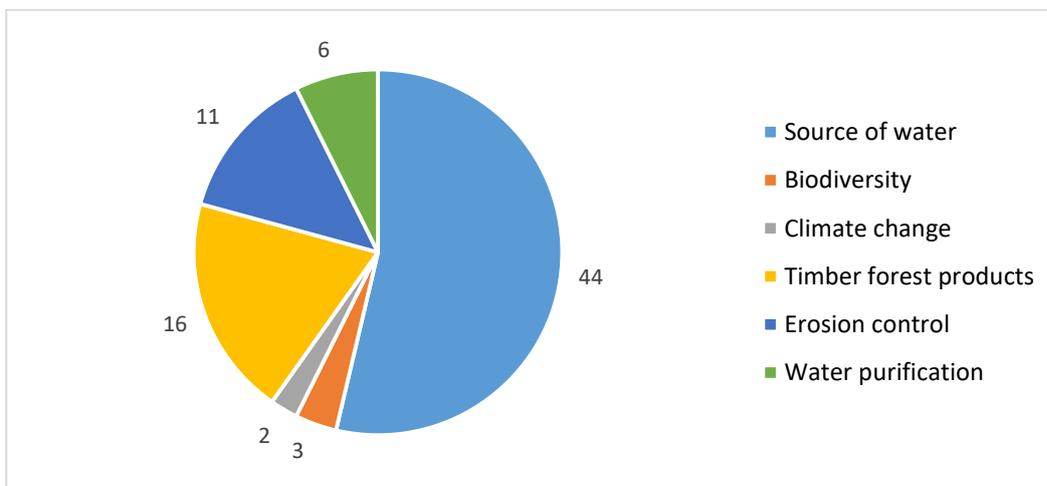


Figure 5-2: Perceptions of landholders on the important aspects of a watershed

When farmers were asked about what environmental conservation meant to them, the most common answer was that it meant bans on hunting of wildlife and protection of the forests. Water management was not given by any of the 82 respondents.

When respondents were specifically asked if environmental conservation was important to them, the majority (60%) stated that it was very important to them while the rest attached different levels of importance of environmental conservation to their land.

Table 5-4: Importance of Conservation to respondents

Responses	Frequency	Percentage
Very Important	49	60
Important	20	24
Moderately Important	13	16
Not Important	0	0

5.3.7 Perception on PWS

None of the participants in the survey (100%) were familiar with the concept of PWS. Despite their lack of knowledge or experience with PWS, they tended to show interest in the scheme after it was explained to them. Of the respondents surveyed, 74.3% stated that they will accept a PWS for the implementation of sustainable land use practices if they are offered compensation. They are some farmers who are reluctant to participate in a PWS with 17% (14 persons) of the participants stated that they will not participate in a PWS scheme due to different reasons. 9% (7 persons) were unsure whether or not they would want to participate in such a scheme.

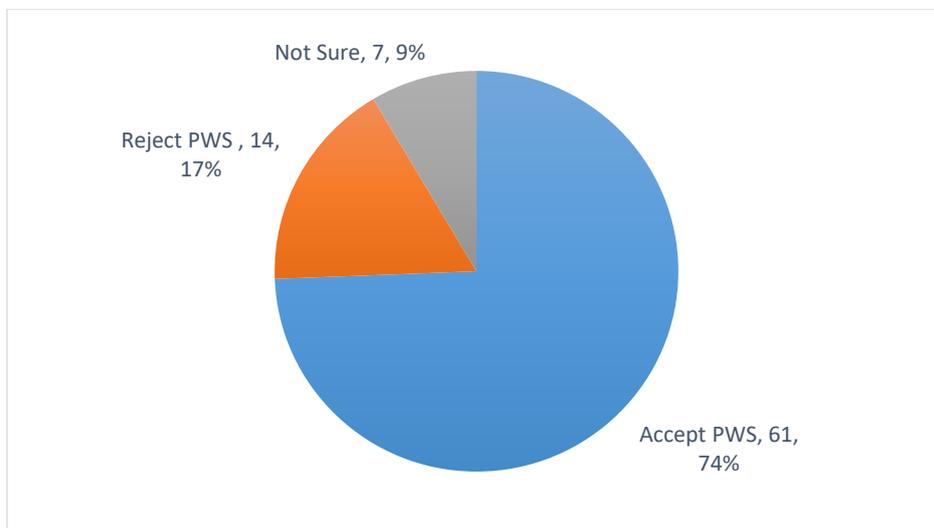


Figure 5-3: Number of farmers willing to participate in PWS

For the 17% that rejected the notion of participating in a PWS, various reasons were given. The main reason was a distrust that managers of the PWS may not live up to the contract agreement by paying the stipulated amounts. This reason may be propelled by a longstanding distrust of authorities and NGOs amongst the Liberian populace. Some other respondents stated that they are unprepared to enrol their land in a scheme for fear that their yields may be affected and they may be unable to provide for their families. Few stated that since the land

that they farm on are not theirs, they could not make the decision to enrol the land in a PWS. The small size of landholding was also highlighted by some farmers while a few felt that there was no need for a change in land use practices.

5.3.8 Types of contracts Preferred

Individual contract was the preferred choice for the majority of the participants in the survey with 58% of them have a preference for contracts with individual terms while 21% preferred collective agreements with other farmers. The majority of those who preferred collective contracts are those who shared land titles with other family members. The remaining participants did not want to participate in the scheme (17%) or they were uncertain as to what mode of contract they would prefer (6%). This question of what contract type farmers would prefer is important because it would have implications for transaction cost levels. Individual contracts will entail higher transaction costs, while collective contracts will entail less.

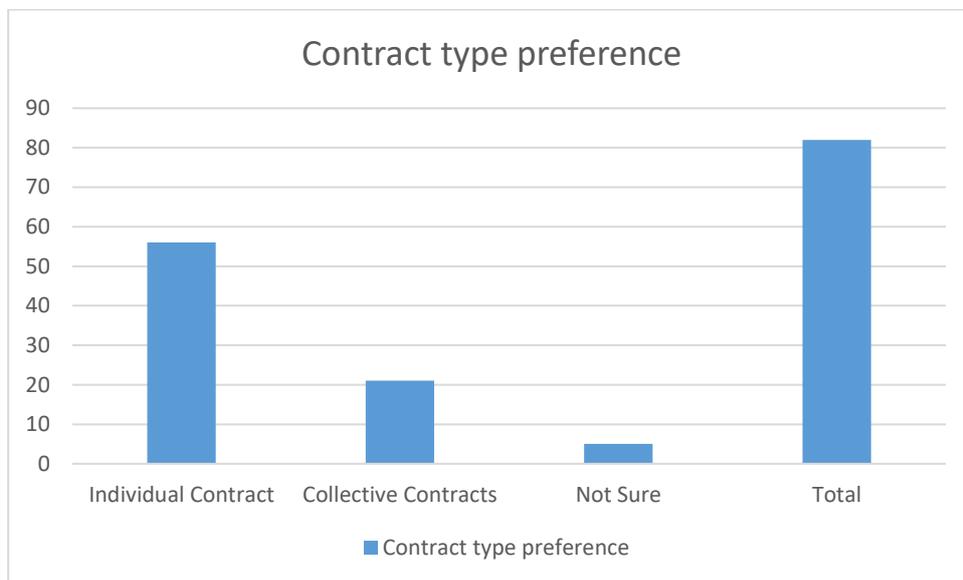


Figure 5-4: Landholders preferences by contract type

5.3.9 Payment Method Preference

When landholders were asked whether they would prefer compensation in cash or in kind, 41% they would prefer payment in kind while 59% preferred payments in cash. The landholders who had preferences for compensation in kind listed tools, building materials, fertilisers, and seedlings as their preferred choices.

Table 5-5: Landholders preferences of payment type

Responses	Frequency	Percentage
Cash	49	59
In Kind	33	41
Total	82	100

5.3.10 Institutions with presence in communities

While 38% of the interviewed participants did not belong to any formal organisation, 62% of the respondents are part of self-help initiatives, community based organisations (CBOs) or

regularly receive help or trainings from NGOs. The farmers usually participate in projects or benefit from the activities of the organisations that they are part of.

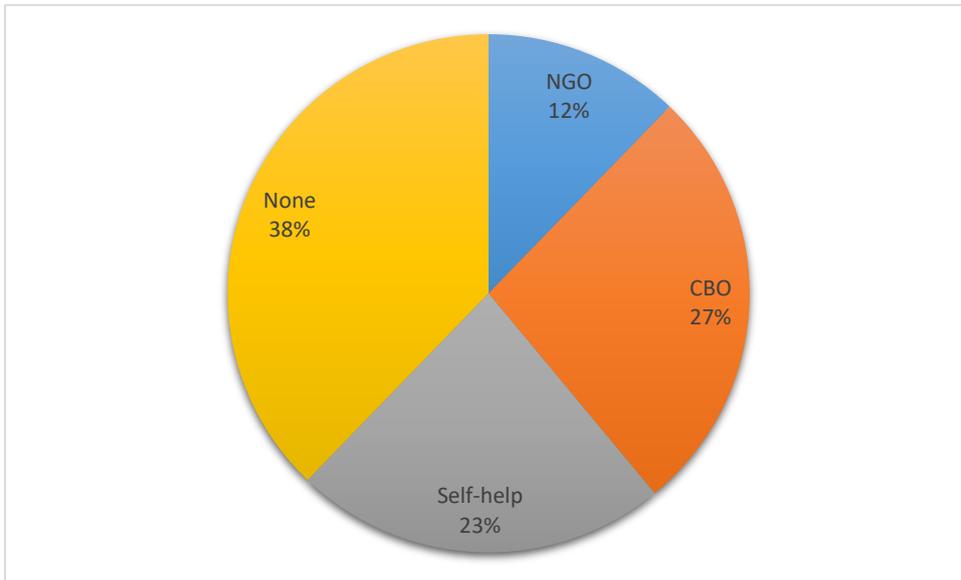


Figure 5-5: Available types of institutions in local communities

5.3.11 Technical capacity of landholders

When the respondents were asked whether they have specifically participated in an environmental scheme such as conservation, environmental sensitisation or water management. Only about 12% of the sampled respondents have been involved in an environmental project and it was in a water conservation project conducted by an NGO. The activities carried out by these community organisations includes health, microfinance, and agriculture

Table 5-6: Landholders involvement in environmental schemes

Number of landholders who had participated in environmental schemes		
Responses	Frequency	Percentage
Yes	10	12.2
No	72	87.8
Total	82	100
Types of environmental schemes		
Responses	Frequency	Percentage
Water Management	10	12.2
Environmental sensitisation	0	0
Biodiversity awareness	0	0
Conservation of forests	0	0
Others	0	0
None	72	87.8
Total	82	100

5.3.12 Monitoring

The farmers that prefer self-monitoring through organised self-help initiatives accounted for up to 47.6% of the interviews while an almost equal number preferred external regulation and monitoring (46.3%).

Table 5-7: Landholders preferences for mode of monitoring

Response	Frequency	Percentage
Self-Monitoring	39	47.6
Participatory Monitoring	20	24.4
External Monitoring	18	21.9
Not sure	5	6.1

5.4 Results of Expert Interviews (NGOs and Public Entities)

5.4.1 Experts knowledge and understanding of PWS

There was high variation in how experts understand PWS. Interviewed experts from government entities (Environmental Protection Agency; Forestry development Agency) were familiar with PES-like schemes such as the REDD+ initiative which is currently ongoing in Liberia. None were familiar with watershed-based payments. Interviewees from public entities tended to be more interested in how the design of the scheme can ensure that individuals participating in it would adopt practices that would alleviate the degradation of the watershed. Two interviewees from public entities also stated that the government should play a leading role in PWS because the institution of a PWS scheme entails high investment costs (Environmental Protection Agency; Forestry development Agency). This view is also held by three of the interviewees from environmental NGOs who acknowledged that the high investment costs of establishing a PWS scheme can be prohibitive because institutions does not have the funding to conduct baseline studies and buyers for ES may be few and inadequate; hence governments must play a major role.

Experts from NGOs propounded the view that PWS can trigger the adoption of sustainable land-use practices which may be extremely difficult to adopt by farmers due to many barriers. One interviewee from government and four interviewees from NGOs highlighted potential barriers that tend to stifle the adoption of sustainable land-use practices as knowledge gaps and lack of training at the local level regarding the adoption of new technologies. Another barrier pointed out by the experts is that in the short run, adopting sustainable land use practices entails establishment and maintenance costs and opportunity costs, which can lead to temporary negative economic returns from yields (Interview with sustainable development NGO, June 21, 2016). A PWS scheme, would therefore provide an incentive to farmers to adopt SLM practices for the generation of ES. However, the influence of PWS on SLM will rest largely with the profitability of SLM techniques, the presence of barriers to SLM adoption, and the beneficiaries' willingness to pay (Interview with conservation NGO, June 23, 2016).

An interviewee from a government entity pointed out that there can be sufficient incentives to trigger the adoption of sustainable land use practices by farmers without a PWS (Personal conservation with an official of government, July 3, 2016). Where the adoption of improved land-use practices increases farmers' output as well as improve the quality of the environment, there would be no need for a PWS scheme. He, therefore, advocated that more concentration should first be placed on promoting the adoption of sustainable land-use practices rather than

a PWS, because if farmers adopt sustainable agricultural practices, farmers will be better off while the environmental quality would improve even in the absence of the payments from PWS. This view was countered by the interviewees 6 interviewees from NGOs. An interesting point raised by an interviewee from NGO-1 was that the sustainable land used practices that could be beneficial to both farmers and the environment may still not be adopted due to barriers such as knowledge gaps, lack of training or the prohibitive costs to establish and maintain sustainable practices. Therefore, if the beneficiaries of ES are willing to pay landholders, a PWS should be established that would address the barriers to the adoption of sustainable land use practices.

Sustainable financing of a PWS scheme was also prominent in the discussions with interviewees from both NGOs and the government, stressing that where beneficiaries of the ES are not willing to pay for the ES, then the scheme may face challenges.

5.4.2 Marketing Watershed Services through PES Programs

The main challenge with marketing watershed services through a PWS scheme is the issue of capturing demand. This concern was expressed by two of the interviewed experts from government and 6 interviewed individuals from NGOs. To capture demand and ensure that there are buyers, it is important that a PWS scheme is piloted in a trial phase over a small geographical area with the aim of demonstrating the benefits that potential buyers of ES can obtain.

Marketing watershed services through a PWS scheme can be cumbersome. The major issue is how to clearly measure the changes in the ES as a result of payments from a PWS. When the question of how can the adoption of the conditions of a PWS be linked to improved ES was posed to experts, it elicited different response. A participant from NGOs stated that there can be difficulties in tracing and linking improved ES to farmer's activities; therefore, instead of a PWS monitoring the actual change in water quality or quantity, it should concentrate on the verification of the adoption of the land management options that are stipulated in the PWS contracts. Additionally, according to NGOs, the buyers of ES may have low confidence in investing in PWS due to difficulties in enforcement of contracts, scientific uncertainty of actual changes in the ES, and the high monitoring costs.

Due to the difficulties in attracting private investment for PWS, it is important the government support a public watershed payment system and in due course, private investment can gradually be encouraged.

5.4.3 Linking land use and Environmental Services

According to several two interviewees from government and four interviewees from NGOs, the issue of linking land use and the flow of water in the watershed is not so simple because it requires rigorous studies to obtain credible measurements. Currently, the Liberia WASH secretariat has sparse information on this. Even with the apparent lack of information, NGOs and government officials have a strong perception that the watershed plays an important role in protecting downstream water resources and is vital for agriculture, water supply for the hydroelectric plant and water supply for the water plant.

5.4.4 Beneficiaries of ES from the watershed

The beneficiaries of the St. Paul River watershed, as identified by the expert interviewees, can be classified into the following categories:

1. Local: includes domestic water users, local companies, farmers, etc.
2. National: the population of the country that is reliant on electricity from the Mount Coffee hydro and the LWSC plant in Whiteplains
3. International: tourists, etc.

5.4.5 Buyers and Sellers of ES

Service Providers

The expert interviewees identified the ES providers as the upstream landholders. Identified service providers are the landowners and land users within the watershed. However, some other experts argued that not all upstream landholders are classified as ES providers. Participants from NGOs generally classified upstream landholders who are incurring costs as a result of adopting land use changes to provide improved ES as the ones who should be identified as ES providers.

Potential buyers of ES

Potential buyers that were identified by the interviewees from NGOs and government include the Mount Coffee hydroelectric plant and The Liberia Water and Sewer Corporation, both of which have a huge presence in the watershed. Another potential buyer is the Monrovia Club Breweries, which is also located close to the St. Paul River.

5.4.6 Actors and their Roles and interests in the Watershed

Based on interviews with NGOs and government entities, the following actors in the management and use of the St. Paul River watershed was established.

Table 5-8: *Actors and their roles in St. Paul River Basin*

Actors	Roles
Liberia Water and Sewer Company	Responsible to provide to Monrovia and its plant relies on water from the St. Paul River. Water treatment costs for LWSC.
Liberia WASH Secretariat	A government-run institution set up to ensure that Liberians have access to clean and safe drinking water
Mount Coffee Hydroelectric Dam	Has its facility on the River and uses the river to generate electricity for Monrovia and its environs
Environmental Protection Agency	The agency responsible for the protection of the environment
Ministry of Public Works	Responsible for the national WASH initiative
Environmental/Conservation NGOs	Environmental NGOs operating in Liberia
Residents/Villagers/farmers	Live in the peripheral zone of the watershed

The different stakeholders all have different interests. The conservation NGOs interest is basically to ensure the protection of the environment. The different public entities are governed by their statutes which range from environmental protection (EPA) to the provision of potable water (LWSC and WASH Secretariat) to the provision of hydroelectricity (LEC) while the villagers interest is the use of the ES provided by the watershed for their livelihood.

Table 5-9: Actors and their interests in the St. Paul River Basin

Actors	Interest
Liberia Water and Sewer Company	Interested in the continuous supply of water to Monrovia and its environs.
Mount Coffee Hydroelectric Dam	The commercial interest to have a stable supply of water for the generation of electricity.
Environmental Protection Agency	Interested in conserving watersheds
Ministry of Public Works	Promotion of infrastructure for the supply of water to Monrovia and its environs
Environmental/Conservation NGOs	Protection of the environment
Residents/Villagers/farmers	Their sole interest is their subsistence. They engage in slash-and-burn agriculture to produce staple food like rice, cassava, vegetables.

5.4.7 Power Matrix

The opinions of the experts (government officials and NGO officials) were gauged to understand the levels of influence of the different actors in the basin. Some actors, like LWSC and the Mount Coffee Hydroelectric dam powers emanates from the government and therefore have a national influence. Others, like the villagers, have limited local or territorial influence.

Table 5-10: Power matrix of the actors in the St. Paul River Basin

Actors	Influence	Source of Power
Liberia Water and Sewer Company	Government	Monopoly of production and distribution of water
Mount Coffee Hydroelectric Dam	Government	Monopoly of electricity generation
Environmental Protection Agency	National	EPA Act; Authority to manage the environment
Ministry of Public Works	National	Act of legislature
Environmental/Conservation NGOs	National, international	International funding
Residents/Villagers/farmers	Local, territorial	Limited

Local communities have limited access to power and resources. The majority of the local inhabitants around the watershed has low educational levels and many are not familiar with a PWS scheme (see table 5-2). On the other hand, environmental and international NGOs tend to have greater scientific knowledge and skills in the environment. Additionally, they do have access to international funding. But from the sample of environmental NGOs in Liberia, no NGO is currently promoting the use of PWS at the moment (Personal communication with expert from Green Advocate, July 6, 2006).

The difference in information, influence and interest amongst the different stakeholders have led to different perceptions on the possible creation of a PWS scheme in Liberia. Table 5-12 summarises the perceived barriers to the development of a PWS scheme in the St. Paul River Basin as a possible solution for conservation.

Table 5-11: Perceived barriers to the establishment of a PWS

Actors	Perceived Barriers
Liberia Water and Sewer Company	Limitations of funding to pay for PWS; unwillingness to pay for PWS. If PWS should be established, payment should be made by industrial and commercial users of water
Mount Coffee Hydroelectric Dam	Limitations of funding to pay for PWS; unwillingness to pay for PWS. Consumers of electricity should pay instead of the Liberia Electricity Corporation
Environmental Protection Agency	High levels of poverty in the watershed; limited property rights to land in the area; high reliance of government on extractive industries such as timber and mining that are taking place in the watershed; The high number of concession companies that have licenses to engage in logging activities in the area; high level of dependence on charcoal for commercial activities in the area;
Ministry of Public Works	Undefined property rights on the part of local farmers; limitations of resources; low educational levels on the part of the population
Environmental/Conservation NGOs	High poverty levels and low educational levels; policies and regulations not clear; high transaction costs; low potentiality of PWS; low ability and unwillingness to pay; land ownership issues; weak institutional framework; high reliance of government on extractive industries such as timber and mining that are taking place in the watershed; The high number of concession companies that have licenses to engage in logging activities in the area; high level of dependence on charcoal for commercial activities in the area;
Residents/Villagers/farmers	Lack of trust in public entities and NGOS; profitability in private logging and charcoal business as opposed to conserving the forest; lack of surety that conservation will be economically beneficial to landholders

6 DISCUSSION AND ANALYSIS

In light of the socio-economic and institutional findings presented thus far, this work shows that a PWS scheme can be a viable mechanism for ensuring that the degradation of the watershed can be curtailed. However, it is also clear that the establishment of a PWS scheme has its challenges and certain conditions must be present before it can be successfully established. Based on the data, this chapter will examine the positive aspects and challenges for the establishment of such a scheme in the St. Paul River Basin.

6.1 Roles and responsibilities of potential PWS support institutions and structures and their patterns of interactions

Using content analysis of literature and interviews, this study developed a comprehensive understanding and assessment of the institutional context that affects the possible development of a PWS mechanism in the St. Paul River Basin. Firstly, there is a complex network of actors, including public and private organisations and individuals who are involved in the management of the basin. The different actors all have different interests – and accommodating all of the different interests will be a challenge. Creating a platform where the divergent interests can be discussed and negotiated to facilitate a consensus agreement and way forward is pivotal. Secondly, conservation NGOs and international donor organisations have traditionally played a more prominent role in environmental management, policy and advocacy in Liberia and are seen as legitimate actors. It is important to leverage the capacity of these institutions' technical capabilities and assets as well as capitalising on their resources and information to enhance the design of PWS scheme for implementation.

Table 6-1: Possible roles of stakeholders in the establishment of PWS

Support Service	Roles Activities required	Available Provider
Development of the Scheme	Baseline studies; preparation and training in PWS; development of business case; Ecosystem valuation; identification of sellers and buyers.	Green Advocates, Sustainable Development Institute (SDI); Society for the Conservation of Nature of Liberia (SCNL); ACIDI-VOCA, etc
Negotiators	Facilitate the negotiations between the sellers (local communities) and buyers	Green Advocates, sustainable Development Institute (SDI); other environmental NGOs
Technical support for sustainable land management	Setting the conditionality by indicating the sustainable land management practices that should be adopted	Ministry of Agriculture; Environmental Protection Agency; Forestry Development Agency;
Financing	Provision of necessary funds for the implementation activities	Liberia Electricity Corporation (LEC); Liberia Water and Sewer Corporation (LWSC); Ministry of Finance; Monrovia Breweries; Coca-Cola Liberia, A proposed national PES fund

In the case studies from Kenya and Tanzania (see Chapter 4), NGOs played a very key role in the establishment of the PWS schemes. CARE and WWF conducted the baseline studies and served as facilitators for the scheme. Due to the fact that local farmers were not knowledgeable about a PWS scheme, the NGOs created the framework for the market, scouted potential buyers and acted on behalf of the buyers. As already indicated, environmental conservation NGOs, due to their expertise and knowledge will have to play a leading role in developing a PWS scheme in Liberia. Local communities do not have the knowledge while the knowledge

and the capacity of the Liberian government is low, according to an interviewee from a conservation NGO). From a survey of NGOs and government institutions in Liberia, possible financiers and technical support providers to a PWS scheme are summarised in Table 6-1 below.

The role that village authorities or self-help initiatives from the villages will play in the implementation of a PWS is important. In the EPWS scheme in Tanzania, for example, the village councils represent the interests of the local farmers and they serve as the link between the intermediaries and the farmers. Payments are made to the farmers through them. In the EPWS scheme in Kenya, the farmers are well-organised and they represent themselves. Due to their high level of organisation, the role of the village authorities is not as essential as it is in the case of Tanzania. The upstream sellers of the ES, the farmers, are organised and represented by Upper Turasha-Kinja Water Resource Users Associations and the Wanjohi Water Resource Users Associations. The fact that the farmers were already grouped within and attached to organisations, made the conditions favourable for a PWS. This level of organisation is not present in the St. Paul River Basin. Therefore, farmers' organisations representing their interests is not possible at this stage. Villages authorities and organised associations of landholders are possible institutions that could assume the role of directly representing the interests of land users. From the results of the survey, there exists CBOs, and self-help initiatives in the villages. However, up to 38% of the interviewed farmers are not part of any formal organisation (See figure 5-5). It is important that CBOs lead the way in organising the land users since they do not have any formalised institution to represent their interests.

The establishment of a PWS will require the interactions of local, national and international actors. As shown in the cases of Tanzania and Kenya, international NGOs can be influential in ensuring that PWS is implemented. NGOs tend to be more powerful in lobbying for the implementation of conservancy projects in Liberia (Discussion with a representative of a Conservation NGO, July 26, 2016)). In Liberia, international conservancy NGOs such as Fauna and Flora, WRI and others have been prominent in ensuring that Liberia adopt certain regulations.

The integration of local communities in the decision making is also important. The results from the interview shows that locals expect to play a leading role in decisions affecting them. The scheme in Kenya and Tanzania also had local communities' participation. In the case of Tanzania, village councils where the leaders while in Kenya, sellers of the ES had organised themselves into groups prior to the commencement of the scheme. The buyers also in Kenya grouped themselves. The local community organisation will be an important facet of a PWS scheme if it is to be established in Liberia.

6.2 Favourable Factors for a PWS

6.2.1 Buyers

The identified potential buyers, the LWSC, Monrovia Club Breweries and LEC, has no direct willingness-to-pay to upland land users. The most likely way for this situation to change is if there are new regulations that would specifically obligate them to do so. LWSC and LEC are public entities while Club Breweries is a private entity. A PWS scheme will be seen as an unwelcome tax or fee when potential buyers are already paying various taxes to the national government. Furthermore, all here companies have monopolies in their sectors, so they therefore have less incentive than if they were in competitive industries where they will want to voluntarily engage in PWS to boost their reputation through CSR activities.

6.2.2 Sellers

The two favourable conditions that would facilitate the establish of a PWS in terms of selecting sellers of ES are:

The majority of interviewed land users in the watershed (74%) are willing to accept compensating to adopt sustainable land use practices in the watershed (see section 5.3.7).

- the majority of the land users, 54%, have titles to land while an additional 22 % or share title with family members. (See section 5.3.5). This means that up to 76% of the sampled size have secured control over the land use practice.

Challenges for the potential sellers of the ES would be the fact that they have low technical capacity and no awareness of PWS. The fact that a majority prefers individual deals as opposed to collective agreements means that transaction costs are likely to be high

6.2.3 The Potential for self-regulation

The potential for self-monitoring is high with 47.6% of the interviewed farmers preferring it as opposed to 24.4 % who preferred participatory monitoring (See Table 5-6). Despite this high preference for participatory monitoring, it can only work adequately if certain conditions are present and if the capacity to engage in self-monitoring is actually available. Self-monitoring is a very cost-effective. However, the success of self-monitoring is influenced by different factors. Firstly, the participating farmers must have adequate capacity. Secondly, there must be a framework wherein participating landholders have an incentive to monitor and report truthfully for their compliance. Thirdly, there must be options available to those engaging in the participatory monitoring to enforce cooperative behaviour and deal with free-riders. If there are weaknesses in the group and if options to enforce is limited, then the monitoring will be ineffective.

6.2.4 Land Tenure

The high level of land tenure security, with 54% having titles and 22 % sharing titles, can be a distinct advantage for the development of a PWS. This situation will make it easier to negotiate PWS contracts. For those without titles to land, negotiating PWS contracts will be difficult. Defined property rights to land in PES schemes is very important, especially in providing confidence that those receiving payments do have the right to engage in the prescribe land-use practices which are set as conditions in the contracts. Secured property rights are also vital as international experiences show that that the actual owners of the land are the ones who are compensated. However, establishing property rights for the entire area is still problematic. Up to 24% of the respondents do not have titles to the land that they occupy and this would mean that they would be excluded from the scheme if a framework cannot be developed wherein they could participate in the scheme.

Where there is an absence of titled rights to land, land users may not be reliable ES providers because they cannot effectively control the external factors that could endanger the provision of services. Furthermore, the determination of how to establish the structure of compensation can be problematic. Up a quarter of the interviewed land users in the St. Paul River Basin stated that they had no title to the land that they occupied. Developing a method where in these land users located in the Basin may be able to participate in the scheme is important. In one of the case studies, the EPWS scheme in Tanzania, landless land users were automatically excluded from the scheme (Lopa D., 2011). Automatically excluding these land users in the treatment area could potentially mean that some high risk areas will not be enrolled in the scheme. Fully

formalised land tenure rights may not necessarily be a requirement to enrol in a PWS but what has to be established is that that land users have effective rights of control of the land they occupy for the implementation of the scheme (Wunder, 2005). Probably establishing specific legislations that would clarify the position of land users without titles to land could help.

6.3 Unfavourable factors for a propose PWS Scheme

6.3.1 Low level of pre-existing organisation

Unlike the EPWS in Kenya that has a significant level of pre-existing organisation and effective coordination amongst the downstream buyers and upstream sellers of the ES, the landholders in the St. Paul River Basin are not organised in any formal organisations. Some 23% of the landholders have been engaged in some self-help initiatives while 27% and 12% have been involved with CBOs and NGOs (see Figure 9). But no water user group or Water-use management groups have been established and no formal organisations specifically for farmers and their land-use practices exist as in the case of the EPWS in Kenya.

6.3.2 Lack of Scientific Data

Vital data and baseline studies of the different stakeholders will need to be acquired before the establishment of a PWS scheme. CARE and WWF conducted the baseline studies in Tanzania with funding from international donors and DAWASCO, the national water company. They also relied on previous scientific studies on land-use practices in the area where the EPWS scheme was located. The previous studies provided a fulcrum for the baseline. This is in contrast to Liberia where there is essentially no scientific study conducted on in the St. Paul River Basin. Scientific data are seriously lacking and this would mean that baseline studies would have to be more thorough. Both a Scientific baseline, and then evidence of (positive) impacts related to land-use changes are very important, especially to buyers if they should have a degree of certainty in the causal link between improved ecosystem services and improved land use practices. Therefore, the lack of scientific information clarifying the impacts of the current agricultural activities and a determination of the actual additionality from adopting sustainable land use practices in the watershed is a challenge.

It is important that before the inception of the scheme, the sellers of the ES and the buyers are properly defined. Where proper identification of those who are actually providing the ES is lacking, the objective of the scheme can easily be undermined. Baseline assessments and appropriate targeting will avoid funds be paid for land use changes that would have occurred even without the scheme. There are recorded cases where poor targeting affected the outcomes of PES schemes in China and Mexico (Bennett and Xu, 2008; Alix-Garcia et al., 2005). High risk areas should be specifically targeted so as to avoid paying compensation to areas with low risks. Wunder (2008) advocates for spatial targeting, but spatial targeting is reliant on the availability of sufficient data both in quantity and in quality. There is also a tendency that spatial targeting would normally increase the poorer landholder relative participation, because environmentally sensitive lands often spatially coincide with remote, sparsely populated, poverty-struck areas.

6.3.3 Information asymmetry between local residents and other stakeholders

Of the residents living near the watershed sampled, none had ever heard about a PES mechanism (See section 5.3.7). Information and other transaction costs may be high if the different stakeholders do not share a common understanding of the PWS mechanism or the nature of issues to be addressed. NGOS in Liberia tend to be more informed about

environmental conservation initiatives than the government entities (Personal Conversation, July 3, 2016). Public agencies in Liberia also seem to be only interested in the traditional mode of conservation activities such as bans. Not any of the interviewed public officials have experimented with the implementation of market based instruments.

6.4 Other Issues to Consider

6.4.1 Eligibility Criteria and landholder's participation

The development of the scheme should take into consideration the need to have eligibility criteria that will not be deemed as exclusionary. In the case of the EPWS scheme in Tanzania, land users without defined property rights were automatically excluded (See section 6.4.9). This should be viewed in lieu of the fact that the majority of inhabitants in the vicinity of the watershed are poor and they are unlikely to meet most of the eligibility criteria. Eligibility criteria that would be deemed exclusionary may breed conflict. The fact that most of the farmers that participated in the survey expressed a willingness to accept (WTA) payments suggest that an inclusive PWS scheme has huge potential for success

6.4.2 Transaction costs

An institutional challenge for the establishment of a PWS is transaction costs. Costs will emanate from the divergences of preferences in contract types and payment types of the landholders. Of the 82 sampled landholders, 58% preferred having a preference for contracts on individual terms while 21% preferred collective contracts (See Figure 8). The higher number of preferences for individualised contracts would mean higher transaction costs because the negotiations would have to be carried out with many different landholders. Other transaction costs will also be incurred due to the contrasting expectations for compensation as 59% of respondents preferred payments in cash while 41% preferred payments in kind (See Table 15). The differences in payment preferences would also mean higher transaction cost as those carrying out the compensation will have to take into account the individual preferences of the farmers. There is the potential for transaction costs to exceed the potential benefits of the scheme as costs for the set-up, management and monitoring of PWS could all be high due. To ensure the successful implementation of a PWS, there is a need to ensure that the transaction costs do not exceed the potential benefits in the scheme.

6.4.3 Technical Support to Negotiate PWS

There is an apparent lack of technical capacity in the local communities in the participation of a PWS scheme. Only 12% of the interviewed landholders had had any experience in participating in an environmental project (see Table 16). The landholders in the villages had never initiated an environmental project and those who had participated in the environmental project were invited to do so by an NGO. This further stresses the importance of the role that NGOs will have to play in educating landholders if they are to participate.

6.4.4 Strategic Behaviour and Free Riding

There were suggestions that local communities might rent seeking behaviour by attempting to obtain more benefits at the expense of others. There have been examples of such rent seeking behaviour in local communities in areas where multi-national companies are operating (Conversation with official of government, July 21, 2016). There is also the problem of free riding with many entities who are clear beneficiaries of the ES from the watershed are not willing to pay for the ES; and without any form of regulation of the use of the water (as it is in the case of Lake Navaisha), there is a likelihood that the situation might lead to under provision of ES.

6.4.5 Balancing efficiency and equity

PWS is established with an environmental objective a priority. Therefore, as Wunder (2007) suggests, a PES scheme should ensure that payments are made strictly for the environmental protection of the area where the scheme is operational due to the existence of threats to the provision of specific ES. Others, like Muradian et al (2010) suggest that fairness should also be a major consideration in implementing PES to ensure that those who are likely to experience losses from production as a result of adopting conservation measures are adequately compensated. This position is buttressed by others who argues that equity considerations should be integrated into conservation planning and implementation because PES that overlooks the relationship between equity and efficiency can in some cases undermine conservation goals (Pascual, et al., 2014). Neglect of equity can lead to negative feedbacks that adversely affect the legitimacy of the scheme, lead conflicts with the propensity to undermine the goals for the scheme or even reduce stakeholder participation (Kinzig, et al., 2013).

If a PWS scheme is to be established in Liberia, it is vital that the design stage focus on equity considerations so as to trigger greater participation in the scheme. In the case of Liberia, it will be important to consider the surrounding social conditions of the participating land users, especially as it relates to compensation. Where there is an emphasis on compensation being made based on the actual level of land use improvement practices, land users who cannot achieve this at a fast pace may become disenchanted. Participating farmers in Tanzania in some cases complained about not receiving their payments on time. A scheme that adopts a payment where everyone is paid equally per land unit tend to be the ideal as farmers are certain about what they will get once they enrol their land. Payments focused more on the actual outcome levels may not be favourable as it would mean that there is no certainty about what exactly the land user will get over a period because the land use improvements will have to be accessed before payments is calculated and paid out. There is already an issue of distrust that the land users have regarding the authorities and NGOs and where there is no degree of certainty on the exact amount they will there, there will be a potential for dissent. For example, the FONAFIFO PES scheme in Costa Rica, pays an equal payment per hectare independent of the spatial variability in the provision of ES or the costs of the required management practices by different landholders (Pascual et al, 2009; Pagiola, 2008) as opposed to the EPWS in Tanzania which uses a payment criterion that is differentiated according to the expected and/or actual level of provision of ES based on the number of water-quality or land-use improvement practices adopted by the farmers, and their likely contribution to the conservation of the watershed.

6.4.6 Measuring successes: The need for control groups and treatment groups

The schemes in Kenya and Tanzania have recorded successes in achieving the environmental targets of the scheme. What could not clearly be determined in both schemes is whether the outcomes in both cases are totally attributable to the schemes or whether there may be other explanations for the changes. One way to eliminate rival explanations of the outcomes is to make provisions for a control group, with similar characteristics to the treatment group, to be observed from the design stage of the scheme (Le Velly & Dutilly, 2016). The treatment group will be the landholders who are participating in the scheme, while the control group will be the group that did not participate in the scheme but have similar characteristics of the treatment group. The St. Paul River has three major tributaries: Wuni, Toma, and Vai rivers. Depending on which part of the watershed that the scheme will occur, it will be prudent to observe non-participating land users with similar characteristics to the participants in another part of the watershed, preferably on one of the tributaries to easily observe the outcomes. There are land

users who will opt not to participate in the scheme due to different reasons (see section 5.3.7). Those farmers who will not enrol and are in the geographical location of a tributary that is not the main location of the scheme can be observed as the controlled group. This group can be provided technical support by the facilitators of the scheme, but allowed to carry on business as usual. Since PES generally have a time frame (5 years or 10 years), this approach can provide valuable insights into how the outcomes can be directly attributed to the land use changes of a PWS scheme.

By comparing the the land use changes undertaken by the scheme participants (the treatment group) to the group of nonparticipants (the comparison group) that are statistically similar in the absence of the scheme, it will be easier to distinguish the impacts of the PWS from that of other factors (Pagiola & Arias, 2013). According to Pagiola & Arias (2013), the few attempts to evaluate the effects of PES schemes have been hampered by the fact that none of the PES schemes established control groups at the inception of the projects. A PES scheme that have successfully included observations for both control groups and treatment groups if the Silvopastoral Project in Quindío, Colombia. Both groups land use changes were monitored throughout the project period (Pagiola & Arias, 2013). The major difficulty in establishing a framework for observing both treatment and control groups is how to identify a valid comparison group that has the same characteristics as the treatment group.

6.4.7 Policy issues

The four main laws that are currently addressing environmental issues are:

- the 1976 FDA Act
- the 2006 Forestry Law
- the 2003 EPA Act
- the 2003 Environment Protection and Management Law

All of these acts are basically regulatory instruments and they follow a polluter pays approach rather than a market-based approach of the PWS. Despite these laws, there is a need for enabling policies that would work along with the aforementioned laws to promote PWS. There may be no need to enact laws specifically for the purpose of implementing PWS, but there will be a need for the policies to be favourable to the establishment of PWS. Policies will include addressing other issues that affect PWS such as land rights issues. All of the interviewed experts stated that there is no specific reference to PWS in the existing policies in Liberia.

The need to provide guidance on the implementation of PWS at the local community level with the aid of enabling policies. Policy measures should be coupled with a more proactive approach by the government and conservation NGOs to create a framework for markets for ES which can be part of the larger strategy for natural resource management in Liberia. Additionally, there is a need to emphasise the domestication of relevant global and national policies to the local level so that it can be embraced and that landholders in the catchment area can understand the changes taking place is also vital. There is a tendency for Liberia to enact laws borrowed from other countries with little local context. The constitution of Liberia is a direct copy of the USA why most laws are borrowed from EU or Western countries with the aim of satisfying international conditions and in most cases, because these laws are not domesticated, they tend not to be successful.

6.4.8 The credibility of Intermediaries

Before a PWS is established, the facilitators will engage in the negotiation of agreements with sellers of ES (landholders) and buyers (public and private users of ES). In the case studies of PWS schemes in Kenya and Tanzania, NGOs served as intermediaries who performed the aforementioned tasks. There is, therefore, a need for NGOs playing this role to obtain the trust of local communities who should part in the scheme. In section 5.3.7, some landholders stated that they are reluctant to participate in a PWS with and amongst the reasons they give was a distrust in NGOs and public authorities. The presence of NGOs who as intermediaries, would facilitate the establishment of the scheme is very important. NGOs role is pivotal as they have the advantage of more local knowledge and should have a better rapport with local communities. In the case of the EPWS in Tanzania, CARE International and WWF were able to garner sufficient trust from the local population to the point that they propel technological changes (such as terracing) which had long been resisted by the local communities. Part of the reason why CARE is a trusted NGO is due largely to the fact that they positioned themselves both before donor communities and the local community as a credible institution that seek the interest of vulnerable people in the treatment area. Additionally, their provision of basic services to the poor communities actually filled the gap of public institutions inadequacies in the public delivery of such services. In this vein, they invariably complement the roles of governments and the collective efforts. A tricky issue to consider is the fact that Liberia has a history of NGOs and multinational organisations supplanting government in rural areas because the local communities shifts the developmental burden from government to them with the expectations that they would fill in where government fails to perform (Conversations from representatives of two NGOs, June 16, 2016).

6.4.9 Opportunity cost

The cost for a conservation project in the form of a PWS can be considered an opportunity cost, given that land users who will be enrolled in the scheme will have to forego hitherto profitable activities that may have been contributing to the degradation. Addressing the issue of opportunity cost so as to make alternative land use unattractive to the landholders is very important for the successful establishment for a PWS. The potential profits for charcoal, timber or agricultural practices in the catchment area of the St. Paul River Basin is deemed considerably higher than the compensation that farmers would be paid if they participate in the scheme (personal conversation with NGO, 2016). Liberia has a thriving charcoal industry with about 95% of Liberia's urban population using charcoal (Jones, 2015) While the charcoal trade tends to satisfy the urban population demand for charcoal, it is having an adverse effect on the habitat and the rural producers who are supplying cheap, reliable fuel for urban consumption (Jones, 2015). Charcoal is not the only lucrative alternative land use. Timber is also thriving. How to make a PWS scheme attractive for landholders to enrol in the scheme and forego the alternative land uses is therefore important. Addressing the issue of opportunity costs is even more important given that there has been a tendency for conservation activities to be targeted to areas in developing countries due to the idea of 'lower cost of conservation' that makes conservation schemes cheaper and given the fact that landholders are usually paid at their current poverty level (Karsenty, 2007). Karsenty (2007) has also argued that the opportunity cost of setting up large scale conservation concessions is much higher.

6.5 Finance

Acquiring finance for a PWS scheme is also challenging. None of the public institutions that were interviewed are willing to pay for PWS (see Table 5-12). Assigning watershed payments to the private sector in Liberia is also a tricky one as they expect a business case for such payments. Specific interviewees from the Liberia Water and Sewer Company, the largest user

of water from tee St. Paul stated that they were not willing to pay farmers money. There were also divergences of opinions of who should pay. Some argued that the government should finance the payments through a national fund while others argue that private consumers of water should bear the responsibility (See table 5-12).

7 Conclusions/Recommendations

7.1 Introduction

This chapter delivers major conclusions and recommendations based on the analysis of literature, desk-based case studies, fieldwork and analysis. Based on the discussion and analysis, the author drew up some policy issues that should be addressed, suggested different models for PWS financing and concluded with relevant areas for further studies.

7.2 Main Conclusions

The main purpose of this thesis was to assess the potential for PWS as a sustainable financial tool for the protection of watersheds in Liberia. The objective was to analyse the applicability of PWS for the conservation of watersheds in the St. Paul river Basin of Liberia, drawing experiences from an African experience of PWS implementation with insights from Kenya and Tanzania by identifying success factors for effective PWS implementation, comparing these success factors in the context of Liberia watersheds and developing a possible framework for PWS implementation in Liberia.

An extensive literature review was conducted with the aim to critically appraise the theoretical concept and global experience of PWS implementation. To this end, various journal articles, reports and publications of various organizations, and reports prepared by researchers with experience in PWS schemes in different regions were reviewed and synthesized in the literature review.

Additionally, an ex-post desk-based evaluation of how PWS works in Africa, using case studies from Kenya and Tanzania was conducted. The evaluation of the case studies concentrated on environmental effectiveness, poverty alleviation, co-benefits and technological improvements. Findings from the desk-based evaluation of the PWS scheme in Tanzania suggests that there were marked improvements in environmental outcomes after the inception of the scheme when compared to the baseline. Additionally, there were improvement in the livelihood of participating land users. However, the scheme failed to involve the majority of the poorest of the poor due to different reasons (See section 4.2.5). The eligibility criteria of the scheme also raised some equity concerns as it automatically excluded land users with titles to the land they occupied and many land users could not also be participating because of their inability to meet the eligibility criteria. There are also concerns about the sustainability of the scheme in Tanzania as it is reliant on NGOs, with only 2 buyers at the moment paying for ES.

Findings from the desk-based evaluation of the PWS scheme in Kenya also reported improvements in the environmental outcomes and improvements in the livelihood of participating land users. It should be noted that the Kenya's Water Resources Management Authority had already instituted a water allocation plan for the area during the same period that the scheme became operational. Therefore, attributing the improvements entirely to the PWS can be problematic. Furthermore, there is no corresponding counterfactual, that is, what the outcome would have been for the scheme's participants if they had not participated in the PES program. The PWS in Kenya has a superior organisation when compared to the EPWS in Tanzania. While the Tanzanian scheme is reliant on CARE and WWF for facilitating the scheme, the Kenyan scheme involves government agencies such as the Ministry of Agriculture, Ministry of Livestock, and Water Resources Management Authority (WRMA). Furthermore, the downstream buyers (LANAWRUA) and upstream sellers (the two WRUAs), are legally formed institutions through Water Act 2002 under WRMA and their mandate and governance

will ensure continuity of PES scheme. Both the sellers and buyers of ES in Tanzania do not have such levels of organisation.

An ex-ante analysis of the potential of PWS as a sustainable financing tool for environmental conservation and poverty alleviation of local communities in the St. Paul River Basin. In order to obtain findings for the analysis, a fieldwork was conducted. The fieldwork included interviews with 82 land users, from six villages in the St. Paul River Basin. 11 expert interviews were conducted from NGOs and 5 government institutions that are involved in conservation in Liberia. Findings from the fieldworks suggests that favourable conditions for PWS implementation in the basin includes the identification of potential buyers of ES with a presence in the basin, including Liberia Water and Sewer Corporation (LWSC), Mount Coffee Hydroelectric plant, and the Monrovia Club Breweries. The majority of landholders in the basin has titles to their land. However, none of the land users in the basin are knowledgeable about PWS. For the sellers, majority have titles to the land that they occupy which means that they do have control over the land use changes on the land. Additionally, majority of the landholders are willing to accept compensating to adopt sustainable land use practices in the watershed. The majority of the interviewed land users also prefers self-regulation which has important transaction cost implications. Unfavourable factors for PWS implementation includes the low levels of pre-existing organisation amongst the potential buyers and land users. Unlike the scheme in Kenya's Lake Navaisha Basin, where land users and beneficiaries of ES are organised in formal entities, no such level of organisation exist at the moment in the St. Paul River Basin in Liberia. Additionally, there is a lack of scientific data on the potential of PWS in the St. Paul River basin. Furthermore, information asymmetry is present with none of the interviewed land users having any knowledge of PWS. The findings also suggest other areas that a potential PWS scheme in the St. Paul River Basin will have to consider are the eligibility criteria for land user's participation, transaction costs, technical support to negotiate PWS, potential strategic behaviour and the problem of free riders and balancing efficiency and effectiveness. The findings also suggest that opportunity costs, the credibility of intermediaries, the need to have enabling policy instruments for PWS implementation amongst others should also be considered when addressing the potentialities for the implementation of PWS in the St. Paul River Basin in Liberia.

7.3 Recommendations

7.3.1 Phasing out the excessive use of charcoal

There is a need to particularly address the lack of energy which is driving the huge production of charcoal to meet the energy needs of the city of Monrovia. The phasing out of the excessive use of charcoal can be done through innovative methods that can shift energy use from fuel wood and charcoal to alternatives that are cheaper and sustainable alternatives. There is a need for a national push in Liberia to seek alternative energy sources with the aim of reducing the huge dependence on charcoal and fuel wood. This can be done through the promotion of innovative and cheap technology such as cheap and improved cooking stoves for both urban and rural dwellers and providing subsidies or incentives to both rural and urban residents to shift from fuel wood and charcoal to more sustainable energy sources. Furthermore, there is a need to strengthen local institutions to work towards phasing out the excessive charcoal use through promoting sustainable production of charcoal.

7.3.2 Recommendations for possible PWS Models

Three proposed scenarios for PWS development are suggested below:

- Direct payments from potential buyers like LEC, LWSC, Club Breweries
- Local Fund for watershed protection
- create a National fund for water resources

Option 1

The first model has little government involvement with local NGOs playing a more pronounced role. With local land users having greater involvement. The PWS scheme is set up with intermediaries acting on behalf of the buyers and sellers with direct payments from buyers. This is the case with the EPWS in Tanzania which is managed by CARE and WWF, with direct payments coming from DAWASCO, the national water supply company and Coca Cola Tanzania. CARE and WWF receive the payments, forward the payments to the village councils which in turn pay the farmers. CARE and WWF also monitor the enforcement of the conditions of the scheme (Lopa et al, 2012).

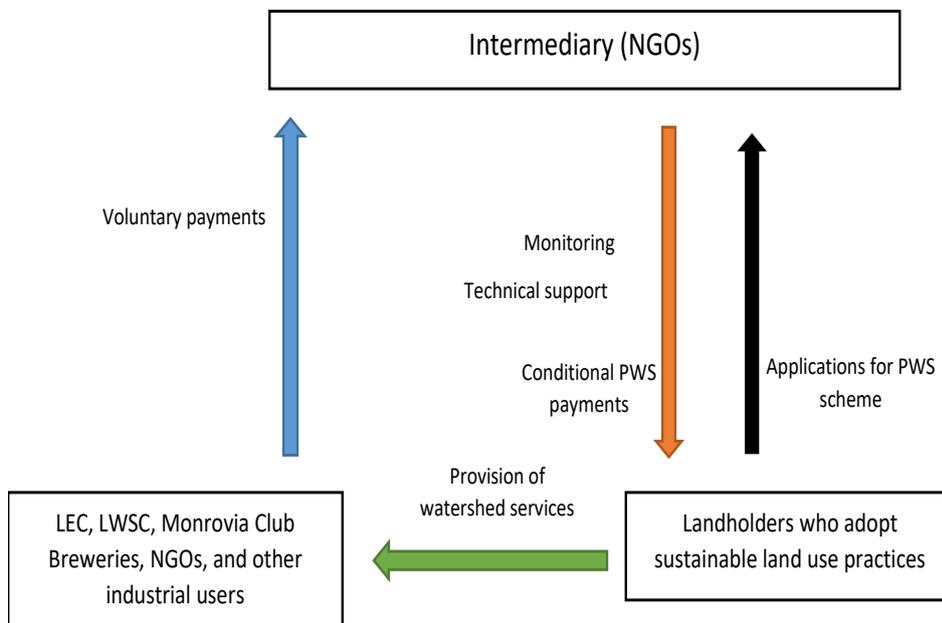


Figure 7-1: Option 1- Direct payments made by buyers to landholders

Option 2

A local fund for watershed payment can be set up through a PWS scheme. This can be funded by royalties from potential buyers like Monrovia Club Breweries and possible support from public entities operating in the watershed like LEC (hydroelectric) and LWSC (drinking water) as well as local and international NGOs. The management of said local fund will involve all stakeholders of the local PWS scheme, including LWSC, LEC, NGOs involved and the landholders. The efficiency of this model depends largely on how the negotiations and discussions are handled. The contracts can be handled at the district level (ST. Paul River district) or county level (Montserrado County). Where the district or county authority lacks the required competencies and resources, NGOs with expertise can spearhead the local fund along with the district authority. This scenario is similar to Sierra de las Minas Biosphere Reserve Water Fund in Guatemala and the PWS scheme in Pimampiro, Ecuador both of which are set up like a trust fund to manage the revenue from the payments.

Possible challenges to this model would be political factors as this model would spell a reduced role for national bodies responsible for water and the environment like the EPA and Liberia WASH Secretariat while giving more powers to the local authorities furthermore.

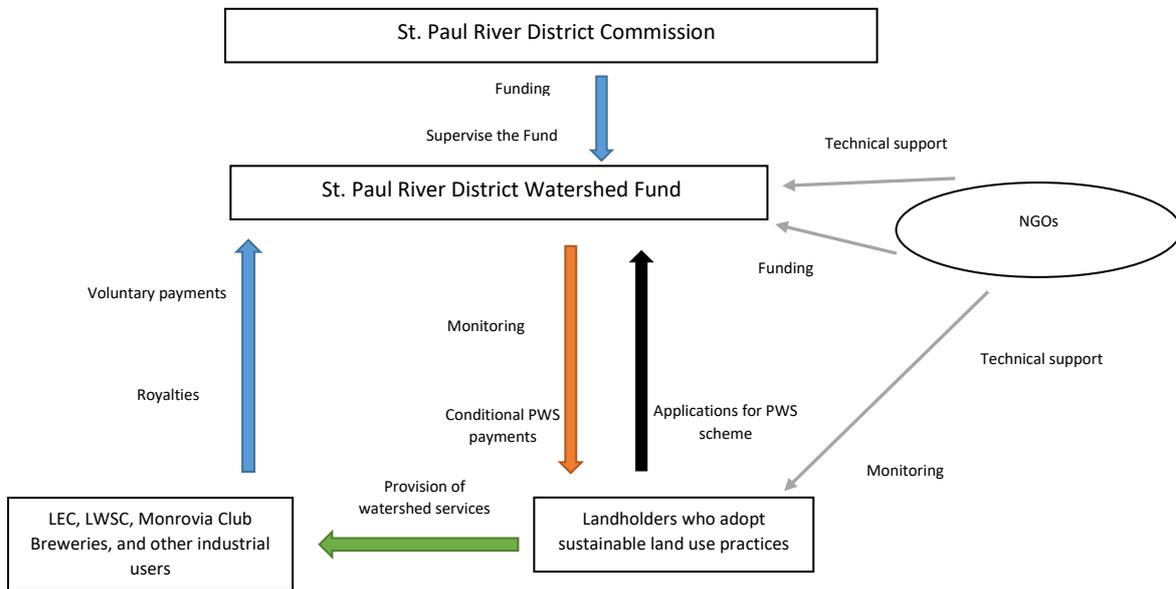


Figure 7-2: Option 2- A Local watershed fund for the St. Paul River District

Option 3

The third scenario is to set up a national fund for payment for watershed services that would be funded through taxes or royalties or through bills paid by water users. The Water Protection Fund (FONAG) in Quito, Ecuador is a national fund and all water users in Quito, including residents and industries contribute to the Water Protection Fund through their monthly water bills (The Nature Conservancy, 2016). Similarly, the National Fund for Forest Financing (FONAFIFO), Costa Rica is a government financed scheme that is funded primarily with revenues from a national tax on fossil fuels (CITATION). A National Fund for watershed would have its own limitations though. For example, enforcement may be a challenge because water users cannot withhold their payments if a specific watershed is not targeted or if they do not receive their desired services. Because the fund will be governed by national authorities, decisions of allocation to the district or county levels based on conservation needs may be decided by the national authorities and not those paying for the PWS.

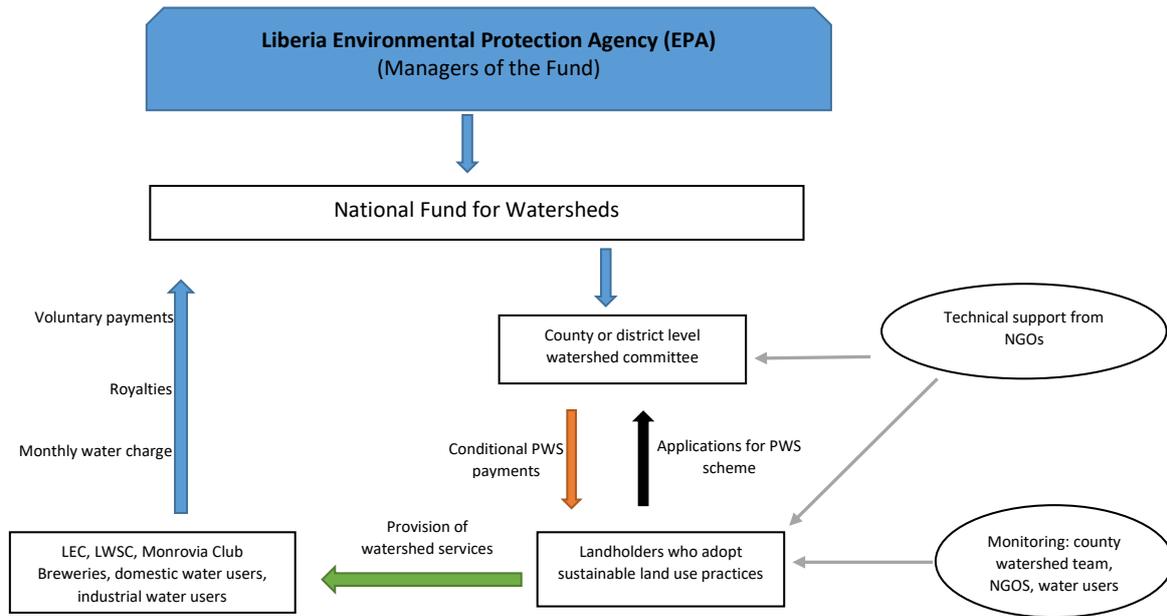


Figure 7-3: Option 3-PWS scheme a part of a national fund for watersheds

7.4 Further Study

It is recommended for further investigation to be conducted on how environmental NGOs can build trust from local communities. This is important because there were instances of distrust amongst the interviewed landholders to public authorities and NGOs. The success of any project in rural communities depends on building trust. Lack of trust in NGO can undermine collaboration between NGOs and local communities.

Further study is also needed to fully understand the costs that are likely to accrue to the various actors in the watershed if a PWS is to be implemented in the St. Paul River Basin. The roles, interests and level of each actor was discussed, but the cost that each actor may incur as a result of the role they may be in a potential establishment of a PWS was not addressed in this study.

It is also important that further study is conducted in a way to improve the business case so as to trigger greater private involvement in potential PWS. The PWS schemes in Kenya and Tanzania reported low buyers buy-in. Private entities in Liberia who are already paying taxes and royalties may not deem it as making business sense to engage in voluntary payments in a PWS.

Additionally, there's a need for improved evidence on the beneficial impacts for the adoption of sustainable land use practices in the St. Paul River Watershed. Such evidence and data would help in encouraging enabling legislation that would not only acknowledge sustainable land-use practices as means to protect and provide watershed environmental services but also promote it.

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Appendix

Sample questionnaire for land users

General

Interviewer: _____

Date: _____

Village/Area: _____

Demographic Characteristics

1. What is your age?

18-30 _____ 31-40 _____ 41-50 _____ 51-60 _____ 60-above _____

2. What is your major occupation?

Farming _____ Business _____ Teaching _____ Clergy _____ Civil Servants _____

3. What is your level of education?

Primary _____ Secondary _____ Tertiary _____ None _____

4. What is your average monthly income (In USD\$)?

\$0-\$20 _____ \$21-\$40 _____ \$41-\$80 _____ \$81-\$100 _____ \$100-Above _____

Land Characteristics

5. What is the size of your farm (in acres)?

0-4 _____ 5-8 _____ 9-12 _____ 12-above _____

6. Is your land experiencing degradation?

Yes _____ No _____ Partial _____

7. What are the most likely land degradation threats to the watershed?

Overgrazing _____ Charcoal production _____ Illegal logging _____ Illegal Mining _____

8. Do you have legal title to your land?

Yes, I have title _____ No, I don't have title _____ I shared title with others _____

9. Do you think that the environmental services in this area can be enhanced?

Yes _____ No _____

Ecosystem Services

10. How is the watershed important to you? (Select the most likely answer)

Source of ecosystem goods____ Source of water____ Biodiversity____ Erosion control____ Climate____ Nutrient cycling____ carbon sequestration____

11. What does environmental conservation mean to you?

12. How important is conservation to you?

Very important____; Important ____; Moderately Important____; Not Important____

Willingness to participate in a PWS

13. Are you willing to participate in a PWS?

Yes____ No____ Not sure____

Negotiations

14. What type of contract will you prefer?

Individual contract____ Collective contract____, Not sure____

15. What Payment method will you prefer?

Cash____ In Kind____

Institutions and activities in watershed

16. Which institutions or activities have you participated in?

Non-governmental organisations____ Community-based organisations____ Self-help initiatives____ None____

17. Have you participated in any environmental initiative?

Yes____ No____

18. What type of environmental initiative have you participated in?

Water management____ Environmental sensitisation____ biodiversity awareness____ forest conservation____ Tree Planting____ others____

Monitoring

19. If you participate in the PWS, what type of monitoring will you preferred?

Self-Monitoring____ Participatory Monitoring____ External Monitoring____ Not sure____

Interview Guide for Expert interviews

1. What is your view on PWS, its important characteristics and its prospects and challenges for establishment in Liberia?
2. Who are the relevant stakeholders/ actors for the implementation of PWS in the St. Paul River Basin?
3. What are the intricacies in convincing relevant downstream users to become buyers of ES, and how poor and landless farmers can participate in the PWS?
4. Whether or not existing policies and laws are supportive of PWS and whether there are policies that hampers the implementation of PWS.
5. What role can government and international NGOs and donors play in the implementation of a PWS scheme in Liberia.

Participant Information Sheet and Informed Consent Form

Research Title: Watershed-based payment for ecosystem services in Liberia: Examining prospects and challenges for implementation in the St. Paul River Basin

1. Information about the project.

The main PURPOSE of this thesis is to assess the potential for PWS as a sustainable financial tool for the protection of watersheds in the St. Paul River Basin.

2. **Why have I been chosen? Do I have to take part?**

You have been chosen as a respondent for this project because you work with a relevant entity (NGO or government) or because you live within the vicinity off the St. Paul River Basin. Participation in this project is purely voluntary and you may choose to participate or not to

3. **What do I have to do? What are the risks associated with this project?**

There is no known risk for participating in this project. The interviews are personal interviews and are recorded in transcripts. The confidentiality of the interviewee is assured.

4. What are the benefits of taking part?

Your participation in this research will give valuable information on local communities' perspectives on the establishment and implementation of a PWS scheme in the St. Paul River Basin.

5. **Do I have options to withdraw from the project?**

You are free to withdraw at any time from this research

6. **Will I be ensured protection of any sensitive data & confidentiality?**

The research will use only anonymous quotes. Sensitive data or anything information that have the propensity to betray the anonymity of participants will not be publish.

7. What if things go wrong? Who to complain to?

The researcher is a graduate student pursuing an MSc in Environmental Management and Policy at the International Institute for Industrial Environmental Economics (IIIEE), Lund University. If agreements are breached, you can contact the institution for redress.

8. What will happen with the results of the study?

The findings of this research will be available as a thesis which will be presented to the International Institute for Industrial Environmental Economics (IIIEE), Lund University.

9. Key contact details

Organization:

International Institute for Industrial Environmental Economics (IIIEE),
Lund University
P.O. Box 196, 22100 Lund, Sweden
Telephone: + 46 46 222 00 00
Fax: + 46 46 222 02 10

Researcher:

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Stora Raby byavag 88
Lund, 22478
Sweden
Email: mis14pin@student.luse

Informed Consent Form Template

Research Title: Watershed-based payment for ecosystem services in Liberia: Examining prospects and challenges for implementation in the St. Paul River Basin

Brief summary information about research

The main PURPOSE of this thesis is to assess the potential for PWS as a sustainable financial tool for the protection of watersheds in the St. Paul River Basin.

Please initial

1. I certify that I have read and comprehended the participant information sheet for the research and have been given the chance to ask questions _____
2. I understand that my involvement is voluntary and that I am free to withdraw at any time _____

3. I understand that all the information I provide will be treated in confidence _____
4. I understand that I also have the right to change my mind about participating in the research up to one week after the research is concluded _____
5. I agree to be recorded and for my quotes to be used anonymously in this research _____
6. I agree to participate in the research project _____

Name of participant:

Signature of participant:

Date:

Witnessed by (if appropriate):

Name of witness:

Signature of witness:

Name of Researcher:

Signature of researcher: