

# Developing a market for watershed services in Tanzania

a scoping study



*A report for the World-Wide Fund for Nature, Care, and the International Institute for Environment and Development*

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## Foreword

This report documents the results of a research project in Tanzania, which is also the traineeship component of the MSc in Environmental Resource Management at the Vrije Universiteit, Amsterdam. The traineeship was jointly undertaken with the World-Wide Fund for nature (WWF) and PREM (Poverty Reduction and Environmental Management), a program run from the Institute for Environmental Studies at the Vrije Universiteit. Our research is designed to contribute to a 5 year project initiated by WWF, Care, and the International Institute for Environment and Development (IIED), titled "Equitable payments for watershed services".

The research was undertaken from May until July of 2006. This report is a joint effort of the two authors.

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<b>FOREWORD</b> .....	<b>2</b>
<b>EXECUTIVE SUMMARY</b> .....	<b>1</b>
<b>1. INTRODUCTION</b> .....	<b>3</b>
1.1. RESEARCH SCOPE .....	3
1.2. METHODS.....	4
<b>2. UNDERSTANDING ENVIRONMENTAL SERVICE MARKETS</b> .....	<b>6</b>
2.1. PAYMENTS FOR ENVIRONMENTAL SERVICES .....	6
2.1.1. <i>Payments for watershed services</i> .....	7
2.1.2. <i>PWS as a poverty alleviation tool</i> .....	8
2.2. OBSTACLES TO A WORKING PWS MARKET.....	8
2.3. FROM OBSTACLES TO DISCUSSION TOPICS .....	10
<b>3. PWS IN THE WAMI RUVU BASIN</b> .....	<b>12</b>
3.1. THE ULUGURU MOUNTAINS .....	12
3.2. WATER.....	13
3.3. FORESTS.....	14
3.4. PEOPLE.....	16
<b>4. BUYING WATERSHED SERVICES</b> .....	<b>19</b>
4.1. POTENTIAL BUYERS.....	19
4.2. WILLINGNESS TO PARTICIPATE IN PWS.....	21
4.3. BUYERS' EXPECTATIONS .....	23
<b>5. SELLING WATERSHED SERVICES</b> .....	<b>25</b>
5.1. POTENTIAL SELLERS .....	26
5.1.1. <i>Catchment Forestry</i> .....	27
5.1.2. <i>Communities</i> .....	28
5.1.3. <i>Summary of analysis</i> .....	30
5.2. TRAINING AND AWARENESS .....	30
5.3. PROPERTY RIGHTS.....	31
<b>6. OPERATING PWS: MARKET DESIGN</b> .....	<b>33</b>
6.1. THE OPERATING AUTHORITY .....	35
6.2. FINANCIAL MANAGEMENT.....	36
6.3. POLICY GUIDANCE.....	36
6.4. MONITORING AND REPORTING .....	37
<b>7. SYNTHESIS</b> .....	<b>39</b>
REFERENCES .....	42
APPENDIX 1: PWS POSTER .....	45

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## Executive summary

Conservation is rarely considered to provide discernible economic benefits to land managers despite its obvious value in terms of ecology and livelihood. It is rather seen as something of a luxury that can be undertaken once enough money is earned from other land uses such as agriculture. This leads to an under investment in conservation, especially in developing countries where dependence on land is greater due to subsistence agriculture. An innovative approach to financing conservation is emerging in the form of Payments for Environmental Services (PES). This concept aims to influence the choices of land managers in favour of conservation by offering a financial reward.

PES has been developed as a conservation tool, and been applied successfully mainly in developed countries, despite its potential to alleviate poverty. This project, initiated by a consortium of WWF, Care and IIED, aims to develop sound business arguments for investing in equitable Payments for Watershed Services (PWS). PWS means developing markets for services such as clean water where beneficiaries pay land managers to provide the service, by for instance reforesting slopes. Equitable PWS means designing markets that deliver both conservation outcomes and benefits to poor people.

The Wami Ruvu Basin in Tanzania represents significant opportunities to implement a PWS scheme. Notably water quality and availability in the river have seriously declined, to a level where the Dar es Salaam water authority cannot provide regular water supplies. Naturally this has significant consequences for industries reliant on continuous supply. It is these water users that were targeted as potential buyers.

The decline in river health is generally considered to be a result of deforestation in the Uluguru Mountains, the main water catchment area. Forests are being converted into agriculture at alarming rates by poor communities whose livelihood depends on subsistence farming. PWS offers communities an incentive to maintain forests, and provides an alternative source of income.

The results of this report indicate that the majority of the work in developing a PWS market will need to be spent on increasing capacity of communities and government bodies. Selling the business case to potential investors appears to be less of a priority than we expected. Surprisingly most potential buyers in this study express a wish to be part of PWS, even though it means paying for something that is usually provided for free. Companies are already experiencing problems with water supply, which affects the operations of their business. This awareness is an important finding, because it clearly motivates their participation in PWS.

The responses indicate that determining scientific relationships between conservation efforts and river health may be less necessary to convince buyers to pay. Potential buyers would invest in a transparent, trustworthy scheme where they can see their money reaching communities. In this sense the poverty alleviation goals of the project may attract more capital from buyers through corporate social responsibility investments.

The analysis of potential sellers concludes that communities are the most appropriate sellers of watershed services both inside and outside the forest reserves. Appropriate in this sense means that the best chance is offered to both alleviate poverty and achieve nature conservation. Catchment Forestry department, owner of the forest reserve, is considered an inappropriate seller mainly because poverty has less chance to be reduced. This is because firstly, less money is likely to reach the poor, due to a lack of transparency of government finances. Secondly if the communities were to be the sellers their autonomy and sense of responsibility would be increased.

In order for this to be possible the communities must be allocated the property rights to the watershed services originating in the forest reserve. Through recent Joint Forest Management legislation the government could delegate responsibility to the communities to manage the reserves, including the rights to market the watershed services. This will require serious commitment to the aims of PWS from a high level of government.

However, reservations about the ability of communities to manage forests of national and global importance are warranted. The communities will need serious support and training, but may potentially manage the reserves more effectively than the government has. Research is needed to determine if this is the case. Another major challenge will be to design efficient and affordable ways to monitor and report on conservation activities across the varied communities.

The many government departments consulted in this study express enthusiasm on the idea of PWS. The Water Basin Authority, responsible for distributing water rights, is well placed to collect money from buyers and possibly operate the market. If the scheme is to achieve its goals of conservation and poverty alleviation however, a supporting policy environment must be facilitated by the central government. This means foremost clarifying roles and responsibilities for managing natural resources amongst the various government departments. PWS will be a demanding task for the Tanzanian government, yet it offers a significant chance to avert a pending water crisis, and to work towards poverty alleviation.

# 1. Introduction

Payments for watershed services (PWS) represent a significant chance to achieve both poverty alleviation and nature conservation (Pagiola et al 2002). Yet the number of established PWS schemes around the world is limited, and the ability of such schemes to alleviate poverty remains uncertain (Landell-Mills and Porras 2002). The approach taken by the consortium of WWF, Care, and IIED in this project is therefore commendable. The consortium aim to develop sound business arguments for investing in PWS, and design markets that both deliver conservation outcomes and benefit poor people. Only through such a practical 'trial and error' approach will it become clear as to the actual potential of PWS to deliver on its promises.

The research detailed in this report attempts to maintain a similar practical, business oriented approach. We are interested in knowing how PWS can work in the project area, and what needs to happen to achieve this. This introduction chapter expands on the scope of our research and describes how we went about our work.

## 1.1. Research scope

Our research is designed to contribute to the first phase of the consortium project. This phase aims to develop a firm business case for a market for watershed services,

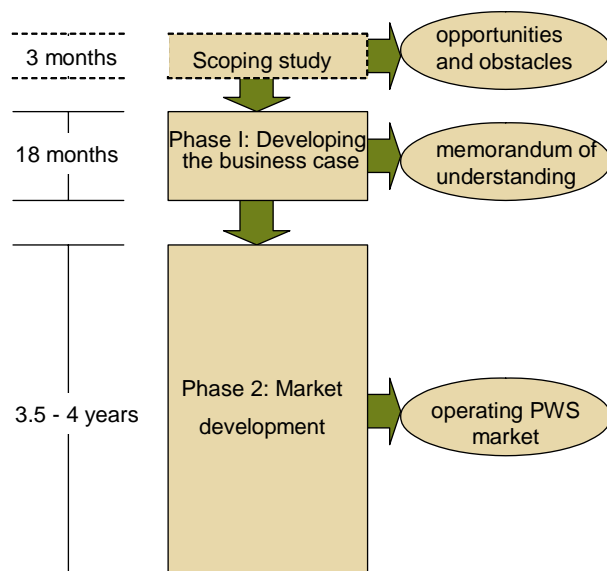


Figure 1-1: Project outlook

culminating in a memorandum of understanding between buyers and sellers (see figure 1-1). The project is being implemented at 10 sites across 5 different countries. Phase 1 has a particularly ambitious aim and requires a considerable amount of work to be done in a short period of time. On top of this in the Tanzanian case there is very little information on potential stakeholder attitudes, and there has been problems employing local staff. In short the Tanzanian sites have got

off to a slow start. In setting the scope of our research we were both bounded and inspired by these issues.

Based on these conditions we attempted to design a research agenda that could operate somewhat independently of the consortium project, but that would nonetheless provide practical input directly to the project. Using our judgement of the initial needs of such a project we resolved to identify the major potential stakeholders and gather their reactions to the idea of PWS. This ‘scoping study’ would indicate how PWS could operate in the project area, by identifying the major opportunities and obstacles.

In our opinion this research is necessary before more substantial activities can be undertaken. We believe our research will greatly enhance the success of the PWS project in the Wami Ruvu Basin by placing emphasis on the concerns of stakeholders involved. This logic is in line with the recommendations of Landell-Mills and Porras (2002) who stress the involvement of stakeholders from the beginning of designing PWS markets. Such an approach will improve the chances that the emerging system will be site specific, appropriate and effective.

## 1.2. Methods

Figure 1-2 depicts the logic used to conduct our research. Prior to our arrival in Tanzania we conducted a literature review focusing on experience using PWS from around the globe to achieve both nature conservation and poverty alleviation. This resulted in a policy paper (Schösler and Riddington 2006) that identified major challenges to equitable PWS from a theoretical perspective, and from lessons learnt in evolving markets worldwide.

To complement this knowledge of PWS the literature review was extended with site-specific material on natural resources and socio-economic conditions once we arrived in Tanzania. The aim of this was to be able to situate our ideas on PWS within the specific local conditions. An important outcome of this activity was the ability to translate the theoretical obstacles identified in the first phase, into locally

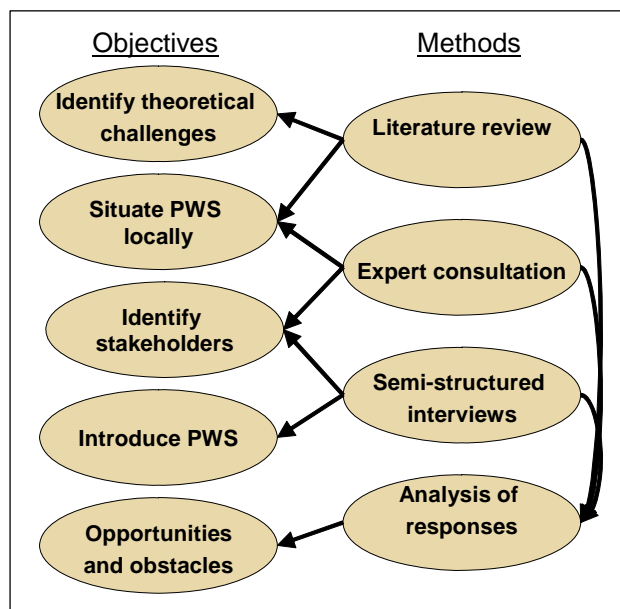


Figure 1-2: Project logic

relevant topics that we could discuss with stakeholders.

Naturally an invaluable contribution to our knowledge in this phase came through consultation of various experts in the area. This included people from: local universities, local NGOs, global NGOs and other conservation projects. Discussion with experts helped us to quickly identify the important topics in the area, and thus to focus our research on locally relevant issues.

Through discussion with local experts we also learnt who might be potential stakeholders in a PWS market. With these people we conducted semi-structured interviews of about 30 minutes. The interviews also served as a way to identify more potential stakeholders. The interviews generally consisted of three parts:

1. Introductory questions to sensitise respondents to the link between land degradation and water quality and availability in the Ruvu River
2. Explanation of the idea of PWS using a poster (Appendix 1)
3. Discussion on the concept of PWS and the challenges identified in our first phase, and how these relate to PWS in the Wami Ruvu Basin

The interviews had two broad objectives. They served to introduce the idea of PWS to relevant stakeholders, which would get people thinking about the idea. This is the project objective. Secondly the interviews provided data for our research analysis. This is thus the research objective.

As depicted in figure 1-2, the first three phases all contribute to the final task of analysing the results. This report combines the information gathered from literature, experts and stakeholders in order to identify the opportunities and obstacles to developing PWS in the Wami Ruvu Basin.

## **2. Understanding environmental service markets**

This chapter aims to provide the reader with a firm understanding of environmental service markets, or “Payments for environmental services” (PES) as it is known. We offer a discussion of the major obstacles we perceive in applying the specific concept of “Payments for watershed services” (PWS) in an equitable manner. We present the obstacles to PWS not because we are pessimistic about the idea. Conversely we believe that by addressing the obstacles in such an early stage of market design the project will have the best chance of exploiting the opportunities. As our research is concerned with the practical implementation of PWS, the final section of this chapter discusses how we moved from theoretical obstacles to locally relevant discussion topics.

### **2.1. *Payments for environmental services***

The idea of “payments for environmental services” has attracted a lot of attention for its potential to marry the dual objectives of poverty alleviation and nature conservation (Landell-Mills and Porras 2002; Pagiola et al 2002). Healthy ecosystems provide a range of services, which are usually not valued in monetary terms. This means there is little incentive for a landholder to refrain from converting such ecosystems into agriculture for instance, which does provide financial returns. Investment in conservation remains limited, as long as it provides minimal returns. In developing countries where dependence on land is much more intense due to subsistence agriculture, the problem is exacerbated.

PES aims to make conservation more economically viable for land managers. Equitable PES aims specifically to increase the economic opportunities of poor land managers. In this way it is hoped that the amount of land under conservation will be increased, and poor people will be better off.

There are many different environmental services produced by forests that could potentially be sold on markets. Table 2-1 depicts various environmental services produced by forests and ways they can be marketed. While this project is only focused on watershed services it is important to remain aware of other emerging markets. Tanzania already sells some carbon services from forestry, and could potentially generate significant capital flows from global carbon markets in the coming years (Scurrah-Ehrhart 2006). The rich biodiversity of the Eastern Arc Mountains is another obvious potential income generator (Conservation International 2003). While designing a watershed market it would be prudent to keep these potential markets in mind as institutional structures may be able to serve a number of different environmental services. For instance in Costa Rica the Ministry of Environment buys a range of environmental services from landholders, and then markets them to local, national, or global buyers in order to maximise revenues (Chomitz et al 1999).

**TABLE 2-1: Various marketable environmental services from forestry (based on Landell-Mills and Porras 2002)**

Environmental service	Possible commodities	Potential buyers
Carbon sequestration	Carbon offsets/credits	Carbon emitting industry, governments.
Biodiversity conservation	Biodiversity offsets/credits	Developers who negatively impact biodiversity
	Biodiversity-friendly products	Consumers
	Bioprospecting rights	Pharmaceutical companies, governments, research institutes.
Landscape beauty	Entry fees	Tourists
Water quality and regulation	Watershed protection contracts	Irrigators, fisheries, drinking water companies, industry using water
Salinity reduction	Salinity credits	Large irrigators, governments

**2.1.1. Payments for watershed services**

This research is focused specifically on watershed services produced by forests. Figure 2-1 depicts simplistically how a market for watershed services could work. This is known as “Payments for watershed services” (PWS). Land managers upstream can be seen undertaking a number of activities that have a positive effect on water quality and water availability in the river. These activities include reforestation, maintenance of existing forests, farming in a low impact manner, and alternative income generating activities such as beekeeping. Such activities limit soil erosion and thus help to maintain good water quality in the river. In the study area, planting trees high in the mountains is considered to lead to increased water availability in the river. This is discussed further in chapter 3.

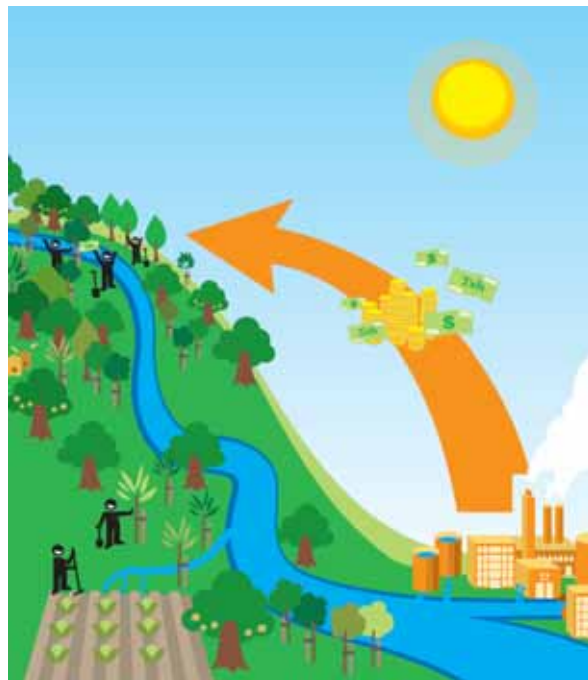


Figure 2-1: Payments for watershed services

The beneficiaries of these 'watershed services' are depicted in figure 2-1 as agriculture and industry, although ideally all water users would participate. These beneficiaries compensate the upstream land managers for their efforts. In this sense the land managers become 'sellers' of watershed services, and beneficiaries the 'buyers'.

### **2.1.2. PWS as a poverty alleviation tool**

Although the concept of ecosystem service markets has generally been treated as simply an innovative way to finance conservation, its attractiveness as a poverty alleviation tool is obvious. Some are sceptical however of the ability of the concept to serve the needs of the poor, mainly because initially it was not designed with a pro-poor focus in mind. Critics say it will need to be manipulated at every stage of development, because market forces will not automatically ensure that the scheme benefits the poor (Pagiola et al 2005). This design flaw may indeed be the downfall of PWS as a poverty alleviation tool. However there are a number of clear benefits.

Firstly, PWS creates a new asset base of which many poor people may have access to and managerial knowledge. Of course this asset base already exists. More correctly, PWS provides a means whereby these assets can generate financial returns (Landell-Mills and Porras 2002).

Secondly it creates a new means of financing conservation, giving developing countries more self-autonomy in managing natural resources and reducing the reliance on aid money (Gutman 2003).

Thirdly, and perhaps most importantly, the opportunity cost of converting forested land to agriculture is diminished because of the income generated by PWS. This inherently gives more choice to land managers. The occupation of 'environmental steward' becomes economically viable for rural dwellers (Shilling and Osha 2003).

## **2.2. *Obstacles to a working PWS market***

PWS has been implemented successfully in only a handful of cases around the world. Amongst these cases, markets are at various stages of maturity, and the benefits to poor communities remain relatively uncertain (Landell-Mills 2002). A review of lessons learnt during the evolution of these markets highlights four main areas of concern for establishing a PWS market in Tanzania (Schösler and Riddington 2006). In our opinion the most important challenges will be to find creative ways to: minimise transaction costs; generate willingness to pay; get around a lack of formal property rights; and establish the institutional capacity needed to support the scheme.

High transaction costs represent one of the most obvious obstacles to establishing PWS. The number and diversity of stakeholders involved in a water catchment is bound to drive up the costs associated with market activity (Landell-Mills and Porrás 2002). As will be discussed in chapter 3 the mountain dwellers of the Ulugurus represent a population which is both relatively dense and significantly diverse. It is easy to imagine that negotiating agreements and then monitoring and enforcing them across such a mosaic of communities will be a costly exercise. The need to develop flexible and efficient approaches that nonetheless ensure accessibility to poor residents is evident.

One of the most striking facts surrounding a PWS scheme is just how little is known about the effect of forests on hydrology (Tognetti et al 2005). Notwithstanding this uncertainty, contracts between buyers and sellers will need to be made, posing two immediate problems. Firstly, beneficiaries must be convinced that investing their money in this way will indeed produce the benefits they want. Secondly, a PWS contract would place a large amount of responsibility on upstream land managers to actually produce the service that is agreed upon. Equitable mechanisms for risk sharing, possibly involving government, should be investigated to minimise the problems caused by uncertainty.

Uncertainty is not the only possible contributor to a lack of willingness on the part of buyers to pay for watershed services. For instance Landell-Mills and Porrás (2002) point out that many people believe the government is responsible for providing such services, and would thus not be willing to pay. What is encouraging in the case of the Wami Ruvu Basin is that water quality and availability are popular topics in the media. Many people we spoke with acknowledged the link between the Ulugurus and river health and recognise that an urgent response is required.

Poorly defined property rights are cited as the most common reason for failure in implementing PES schemes (Landell-Mills and Porrás 2002). In the case of the Ulugurus this represents a significant obstacle, which should not be underestimated. The complexity and diversity of land tenure systems that will be discussed in chapter 3 highlights the problems faced in designing a system which truly benefits the poor, especially those with negligible land rights. While there are examples of successful common-property management of forests elsewhere (McKean 2000), this would require significant changes to institutional structures in Tanzania.

A number of new roles will be created as a result of the market, ranging from monitoring and enforcement to mediation. A holistic approach to institutional design will prevent problems arising later on. This means taking into account established power structures. For instance, the process of redistributing

responsibility of forestry management is bound to be politically charged (Hartley and Kaare 2001). In addition, informal or customary rules that underlie institutional structures need to be recognised. In particular, the attempt to channel benefits directly to the poor is likely to conflict with traditional power structures in the villages (Hartley pers comm). An insensitive approach to this issue may lead to inequitable distribution of benefits or even ultimate failure of the scheme.

These four obstacles provide us with a basis from which to begin to think of how to design an appropriate and equitable PWS market in the project area. However the obstacles remain quite abstract. In our opinion to be able to discuss these issues with stakeholders they require some interpretation.

### **2.3. *From obstacles to discussion topics***

To develop the major topics for discussion in interviews we began with the four obstacles to equitable PWS highlighted above. These obstacles are broad and we could not hope to cover all issues relating to each one. Rather we had hoped to discuss issues that are locally relevant, which would give us an overall indication of the importance of each obstacle in the area.

The process of developing the discussion topics took place both before we began interviewing and throughout the interview process as new information came forth. It was a result of extensive discussion with various experts in Tanzania, stakeholders, and the knowledge we brought with us from the literature.

Figure 2-2 shows how the four obstacles are translated into discussion topics. Naturally not all the discussion topics are relevant for each stakeholder. For instance the capacity to plant trees was to be discussed with the sellers, and perhaps some intermediary bodies, but not buyers.

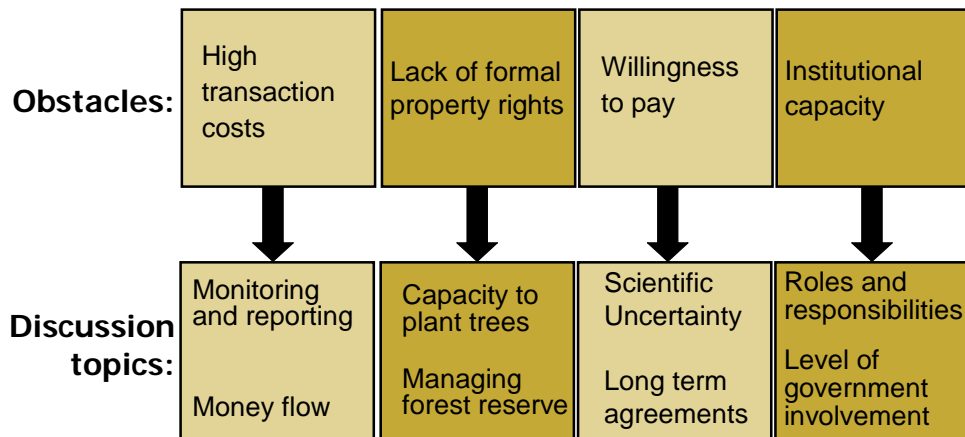


Figure 2-2: Discussion topics

We believe the topics chosen for discussion provide a good indication of the issues in the basin. This approach is intended to establish how the project can best initiate the design process for a PWS market in the area. It is further intended to incorporate stakeholder concerns at this early stage of the project to increase the chance of wide support. We now look at issues relevant to implementing PWS in the area.

### 3. PWS in the Wami Ruvu Basin

This chapter provides an overview of the problems associated with watershed protection and poverty in the Wami Ruvu Basin. It aims primarily to provide an understanding of the major issues in the area. It is also intended to argue a clear rationale for implementing PWS in the project area. We offer first an introduction to the Uluguru Mountains, which are the main water catchment area for the Ruvu River. We then concentrate around the main topics of water, forests and people.

#### 3.1. The Uluguru mountains

The Uluguru Mountains form the main water catchment area of the Wami Ruvu Basin, and receive one of the highest rainfalls in Tanzania (Burgess et al 2002). The Ulugurus are a part of the Eastern Arc mountain range that is recognised as one of the 34 globally important "hot spots" for biodiversity according to Conservation International (Mittermeier *et al.* 2004). Figure 3-1 shows the Uluguru Mountains roughly in the middle of the Eastern Arc Mountain range which stretches across a large part of Tanzania and into southern Kenya. The major towns in the basin can also be seen. Morogoro lies adjacent to the Ulugurus, and Dar es Salaam is on the coast of the Indian Ocean. The Ruvu River, fed by the high rainfall in the Ulugurus, is the major source of water for both of these cities.

The Uluguru's rise steeply up to about 2600 m from the surrounding plains. Air masses moving in from

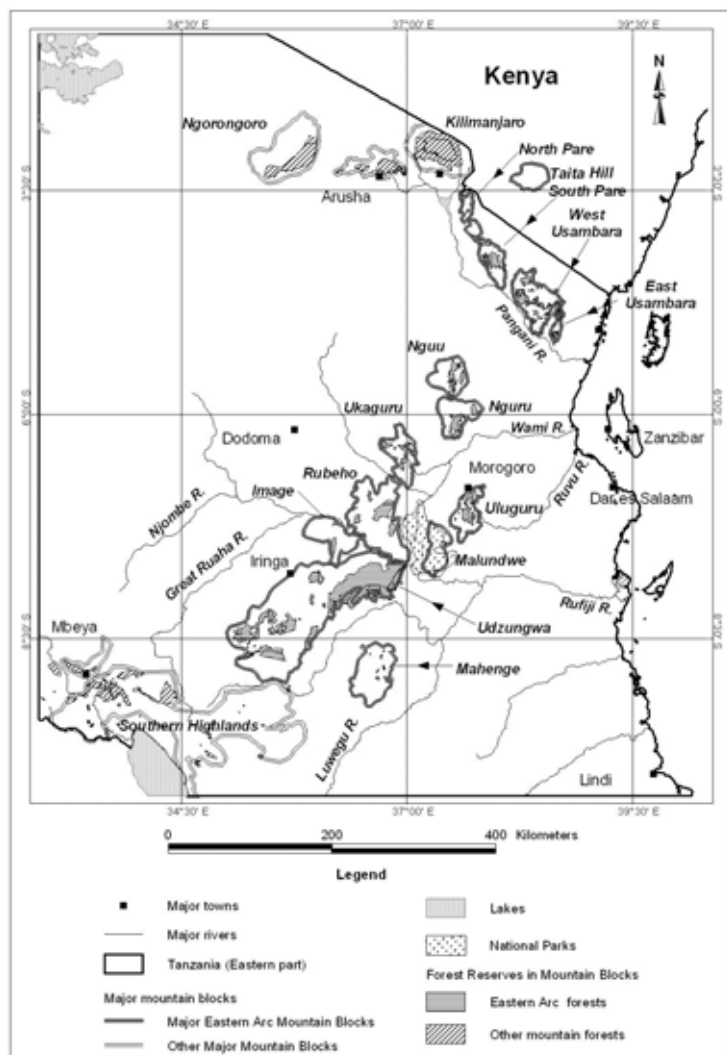


Figure 3-1: Eastern Arc Mountains, Tanzania (source: BIC 2005)

the Indian Ocean are forced to rise and as a result cool and are converted into precipitation on the mountains (BIC 2005). The remnant forests crowning the mountains are considered the country's most important catchment forest because of their contribution to national water supply (Burgess et al 2002).

### 3.2. Water

On its way from the Ulugurus to the Indian Ocean the Ruvu River supplies many people with drinking water, including Dar es Salaam with an official population of 2.5 million (NBS 2002). The river is also a major source for Dar es Salaam's important industrial sector and a growing irrigated agriculture sector. It is also relied upon by the fisheries industry. It is obviously a central lifeline to Tanzania's economy and livelihood.

The importance of water to Tanzanians has been highlighted by a recent series of droughts. This has led to water supply problems across the country. Perhaps more devastating though has been the power shortages across much of the country, which result from a lack of water in the hydro electricity dams (Burgess 2006b). This increased awareness of water has given both the public and the government reason to turn their attention to the importance of the Uluguru Mountains to water availability. This situation offers a good opportunity to present PWS as part of the solution to the current problems.

For PWS to operate hydrological data will be needed in order to establish a correlation between upstream land use and water quality and availability in the river. Unfortunately substantial data that proves such a correlation is not currently available. However, an analysis of available data indicates that rainfall in the basin and flows in the Ruvu River have declined over the past decades (see figure 3-2). Streamflow declines in all seasons in the Ruvu River have also been recognised as statistically significant by a recent report (BIC 2005).

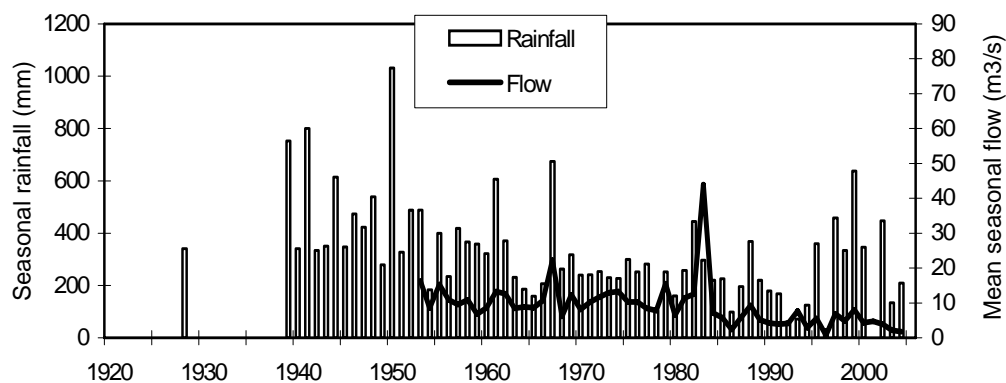


Figure 3-2 : Annual total rainfall and river flow in the Ruvu Basin supplying the Ruvu River (source: Burgess 2006)

To guarantee a rationale for PWS a strong relationship must be shown between forest cover and streamflow. Official reports so far do not go further than stating that there are "indications of the effects of depleted forest cover on streamflow regime" (BIC 2005, p.101). Even in the best situations, however, determining the relationship between river hydrology and forests is notoriously difficult (Tognetti 2005).

It seems in this case however, that the reluctance to draw conclusions about effects of deforestation on water availability is mainly caused by missing data. The PWS scheme will clearly need to spend a great deal of effort collecting and analysing data.

### 3.3. Forests

The importance of the Uluguru forests to water supply was recognised as early as 1906 by the German colonial powers. They swiftly created the Uluguru South and North forest reserves in the upper slopes (Frontier-Tanzania 2005). These two reserves contain almost all of the remaining high altitude forest in the Ulugurus today (Frontier-Tanzania 2005). In addition to these two reserves there are a number of smaller forest reserves located in the Ulugurus and surrounds.

Figure 3-3 shows the elevation of the eastern slope of the Ulugurus, with the forest reserves represented in black. Most of the (230 km<sup>2</sup>) forest cover on the mountains can be found within the reserves (Burgess et al 2002). Forest cover outside the reserves has been almost completely removed for agriculture or settlement. Forest cover is 23% less (roughly 70km<sup>2</sup>) than it was 50 years ago (Burgess et al 2002). While this may seem little in comparison to countries in Asia for instance, it is a significant loss of a rare ecosystem.

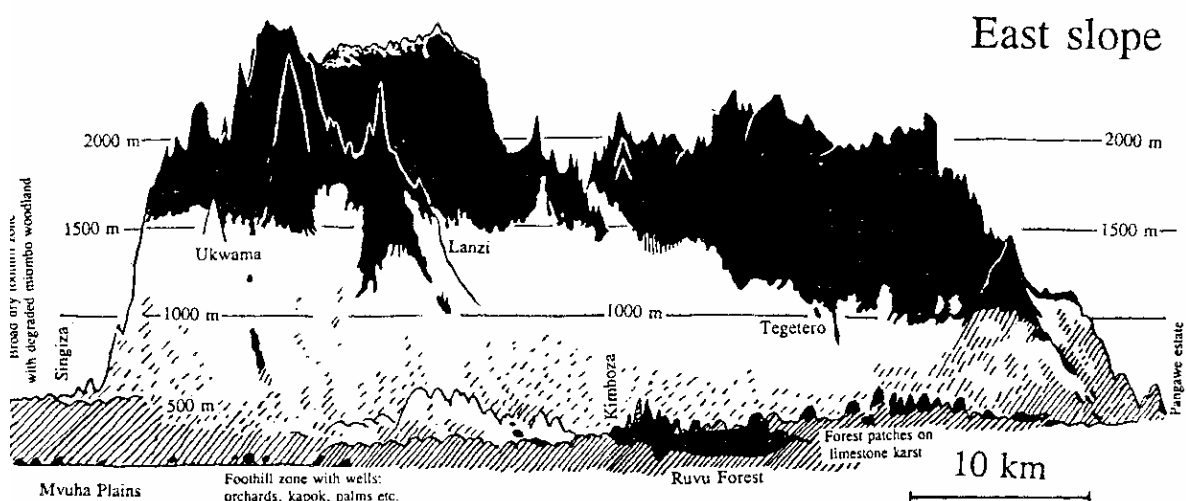


Figure 3-3: Elevation of Uluguru Mountains, showing forest reserves in black (source: WCST 2000)

The forest within the Uluguru reserves mainly consists of tropical montane and upper montane forest. These forests represent a unique 'cloud forest' ecosystem. As well as being a haven for a number of rare and endemic species, cloud forests perform important functions in terms of water catchment (Munishi and Shear 2005). Cloud forests capture mist from clouds and transfer it as water into streams. A reduction in cloud forest cover is thus generally considered to lead to less cloud capture, and reduced stream flows particularly in the dry season when there is little rainfall (Bruijnzeel and Hamilton 2000). However, exact relationships remain difficult to determine (Munishi and Shear 2005). It is currently uncertain as to exactly at what elevation cloud forests stop in the Ulugurus. This would need to be studied in the initial stages of PWS, so that reforestation activities could clearly be marketed as cloud forest services.

Uluguru North and South are national forest reserves owned by the central government of

### **Box 3-1: Joint Forest Management**

*The Uluguru forest reserves have long been managed with 'command and control' approaches. Both German and English colonial powers forbade people to 'trespass' within the reserves. These left over rules from colonial days remain today, despite recognition by many that the effectiveness of such approaches is negligible (Hutton et al 2005).*

*To the government's credit they have realised that without the support of local people it is extremely difficult to achieve conservation objectives. With this attitude they are busy attempting to set up Joint Forest Management agreements (JFMs) with communities to conserve the remaining forests. JFMs aim to allocate particular responsibilities to communities, such as enforcing the reserve boundary, and in return they receive particular rights, such as to be allowed to collect firewood.*

*The process involves the establishment of an environmental committee within each village that is responsible for developing management plans together with the Catchment Forestry department. JFMs appear positive as they can potentially empower poor people by involving them in decision-making and management, and thus foster a sense of responsibility for maintaining natural resources. As well as social benefits, in many cases a robust natural resource base will greatly increase the quality of life of communities dependent on these resources (WWF 2006).*

*JFMs in the Ulugurus are in various stages of development. The speed of implementation may be influenced by a reluctance of government to give up decision-making powers and responsibilities (Hartley and Kaare 2001). Another important limiting factor of JFMs is that communities are offered little reward for their efforts (Moshi et al 2001). In this sense they are asked to take care of the environment for the greater good without receiving any compensation. PWS presents an obvious incentive to communities, and funding to Catchment Forestry.*

Tanzania, and under the responsibility of the Catchment Forestry department. The government's idea of the reserve has been to keep people outside the borders. Strictly speaking people are breaking the law whenever they enter the forest reserves. This nonetheless happens both because of poor boundary demarcation and a lack of enforcement. Without strong enforcement such a policy is of course near impossible to maintain, and communities have crept back into the reserves over the years. In contrast to minimal enforcement, the current government has announced suddenly that those who have encroached on the reserve must move, or be removed (Guardian 2006). At the same time however, the government is also initiating more community oriented conservation plans, as highlighted in box 3-1.

The main problems arising from human disturbance in the forest reserves are cutting timber (see figure 3-4), taking tall thin trees for poles and encroachment for agricultural purposes (Frontier-Tanzania 2005). Other impacts relate to firewood collection and paths to travel between villages, and to collect things such as medicinal plants and herbs. The forests are clearly an important resource for the people of the Ulugurus.

### 3.4. People

Socio-economic data on the Ulugurus is patchy, and often conflicting, making it hard to give a general picture of living conditions. There are about 50 communities living adjacent to the forest reserves and they differ a great deal as far as socio-economic structures are concerned (Hartley and Kaare 2000). The communities range from very poor people depending on subsistence farming to less poor communities that have developed intensive agriculture. Their land use choices and economic livelihood depend on a range of factors such as climate, location, tradition for food or cash cropping, religion and access to markets.

Farmers often own scattered pieces of land, usually less than 5 acres per parcel (Hymas 2000). In some cases however, farmers rent land where landowners determine what they can grow on it (Hymas 2000). In such cases farmers



Figure 3-4: Pit-sawing in the South Ulugurus

**Box 3-2: Poverty**

*Levels of poverty are usually determined according to income and consumption levels. If an individual has an income or consumption level below a certain amount, this is considered living below the 'poverty line' (WWF 2006). According to the Millennium Development Goals, extreme poverty is generally considered as living below US\$1 per day (UNDP 2003).*

*However poverty is also recognised as being more than only about money. The ability to make decisions that will impact one's life, the amount of opportunities, and exposure to choice all contribute to the level of poverty (UNDP 2003). To address such poverty the UN proposes to focus on the strengths and assets that people have access to. A central focus of this project is to increase opportunities for the poor in the Ulugurus, by valuing their strengths and assets in regards to forest management.*

usually do not have the capacity to plant trees as they only hold title to the land for a limited time period. As stressed in chapter 2 of this report, a lack of property rights has been responsible for the failure of many PWS schemes. This indicates significant implications for PWS because it will have to incorporate such locally specific land tenure systems. However, in our opinion it should be possible to design contracts that incorporate these concerns. For example contracts may specify that conservation management be modelled on current land management regimes ensuring that tenants are not excluded from benefits.

Another point of concern for the poor is highlighted by Franks et al (2005) in a study on forestry in the Ulugurus. They point out that wealthier households are quicker to adopt new measures because they have more land and are willing to take greater risks. The complexity of poverty poses serious challenges to PWS (see box 3-2). The poor may not have the ability to change their behaviour and will remain a source of pressure on forest resources. This strengthens the argument that PWS should indeed make an effort to ensure access to poor people.

However pressure on forest resources cannot be attributed to the poor only. People in the mountains are also responding to a rising demand elsewhere. With increasing urban population and economic growth in the basin the demand for freshwater, fertile agriculture land, and fruit and vegetable products has increased. The Ulugurus - with favourable



Figure 3-5: land cleared for agriculture in the Ulugurus

climatic conditions and relatively fertile land - currently provide agricultural products for almost the entire basin and are considered the bread basket of the area. Villages with good access to markets are starting to develop irrigation agriculture and are increasing extraction of water from the Ruvu tributaries. The dramatic decline in river flow in the Ruvu has also been attributed to this, although the extent remains uncertain (Burgess 2006a).

In summary, the Wami Ruvu Basin exhibits many characteristics that make it a logical site to initiate an equitable PWS scheme. There are widely recognised problems with water availability and water quality in the Ruvu River. These are also widely believed to stem from deforestation in the Ulugurus, although scientific evidence for this is lacking. There is a government push to conserve the catchment forests, both by enforcing its own laws, and by cooperating with communities. Finally, there are high levels of poverty in the Ulugurus, which could potentially be reduced by PWS. Given this motivation for PWS, we now move on to look in more detail at how PWS may work in the area.

## 4. Buying watershed services

In this chapter we discuss who are the potential buyers of watershed services and why. We begin with the identification of stakeholders and subsequently discuss their rationale to participate. This is partly based on facts concerning water resources but also on certain beliefs about the situation and the mentality of companies towards the problem. The information is a result of interviews with potential buyers and consultation with relevant experts.

### 4.1. Potential buyers

Potential beneficiaries of watershed markets are basically anyone who relies on water quality or water supply. Water users can be identified in three different groups:

- ❖ Domestic water users,
- ❖ Industrial water users and
- ❖ Agricultural water users.

Our research focuses only on the biggest industrial water users in Dar es Salaam as we considered them most capable of paying for watershed services. Research will be necessary to determine the capacity of agricultural water users and possibly fisheries in the Basin to participate in PWS. At a later stage also domestic water users should be included in the system.

Next to different water users, there are various sources of water. Table 4-1 provides an overview of where water comes from in Dar es Salaam, and to whom users should be paying for the water. This is interesting because it suggests how charges for PWS might be collected, but also because it hints at the severity of water supply problems. Those users who have resorted to trucking in water will have very different rationales to invest in PWS than for instance the city water supplier, Dawasco.

Table 4-1: different water sources and where users pay

User	Source	Pays to
Dawasco	Direct river water extraction	WBA*
	Groundwater extraction	WBA
Industry	Direct river water extraction	WBA
	Groundwater extraction	WBA
	Water mains	Dawasco
	Delivery trucks	Private delivery companies

\*WBA = Wami/Ruvu Water Basin Authority (distributor of water rights, discussed in Ch. 5)

The Dar es Salaam Water and Sewerage Company (Dawasco) is potentially the biggest buyer of watershed services in Dar es Salaam, because they supply water to all users connected to the water mains. Unfortunately the company was not available for an interview. But as a key player in the Dar es Salaam water business they need to be approached in the future. Their rationale to participate in PWS is straightforward. Currently, Dawasco provides many customers on an irregular basis with water of low quality. Because of this, the company has lost many customers who move to alternative water sources. Respondents pointed out to us that they would prefer to be supplied with freshwater<sup>1</sup> from Dawasco if their water needs and standards could be met. Dawasco has thus a clear rationale to secure a constant supply of good quality water, which could be done by investing in PWS.

The potential revenue increase that could be earned from providing these customers will however come at a cost to Dawasco. Part of the reason Dawasco fails to provide water is due to timeworn infrastructure or illegal tapping of pipes. Both factors lead to uncontrolled “leakage” of water that Dawasco receives no payments for. In other cases, companies want to be connected to the water mains but Dawasco fails to build the infrastructure. Investing in these issues will be necessary if the company is to maximise its revenues, and thus increase the number of potential participants in PWS. If Dawasco were to supply most of the water users, they could ensure a large-scale dissemination of costs for watershed services by eventually passing them on to all water users. However, in the beginning we imagine that Dawasco could effectively charge only its industrial customers for PWS.

The major water using industries in the basin are:

- ❖ Cement factories
- ❖ Breweries and distilleries
- ❖ Bottling companies (water and soft drinks)
- ❖ Textile factories
- ❖ 5 star hotels in Dar es Salaam

We suspected that all these industries have a rationale to participate in PWS because their business depends on water availability and quality. In order to verify this we asked companies about the general water supply situation in the area. We spoke to 9 companies from 4 of the above groups (cement factories were unavailable) and selected respondents with the ability to talk about and ideally decide on long-term company strategy and policy goals. We wanted to know if they would actually invest in PWS.

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<sup>1</sup> Whenever we refer to freshwater we are speaking of water provided by the Ruvu River.

## **4.2. Willingness to participate in PWS**

Companies currently struggle with many problems related to low water quality and are concerned about this situation. They all face substantial costs for treating the water to a quality level that lives up to their various production standards. Many companies have invested in costly water treatment plants and face continuous costs for maintenance, filters and treatment chemicals. If PWS could improve water quality for these users, treatment cost would decrease. However, some companies also mentioned problems of bacteria and pesticides in the water that may not be removed due to PWS efforts.

Companies also struggle with seasonal fluctuation of water quality since this drives up treatment costs. If sediment load fluctuates, machinery and filter techniques have to be continuously monitored and adjusted. This has motivated some industrial water users to switch from freshwater to groundwater. Groundwater quality is relatively stable although still requires treatment to lower salinity levels. This is a costly process and if not all salt is removed it can harm machinery. Therefore respondents assert they would much rather use freshwater if quality was stable.

Besides quality, water availability causes companies various problems. The demand of freshwater of some companies cannot be satisfied by Dawasco so again they are forced to move to alternative water supply sources. Many of them have invested in boreholes or receive water from private companies using trucks. At first sight this makes them independent of freshwater supplies from a market for watershed services, but our respondents give a different account. Water supplied in trucks is very costly. They dislike groundwater from boreholes for reasons mentioned above. If freshwater were provided reliably many companies would be willing to switch.

Another reason that companies are concerned about availability of water is the fact that it limits their production capacity. Especially water bottling companies mention that they face this problem during the dry season. In that period the demand for bottled water on the market goes up while availability of the resource is even more restrained. If PWS can resolve this problem of water availability, these companies indicate they would substantially increase their turn over.

However, some caution needs to be exercised on generalising the potential beneficial effects of PWS to all stakeholders in the basin. One of our respondents differed completely from all others. This was a big hotel which has built a complete water treatment plant in its basement. The hotel is located on the shore of Dar es Salaam and is tapping groundwater from seawater reservoirs that refill regularly. This respondent was very happy with his current supply situation and saw no business rationale to participate in PWS. This case shows that the situation of stakeholders can be very different from each other and time is needed to investigate their rationale to participate.

Table 4-2 below provides a short summary of facts concerning industrial water users and how these might motivate participation in PWS. All these facts show that companies currently face many problems directly related to water quality and availability and illustrate what factors have to be taken into account if the project team wants to make the actual business case for PWS.

Table 4-2: facts motivating or discouraging companies to participate in PWS

Rationale	Facts motivating participation	Facts discouraging participation
Water quality is low	Costs for water treatment are high	Investments in boreholes and treatment plants have been made
Water availability is insufficient	Costs for alternative water supply are high (trucks, boreholes)  Revenues are foregone due to limited production	Investments in boreholes have been made

After we had discussed problems with water supply that could motivate their participation, we asked respondents if their companies would be willing to participate in PWS. With the exception of one respondent all consulted companies gave a positive answer. We could identify certain beliefs or mentalities that acted as a motivator, which are discussed here.

The most important reason why companies were willing to participate is their acknowledgement of the current water supply problems and a belief that the situation may turn critical in the (near) future. Respondents acknowledged their fear of a pending water crisis that will affect the whole country and subsequently their businesses. The ability of companies to respond to such a crisis, in our opinion had to do with the size, and consequently the long term outlook of the company. For instance one successful company stated, "We plan to be around for long so we have to take a long-term perspective." This respondent was also aware that use of groundwater is unsustainable and that the resource is already overexploited. Many companies are thus well aware of the benefits a market for watershed services may offer to them by solving these problems.

Another important motivation was the 'emotional' value companies attach to water. We noticed a difference between companies that use water for their production processes and those who use it for consumption products (drinking water, breweries, soft drinks). The latter are clearly more willing to participate because of the central role of water in their business. Some respondents claimed that, "We can't run our business without water" and "Water is everything to our business".

Other companies indicate they would feel obliged to participate because of social pressure. Such as, if high-profile public figures were to champion the scheme or if larger companies were to go first.

Only one respondent argued against participation because he considers water resources management a government responsibility that should be financed from current tax revenues. Therefore he thinks paying for watershed services is not really fair. Still, he could motivate the investment if it were considered as Corporate Social Responsibility (CSR).

***Box 4-1: Why are companies willing to participate?***

- ❖ *Companies dread a pending water crisis*
- ❖ *Water is their central product*
- ❖ *They feel corporate responsibility to counteract water crisis*
- ❖ *They feel that use of alternative water sources is unsustainable*
- ❖ *Social pressure*

### **4.3. Buyers' expectations**

As we discussed in the first part of this paper, implementation of PWS around the world has been problematic often because of scientific uncertainty regarding exactly how forests influence water quality and availability. Even if we can establish that certain land use changes will benefit water resources, it will be extremely hard to say in advance when exactly and to what extent benefits will accrue to downstream investors. We want to highlight how potential buyers perceive this challenge. We therefore asked what sort of guarantee or proof they would need to see to compensate for this uncertainty and to justify the investment.

Generally long-term investments are problematic mainly for smaller companies. Such companies need to see almost immediate returns on investment, so a time span of 5 to 10 years will be too long for benefits to materialise. Companies are also worried that government legislation is unstable and that unforeseen changes can jeopardise potential investments in PWS. This issue indicates the need for clear contractual arrangements that give investors security and comfort. If some companies have no financial scope to make long-term investments, others will have to take a lead in investing.

However, especially bigger industries have a very different standpoint on this question. Timeframe is not an issue for them. Respondents say they would pay “even if benefits only showed 20 years from now”. They argue that “it took a long time to destroy the forests, so it will take a long time to repair it”.

Before benefits from PWS materialise there is a great need for information on what is being done with the money invested. Transparent planning and reporting mechanisms need to be put in place. Companies want to see clear plans (from communities) and periodical reporting on what’s actually being done on the ground. “Information is comforting”. They want to see that partners (sellers) are committed. Respondents utter their concerns from experience that projects look good on paper but no results are being delivered in implementation.

However, one of the most interesting findings is that the conservation outcomes of a PWS investment may be less important to companies. Some find the PWS objective to alleviate poverty most important and are willing to invest<sup>2</sup> in PWS because it provides benefits to poor communities. In this sense they still want the scheme to be transparent and trustworthy. They are less concerned with seeing hard scientific evidence regarding the link between forests and hydrology. For PWS this could mean that pressure on the evolving market to show quick benefits would be relieved. On the other hand it could also be argued that having serious investors who want to see conservation returns may be beneficial to driving market development.

In summary, the willingness to participate is generally high and is based on various motivations depending on a company’s specific situation or mentality. Long-term investments are more problematic for small companies than for big ones. To compensate for this it is suggested that some public high-profile figures lobby for support of industry. Big companies from the water consumption industry are most likely to make investments first and subsequently smaller players. This may benefit PWS in its starting phase in many ways. Smaller companies would have less financial burden by joining the scheme when it is more mature, while at the same time transaction costs incurring from many and diverse stakeholders would be limited.

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<sup>2</sup> Especially large companies in Tanzania regularly invest or rather donate money to community development.

## 5. Selling watershed services

This chapter maps out how PWS may potentially look on the supply side. Our findings are based on interviews with potential sellers, consultation of relevant experts and literature. As pointed out earlier in this report most of the forested land in the Ulugurus is designated forest reserve, owned by the central government. In considering a PWS scheme we thought of both the forest reserves plus other land in the Ulugurus as potentially producing watershed services. Box 5-1 below gives some suggestions as to how various services may be marketed, and indicates whether they originate inside the forest reserve or outside. The main purpose of this chapter however is to analyse how roles and responsibilities on the supply side could be fulfilled so that PWS may effectively alleviate poverty and conserve nature.

### **Box 5-1: Commodities on a watershed services market in the Wami Ruvu Basin**

*It is imagined that there will be different types of services offered on a PWS market, with various prices. For instance maintaining established forest may be worth less than reforestation.*

#### **Availability**

*Water availability can be increased by*

- ❖ *Planting or maintaining particular species of trees in the mountains above a specified elevation. This service could be sold as ‘cloud forest credits’ or ‘quantity credits’ (outside reserve).*
- ❖ *Managing the forest reserve, marketed as ‘protection credits’ (inside reserve).*

#### **Quality**

*Quality could be influenced in a number of ways, with corresponding ways to market it.*

- ❖ *Planting trees in riparian zones, for instance within 200m of a watercourse, could be marketed as ‘high (value) quality credits’, with the intention to improve river quality (outside reserve).*
- ❖ *Trees on slopes steeper than a specified percentage, could be marketed as ‘medium (value) quality credits’, intending to limit slope erosion (outside reserve).*
- ❖ *Trees planted elsewhere that will reduce erosion, marketed as ‘low (value) quality credits’ (outside reserve).*
- ❖ *Farming aimed at reducing soil erosion, marketed as ‘sustainable agricultural credits’ (outside reserve).*
- ❖ *Managing the forest reserve, marketed as ‘protection credits’ (inside reserve).*

## 5.1. Potential Sellers

In principle watershed services could be provided by anybody with the ability to undertake conservation work or initiate land use change in a manner which improves water quality or availability. As noted above we assume that watershed services can be produced both inside and outside the forest reserve. Therefore in this section we consider two major groups of potential sellers: the communities outside the forest reserve; and the communities plus the Catchment Forestry (CF) department within the forest reserve.

In analysing who should be the sellers we kept in mind who could effectively do the work (conservation goal), and who is most appropriate to receive money (poverty alleviation goal). These two major criteria for analysis reflect the overall goals of the consortium project and can be seen in table 5-1 below. This analytical framework also includes efficiency and willingness as secondary criteria. We consider these objectives equally important, but in our opinion they have much more chance to be influenced by the actual design of the PWS system. For instance communities are likely to be more willing to change their behaviour the more that is offered by the buyers. This analytical framework forms the basis of our discussion of potential sellers in the following two sections.

Table 5-1: analytical framework for evaluating potential sellers

Major criteria*	Requirements
Effectiveness [ie. conservation goal]	<ul style="list-style-type: none"> <li>❖ Has the technical and practical knowledge to actually undertake the work</li> <li>❖ Has the labour capacity to do the work</li> </ul>
Appropriateness (to receive money) [ie. poverty alleviation goal]	<ul style="list-style-type: none"> <li>❖ With this income poverty has a good chance to be reduced</li> <li>❖ The ground work would actually be done by the recipient</li> <li>❖ The recipient owns the (use) rights to the resource</li> </ul>
Secondary criteria**	Requirements
Efficiency	<ul style="list-style-type: none"> <li>❖ Transaction costs are not prohibitively high</li> </ul>
Willingness	<ul style="list-style-type: none"> <li>❖ Has the desire to change behaviour</li> </ul>

\*Major criteria are considered structural issues that are not easily influenced by the design of the PWS market

\*\*Secondary criteria are equally important to the success of PWS, but in our opinion have the opportunity to be influenced by the design of the PWS system.

### 5.1.1. Catchment Forestry

Catchment Forestry (CF) is the arm of government responsible for managing forests that are deemed important to water catchments. CF is thus the owner of the Uluguru North and South Forest Reserves. This makes them the largest single land owner in the Ulugurus and the most obvious seller of watershed services. CF has to date not managed to maintain a high level of conservation in the reserves. PWS could offer both the contractual obligation and the necessary funds to develop more effective management regimes. In our interview with CF they clearly indicated their awareness of the possibilities offered by PWS, and their willingness to take part.

CF represents a very attractive seller for a PWS market as they offer a large amount of watershed services in one go. This means that the so called 'threshold effect' can be attained easily (Landell-Mills and Porrás 2002), meaning that enough land is put under conservation to actually produce an effect. In this sense the effectiveness of CF as a seller could be seen as high. However the track record of the department is plagued with inefficiency and corruption (CEPF 2005) which clearly limits their potential effectiveness. We therefore rate their effectiveness as medium. Funding made available through PWS could go a long way to addressing these problems if transparent and accountable monitoring systems were in place. However it is evident that without the support of local communities, management of the forest reserve will remain problematic.

This leads us to our major criticism of CF as the main seller, in that a major objective of this project is to alleviate poverty. If CF were to be the major sellers of watershed services it is questionable as to how much of the benefits the poor would see, or worse they could be denied access to the resource. Therefore in our opinion CF scores poorly on the 'appropriateness' criteria. To the government's credit recent initiatives aimed at addressing forestry management problems of the past focus heavily on community involvement. These attempts to establish Joint Forest Management (JFM) are described in box 3-1 on page 16. Under JFM some responsibilities and rights are delegated to communities, although ownership remains solely with the government. On the face of it this would appear to suggest that the government could be the seller, and should then distribute a share of the income to communities to reward their assistance in management. This would provide monetary incentives for communities to enter into JFM which are missing from the current JFMs, and it would force the government to put its money where its mouth is. However there are a number of problems with this scenario.

Firstly if CF received the money and then distributed it to communities it adds another level of bureaucracy that the money has to travel through. This means there will be less money reaching the ground, but it also means the money will be harder to trace. This is especially true if the money would have to go through the central government treasury, which is likely. Secondly it gives only minimal rights to communities. Communities would be reliant on

successive governments to honour the deal agreed upon. The government would maintain the property rights to the watershed services produced by the forest reserve. Whereas if the communities themselves were the sellers they would have much more autonomy, leading to increased opportunities and ultimately more control over their lives.

Concerning efficiency, having CF as the seller has the clear benefit that transaction costs are kept to a minimum. Costs associated with negotiating with countless villagers will be avoided, as the seller would be a single organisation. However the cost of negotiating JFMs with numerous villages would remain, and would be considerable (Moshi et al 2001).

Monitoring and reporting could be undertaken potentially quite effectively due to the knowledge and forestry experience that the department already possesses. Enforcement will however remain extremely difficult unless communities are involved in the management and have an incentive to participate. This analysis indicates that CF acting alone will be only marginally efficient. With support of communities efficient management becomes much more achievable.

### **5.1.2. Communities**

As highlighted in box 5-1 at the beginning of this chapter there is a lot of land managed by communities outside the forest reserve which could potentially be producing watershed services. We consider the communities the potential sellers of services originating from this land without question. On top of this however there is the forest reserve, which could also potentially be managed by the communities with the intention to sell watershed services. We spoke with men and women in the communities about both possibilities, including farmers and village leaders. In deciding on which villages to target, we chose those villages close to, or upstream from points where there were established river monitoring stations. These stations are operated by Catchment Forestry, and could be used to measure effects on the river of conservation work once PWS was operating. In the end we could not visit these villages as funding did not permit our own transport. Therefore our choice of villages was determined by the destination of the Care car that we travelled with.

We visited in total four villages adjacent to the Uluguru South forest reserve: Kibungo, Ng'weme, Nyingwa and Vinile. Given the limited number of interviews we could conduct, our sample is not intended to represent the large variety of communities in the Ulugurus. Rather we hope that our work gives an initial insight into the opportunities and obstacles that PWS may present to the people of the Ulugurus.

Generally people we spoke to were enthusiastic about PWS, which is not necessarily surprising given that the idea promises money. More specifically though, some people had already suggested this idea themselves prior to our visit. Different groups have been working in the mountains and talking to the

people about the importance of the area as a water catchment. Apparently villagers themselves have been suggesting for some time that those benefiting from their efforts to conserve the watershed should compensate them for it. This was particularly encouraging to hear, as it allays our fears that we are imposing an exogenous solution to a local situation where it does not suit. One respondent told us that PWS was the situation they had been dreaming about.

In terms of practical, on the ground ability to conserve the forest reserve, it could be argued that the communities living in the area are the best placed to do the work. Local communities have arguably the most practical knowledge of the forest because of daily experience. What they are lacking is technical knowledge, which would need to be facilitated. It is also much easier for locals to maintain a constant presence within the reserve, if the task is to enforce the boundaries. It could also be argued that if currently those who are taking things from the forest are the communities themselves, it makes sense to put these same people in charge of protecting the forest. This would mean that they would have less need of forest resources, because of the extra income earned from forestry work, and they would have a monetary reason to conserve the forest resources. Nonetheless, based on current circumstances we score the communities low in terms of effectiveness. We believe this could potentially be increased, however research is needed to compare their effectiveness against CF.

The question then becomes who exactly will have the capacity to sell services from the communities, and whether it is possible to benefit the poorest people. Our concern here is that the poorest people in the villages may not hold sufficient title to land to be able to participate in PWS outside the reserve. This issue is discussed below in section 5.3. It could also be argued that the communities are not appropriate sellers within the reserve, because the contractual obligations of PWS will place too much pressure on them, and that CF is more suited to bear this burden. It is our opinion however that with adequate support, such responsibilities will prove an asset to communities. By taking on environmental stewardship responsibilities communities may redefine their own role within Tanzanian society. Communities in our view are clearly the more appropriate sellers of watershed services originating from the forest reserve.

Perhaps the biggest challenge faced by designating the communities as sellers relates to transaction costs. Because of both the number of sellers and the diversity of communities, operating costs are likely to be substantial. In our opinion this should not discourage the focus on communities as sellers. With creative approaches to monitoring and enforcement and financial transactions we believe that this problem can be minimised. These issues are discussed further in chapter 6.

Most people we spoke to were willing to change their behaviour if they were rewarded for it. We did not undertake an economic analysis of how much it would cost to change their behaviour, however PREM is busy with this issue.

### 5.1.3. Summary of analysis

This chapter shows that the central government is at first glance the most able to effectively provide watershed services. However due to poor track record of the forestry department in effective conservation they score only mildly on the effectiveness scale (table 5-2). Communities currently have low effectiveness. While they are lacking in technical knowledge, they are rich in practical knowledge. They also have the ability to stop many of the destructive behaviours within the reserve because of their constant presence in the area. We are therefore positive that this can be improved.

CF score badly as an appropriate seller. We believe that the chance that poverty would be alleviated with CF as the seller is significantly less than if the communities themselves were the sellers. This is not only because communities would receive more money, but because the associated distribution of property rights would substantially enhance the opportunities of communities.

CF may be an efficient seller, however they will either need to cooperate with many different villagers, or enforce heavily, so they score mildly. The efficiency of the communities is jeopardised because of the number of stakeholders.

The willingness of both parties is encouragingly high.

**Table 5-2: Analysis of potential sellers**

Criteria	Catchment Forestry	Communities
Effectiveness	Mild	Low
Appropriateness	Low	High
Efficiency	Mild	Low
Willingness	High	High

Based on this analysis both parties could potentially be the sellers in the FR. However if the two major criteria are taken (effectiveness and appropriateness) the communities score better. We therefore assume that the communities will be the sellers both within the reserve, and outside the reserve. However there are a number of issues to be dealt with in order to facilitate the communities ability to manage the forest reserve.

## 5.2. Training and awareness

Many people in the villages are aware of environmental problems such as decreasing river flows, worsening water quality, and to a lesser extent,

declining soil fertility. More than one respondent told us how in the past the river could not be crossed for some weeks in the wet season. This has not been the situation now for many years. When asked as to the cause of these problems, many people told us without hesitation that they are caused by deforestation. One elderly lady told us to our surprise that clouds do not form in places where they did in the past because the forest is not there anymore. This sort of awareness was encouraging for us to hear.

However there were also people who had little knowledge of the link between forests and water. One man for instance, told us that water quality had declined because trees had been planted along watercourses. Also concerning is the species of trees that most people would prefer to plant. Exotic species such as Eucalyptus and Grevillea are favoured because of their high growth rate, producing returns much more quickly than native species. However, these species have very high water consumption and thus have a negative impact on water quantity. Care and other local organisations are already working on raising awareness of this issue.

PWS would require a concerted effort in villages to train and educate people on new practices, and for instance to establish nurseries for tree seedlings. These activities could conceivably be performed by Care who is already active in the villages. However for continuity it is perhaps wise to consider a local organisation which will be around in the long run. The possibility of the district level government is discussed in chapter 6 in regard to monitoring and enforcement responsibilities.

Another major issue requiring attention if the communities are to be the sellers, is the lack of formal property rights to resources both inside and outside the forest reserve.

### **5.3. *Property rights***

As mentioned in the first part of this report, poorly defined property rights are the most commonly cited reason for failure of PWS initiatives. We are particularly concerned that this issue will effect the poorest people in the area, who do not hold secure titles to land. Literature and experts indicated that renting land is common in the Ulugurus where renters have very little rights (Hymas 2000). However during our (limited) experience in the villages we only came across people who owned land, and had the ability to plant trees on it. This may have been due to the fact that our respondents were usually chosen by village leaders. Regardless, this issue clearly requires consideration.

If communities are also to be the sellers within the forest reserve, property rights will need to be re-evaluated there. The direction currently being taken by the Tanzanian government to redistribute management responsibility for forestry is commendable, and ought to be embraced. PWS offers a chance to take this to a new level and to test the commitment of the government to its

stated policy directions. PWS will challenge the government to make explicit exactly to what extent it is willing to give up rights and responsibilities to the communities.

By allocating property rights it does not mean that the government would have to give up ownership of the forest reserve. We consider this unrealistic, regardless of whether it is a good idea or not. Rather we propose that the rights to manage the resource alone should be granted to appropriate communities. The land would remain the property of the government. Importantly the communities would be granted the rights to the watershed services produced by the forest.

In this sense watershed services could be treated similar to any other resource that is state owned but privately managed. For instance mining companies frequently own the rights to a resource, but the land itself remains government property. In this scenario the government could receive royalties from the income generated by the communities. But the communities themselves would maintain the rights and responsibilities to market the services.

This scenario would be attractive for the government because although on first sight it may appear that they are giving away resources, they are actually giving away responsibility and cost of monitoring and enforcement (Sterner 2003). As mentioned earlier the management of the forest reserve has proven difficult for the government. If communities can effectively manage the reserve, 'privatising' the watershed services could prove the most efficient way for the government to conserve the reserve.

The most encouraging thing about this scenario is that it can be organised largely through existing legislation. Via JFM agreements CF could stipulate exactly what type of management it expects from communities. However because the Uluguru forest reserves are considered 'strategic forests', government would only hand over responsibility to communities if it deemed this to be the best way to achieve conservation (Hartley and Kaare 2001). Concern has been expressed however as to the ability of communities to responsibly manage forests of national or global importance (Moshi et al 2001). This suggests the need for further research into the potential effectiveness of community management.

Roles and responsibilities such as this will need to be clearly spelt out. The following chapter delves deeper into how the market itself could be designed, and how roles and responsibilities could be filled.

## 6. Operating PWS: market design

This chapter moves on from the main stakeholders, the buyers and sellers, and begins to map out the structures necessary to support market interaction between the two. We discuss the major responsibilities we perceive in operating a PWS market and offer suggestions as to how these roles could be filled.

Figure 6-1 depicts a possible scenario for a PWS market in Tanzania. In this scenario the Water Basin Authority (WBA) is the main operating authority, which collects money from its customers through its water rights distribution responsibilities. The WBA then distributes the money to appropriate communities; or rather it buys watershed services from them, by placing sale orders for a certain amount of particular services. Prior to this the sellers would have submitted conservation plans, detailing the proposed activities. The WBA would thus choose the most cost effective combination from these plans.

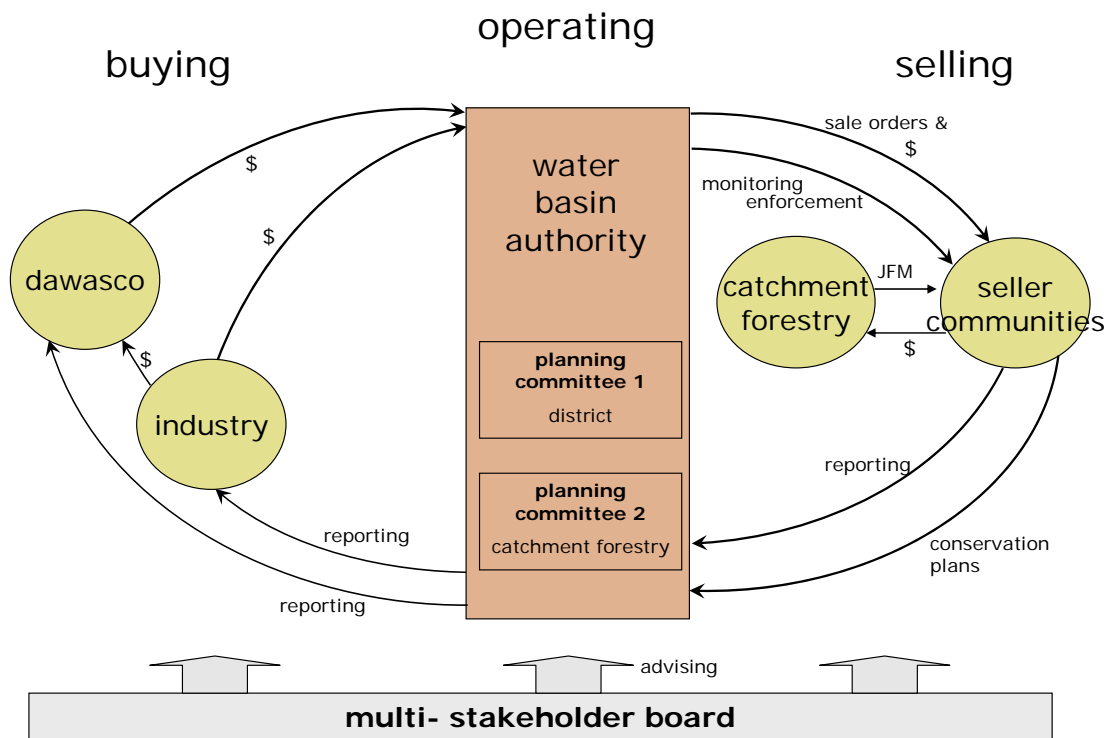


Figure 6-1: Market design scenario

In choosing which services to buy, the WBA is guided by two planning committees. The first consists of the WBA and the District government and would establish conservation planning guidelines for outside the reserve. This would ensure that the investments by the WBA would have the maximum benefit for other District objectives, such as biodiversity protection. The same

would be done by the second committee, consisting of the WBA and Catchment Forestry, for the area inside the forest reserves.

The communities provide periodical reporting of their activities, proving that they are complying with the specified conditions. The WBA assesses the reports and undertakes its own monitoring and enforcement, which should be periodically audited by external authority. The results are reported to the buyers by the WBA to keep them informed about their investment.

In recognition of the owner of the forest reserve the communities pay a royalty fee to catchment forestry (CF). In reality this money may be better transferred directly from the WBA to CF to avoid unnecessary handling of money. Through Joint Forest Management (JFM) agreements, CF allocates the property rights of the watershed services originating in the forest reserve to the communities to allow them to market them. The JFMs may also dictate other use rights to communities such as firewood collection, as long as they do not impact on watershed services.

The whole system is overseen by a multi-stakeholder board, which acts as a forum for different opinions, but also as a watchdog to ensure PWS operates smoothly. They do not hold decision making powers, but rather communicate their advice to the operating authority, the WBA.

It is important to note that the government in general is not depicted in figure 6-1, although the role of the government is central to PWS. It is crucial that the central government creates the most supporting policy environment possible to allow PWS the best chance of success. In our opinion ensuring commitment of the government to the aims of PWS deserves the highest of priorities for this project.

It should be stressed that this scenario is only a suggestion to illustrate how PWS could work. While we have designed this scenario based on our analysis, we are also aware that the roles may very well be filled differently. For instance if the initiative came strongly from industry, a trial scheme may be set up where industry negotiates more directly with sellers. This was suggested frequently by companies due to distrust in government. In this case an organisation such as the Confederation of Tanzania Industries could act as a representative of buyers. Such a scenario would nonetheless require support of the central government.

We imagine that for some time there will not be a developed market where buyers negotiate directly with sellers, if ever. Rather there will need to be some sort of intermediary body or bodies, which will act on behalf of the buyers and sellers and coordinate the day to day operations of PWS. This could include a number of activities, and we offer here some likely examples.

## **6.1. The operating authority**

We have proposed that the WBA take on the operational responsibilities of PWS because of their assumed role within the watershed. Their purpose is to manage water resources sustainably within the Wami Ruvu basin, which also means maintaining a healthy water catchment (Mutayoba 2002). It is a little unclear as to exactly what this means in relation to the responsibilities of the Catchment Forestry department, as their roles appear to overlap somewhat. Nonetheless the WBA does indeed have an interest, and a legislative responsibility to maintain the water catchment. However the major attraction of having the WBA play this intermediary role is that it is also their duty to allocate water use rights. This means that they collect (a marginal amount of) money from users based on their water use. It would be conceivably quite easy to add a charge for PWS on top of this use right fee. This would have the added advantage of eliminating the need to convince buyers to pay: they would simply be forced to.

One of the challenges to be overcome if this role is given to the WBA will be to increase substantially their capacity. It is only since 2001 that the Wami/Ruvu WBA exists (Mutayoba 2002). They are still busy identifying most of their clients, and do not currently hold accurate information about total extraction from the river. They also issue use rights for groundwater, and are currently in the process of identifying the number of bore holes that have been drilled in the basin, mainly by industry. This process has been slow and cumbersome due to limited funds and labour power.

The WBA would actually have a decent income if everybody who used water paid them for the rights. In the long term therefore we think that the WBA is a good candidate for this role within PWS. The WBA themselves have already been thinking about PWS and also saw themselves playing a similar role to that which we have sketched. They would no doubt require significant training, and may possibly outsource some of the work such as enforcement. It is also very important that a transparent process is designed to allay fears of inefficient governance.

As indicated in the market design scenario (figure 6-1) it is a possibility that the WBA could establish planning committees. This would mean that the WBA would sit with the District government to develop strategic plans for conservation outside the forest reserve, and with Catchment Forestry for planning within the reserve. While this may appear to add another unnecessary layer of bureaucracy, we propose it to ensure that conservation activities may contribute to broader catchment goals. For instance reforestation could provide important corridors for biodiversity with prudent planning.

We propose that the planning committee should not be responsible for distributing money, but this responsibility should remain solely with the WBA. Rather the committee's role would be to establish conservation priorities on a

strategic level. It would aim to combine the objectives of both parties: for the WBA to achieve the most watershed services from the activities, and for the District or CF to ensure the conservation activities fit into their broader plans for the area.

To increase efficiency the role of the planning committee should be limited within PWS. For instance the strategic plans should be made, perhaps on an annual basis, which will then guide the conservation activities directed by the WBA. In this way the planning committee will not need to approve every conservation plan, and things can work more swiftly.

## **6.2. Financial management**

Money collected by the WBA needs to reach villages where the groundwork is being carried out. Due to the remoteness and limited infrastructure in the potential seller villages, designing efficient and transparent ways to deliver money from buyers will be a challenge. Some villages have bank accounts and some do not. We did not come across any individuals who had a bank account. Nonetheless the nearest bank is in Morogoro, which can mean a significant journey to make a withdrawal.

Of course this problem is not new to the area. There is a group called Saccos, which currently operates banking like services in some of the areas we visited on the eastern side of the mountains. They have a few branches in different villages and can transfer money from banks for a relatively significant fee. It is conceivable that with their cooperation a relatively simple and efficient transaction system could be established.

Through such a transaction system at least the money could reach the village government. Most villagers who we spoke with trusted the village government to distribute the money fairly. It was suggested that it would be hard for the government to cheat them if there were clear guidelines as to how much they were entitled to.

On the buyers side however, there is little trust in government handling monetary resources transparently. This seemingly supports a possible solution in which companies negotiate more directly with potential sellers. As an initial PWS trial this may be possible. However in our opinion for PWS to be sustainable in the long run it would be better to facilitate transparency in government bodies. The complexity of these practical issues points to the need for clear overall policy guidance.

## **6.3. Policy guidance**

Due to the numerous stakeholders involved in PWS it seems wise to establish a forum for bringing the different view points together. Such a multi-stakeholder board could play a number of roles ranging from simply a forum, to actually managing the scheme, distributing money, and monitoring and

enforcement. In our market scenario (figure 6-1) we have placed the board as an overall policy advisor, where it ensures that the right policy environment is in place for PWS to flourish. It would then monitor the scheme to ensure that it was evolving in the desired direction and suggest adjustments if necessary.

The role we envision for the board then is advisory, and not practical or with decision making powers. We suggest this background role for the multi-stakeholder board to ensure that PWS can operate efficiently. The board would likely be quite large; incorporating vastly different views, education levels etc., and would no doubt be costly and difficult to convene. The board is thus inappropriate for operational management, where swift, flexible decision making powers are necessary. Where it is useful is as a guidance body.

The challenge is to design a system where the views of the board are taken into account in policy making and operating of PWS. This is difficult because the conclusions of the board may not always fit with those of the policy makers. But if the advice is not adopted the legitimacy of the board is jeopardised, and participants are likely to become disheartened.

Stakeholders that we think are important to sit on the board include: the local agricultural university; Dawasco; representatives from industry and communities; District government; NGOs with experience in poverty (locally), conservation, and PWS. The board could possibly be chaired by the WBA, Catchment Forestry and the Vice Presidents Office, or another representative of central government.

The government holds a very central position in our market design scenario, yet we envision them operating mainly in the background. A similar vision was expressed by buyers, who thought government could best play a monitoring and policy role. Central government should make sure that their policies accommodate PWS and think about ways to provide incentives for industry to participate, like fiscal relief for PWS investments. In this sense they make up the backbone of a PWS market.

#### **6.4. *Monitoring and reporting***

Eventually sellers of watershed services will need to provide regular proof that they are doing activities that they have agreed to. Who should be responsible for this is questionable. Villagers themselves mostly suggested that the village council should be responsible for making sure villagers are living up to their contractual arrangements. The village councils however are clearly not capable of undertaking all reporting activities necessary from a contractual perspective. They are also not in a position to offer a neutral evaluation, as the outcome would directly affect their livelihood. It is possible that many people we spoke with did not fully understand the extent to which reporting activities would need to be performed. For instance one man suggested that

his father was the best placed to report on his contractual obligations. Clearly some degree of external evaluation will be necessary, which nonetheless will drive up transaction costs.

Extension officers from the district level government are present in some villages in the area. Their objective is to implement policy in practical terms, for example training in more sustainable farming techniques, or advising on forestry options. These officers have regular contact with the district office in Morogoro, and thus could potentially perform reporting duties on behalf of the communities. The team of extension officers would surely need to be strengthened and trained, but because of their current experience, start up costs would be significantly less than a completely new team of evaluators.

A different government department such as the Water Basin Authority or Catchment Forestry is also an option to fulfil the role of evaluation. Catchment Forestry is relatively well equipped to perform the task in terms of forestry knowledge and experience. However as either a seller or dormant owner of the services, their ability to give unbiased reporting is potentially jeopardised. This indicates that the WBA is theoretically the best placed to coordinate the monitoring and enforcement activities. However due to lack of experience in these activities it may be wise to consider collaboration with the district offices, and build on the existing extension officers.

## 7. Synthesis

The previous three chapters suggest a number of opportunities and obstacles that will be faced in designing a PWS market in the Wami Ruvu Basin. These are summarised here as they provide a basis from which to understand how to facilitate PWS.

Table 7-1: Opportunities and obstacles of PWS in the Wami Ruvu Basin

<b>Opportunities</b>
JFM legislation largely accommodates PWS
Government is receptive to the idea of PWS
Potential stakeholders are enthusiastic about the idea
Potential buyers are generally willing to pay
Scientific uncertainty is less of a problem than expected in convincing buyers to pay
General awareness of a pending water crisis
<b>Obstacles</b>
Communities do not currently have property rights to the watershed services in the Forest Reserve
High transaction costs due to problems with monitoring and reporting, and financial management
Lack of knowledge on conservation activities within communities
Lack of capacity within government bodies, especially the WBA
Unclear and overlapping responsibilities within government departments

The summary of opportunities and obstacles presented in table 7-1 provides us with a clear starting point for determining what needs to be done to set up a PWS market. Based on our analysis we conclude that there are three major groups that deserve attention. These groups are depicted in figure 7-1 (following page) which shows the level of capacity and willingness each possesses. These levels are underpinned by the opportunities and obstacles that appear from our analysis. We could have included others such as NGOs which may play an intermediary role, although we believe that the three groups depicted here will demand the majority of the effort of the PWS project.

The spheres representing each group portray the range of capacity and willingness within each group. For instance due to reasons discussed below, governments' willingness ranges from highly willing to only mildly willing. By capacity we are referring to the present ability of the group to fulfil the roles

or responsibilities that would be expected from it under a PWS market. Willingness refers simply to the level of motivation to participate that groups expressed to us on the initial idea of PWS.

The capacity of companies to participate in PWS is judged generally as high. It ranges to mildly capable due mainly to small companies. For these stakeholders, short term outlooks and possibly the financial burden of PWS limits their capacity. The willingness of companies is encouragingly high. The range is due to the importance of water to the business, their reliance on water from the Ruvu, and to the perception of the potential effectiveness and transparency of PWS.

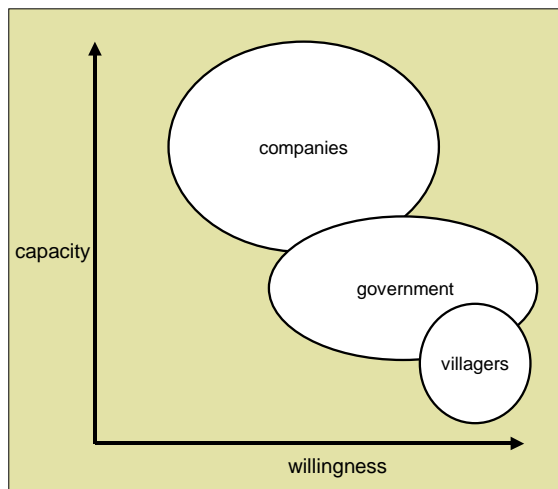


Figure 7-1: Capacity and willingness of major stakeholder groups

The government group consists of all levels that we encountered including central, regional, district, and village. It also includes the major departments relevant to PWS: Catchment Forestry and the WBA. It is therefore a very broad group. Important in this analysis is that the capacity is consistently low throughout the group. This is due variously to inefficient institutions, limited funding, corruption, and unclear government responsibilities. Willingness ranges from high to mild depending on the exact set up of PWS in terms of who receives payments and what the responsibilities are.

Villagers have a low capacity to participate in PWS due mainly to a lack of property rights within the forest reserve. Their capacity is also severely hindered by the difficulties associated with monitoring and reporting, financial transactions and the high costs related to this. Also they currently have limited knowledge of conservation activities that will have a positive impact on watershed services. Willingness of villagers to change their behaviour is encouragingly high.

To develop a market successfully, ideally all stakeholders should move to the upper right corner of the diagram in figure 7-1. Our analysis shows that the majority of the effort in establishing equitable PWS will be needed in increasing the capacity of communities and government institutions. This has serious implications for the consortium project. The approach taken to date by the consortium has been to focus heavily on generating demand, whereas our results show that the major problems lie on the supply side, and in institutional capacity.

In order to increase capacity within the communities they will firstly need to be allocated use rights to the forest reserves sufficient to be able to market

watershed services. This will be a major step for the government, but in our opinion is necessary if PWS is to achieve its poverty alleviation goal. Important also is to investigate effective, efficient and transparent mechanisms for monitoring, enforcement, reporting and money distribution. Training is also crucial in appropriate land use and conservation activities, as well as developing other income generating activities such as beekeeping.

The capacity of the government could be increased significantly if commitment to the objectives of PWS are made at a high level, for instance by the president. This would require clarifying responsibilities for managing resources within the various departments, making funding available to strengthen relevant institutions, and implementing transparent, accountable financial management within departments.

While buyers are the best placed of the three groups, their position could still be improved. Willingness may be increased by approaching some high-profile public figures to participate and lobby for the scheme. This will motivate other companies to participate and give PWS better public standing. A transparent scheme with systematic reporting will allay many concerns of buyers, and increase willingness. Willingness of buyers becomes less important however if PWS is added as a mandatory charge via water rights fees of the WBA. Low capacity may be hard to improve if smaller companies cannot afford the extra charges. Research is needed to discover the actual ability to pay of potential buyers. Nonetheless an initial focus on large industries will be able to generate substantial funds. Smaller water users may be involved once the market is more mature.

If problems with capacity are addressed, we believe strongly that the enthusiasm shown by all stakeholders gives PWS a more than reasonable chance of success.

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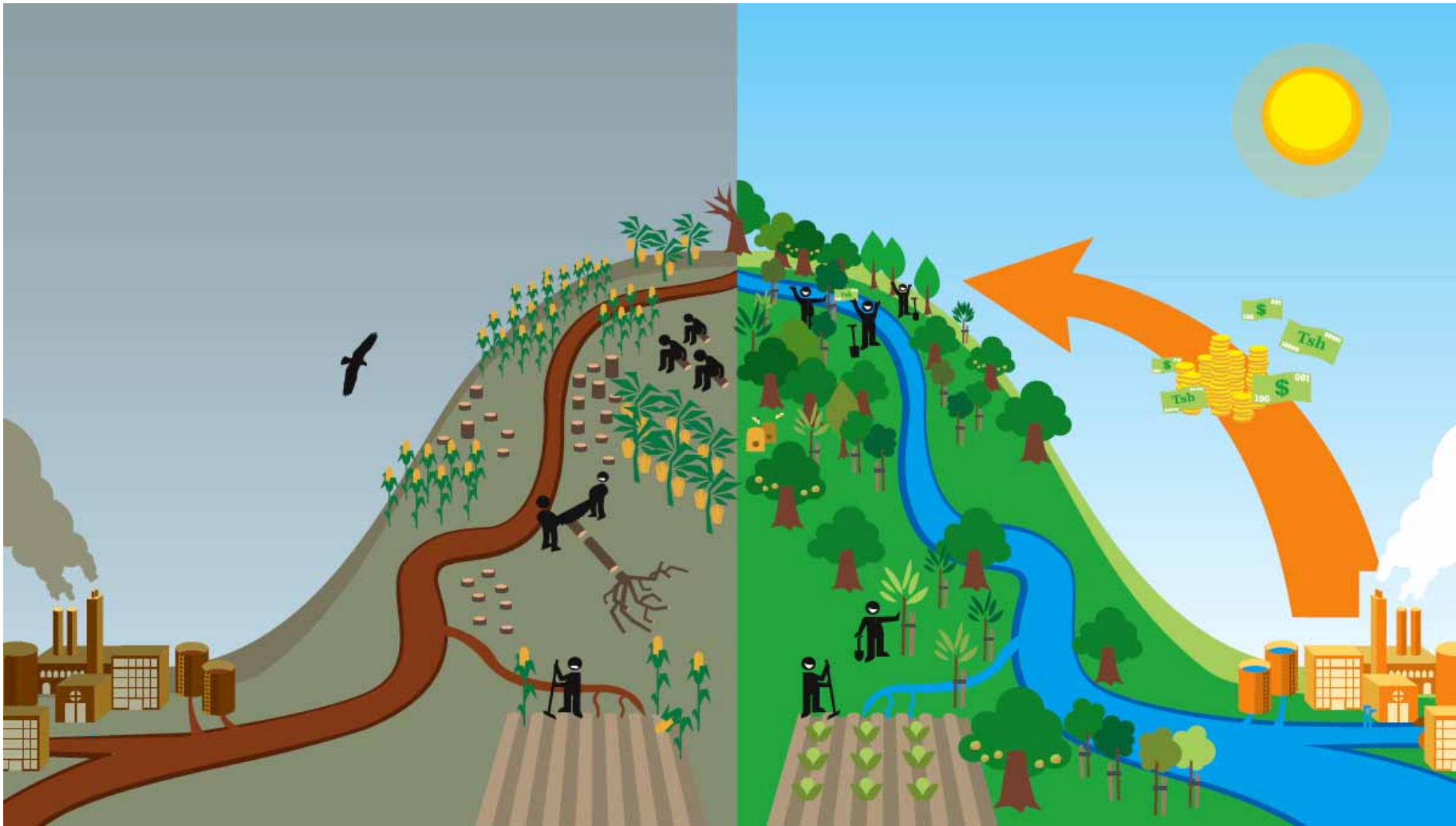
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Appendix 1: PWS poster



Poster designed by Casper Glorius and Willem van de Ven