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Influence of governance institutions on households' willingness to pay for resources conservation in Khalong-la-Lithunya wetland area, Lesotho

By

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DECLARATION OF ORIGINALITY

I hereby declare that this dissertation which I submit for the degree of MSC Agric (Agricultural Economics) at the University of Pretoria is my own work and it has not been previously submitted by me for a degree at this and for any institution of higher learning.

Signature ----------

Ikhothatseng Jacob Greffiths

Date ----------

Approved by:

Signature ----------

Prof E.D. Mungatana

DEDICATION

I dedicate my dissertation work to the Almighty God for His divine power and mercy.

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ABSTRACT

This study uses the double-bounded bid elicitation format to estimate how much households in the Khalong-la-Lithunya wetland area (KWA) would be WTP (on top of monthly water bills) for wetland resource conservation, and test whether WTP significantly varies with the institution responsible for its conservation management. KWA was purposely selected on account of the critically important role it plays in securing water provisioning ecosystem services; a role that is currently threatened by proximate and ultimate factors hypothesised to be driven by its unrecognised economic value. WTP was thus elicited and compared when the governance institution was (i) the Ministry of Natural Resources, and (ii) a private environmental conservation agency that is currently active in Lesotho i.e. the Transformation Resource Centre (TRC). Purposive and simple random sampling methods were used to collect survey data from 204 households.

Results show that respondents have high levels of factual knowledge about the threats to the sustainability of KWA. They also have attitudes, opinions, and perceptions that are receptive to a policy that improves the *status quo*. Mean WTP was M78.80 per household per month (UB M92.89 and LB M38.21) when the Ministry of Natural Resources was responsible for conservation management in KWA (equivalent to M 0.011 per litre or M0.21 per 20 litre jerry can), and M83.09 per household per month (UB M98.00 and LB M32.94) when TRC was responsible for conservation management in KWA (equivalent to M0.011 per litre or M0.22 per 20 litre jerry can). The null hypothesis of equality of the two mean WTP values was rejected

at the 1 % level (t= 4.34 and p = 0.000), suggesting that institution responsible for conservation management in KWA significantly influences households' WTP.

Double bounded models differentiated by institution responsible for conservation management in KWA were used to econometrically determine factors that influence households' WTP. Results show that WTP was positively related to the following variables: income, age, education, whether households had experienced seasonal water shortages, knowledge of health risks associated with water shortages, and gender (males had higher WTP). WTP was found to be negatively related to household size (the more the household members, the lower the WTP). These results were consistent with prior expectation and literature.

Considering, also, that this study further used secondary sources to estimate that households, on average, spend about M300 per month on water (equivalent to M0.04 per litre or 0.80 per 20 litre jerry can), three key recommendations follow. First, subject to extensive stakeholder consultations, the Water and Sewerage Authority (WASA) of Lesotho should consider adding to the regular charge a resource conservation tax amounting to at least M0.011 per litre of water delivered to customers, i.e. instead of charging M0.04 per litre of water delivered, WASA should charge customers at least M0.051 per litre of water delivered. Second, WASA should consider instituting a policy that isolates the conservation charge from the M0.51 per litre, and explicitly invest it in mitigating the resource conservation challenges in KWA (i.e. the charge should be used to support activities that secure the sustainable water provisioning ecosystem services from KWA). Finally, WASA should consider engaging TRC directly in converting the proceeds from the conservation charge to tangible resource conservation outcomes in KWA, given that households expressed higher WTP when TRC was responsible for its conservation management.

Key words: contingent valuation, water provisioning ecosystem services, willingness to pay (WTP), wetland management and conservation, water supply sustainability, Lesotho

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List of Acronyms

KWA	–	Khalong-la-Lithunya Wetland Area
WTP	–	Willingness to Pay
WTA	–	Willingness to Accept
CVM	–	Contingent Valuation Method
TRC	–	Transformation Resource Centre
WASA	–	Water and Sanitation Authority
TEV	–	Total Economic Value
ANOVA	–	Analysis of Variance
RR	_	Resource Rent
CAC	_	Control and Command
MBI	_	Market-based Instrument
LHWP	_	Lesotho Highland Water Project

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

There is mounting evidence to show that wetland degradation is a problem that significantly impacts negatively on social welfare and environmental outcomes, and thus demanding urgent policy attention (Horwitz et al., 2012; Akwetaireho, 2009; Caliskan, 2008). The Ramsar Convention Secretariat (2007) defines wetland degradation as the loss or alteration of wetlands by natural and human factors through impairment of some physical properties and in which the alteration results in a reduction of biological complexity in terms of the diversity of wetland-associated species. It has been estimated that since 1900s, more than half of the world's wetlands have disappeared (Ramsar Convention Secretariat, 2007). For example, New Zealand experienced large scale losses of wetlands over the past 160 years, such that only 10% of the original wetland area of 2.47 million hectares currently remains (Ausseil and Gerbeaux 2008). According to the (Millennium Ecosystem Assessment 2005), degradation of wetland ecosystems has implications for both social and environmental welfare. It has been associated with reductions in health outcomes for people, reduced income generating opportunities in rural and urban areas, reduced environmental integrity, and reduced development prospects (Horwitz et al., 2012:1; Kibwange et al., 2008). Even within Africa, Schuyt (2005) reports reductions in social welfare and environmental outcomes associated with wetland degradation in Malawi, Uganda, Nigeria and Southern Africa.

Wetland degradation can be attributed to proximate and ultimate causes. The proximate causes of wetland degradation are defined as the immediate and often most apparent causes of ecosystem loss (Turpie and Barnes 2003) including water pollution, ploughing for agriculture, livestock overgrazing and trampling, vegetation invasion, and burning. The ultimate causes of degradation are defined as the less obvious and more distant factors that cause environmental loss (Senaratha et al., 2011). They include the property rights regimes governing entrance and conservation of wetland's resources, policy intervention failures, market failures, information failures, poverty, and severe economic challenges (Dugan, 1992; Heltberg, 2002:189; Schuyt, 2005:179). Conservation biologists and managers tend to concentrate on finding solutions to

the proximate rather than the ultimate causes (Turpie and Barnes 2003). Senaratna et al (2011) contends that the control of ultimate causes has remained out of reach for most policy makers.

The conservation and sustainable management of wetlands in Lesotho has recently gained policy attention because of the important roles they play in the socio-economic development of the country. Wetlands in Lesotho, which are broadly classified into high and low altitude wetlands (Turpie et al., 2006), cover approximately 1.36% of the total land area of the country. Low altitude wetlands are found in the lowlands (Turpie et al., 2006), and include Maliba-Matso, Motete and Matsoku wetlands. High altitude wetlands are found towards the tips of rural mountain areas and include Khalongh-la-Lithunya, Kotisephola and Letseng-la-Letsie (Turpie and Barnes 2003). Of all the high altitude wetlands, the Khalongh-la-Lithunya Wetland Area (henceforth abbreviated KWA) has received much attention from researchers and policy makers on account of its relatively large size and the significant contribution it makes to socioeconomic welfare and environmental outcomes. KWA supplies provisioning ecosystem services including water and grazing to the local and urban communities of Botha-Bothe district. Lesotho Agriculture (2007) for example estimated that of the grazing value of 111,000 Maloti/year generated by high altitude wetlands in Lesotho, KWA had the largest share. In addition, KWA supplies water to the largest electricity generating plant in the country, the Lesotho Highlands Water Project (LHWP). The Department of Water Affairs (2008) reported that the water harnessed from LHWP and exported to South Africa in 2007 generated revenues amounting to Maloti 15 million.

Despite such demonstrated benefits, wetlands in Lesotho continue to be degraded thus threatening current and future development options. The key proximate threats behind this degradation include excessive resource extraction, livestock overgrazing and trampling, conversion to agricultural uses, bank erosion and water pollution. In the view of this study, the most important ultimate threat to wetlands in Lesotho is their partial to pure open access nature. Most wetlands in Lesotho are characterised by the absence of clearly defined and secure property rights. Kirsten et al (2009) contends that the lack of well-defined property rights, their monitoring and sanctioning results in overharvesting of resources. The literature shows that when access to a resource is open to all, it results in open access externalities where incentives to conserve are weakened and resource overuse gains momentum. In an open access regime, a resource has no price and markets fail to reflect the value of the ecosystems as individuals are not faced with the full consequences of their actions. This lack of understanding and failure of markets implies that information conveyed to economic decision-makers at all levels is incomplete (Schuyt (2005). Incomplete information implies that the full social and

environmental benefits of wetland goods and services, and the full costs of their degradation are not translated in a way that will ensure optimal decisions for both the economic purpose and the environment (Barbier et al., 1997). It thus the contention of this study that to sustainably secure the management of wetlands in Lesotho, it is critical to investigate policies that would encourage decision makers at all levels to internalize externalities in making choices related to wetland use.

Economists have developed a suite of policy instruments for mitigating resource degradation including direct regulations, taxes, tradable permits, subsidies, deposit refund schemes, refunded emission payments, definition of property rights where more existed, legal instruments, and information policies (Sterner 2003). Of all these, a review of the literature suggests that command and control (CAC) and market based instruments (MBIs) are the most widely used in practice. CACs use conventional approaches like explicit directives to regulate natural resources use, while MBIs encourage environmentally friendly behaviour through market signals (Coggan and Whitten, 2005). A review of the literature further shows that MBIs have gained more popularity over CACs because they are considered more efficient in a variety of settings (Landell-Mills and Porras, 2002; Sterner 2003). Given that this study is particularly interested in an instrument that could in principle be used to internalize externalities associated with overuse of wetland resources, it will focus on the specific MBI economists refer to as the resource rent (RR).

In theory, the RR of a natural resource is defined as the total revenue that can be generated from extraction of the natural resource less the cost of extraction including a normal return on investment to the extractive enterprise (Sharp, 2003; Luchsinger & Muller, 2003; Scherzer & Sinner, 2006). In practice, RR is calculated as total revenue minus intermediate consumption, compensation of employees, consumption of fixed capital, and normal profit (Miguel et al., 2004). For economic sustainability in the exploitation of wetland resources, theory suggests that the RR should be estimated, captured and reinvested in the wetland resource to account for the costs of depletion, the costs that go into extraction and restoration of the wetland (Humphreys, 2005). In this way, exploitation of wetland resources can be economically sustainable as a permanent source of income would be created for wetland conservation and management. It follows that to appropriately use RR as a tool for sustainable natural resources management, the two conditions that should be met require the magnitude of the resource rent should be known and institutions must exist for the efficient capture and administration of the RR for reinvestment (Miguel et al., 2004).

1.2 PROBLEM STATEMENT

Located in Botha Bothe district, KWA is the largest and most important wetland area in this district. This wetland is estimated to have the area of 3,280 hectares and it is located at altitudes between 3100 metres and 3200 metres above sea level (Department of Environment, 2009). KWA contains the upper and lower catchments which supply water to the local community, urban residents in Botha-Bothe town and to the largest power generating plant in Lesotho which is LHWP. It supplies many ecosystem services to local and urban communities including opportunities for harvesting fish, wood, water, fibre and medicinal plants under open access. KWA also provides important grazing ecosystem services since it known to have unique grasses that are palatable to livestock which includes: *Festuca caprina*, *Merxmuellera disticha* and *Pentaschistis oreodoxa*. Despite these indispensable benefits, KWA is currently threatened by excessive human extraction, livestock overgrazing and trampling (high stocking rates during seasonal migrations), agricultural conversion, erosion, and water pollution. According to Olaleye et al (2014), livestock over-grazing and trampling has been a critical challenge in KWA. The consequences of this degradation include extinction of wild animals and medicinal plants, formation of dongas from the soil erosion, water pollution and livestock diseases.

In an effort to mitigate wetland degradation in Lesotho, government established a wetland unit after the Ramsar Convention treaty in 1971, which embarked upon efforts to rehabilitate KWA. The rehabilitated area is now partly fenced to restrict assess. According to the Department of Environment (2009), of the 3,280 hectares of wetland area, the catchment area of 1,332 hectares has been restored since 2007. However these conservation attempts show little proof of success, as KWA has not yet fully regained its former status. Olaleye et al (2014) shows that the quality of KWA has dramatically decreased: after five years of restoration attempts, mineral loss, water loss, decreased water quality and vegetation loss still remains a challenge yet the funds that had been earmarked for this purpose have run out. It follows to secure resource management and conservation in KWA, alternative funding mechanisms must be explored. It is on the basis of the foregoing challenges that this study was designed to estimate the RR associated with resource exploitation in KWA, with the view that once it can be estimated, it could be used as a tool for resource conservation in KWA.

We earlier stated that for RR to be used as a tool for sustainable resources management, two conditions must be fulfilled. First, the magnitude of the RR must be known and second,

institutions must exist for its efficient capture and administration (Miguel et al., 2004). Since the magnitude of the RR in KWA is currently not known, estimating it in this study would be an important step in operationalizing the theory. We earlier stated that to calculate RR in practice requires an estimate of the value of output. However unlike the output from exploitation of fossil fuels and minerals that are traded in competitive markets, the value of the different ecosystem services supplied from KWA do not have a competitive market.

Since the non-existence of a competitive market reflects the open access and public good nature of KWA, it was therefore found relevant to this study to use non-market valuation. Of all non-market valuation techniques commonly used, Contingent Valuation Method (CVM) was found relevant for this study to estimate the value of RR as it is known to be widely used method in estimating economic values for all types of environmental goods and services which is beyond the scope of other methods. This method asks people to report their willingness to pay (WTP) for a conservation charge for KWA to secure water provisioning ecosystem service. Since, there is no specific institution currently in existence to administer RR, it was also found relevant to conduct this study using CVM to determine the relevant institution that will result into better conservation and sustainable use of wetland resources. The level of knowledge, attitudes and perceptions of the respondents about KWA conservation were also investigated to determine whether the respondents are willing to pay based on the factors that were found to have bearing in the literature (Whittington et al.,1991, 2004; Khan et al., 2010; Altaf et al., 1993). Among many other ecosystem services, water is known to be the main resource that has larger share of GDP in Lesotho through its sale to the neighbouring country and to the urban areas of Lesotho as it was indicated earlier in this study. This study was conducted in the urban area where people are already paying for water, so as to quantify the conservation charge that can be applicable to all beneficiaries of the wetland resources. Consequently, this study seeks to address the following questions:

1. How much should households that are benefitting from water harnessed from KWA be willing to pay to secure the conservation of KWA for water supply security?
2. How much conservation charge should be included in the municipality water bill for continued water provisioning ecosystem service?
3. Which institution should be responsible for administration of conservation charge?
4. How does the factual knowledge, perception and attitudes affect the conservation of KWA?

There are a number of foreseen benefits to the implementation of a study of this nature in Lesotho. First, it will provide empirical evidence that can be used for policy recommendations to inform sustainable use, conservation and management of wetlands in Lesotho. The study might also intensify the interest of government for conserving wetlands to secure sustainable water supply considering that the largest part of Lesotho's GDP comes from water consumed domestically and exported to South Africa. The study might help to convince environmental organisations that wetlands are worth improvement, hence might attract possible funding for policy implementation of wetland conservation. Eventually, the results as found may help in decision-making that will guide the stewardship of wetland use.

1.3 RESEARCH OBJECTIVES

The main objective of this study is to use the contingent valuation method estimate beneficiaries' mean willingness to pay (WTP) for the conservation of KWA to ensure it continues to supply water provisioning ecosystem service. This research is guided by the following objectives:

1. To assess the knowledge, attitudes and perception of urban households towards the conservation of KWA for the continued water provisioning ecosystem service in the urban area of Botha-Bothe district.
2. To determine whether a conservation charge for Botha-Bothe urban residents is positive for continued water provisioning ecosystem service from KWA.
3. To determine whether the willingness to pay (WTP) of households is dependent on what institution governs KWA.
4. To determine the socio-economic characteristics that explains variation in WTP for conservation of KWA.
5. To draw policy-relevant information that will assist with sustainable management of the continued water provisioning ecosystem service.

1.4 HYPOTHESES

i. The level of respondents' knowledge, attitudes and perception is a serious issue in wetland management and conservation. It is believed that knowledge about the wetland influences the attitudes and perception of the people. A study conducted by Atreya et al (2015) in Nepal shows that only 18 % of people in the community were participating in conservation of wetlands and an awareness programme, which reflected their attitude towards conservation of the wetland. The study further indicated that meetings, workshops and training played an important role in creating awareness among people. The ratings of the study indicated that 69 % of the migrants and 63 % of the indigenous people rated conservation and better management of the wetland as a good plan, while 28 % of the migrants and 36 % of the indigenous people rated conservation as very good idea. On average, more than 80 % of the people considered conservation of the wetland as good. In essence, this also reflected their positive attitudes towards conservation of the wetland, which emanated from the knowledge of the wetlands. Sah and Heinen (2001) indicated that people are willing to pay for resource use if they are participating in the conservation of the resource, as they develop a sense of understanding that determines their decision-making in WTP. Thus, the study tests the following hypothesis:

The respondent's WTP is not statistically influenced by the knowledge, attitudes and perceptions of the respondent

ii. Conservation charge is known as the resource rent for the efficient allocation of natural resources. When people pay resource rent, it implicitly reflects the value they place on the resource, which concurrently indicates their level of utility in monetary form. The respondents place the value on the natural resource through their WTP. Policy makers and funding agents should be more interested in the information furnished by a WTP study to help in the provision of goods more closely in line with the consumer preferences underlying the good (Hanemann, 1991). This means that the resource rent generated through WTP measures the level of individual preferences, hence determining whether the rent is positive or zero. Following the value theory of Smith (1776), the resource rent is one component of the profit derived from the use of a resource and profit is known to be non-negative. Assuming that the natural resource is beneficial to the people, resource rent as defined is also non-negative. The resource rent can be either zero or positive, depending on the conservation regime of the wetland. Under a pure open-access regime, competition drives resource rent to zero (Freeman, 1991; Scott, 1954). When the wetland is under partial open-access and a private regulation regime, the rent is expected to be positive, hence it is hypothesised that:

The conservation charge for continued water provisioning ecosystem service from KWA is positive under partial open-access regime

iii. The conservation of wetland areas is influenced by the regime that governs the wetlands. The government in most cases is not trusted by the public for conservation of the ecosystem, including wetlands. When the people are asked to pay for ecosystem services to avoid their extinction, people refuse on the grounds that it is government's responsibility to deliver free services. This was recorded in the study by Whittington et al. (1998), conducted in three villages in Nigeria on improved public tap water and a private connection system. The results revealed that people reported low WTP for an improved water service because the people said that their government was not trustworthy and that it was the duty of the government to roll out services, free of charge. That is the reason why this study hypothesised that:

The respondent's WTP is statistically dependent on the institution governing KWA

iv. The WTP of the residents for an improved water provisioning ecosystem service is influenced by some key socio-economic characteristics, such as gender, age, income, household size and other factors. According to Moffat et al. (2007), those households with high monthly incomes demand more clean, and high quality, water. Moreover, Choe et al (1996), Hoehn (2000) and Kolstad (2002) have indicated that income is the main determinant of a respondent's WTP and is positive and statistically significant. This means that a household's demand increases with income of the household, that is, the higher the income of the household is, the higher is its demand for water. Alaba (2001) indicated that age is positively related to WTP, implying that older people are more willing to pay for improved water service, as they are less energetic for moving around to search for distant, alternative water sources. For justification of the above information, this study tested the following hypothesis:

Respondents' mean WTP is not statistically influenced by the socio-economic characteristics of the households.

1.5 IMPORTANCE AND BENEFIT OF THIS STUDY

The rationale behind conducting this study is to assist wetland users and policy and decision makers to realise the importance of the KWA in the different range of services that it offers. This study generates relevant information which would fill the gaps in the current and future wetlands policies. Most of the current policies do not fully address the challenges of wetlands' degradation; therefore, this study generates relevant information to fill such gaps in the policies

governing the conservation of KWA for continued water provisioning ecosystem service. Furthermore, the purpose of this study is to help in the efficient and sustainable allocation of wetland resources. This is achievable through proposing the institutions which might lobby for conservation and suggested development planning for wetland use, as well as designing a financing strategy for conservation of KWA, and developing incentive mechanisms and an appraisal of development application. The study estimated the conservation charge that residents place on conservation of KWA for continued water provisioning service, which is derived using a contingent valuation method. This method asks people to report their willingness to pay (WTP) for a conservation charge for KWA. This quantitative economic valuation would assist with the comparison of the real costs and benefits of wetlands ecosystem use in water supply and degradation, which would lead to more sound decision making regarding the protection and restoration of wetlands. This will also facilitate the efficient decision-making that optimises societal welfare of people in benefiting from the wetland's water supply. The outcome of this study would be useful for policymaking that helps to reconcile economic and environmental objectives of wetland use in a way that does not marginalise the poor.

The remainder of this dissertation is partitioned into the following chapters: Chapter 2 which presents a review of both theoretical and empirical literature on the use of CVM for conservation of a wetland for its continued water supply. Chapter 3 describes the study area, the research design, data analysis and household characteristics of the households interviewed. Chapter 4 presents the results and discussion of the entire study, and lastly, Chapter 5 gives the conclusions and recommendations flowing from the findings of the study.

CHAPTER 2

THEORETICAL AND EMPIRICAL LITERATURE

2.1 INTRODUCTION

The purpose of this chapter is to present information from theoretical and empirical literature concerning water and wetlands conservation using a contingent valuation method, as well as the institutional implications. This section categorises CVM literature and studies along several dimensions which leads to the explanatory synopsis of the determinants of the wetland values and the knowledge gap. Additionally, this section is complemented by a more rigorous assessment of the wetland CVM studies done on wetlands and water, which are the backbone of this study. The organisation of this chapter is as follows: section 2.2 presents the introductory part of theoretical literature, which is further partitioned as follows: section 2.2.1 outlines the contingent valuation methodology framework, section 2.2.2 presents WTP theory, section 2.2.3 outline the theoretical framework underlying CVM, section 2.2.4 discusses different CVM elicitation methods, section 2.2.5 gives the advantages of CVM, and weaknesses of CVM are given in section 2.2.6. This section goes on to present the improvement of weaknesses of CVM in section 2.2.7, why wetlands are undervalued, which is in section 2.2.8, and lastly, the institutions and local participation approaches are set out in section 2.2.9. Of wetland conservation and management, Section 2.3 gives an overview of the empirical wetland valuation literature and presents the results of studies previously done in a clearly condensed form. The section is divided into introduction in section 2.3.1, the overview of empirical wetland valuation studies and the CVM on water provisioning services.

2.2 THEORETICAL LITERATURE

This section presents the economic theories and literature relating to wetland ecosystems, and it is much supported by different aspects of contingent valuation literature. It goes on to discuss the theories of valuation of wetland for continued water provisioning ecosystem service.

2.2.1 Contingent valuation methodology framework

The contingent valuation method is a popular instrument in natural and environmental resource valuation. It is also known as a stated preference approach. It is named contingent valuation

because people are asked to indicate their WTP, contingent on a specific hypothetical scenario and description of an environmental service. It is also called stated preference method because it asks people to state their values, rather than revealed preference, and thus infers value from the actual choices.

The CVM approach is a technique which involves a direct elicitation of values from the respondents with the aid of a carefully designed and administered sample survey (Arrow et al., 1993; Mitchell & Carson, 1989; Akwetaireho, 2009; Hanemann & Loomis, 1991). This tool is designed to estimate the monetary value of non-market goods and services in decision making concerning environmental damage assessment and cost–benefit analysis (CBA) of public policy or investments (Dennis and Mazotta, 2001).The application of CVM in developing countries was initially used in two main areas, water and sanitation, and recreation, tourism and national parks, although it currently seems to growing rapidly in other areas of investigation (Whittington et al., 1998).

The CV survey utilises the notion of willingness to pay (WTP), or willingness to accept (WTA), depending on the circumstances or nature of the problem under investigation. The literature (Arrow et al.,1993 Whittington et al.,2004) indicates that CVM is designed to cater for the missing monetary-based market of the public goods by determining individuals' WTP for a specified change in quality or quantity of such goods, or what amounts of money people are WTA as compensation for the degradation in the provision of the goods (Carson et al., 2003). The literature further indicates that CVM can also be used to elicit people's WTA to forgo a change or tolerate a change, and the mostly commonly used tool in CVM is an interview to ask people about their WTP to preserve an asset (Bolt et al., 2005).

The WTA is normally converted to WTP format, unless otherwise stated, because the improvement in environmental quality can be good to one party (consumer) and bad to the other party (producer) due to the immediate cost of the pollution to be incurred by the producer (Mitchell & Carson, 1989). The literature indicates that WTA does not elicit valid data in many cases and WTP should be used whenever individuals are to reap benefits from the proposed policy. Therefore, this study will utilise the WTP format to elicit values for the improved quality of water supply and for the purpose of acquiring valid data.

The economic theory underlying CVM is the basic welfare analysis and the CVM that satisfies the basic welfare criterion can be utilised to elicit WTP functions for the consumer good. This helps to provide the welfare change estimates that would be used for economic planning and policy formulation leading to conservation of the environmental good under consideration,

which is water in this case. The CVM is one of the methods in environmental analysis that incorporates the wide variety of a wetland's use.

2.2.2 Willingness to pay (WTP) theory

The willingness to pay technique is a widely used concept in the valuation of non-market goods, like wetland water. In order to determine the cost and the benefits of the conservation of the wetland for sustainable water supply, the main considerations are the social costs, private costs and the externalities. The divergence of social cost from private costs results in market failures, which is not desirable in a perfectly competitive market, hence opportunistic behaviour takes place. For the purpose of controlling for such market failures, the concepts of WTP and WTA are normally used for non-market goods to place a value on non-market goods.

The concept of WTP was pioneered by environmental economists to value non-market goods with public characteristics and ill-defined property rights (Frew, 2003). These properties result in the consequences of non-excludability, which is catastrophic in the conservation and management of a natural resource. Frew (2003) defined the WTP valuation exercise as using a hypothetical question about a pre-specified, prospective change with the intention of eliciting the maximum amount of money that an individual is willing to give up to ensure a change in the form of improvement taking place. Therefore, the WTP technique seeks to determine the welfare change in the form of compensation variation that maintains individuals at their initial utility level, and thereby evaluate the likely impact of a change in the utility.

Stavins (2004) raised a question about the validity and reliability of WTP results. The author asked whether the neglected attributes influence the choice decisions of the respondents, which gives biased results. However, Willig (1976) had already indicated that reliable and valid WTP findings are very important in policy formulation. The author further stressed that measuring WTP values of individuals helps to provide insight about the provision of the good under investigation. The relevant policy makers and funding agents are interested in the information furnished by the WTP study to help in the provision of goods more closely in line with the consumers' preferences underlying the good, and so improve the rationality of decision-making (Hanemann, 1991).

The economic value of a natural resource is internal to individuals, and depends on how they assign a price to that good. Then, the total value of a natural resource is the sum of the values of all the individuals who are interested in the environmental good specified. One way to

uncover these values from individuals is through asking them to report their WTP to receive the good, or their WTA compensation to forego the resource. The concepts of WTP and WTA thus play a crucial role in the field of welfare measurement. According to Willig (1976), the main challenge of these concepts is that they are inequitable, as they give greater weight to the responses of the well-off respondents. While understanding the validity and reliability of this challenge, it is also important to realise that there is no rational and reliable method of valuation currently in existence that can substitute this method (Hazilla & Kopp, 1990). It was further stressed by Hanemann (1991) that the problem of equity should be addressed separately from that of cost estimation.

2.2.3 Theoretical framework underlying CVM

The CVM is widely used in modern welfare economics to measure the values of welfare gain and loss. Modern welfare economics operationalises the concept of a Pareto criterion by endeavouring to find ways of attaching a monetary value to non-market good, such as of wetland's water on the gains and losses in the provision of that good (Wilson and Carpenter, 1999). In order to assign monetary values on the non-market goods, like the wetland water, two key assumptions are normally adopted. One of the assumptions adopted is that the economic agent (the consumer), when confronted with a possible choice between two or more bundles of goods, must have a preference for one good over the other. From the consumer theory perspective, the other assumption is that, in their actions and choices, the consumers are attempting to maximise their overall level of utility.

The two assumptions have economic implications for the CVM, which is said to be unique among benefit measurement techniques for its ability to obtain detailed distributional information (Hausman, 1993). Moreover, CVM is said to be consistent with the consumer sovereignty assumption in a sense that a consumer's spending behaviour in a market of goods is a sufficient signal of the consumer's preferences for different range of commodities (Fujita et al., 2005). The motive behind using the criterion of welfare economics is to evaluate a given policy by judging whether a particular policy is important for improving the allocation of one good, without detriment to another, especially for the goods with public attributes (Haab *et. al.* 2013). In essence, this can be translated as assessing whether a particular policy of natural resource allocation is Pareto improving or not. From the viewpoint of economic analysis, classical welfare economics is much concerned with analysing conditions under which a Pareto optimum may be achieved. Despite its analytical importance, the Pareto criterion is very

restrictive since it provides no guidance to choice between alternatives which involve one person becoming better off, while another becomes worse off (Kaldor, 1939; Hicks, 1939).

Since almost any formulated economic policy has a high risk of making some people worse off, while others are reaping the fruitful outcome of the policy, this is said to be a serious restriction of classical welfare economics (Kaldor, 1939; Hicks, 1939). In order to overcome this challenge, Kaldor (1939) and Hicks (1939) proposed that an appeal can be made to the new welfare economics which seeks to modify the Pareto criteria with compensation test criteria to determine whether an activity is moving the economy towards Pareto efficiency or not. Drawing on Kaldor's criterion (Kaldor, 1939), an activity will contribute to Pareto Optimality if the maximum amount of money the gainers are prepared to pay as an offer for the loss created is greater than the minimum amount that the losers are willing to accept as the compensation for the environmental change in this context. Furthermore, the Hicksian criterion (Hicks, 1939) sought to target the losers by indicating that an activity will contribute to Pareto efficiency if the maximum amount of money that the losers are prepared to accept as an offer from the gainers in order to prevent environment change is less than the minimum amount the gainers are prepared to pay as compensation to forego the change.

Therefore, if these two conditions are satisfied, economists believe that both gainers and losers will agree that the proposed activity will move the economy towards Pareto efficiency. This is known as the Kaldor-Hicks-Scitovsky efficiency criterion, which stipulates that the change can be recommended only if the benefits can adequately over-compensate for the losses. The compensation test of Pareto improvement is not in widespread use in practice because compensation is rarely paid to the losers. In order for such a criterion to be implemented, those who gain from the policy change would have to compensate the losers according to a potential Pareto improvement criterion, which is known as the Potential Compensation Test (Hicks, 1939; Kaldor, 1939). Without the actual payment of compensation, there is high likelihood of rendering a smaller segment of population much better off, while the mass suffer.

In order to materialise the potential compensation test, the very popular and widely adopted technique of CVM is used in applied economics. The CVM approach helps to provide relevant information to evaluate the benefits through a variety of criteria, including both voting and the Potential Pareto Improvement Criterion. In order to implement the Potential Pareto Improvement Criterion, the Hicksian compensation version of consumer surplus becomes a useful tool. The CVM provides the direct measure of WTP or WTA. The Hicksian Consumer Surplus (HCS) measure can be obtained through a CVM survey which uses the elicitation

questions of WTP or WTA. For example, assuming that an individual who is currently enjoying a specific level of environmental good q, and the given Hicksian quantity of all other goods, collectively known as the numeraire good X, the consumer's level of utility U is dependent on X and the quantity of that particular environmental good, hence the consumer income is affected.

In a CVM survey, the respondents are asked to report the amount of income they would give up to obtain an increase in an environmental good, which is wetland's conservation for continued water provisioning ecosystem service in this case, or forego a decrease in consumption of that good. The rationale behind this method is that individuals can construct unique economic values for these goods by referring to their own-constructed and well-known internal preferences orderings. Moreover, the respondents are assumed to be able to distinguish between different quantities or qualities of the good and to reflect this in their individual valuation functions. Economic theory also sheds light on the point that these WTP functions, which give the total value curve, would be expected to take the theoretical consistent form outlined by the Bradford bid curve (Bradford, 1970) and this is geometrically shown in Fig 2.1 below. The graph explores the individual total value for the increments and decrements in the level of provision of an environmental good.

The total value curve (TVC) reflects an indifference curve, passing through the individual initial state of water shortage in this study, which is shown by the following equation. The individual WTP is the total value of an increment of environmental good q0 to q+ while the WTA is the total value of the individual of a decrement from q0 to q- which modifies the above equation as follows:

U (q^0, X^0) = U $(q^-, X^0$ + WTA) = U $(q^+, X^0$ - WTP)

From the above equation, if the wetland improvement from q^0 to q^+ is a one unit increment in q, WTP is equal to the buyer's best offer for that increment and with a unit of wetland conservation decrement from q^0 to q^-, WTA is equal to the seller's reservation price for that decrement. Then, if the increment would cost more than an individual's WTP and a decrement would net the individual less than his or her WTA, he or she would refrain from any kind of trade in q and remain at initial situation.

In this context, assuming that the wetland conservation improvement for sustainable water supply from q^0 to q^+ reflects one unit increment in environmental good q, WTP is equal to the respondent's better offer for that increment. If it turns out that the increment would cost more

than an individual's WTP and the decrement would net the individual less than less than their WTP, the two parties would refrain from this kind of trade and remain at initial situation of water shortage. Therefore, the appropriate measure of welfare change to assess the conservation effectiveness of the KWA is the consumer surplus by the Hicksian measures.

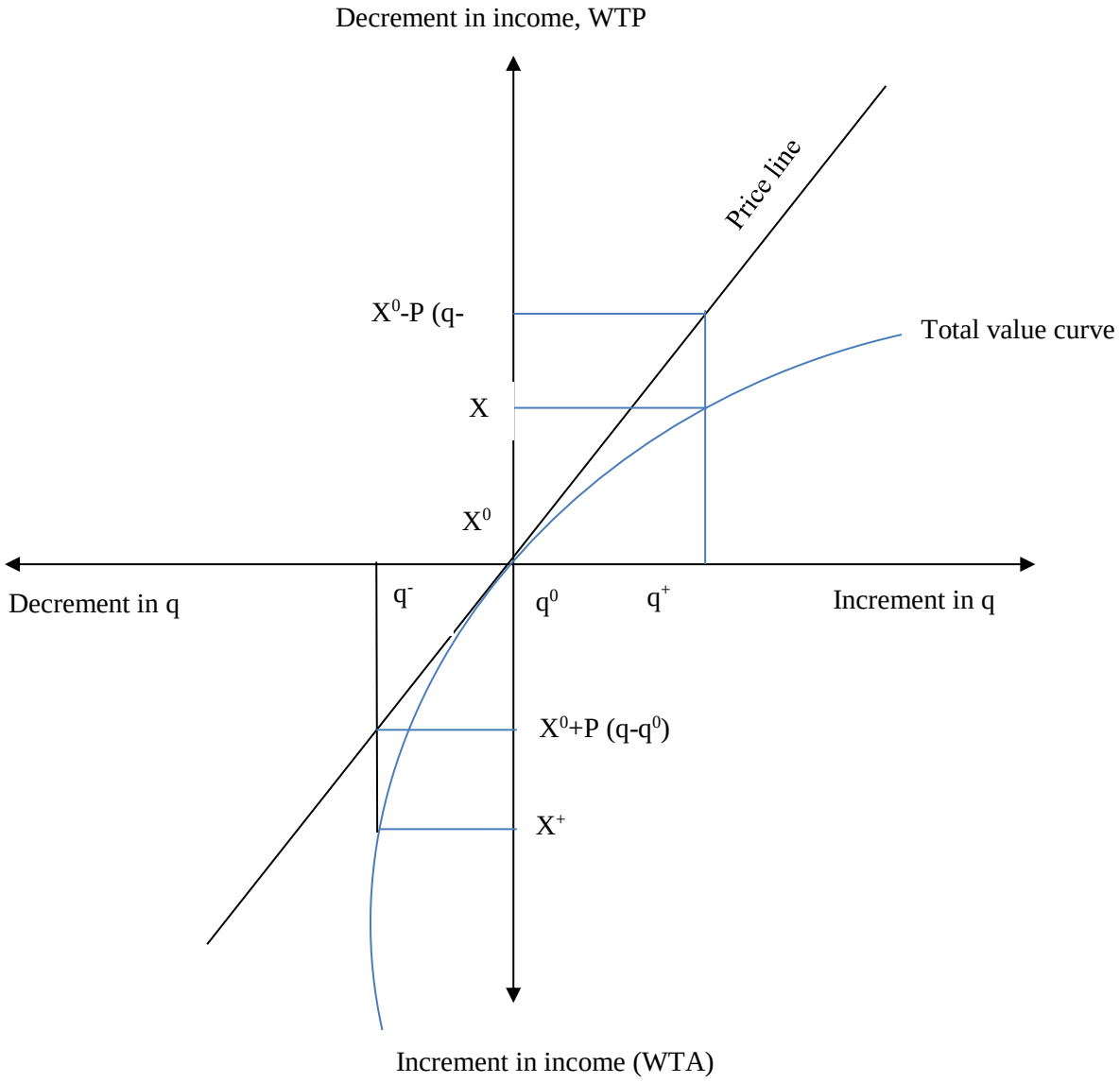

Figure 2.1: Total Value Curve

Source: Bradford (1970)

The consumer surplus is brought about by the changes in utility levels of the respondent that lead to changes in welfare of an individual due to improvement or deterioration in the supply of the non-market good. Theoretically, the measure of welfare change can be determined by either equivalent surplus (ES) or compensating surplus (CS) depending on the implicit

assignment of property rights. For instance, if the environmental quality represented by the vector q, it is assumed that the respondents maximise utility given the q and price of market goods. If u^0 denotes the maximum utility corresponding to a given q^0. The expenditure function is expressed as $e\ (q^0, u^0)$ which indicate the minimum level of expenditure needed to achieve maximum utility given q^0. It is therefore possible to measure value of change in environment quality from q^0 to q^1 using ES and CS. CS measure the amount of compensation to be given or the amount of income to be taken away from the respondent after the change in environmental quality to leave the respondent at the same level of utility as in q^0. Additionally, ES measures the respondent's minimum WTA compensation or the maximum amount the respondent is WTP to forgo a move from status quo to the improved situation of the environmental good (Hicks, 1943).

Algebraically the CS can be shown as follows:

$$CS = e\ (q^1, u^0) - e\ (q^0, u^0)$$

While ES is shown as follows:

$$ES = e\ (q^1, u^1) - e\ (q^0, u^1)$$

The difference in utilities can be captured using the Random Utility Maximisation technique which will lead to discrete model estimation. Since the discrete utility maximization presumes that the choices are random from the perspective of the researcher, the models are often referred to as random utility models (RUM). It is the RUM concept which provides the link between a statistical model of observed data and the economic model of utility maximization. In the RUM model, it is assumed that while the respondents know their preference with certainty and does not consider them stochastic, they contain some components which are unobservable to the researcher and they are treated by researcher as random (Hanemann, 1984). These unobservables could be the characteristics of the respondent or the attributes of the item and they can stand for both variation in preferences among members of the population and the measurement error.

If it is possible to observe all the elements that determine the respondent's utility and the structure of the utility function is known, then the respondent's utility would be perfectly predicable. The respondent WTP could also be econometrically estimated. However, in reality, this is impossible because it is not easy to know all the determinants of respondent's utility, therefore respondent behaviour will still remain unpredictable to some extent. Since the respondent's WTP for the change in environmental quality is not known to the researcher, it is

treated as random variable. Using the RUM model from the compensating variation function, the researcher can assume the cumulative distribution function (cdf) and the corresponding density function hence the researcher can estimate the parameter from the CV data. For the purpose of this study, compensating surplus will be used, as they treat individuals as if they have rights to their initial welfare level, hence it is consistent with the Potential Pareto Improvement Criterion, whereas equivalent measures seem less useful in this study. The central part of this research is to estimate mean WTP for the urban residents of Botha-Bothe district in sustaining water supply from KWA. Because the utility is not observable in the market, it is possible to move from utility to the money metrics measure of welfare, which is more observable.

2.2.4 Estimation of average WTP

As the environmental good to be valued is purely hypothetical, the estimation of average WTP starts from assuming TVC from figure 2.1 depicting Hicksian compensating surplus as a measure of welfare change. The responses to the dichotomous questions are used to estimate the bid curve or the TVC. In the light of respondent's preference and household disposable income, the yes response to the initial bid implies that the compensation range is either above or below the TVC of the respondent household. The no response is also expected to fall in the area above the TVC. The follow up bids further add to this iteration process and the responses to the second sets of bids narrows down the range even closer to the to the actual TVC. Assuming that there is no anchoring effect emanating from the public good nature of the benefits biases in responses format, the correct guessing of the TVC from the final set of responses can be obtained.

The WTP from the second bid is the weighted average of the actual WTP in the first instance and the first asked bid hence the values of the final WTP is lower and smaller is the original WTP and the first bid. For more emphasis, the general formulation of the WTP for the double bounded model is assumed as follows:

$$WTP_{ij} = \mu_i + \varepsilon_{ij}$$

Where WTP_{ij} is the j^{th} respondent's WTP that is unobservable, and i=1, 2 represents the response to the initial bid and the follow up bids respectively. Denoting the initial bid by B_1 and the follow up bid by B_2, the follow up bid is contingent upon the response to the initial bid and the lower bid is asked if the response to the initial bid is no ($B_2 < B_1$). Similarly, the higher

bid is asked if there is yes response to the initial bid ($B_2 > B_1$). Then the double bounded dichotomous choice survey generates four sets of responses yielding both upper and lower bounds on the respondent's WTP.

2.2.5 CVM elicitation methods

A contingent valuation survey utilises a diverse range of methodologies that help to simulate a market for a non-market good or environmental good that is not currently available in a market place. The ultimate goal of the methodologies is to estimate a respondent's consumer surplus for the good and the maximum amount of income the respondent attaches to environmental good. The procedure of doing this is through a personal interview, administering bidding questions, which seems to be more recognised in the applied economics of environmental economics. The bidding approaches are by far the most highly recognised form of contingent valuation and they yield willingness to pay answers for the environmental good under consideration.

The WTP is elicited using bidding questions which are open-ended and close-ended. For example, the maximum WTP questions are open-ended, as the respondent is not presented with the amount to accept or reject, but rather the value is internal to the respondent. However, the results these kinds of questions are known to produce unacceptably large number of non-responses or protest zeros (Desvousges et al., 1983). The downsides associated with open-ended questions are further reinforced by the study of Arrow et al. (1993) which indicated that the nature of these questions present respondents with a difficult task.

The close-ended CV surveys, otherwise known as referendum surveys, have recently gained momentum in yielding WTP answers. The close-ended questions use the dichotomous choice format question, where the respondent is presented with the value to reject or accept in the form of 'yes' or 'no' response as to whether they would pay it or not. According to Whittington (2002), high-quality CV surveys use referendum and split sample procedures. The purpose of this experimental design is to estimate respondent's WTP, and test for the reliability and consistency of the respondents' answers. There are also other commonly used elicitation methods, like bidding game, payment cards, and the discrete choice, which is also known as a 'take-it' or 'leave-it' offer. The discrete choice can be in the form of follow-up approaches and a modified dichotomous approach.

The most commonly used CV method was the bidding game. This method was pioneered by the Davis (1963) to estimate the value of game hunting in Maine, in the USA. The bidding game technique is normally modelled in a real-life situation, like in environmental goods, through in-person interviews, telephone surveys, and to a lesser extent, in mail surveys. The rule of the game is that the interviewer iteratively changes the bids to be paid or received until the respondent is willing to pay, or the lowest bid the respondent is willing to accept. That amount is the estimate of a point along the total curve, indicated in Figure 2.1 discussed earlier. According to Cummings et al. (1986), the bidding game commands the highest possible price that a respondent is willing to pay, hence it measures the full consumer surplus. Furthermore, Hoehn and Randall (1983) indicated that the iterative process used in a bidding game enables the respondent to recognise the full value of the environmental good. Some studies (Cummings et al., 1986; Boyle et al., 1985) have stated that the bidding game is inherently associated with the starting-bid bias; however, this is in contradiction with the findings of Whittington et al. (1990) in a study in South Haiti using the split sample technique, where the study found that there was no starting bid bias.

As an alternative approach to a bidding game, Mitchell and Carson (1984) developed a technique called the payment card method. This method is said to increase the response rate to WTP questions by providing respondents with a visual aid of a card with an array of dollar values from which to choose their maximum WTP value. The technique specifies the increment or decrement in value of the environmental good which is provided in quantitative terms and it is also coupled with substantial details about the institutional structure of the hypothetical market. The questions asked under the payment card technique can be in the format of either open-ended or close-ended questions. The open-ended questions provide an exact monetary value of WTP of the respondent which is a point on the total value curve indicated in Figure 2.1 above. The close-ended questions provide a precise amount of environmental good to be gained or lost through ‘yes’ or ‘no’ responses. This technique avoids providing a single starting point bid, hence it is believed that it eliminates starting point bias. Despite the importance of this method in minimising the anchoring problem more than a bidding game (direct questioning) does, the method is subject to bias associated with the ranges of values used on the cards and the location of the benchmark (Mitchell & Carson 1989).

The other elicitation method, the dichotomous choice (take-it-or-leave-it, and referendum), was developed by Bishop and Heberlein (1979) and is known as the discrete choice as the method uses only close-ended questions. According to Arrow et al (1993), the desirable form of dichotomous choice format is the one that has questions that ask the respondent to vote for or

against a particular level of taxation, as occurs with most real referenda. This technique is desirable, because with open-ended questions, respondents find it difficult to identify their true value of gaining access to an environmental good, and accordingly this technique helps to improve the response rate in the same fashion as a bidding game, but without iterative procedure. The disadvantage of this method is that it is a very large sample size procedure; therefore, a large number of observations is needed for statistical precision of estimates. This is because only a discrete indicator of maximum WTP is obtained, instead of a maximum WTP amount. Moreover, another inherent problem is that the analysis is dependent on the assumptions about how to parametrically specify the valuation function or the indirect utility function to obtain the mean WTP.

For the analysis, Bishop and Heberlein (1979) have stated that a logistic or probit regression curve could be fitted to the percentages of the randomly assigned prices of the respondents' WTP. The authors go on to say that integrating the area below the logistic curve would provide the equivalent measure to the mean WTP. It is also possible to estimate the mean WTP directly from the parameters of the probit equation. Another widely used method is the discrete choice with a follow-up approach, which uses a biding game technique to ask follow up questions with 'yes' or 'no' answers. The follow-up question is asked using a higher price, randomly chosen from the pre-specified list, and the method is said to offer the potential for considerable gains in efficiency. Nevertheless, this method is not applicable in email surveys, like the modified dichotomous choice method, because of the follow-up questions. The binary data collected using this method can be analysed successfully using the procedure of integration of the cumulative density function (Wattage et al., 2000).

Owing to the challenges and the weaknesses of other methods, a split-sample, the bidding game and the dichotomous choice method with follow-up questions were used in this study. This is drawn from the recommendations of Whittington (2004) and other literature that for a high-quality CV survey, a split-sample and referendum should be utilised. The author indicated that the split-sample technique helps to check for both reliability and consistency of respondents' answers. This also works in similar fashion with the dichotomous method with follow up questions. It is through the follow-up questions that respondents' answers can be justified beyond doubt as being correct. This study was also motivated to use the dichotomous method with follow up questions because of its relevance, as there is no involvement of a mail survey.

2.2.6 Advantage of the contingent valuation

CVM can be used to estimate the economic values of all kinds of ecosystem and environmental services (Akwetaireho, 2009). It is also shown by the literature that CMV studies are conducted to assess the monetary values of indirect, option, existence and bequest values. The use of the CVM to elicit WTP has been identified and proven (Frykblom, 1997) to be one economic tool that can be used for a direct estimate of the value that a person places on non-market goods and services; in this case, wetland conservation to secure water supply. This method can also be used to measure the values of non-use or passive use benefits, which are beyond the scope of travel cost and hedonic pricing studies (Hanemann, 1991, Bateman & Langford, 1997). This is further indicated by Bateman et al (2002) who stated that the preference technique is useful to elicit WTP estimates when non-use values are likely to be beneficial. CVM can be used to elicit the values of resources that people will never personally utilise or visit (Bolt et al. 2005), and lastly, CVM can be used to assist in proposed policy evaluation (Carson, 2000).

2.2.7 Weaknesses of Contingent Valuation: Biases

CV surveys are prone to different kinds of biases (Amarnath and Komagal, 2014; Hausman, 2012). Some biases are inherent in the design of the CV survey more precisely during market and bids design while some biases on the other hand, originate from individual opportunistic behaviour. These biases include anchoring bias, shifting bias, strategic bias, yea-saying effect, hypothetical bias and interview bias. Since the credibility and plausibility of the results of CV survey is contingent on the efficient design, therefore if the design is wrong, then the survey will yield inaccurate results, leading to wrong policy formulation.

2.2.7.1 Anchoring bias

Anchoring bias is the tendency of the respondent to associate the second bid to the first bid (DeShazo, 2002). The idea is that, when the respondent is presented with the first bid, that may indicate a normal level of value or payment, and the second bid may be drawn in the direction of this initial amount. This problem is amplified by lack of proper knowledge on the goods or services to be valued, and the valuation procedure. In a more specific context, the initial bid may serve as an anchor, if the respondent assumes that the initial bid conveys information on the true value of the good. As a result, this causes differences in utilities whereby utility equated to the first bid is normally higher than that of the second bids. The literature (Watson and Ryan, 2007, DeShazo, 2002) shows that respondents who are presented with ascending sequences interpret the follow-up bid as a lower weighted average bid, which increases the probability of

accepting the follow-up bid. Likewise, respondents who are assigned a descending sequence as they construe the follow-up bid as a higher weighted average bid, which decreases the probability of acceptance. Herriges and Shogren (1996) approached anchoring by postulating that the respondents change their valuation of the item after the first bid forming their original WTP. In the view of this study, anchoring effect was less likely to occur because different starting bids were assigned to respondents and the distribution of the bids were analysed to see if they comply with the expectation. Normally, higher bids are expected to have lower response rate than higher bids which was the case in this study.

2.2.7.2 Shifting Effect

Shifting effect means that the respondents perceived the second bid as an additional amount to the first bid. Flachair and Hollard (2006) observed that first bid may be interpreted as providing information about the real cost of the goods and services being offered. Thus, the respondent who accepted first bid perceives the second bid as unfair request to pay additional costs of the goods and services offered hence the respondent undercut their true WTP. The shift effect is observed as a shift in total value curve (TVC). In the same vein, Aaadland and Caplan (2004) proved that, an individual who rejected the first bid, the follow-up bid could be interpreted as a lower quality good, leading to reduction in WTP. As a result, the "no" responses tend to increase and this shift TVC down and shifting parameter is expected to be negative (Whitehead, 2002). Along these lines, shifting effect is modelled as a change in the WTP that is independent of the initial bid. However, the empirical evidence in the existing literature is not clear about controlling for shifting bias except providing more information about the goods and services offered. In this study, this problem was not common as the different starting bids were developed to test for such bias. The increase in the "no" responses was consistent with prior expectation, that is, higher bids are subject to more rejection than lower bids.

2.2.7.3 Strategic bias

Strategic bias is analogous to framing effects in the sense that they are both related to anchoring. The idea is that, with strategic behaviour, respondents may understate their WTP, in an effort to maximize their gain. Strategic behaviour arises, because the presence of a follow-up question gives second chance of choosing between the two bids which signals price flexibility. Due to opportunistic behaviour inherent in individuals, respondent tend to choose lower bid. If respondents understand the double-bounded CVM questionnaire, they may attempt to understate their true WTP, in an effort to game the results (Carson et al., 1999, DeShazo, 2002). Similarly, the existence of a higher follow-up bid is likely to increase the

probability of rejection, thus resulting in downward bias of reported WTP values (Watson and Ryan, 2007). The occurrence of strategic behavioural bias is perpetuated by the use of open ended elicitation format (DeShazo, 2002). Since strategic bias is said to be associated with the open ended questions, this study used the double bounded elicitation format with closed ended questions to attenuate the occurance of this bias.

2.2.7.4 Yea-saying effect

Yea-saying bias describes the tendency for respondents to accept any proposed bid. Rather than perceiving the bids as information related to the good in question, respondents may, instead, feel that they should attempt to garner approval from the survey enumerator by agreeing. The idea is to impress the enumerator than attaching the cost to the goods under consideration. Alternatively, this bias can be amplified by failure of respondent to understand the CV scenario. Under these circumstances, respondents overstate their true WTP in order to acknowledge the interviewer's proposition (Flachair and Hollard, 2006) and it is often associated with ascending bid sequences rather than with descending bid sequences (Watson and Ryan, 2007). This impose upward bias in the shifting of TVC which results into positive shifting parameter (DeShazo, 2002, Chein et al., 2005 and Watson and Ryan, 2007). In order to avoid yea-saying bias in this study, more premium was placed on hypothetical market description with demonstrations of colourful pictures as a back-up for understanding the scenario. Yea-saying bias was also tested in this study through analysing the distribution of bids which was found to be in line with prior expectation.

2.2.7.5 Hypothetical bias

Hypothetical bias is defined as the difference between what a person indicates they would pay during interview and what a person would actually pay (Champ et al, 2009). That is, the hypothetical bias reflects the old saying that there is a difference between saying and doing. Hausman (2012) showed that hypothetical bias often manifests itself as overstatement of WTP which is different from what the respondent is actually willing to pay. This is because some if the respondents find the hypothetical scenario unrealistic hence take it for granted and give wrong answers. Whittington et al (1998) state that a good CV scenario should be well designed and administered in order for the respondents to take the hypothetical choice seriously. The author also indicated that the more the respondents understand the choice posed to them, the hypothetical scenario will then seem to be less hypothetical to them. However, the empirical literature proved that measuring hypothetical bias is difficult for non-marketed resources and public goods. In order to measure hypothetical bias, the analyst needs to know the true WTP

which is not easy as it is internal to the respondent and it is hard to force people to pay for a none-excludable public good (Carson and Groves, 2007). Nevertheless, the literature proved that there hypothetical bias is not common in many of the recent studies (Johnston, 2006; Vossler and Watson, 2013). Despite all of the empirical work on hypothetical bias, there is still no widely accepted theory of hypothetical bias in stated preference surveys and it is not yet sufficiently understood (Mitani and Flores, 2010; Murphy et al., 2005, p. 318). In the view of this study, hypothetical bias was overpowered by bidding game technique which helped to check the consistence of values in the light of respondent budget constraint.

2.2.7.6 Interview bias

According to Frykblom (1997), interview bias is defined as a problem in CVM that is caused by the impression of a respondent about the interviewer, which could ultimately affect the answers that the respondent gives. The idea is that, in the rural area when rich or educated people propose some changes, their decisions are highly respected and supported. The propensity to trust some people than others causes noise in analysing CVM responses. This might also be the case with this study, as educated people are highly regarded in the rural-based communities and are believed to bring changes; therefore, responses might be exaggerated. However, Evans (1992) has pointed out that using local interviewers can solve the problem of interview bias. In order to respond to this challenge in this study, local enumerators were used to administer the questionnaires in this study.

2.2.8 Improving the weaknesses of the CVM

There is exponential surge of studies designed to address the weakness of CV studies. These studies were arising from the fact that CV surveys were perceived to be poorly administered and executed. Consequently, the findings of many CV studies were inaccurate and unreliable for policy formulation and there has been a pressing need to improve the quality of CV studies so that they can inherently be capable of accurately measuring individual preferences. Therefore, the importance of minimising weaknesses of CVM gained momentum to ensure that the results obtained from this kind of surveys are reliable for policy recommendations. The following improvements were suggested:

2.2.8.1 Determining proper bids designs

Designing of bids in CV studies has been a long-standing issue that need considerable effort, as there are valuable evidence pertaining to poor bid design (Franchiare & Hollard, 2006). The

poor bid designs resembles a normal saying that say 'garbage in garbage out'. In a more specific terms, poor bid designs results into poor outcome of CV studies because different starting bids are capable of inducing different answers from respondents based on the magnitude of the bids. In order to check the validity of CVM responses generated by the different bids, Navrud (2000) suggested that the environmental goods under consideration should resemble the market goods by following the law of demand. Thus, higher randomly assigned bids set by the researcher should diminish the rate of responses. Alternatively, when the bid is lower, the response rate increases as the bids are the representation of the actual cost of environmental good in question. The analysis of distribution of initial bids in this study were, therefore, in line with economic theory and literature. The response rate was ascending with descending bids. The bid design of this study was evolving from the pilot study conducted before to set the limits of the bids. Pilot study is known to provide the researcher with an opportunity to learn more about what works and does not work. The bids design is normally identified in the pilot study which provide the framework for the real study implementation. The choice of the bids must be in line with the economic status of the households. Alternatively, the appropriate bid design can be extracted from the previous similar studies. The good choice of the bids is expected to result into less protest zeroes and genuine zeroes as they are highly based on the budget constraints of the respondents.

2.2.8. 2 Crafting CV scenario

One of the challenges of CV studies is misunderstanding of CV scenario, which emanates from the poorly crafted CV survey. In the CV studies, more premium is placed on the CV scenario which reflects the real problem and payment logistics for providing the good under consideration. The important step in introducing the CV survey to enumerators is to carefully explain the subject matter of the CV scenario. Normally, the respondents often ask questions or request clarifications of matters raised in the CV scenario, therefore the enumerators should be able to respond in a knowledgeable and informed manner to such questions. Failure to understand the basic scientific and technical aspects of the hypothetical good or service being offered to respondents may result into hypothetical bias (Amarnath and Komagal, 2014). In this study, a substantial effort was employed in designing CV scenario whereby many publication outlets and supervisors were consulted. During training the enumerators were given plenty of time to discuss and ask questions about the technical material in the CV scenario and answers were shared with the whole enumeration team. This was done to ensure that enumerators understand and closely followed the questionnaire when presenting the CV scenario to the respondent. Additionally, the other part of the questionnaire asked respondents

whether they have any questions about the materials presented. During interview, it is essential that all the enumerators on the team have a solid and common understanding of the subject matter of the survey so that they will answer all respondents' questions in a consistent way. As per advice of Whittington (2002), the CV scenario was designed with colourful graphics to stimulate understanding by the respondents. This design yielded plausible results in the analysis of CV scenario responses. The results of the study showed high level of understanding and reliability of responses from respondents.

2.2.8.3 Split-sample technique

Most high quality CV surveys use split-sample technique as part of the elicitation procedure or the CV scenario itself (Whittington (2002). The objectives of these experimental designs are to estimate respondents' willingness to pay and test the reliability and consistency of respondents' answers (Whittington 2002). The literature on the contingent valuation method (Carson et al. 1999; Whittington et al. 1993) stresses the importance of carrying out a variety of split-sample experiments in order to better understand how respondents may be reacting to the CV scenario and the elicitation procedure. There are two main reasons for conducting split-sample experiments in CV research designs. The first is that, as described above, the CV researcher almost always faces some difficult choices in the study design with respect to the crafting of the CV scenario and elicitation procedure. Secondly, the CV researcher can utilize split-sample experiments to gain insight into the question of whether the researcher made the right design choice with respect to a few critical issues. These are some of the reasons why this study used split-sample technique divided into private and government conservation regime of the wetlands. This decision was also informed by the CV study conducted by Whittington et al (1989) in Nigeria that indicated the importance of governance institutions in natural resource conservation.

2.2.8.4 Referendum method

One of the popular challenge in CV study is to ask the respondent their maximum WTP (Whittington et al (1998). This has been proven to cause confusion and misunderstanding to the respondent. In technical terms, the word maximum WTP is difficult to understand and this end up confusing the respondent to figure out what exact answer is needed. Consequently, this will results into less or higher amount reported by respondents due to opportunistic behaviour inherent in individuals. As a solution for this challenge, the referendum method was proposed as an alternative. Whittington et al (1992, 1998) indicated that when a referendum elicitation

procedure is used, there would be no need to ask the respondents their maximum WTP for a hypothetical good. When referendum technique is used, different predetermined prices or bids by researcher can be assigned to randomly selected respondents in the form of closed question. This means that the referendum technique can be used in conjunction with split-sample method however, the two are different. Failure to conduct split-sample experiments in referendum also represents a lost opportunity to learn more about how to improve CV studies in developing countries (Whittington et al., 1998). Given the inherent difficulties of understanding respondent behaviour in different cultures, referendum tecnique should be standard practice in this field to avoid open ended questions like asking respondents their maximum WTP that might results into misleading conclusions Whittington et al (1992). In the view of this study, referendum technique was found important to estimate the conservation charge or WTP for conservation of resources in KWA. All the WTP questions were in the form close-ended question format.

2.2.8.5 Good enumerator

Most inconsistent findings that are often found in CV surveys are attributed to poorly trained enumerators (Whittington et al., 1998). The enumerators are said to be the critical link in the implementation of a CV survey in terms of effectively communicating a well-crafted CV scenario to respondents. Moreover, enumerators are viewed as the listening instruments to the respondent during survey and more specifically, the message from the respondents to the researcher is filtered through enumerators (Whittington et al., 2004). Therefore, understanding of the CV survey and problem at hand by the enumerator is a critical issue in administering CV survey. This can be achieved through well-trained and committed enumerators. The work of the researcher after designing the questionnaire is to train and manage the team of enumerators. According to Whittington et al (2004), the researcher is lucky to find well-trained and experienced enumerators from the previous survey but that should not obviate the need for careful field training. The authors further indicated that the university students could also play a satisfactory job of enumeration. Additionally, the local enumerators that are familiar with the local language and understand the local problem better are recommended. In this study, local university students who had previous experience in conducting research surveys and reside in the study area were used thereby eliminating the language challenge. Despite being experienced, the enumerators were also effectively trained for the purpose of this study.

2.2.9 Why wetlands are undervalued?

There are numbers of factors which have led to undervaluation of the wetlands. The first series of factors are considered as constituting the signal of market failure. Market failure is triggered by the public good characteristics of the wetland and externalities. Many of the wetland ecological services, biological resources, and amenity values have attributes of public goods. These services are seen as free and they are not traded in the market, hence are not accounted for in the market (Vorhies, 1999). It is difficult to derive the economic value of wetlands because they have a public good nature which makes it complicated to measure them in financial terms (Millennium Ecosystem Assessment, 2005; Wood et al., 2013; McCartney et al., 2010). Externalities also cause the full social cost and benefits in the economic activities to be not reflected, hence wetlands are likely to be undervalued.

Another factor which has led to wetlands' undervaluation comprises perverse incentives, such as taxes and subsidies. Many government policies and decisions stimulate the very economic activities that are unintentionally counteracting with the conservation of the wetlands, which threatens their sustainability (Vorhies, 1999). Other factors include unequal distribution of costs and benefits, no clear ownership, and devolution of decision-making. The costs and the benefits associated with wetlands use are not the same, across the different categories of stakeholders. The people who benefit from a wetland ecosystem or its overuse, in most cases are not the those bearing the costs of the wetlands' conservation. For example, people in the downstream of wetlands might suffer more from the upstream pollution of rivers, without receiving any compensation (Stuip et al., 2002).

Another problem is the assignment of property rights to the wetland users. This is attributed to the unclear natural boundaries of the wetlands, which are not in line with the administrative boundaries of the government. Therefore, it is difficult for the government to assign the bounds of responsibility, and user values are not clear to decision makers. That is, the failure of decision makers and planners to recognise the importance of wetlands can lead to wetland degradation (Vorhies, 1999; Stuip et al., 2002). Moreover, there has been few empirical studies which reflect the extent and the magnitude of the threat caused by the loss of wetlands and degradation to the poor community who depend entirely on wetlands for their livelihood (Ramsar Convention Secretariat, 2007; Mukaro, 2012). Furthermore, literature reveals that most researchers do not aim to assess the relative dependency of poor, local communities on wetland provisioning services, hence the under-estimation of wetland services (Lannas & Turpie, 2009).

2.2.10 Institutions and local participation in wetland conservation

The conservation and management of the wetlands can be dissected and understood well through the use of an institutional lens. The sustainability of wetlands depends entirely on the policies and, to a larger extent, on the formulation of property rights. According to Kirsten et al (2009:47), property rights are defined as the fundamental institutions which govern who can do what with the resource. The authors go on to say that property rights define the actions that individuals can take in relation to others and that all property rights are associated with corresponding duties of others to observe them. There are different kinds of rights, which include extraction rights, transfer rights, user rights, exclusion rights, and encumbrance rights. According to Ramsar Conversion Secretariat (2007), the management of wetlands is closely linked to property rights and their regimes. The literature further shows that the sustainable management of wetlands requires the regulation of property rights, and the manner of that regulation is determined by the legal rules in place.

Institutions in the form of property rights help in the efficient functioning of a market for natural goods, like wetlands, which can harmonise the enforcement of rights. The absence of property rights implicitly translates that there is a free riding situation, which implies there is no incentive for anyone to conserve, as people will think their rivals will in any event behave opportunistically. From the historical legacy viewpoint, there is no case where a well-developed market system was not also embedded in a well-developed political system (Haber et al., 2003). The problem of degradation of wetlands in most developing countries requires political institutions that limit the discretion and the authority of the government, or individual actors within the government. This is because the necessary connection between government and the market seems to create a thorny problem in the context of natural resource management.

The establishment and enforcement of private property rights provide an alternate framework for the solving of externalities, such as pollution in wetlands and ‘free riding’. A private property right is a legally established title to the sole ownership of a scarce resource that is enforceable in the courts. Private property rights offer a number of solutions to the problems indicated above. This includes extraction and use rights over the wetlands. Firstly, the establishment and enforcement of greater private property rights by the legal system would allow victims of negative externalities and free riding to sue the offending party for compensation for the damage caused. For example, if property rights are assigned to a private association or a range committee, it would be easy for them to sue those who degrade the wetlands through illegal harvesting, hunting and trespass.

There are many ways in which property rights can be allocated to different people, in the interests of the conservation of wetlands. These rights can be held by individuals or by a group of people. These rights can be allocated through a devolution mechanism, which could be in the form of collective action or private property rights. Devolution is defined as a part of a number of related policy reforms in which central government agencies transfer rights and responsibilities to more localised institutions. This plan is said to be a good strategy if it is done through a decentralisation strategy where the natural resource authority is vested in private organisations or an institutional arrangement of collective action. The strategy has some down sides, if the power is in the local government body as the strategy is diverted to be a political issue. Justice is only dispensed to people who do not support political party in power (Kirsten et al., 2009).

Collective action is represented by a situation where the government transfer rights from the local community to independent private organisations and local government bodies. It is also considered as a very desirable strategy, which works best when there are weak states and missing markets (Kirsten et al., 2009). Collective action can be set in the form formal organisations, or to a lesser extent, it can be informal, although this is rare nowadays. In this regard, collective action seems to be a good strategy for the conservation of most natural resources, including wetlands, as they are communal areas, and so there is no market where their products can be traded, such as the reeds, raw fish and others. According to Mansuri and Rao (2004), collective action in water supply and sanitation, health care and education is essential for community-driven development projects. However, many formal organisations are ineffective and moribund (Kirsten et al., 2009).

Moreover, the local participation of the people of the community is also proven to be an important initiative which should be taken by the government to conserve and manage wetlands. According to Williams (2002), the need for local community participation is well understood by authorities worldwide and has been adopted in many countries. The study further indicates that the traditional approaches have to be discontinued in the conservation and management of wetlands, as they are no longer active in wetland management. Atreya et al (2015) show that many studies have been conducted on wetlands, but only few studies have concentrated on wetland conservation and the contribution of wetlands to human livelihoods.

The reasonable restriction of the local community from the free use of natural resources that are essential for their livelihood is important for conservation of wetlands (Andrade & Rhodes, 2012). Their study further indicates that a higher level of community participation ensures

long-term conservation. Furthermore, participatory approaches, such as policies, legislation and programmes that include people in decision making, enhance cost effective and sustainable resource use (Andrade & Rhodes, 2012).

In developing countries, the conservation of natural resources is a critical issue when greater priority is given to poverty reduction than it is to the conservation of the wetland, especially if the local community does not understand the economic value of the wetland (Wood et al., 2002). This was further emphasised by the Williams (2002) who notes that a participating local community should be aware of the value of their wetlands and the importance of the wetlands as a water cycling mechanism, as well as its nature and effects for human impact. Therefore, local community traditional knowledge, skills and practices can help in the resource conservation of exploited wetlands.

Additionally, the study in the Temiang watershed in Malaysia by Chun et al. (2012) indicates that voluntary involvement in wetland conservation is important, in addition to knowledge. The study further reflects that factors, such as age, education, gender, income level, marital status, and residential location, affect the participation of communities. Another community-centred approach study was conducted by Islam (2011) to identify local vulnerability and implement relevant solutions for what was a proved to be a successful initiative. Interestingly, a study by Thompson and Choudhury (2007) in Bangladesh shows that a community participatory approach had been a success in Bangladesh, and it was highly adopted for wetland conservation. The study by Trisurat (2006) holds the same idea, that community involvement in the conservation of a wetland is a prosperous approach, as this was proved statistically. Senaratna et al. (2011) underscored the point that when people are involved throughout a conservation project, they will be more vocal on how the wetland should be managed, in a locally and politically acceptable manner.

However, research by Terer et al. (2004) showed that, despite legislation designed to protect wetlands in Kenya, they continue to be degraded and lost at an alarming rate. This is attributable to a lack of understanding of their ecological and socio-economic importance, which leads to distorted policy and decision making regarding their use and management. Collins (2005) also emphasised that although most South African wetlands are threatened by human activities, the Lesotho wetlands are particularly threatened by livestock overgrazing, especially in the upper catchments of the of the Senqu River in the Maluti Mountains in Lesotho as that the high altitude places are reserved for livestock cattle posts.

All the above-mentioned destructions of the wetlands does not take place in a vacuum of institutions. This transmits a clear signal that the current wetland policies lack effective institutional capacity to manage the wetland sustainably. The main problem is that property rights are not well defined, and wetland conservation and management institutions are not clearly articulated as a standalone policy. The policies regarding wetland use are reflected in the overall policy on natural resources, like water management policy, environmental policy, biodiversity policy, and natural resource management policy. Some of the policies concerning the wetlands are stated in implicit form, and create a platform for lax enforcement, hence perpetuating the degradation of wetlands.

The public-good nature of wetlands, and the numerous benefits they provide, often results in the wetlands being undervalued in decisions relating to their use and conservation. This has resulted in an increase in the diverse range of studies relating to the valuation of wetlands. Economic theory states that goods and factors of production have values attributable to the satisfaction which people derive from their consumption, their scarcity and the possibility of exchange in relation to uses to which individuals and groups of people put them. This is not an exception with the wood, fibre, water, and recreation uses, comprising most of products obtained from the wetlands, as their value does not reflect a true market value, hence they are undervalued most of the time, which results in their overexploitation, despite their enormous benefits. These natural resources are consumed collectively, owing to the lack of private property rights assigned to them, and therefore, no true value is attached to them (Deininger and All., 2007).

2.3 EMPIRICAL LITERATURE ON CV STUDIES

2.3.1 Introduction

There has been a wide range of empirical studies which have been conducted concerning the trade-off between the conservation and the use of wetlands. Wetlands have been an important and productive gift of nature for centuries, but the problem of degradation has been devastating for wetland integrity in the past years, owing to overuse and undervaluation of the wetland ecosystem. Therefore, this section explores the empirical studies which have emerged significantly as a response to valuing wetlands in the interests of better management and conservation. The reviewed empirical studies are partitioned into different sub-sections, which are as follows:

2.3.2 Overview of empirical literature on wetland valuation

Different studies have dissected the contingent valuation of wetlands using different methods. The WTP value is reported in several forms, which include the average and marginal values, and lastly in discrete form. According to Bergstrom and Taylor (2006), a small change in the value of the good should be valued using marginal values, while the aggregate values should be determined using the average value

Byström (2000) conducted a study to underscore the importance of water from the wetlands using the replacement cost method to place value on water quality from wetlands in Sweden. This non-contingent valuation study was carried out to measure the value of water quality improvement and ancillary support for Swedish wetlands draining into the Baltic Sea. The study assessed the value of abating nitrogen load from agricultural sources and upgrading secondary effluent for water cycling, and the placement cost method was used that yielded a value of 4080 USD/ha/annum.

Yang et al. (2008) compared the placement cost method to CVM to assess the value of upgrading and reusing the eutrophic effluent of an ornamental fishpond in Hangzhou in China. The placement cost method yielded the value of 13754 USD/ha/annum while the CVM yielded the value of 294729 USD/ha/annum. The value for CVM was higher and this can be attributed to the fact that CVM is far-reaching in its effect, as it values a wider range of benefits of an ecosystem. Furthermore, the CVM study assessed the welfare impact of other wastewater treatment services for the wetland, such as wildlife enhancement.

Yang et al (2008) compared the placement method and CVM to estimate value wetland use in Hangzhou in China. The CVM gave a welfare value of 151830 USD/ha/annum, which was greater than the placement cost method which was not specified in the report. The margin of differences in estimates was found to be considerably wide. Whittington (2004) indicated that the differences in the estimates could be attributed to the dilemma of cross-cultural and environmental differences.

Verma (2001) conducted a CVM study on the value of wetlands providing the artificial impoundment for waste storage in Asia, and the value was 4 031USD/ha/annum in Bhoj wetlands in India. A CVM study by Vidanage et al. (2004) gave a passive value of 13269 USD/ha/annum for an irrigation water supply in Sri Lanka.

The study conducted in Ga-Mampa South Africa by Adekola et al (2012) used the price method to value the grazing provisioning ecosystem in the wetland. The study showed that 38% of the

livestock depend on wetland for their forage. The net financial value for the wetland grazing was found to be $192 on average per household. Another study on grazing valuation was conducted by Atreya et al (2015) which shows that the value of fodder valuation from wetland was estimated to $ 1404 on average.

Lannas et al (2009) conducted a study in Mfuleni community in South Africa and in one of the wetlands in Lesotho. This study was also valuing grazing provisioning ecosystem services in wetlands using market price method which revealed that the value of animal grazing was US$ 257343/ha in Mfuleni South Africa. Alternatively, this study valued livestock grazing services using grazing model in Kwazulu Natal in South Africa. The study found that the value of impact of grazing was very high according to the livestock grazing modelling.

Birol et al. (2007) conducted a study on the sustainable management of wetland in Akrotiri in Cyprus. The study used the two-split sample method based on the non-users and users of the wetland, and the scenario difference approach was used whereby three scenarios were developed to value improvement of wetland relative to a status quo. The Ordinary Least Squares method (OLS) and stacked regressions were utilised, where the logarithm form of WTP was specified as the dependent of WTP for wetland management. The variables, which were found statistically and positively significant included education, number of children and employment. Distance from the wetland was found to be negative. The mean WTP for the three unspecified scenarios were $12.6, $14 and $17.7. The WTP for the sample of the users of the wetland was also found to be higher than that of non-users of the wetland.

Jeff et al. (2010) carried out another CVM study in Southern Ontario Credit River Watershed. This study valued the wetland benefits whereby two versions of questionnaires were developed for two split samples. The two probit regressions were estimated to yield the WTP results. The chi-square were also used to test whether different characteristics of individuals differed from that of the population. The results showed that the age, household size, education and income seemed to resemble that of the population. The estimated household annual WTP was $228.28 and $258.78 for the two split samples. The age was found to be positive and statistically significant in this study.

Furthermore, another CVM study was conducted by Grossman (2010) on the valuation of River Elbe for benefit transfer in Berlin and used the observations of 215 respondents to justify the importance of the split-sample. The study utilised both in-person and mail sampling, and ultimately the mean WTP for the mail survey was found to be higher than that of the in-person interviews. The Ordinary Least Square (OLS) regression was used to analyse results and the t

test was used to compare the mean size of wetland sites and the sample of the population. Additionally, the mean WTP for CVM was found to be greater than that of other methods, however, the magnitudes were not specified.

Generally, the above-discussed studies did not specifically address the issue of water conservation from the wetlands but rather the general benefits of the wetlands using different methods. Since water is a crucial resource worldwide and also owing to the draught induced water deficiency, there is a pressing need for new knowledge in conservation of wetland to secure water provisioning ecosystem service which seemed to be lacking in the studies discussed earlier. In summary, the literature reviewed showed that when compared to other methods, CVM produce better results than travel costs method and placement costs method (Yang et al. 2008).

2.3.3 CVM on water provisioning services

Over the past years, there have been surge of practice in the use of CVM in valuing water provisioning ecosystem services with the intention of eliciting values of water for consumption in households and for commercial purposes. The following studies contributed significantly in adding value to the CV studies pertaining to improved water provisioning ecosystem services. The studies below are divided into the main theme under consideration.

2.3.3.1 Influence of type of institution hypothesised to make improvements on WTP

Whittington et al (1989) conducted a study in three villages of Nsukka district in Nigeria to determine the WTP value for an improved public tap water and private connection water supply. The study used in-person interviews and open-ended questions, with one follow-up question for dichotomous analysis. Random interviews were used to draw information from people in the community because there was no adequate list of households from which to choose the sample. The results showed that despite the fact that people would take a long time to reach the water source, and larger amounts of money spent on water during dry seasons, the WTP by people was very low. These results were attributed to the type of institutions that were hypothesised to be responsible for improving water services. The main reason given for low WTP was that people did not trust government to materialise the plan for improving water service and some respondents believed that it was mandatory for the government to provide a free service of water supply. Again, people found it unnecessary to pay monthly taxes for the seasonal and sporadic problems with water supply.

2.3.3.2 Influence of time-to-think on reporting WTP

Another prevailing argument among CV proponents is giving respondents time to think before they report their WTP. The CV study conducted by Whittington et al (1991) on water vending and the WTP for improved water quality in Onitsha, Nigeria provided an evidence of no disparities in reported WTP. The study used a sample size of 235 and the bidding game method of elicitation via face to face interviews. The sample size was divided into two groups to design the experiment whereby the first group was asked to report their WTP immediately and repeated after some time. The other group was asked to report their WTP on another day different from the other group. The purpose of giving respondents time to report their WTP was to allow them to think in order to minimise the missing responses or strategic bias on the part of the respondent. The outcome of the survey revealed that people who were given time to think reported lower WTP than those who were asked immediately for their WTP. The difference was much larger for public taps than for private water connections, and the same trend was noticed when the interval-data estimator for double-bounded data was utilised, as compared to OLS and probit.

Paradoxically, there is justification that giving respondents' time to think does not have influence on reporting WTP. The CV study conducted by Whittington et al. (1993) discovered that giving respondents time to think did not influence WTP. This study was done in Kumasi in Ghana with the aim of estimating the demand for improved sanitation services. The study used the same methods as the preceding study, as it utilised in-person interviews and dichotomous choice with follow-up questions, and a last open-ended question of maximum WTP. The two-stage stratified procedure was used whereby 1524 households out of 1633 households were interviewed. The model used to estimate the WTP was the interval-data maximum likelihood estimation. The study also found that the presence of people at the time of interview did not affect WTP, although the authors pointed out that the reported WTP bids reflected the respondents' private valuation.

Whittington et al. (1997) repeated the same study in Calamba in the Philippines to test for the effect of giving respondent time to think before reporting their WTP. The non-market good which was valued involved three choices: a connection to sewer system only, a sewer system plus waste water treatment plant; and a regional plan to preserve surface water quality. Stratified sampling was done whereby 1500 households were interviewed. Five different starting bids and a dichotomous choice with follow up question were used. The models used to estimate WTP included ordinary least square (OLS), Tobit and probit models. The study tested

the hypothesis that giving respondents time to think lowers their WTP, as based on the earlier study of Whittington et al. (1993). The respondents seemed to appreciate the difference in the size between the three plans, regardless of whether they were given time or not. Therefore, in the view of this study, giving respondents time to think is not a main concern as the study used immediate reporting of WTP. Again, Whittington (2004) indicated that in some of his studies people tend to discuss their WTP values when given time to think hence this increase the possibility of strategic bias where respondents report less value.

2.3.3.3 Influence of socio-economic characteristics on WTP

There is a stronger evidence that socio-economic characteristics play an important role in determining respondent WTP. In several occasion, the WTP is found to have correlation with socio-economic characteristics such as household level of income, age, education, household size and gender. This is in line with one of the hypothesis in this study, which tests the influence of socio-economic characteristics of the respondent on WTP. The CVM study by Khan et al. (2010) in Pakistan, which elicited the WTP value of people for an improved drinking water service, shed light on how socio-economic characteristics play a role in determining WTP. The study used a sample size of 150 which was randomly selected and it employed a multinomial logit model and the Ordinary Least Squares method (OLS) to analyse the responses of the people. The variables, such as income, education and household awareness to mass media, were positive and statistically significant in influencing WTP.

Another evidence was provided by the CVM study conducted in Nigeria in Kwara by Ogunniyi et al (undated) which elicited WTP values of the rural households for safe water. A Tobit model was employed to analyse the responses. A sample size of 120 households was used and the Tobit model was utilised to analyse the WTP responses. The results showed that about 54 % of the respondents were willing to pay for improved water quality. The variables, such as household income, waiting time for water and education, were found to be positive and statistically significant in determining WTP for the people, which implies that the households with more income, a longer distance to a water source, and higher education, were more willing to pay.

Another CVM study conducted by Kolstad (2002) on coastal water quality estimated the non-market benefit of two environmental goods, water salubrity and preservation of the ecosystem against eutrophication. The findings of the study showed that WTP for salubrity was affected by the environmental sensibility and awareness. In that case, the WTP depended much on the information about the negative effects and the current level of pollution, implying that if the

respondents are not aware of being currently affected by pollution, they will report lower WTP, hence undervaluing the benefits of environmental improvement. The other variables showed that the results of WTP were closely related to the level of education of the respondents. The higher the education of the respondents, the higher the WTP value they place on the preservation of the ecosystem.

The CVM study conducted by Kaliba et al. (n.d.) reported on improved community-based rural water in 30 villages in two regions of Tanzania, namely Dodoma and Singida indicated the importance of socio-economic factors in eliciting households' WTP. For the former region, the results showed that 14 % of the respondents were satisfied with the status quo, while 22 % suggested other improvements relating to water quality. In the latter region, 31 % of the respondents were satisfied with the status quo, 59 % wanted deeper boreholes and watering points, while only 10 % indicated other types of improvement relating to water quality. The study used both a multinomial logit model to estimate determinants for improved water related services and a Tobit function to estimate the choice of improvement of water services. For the probit model, the family size and the satisfaction in the performance of the project activities were statistically significant in Dodoma region. The age, income and cash contributions were negative and statistically significant, implying that older and richer respondents were more likely to remain in the status quo situation. For the other region, Singida, females were more willing to pay for water improvement than males were. This was not surprising, as females are the ones responsible for collecting water. The multinomial model showed that the mean WTP for identified and desired improvements in Dodoma region was higher than the existing tariff for increasing water supply.

Moffat et al. (2007) conducted another study in Botswana. The study focused on the WTP for improved water quality and reliability. The results of the study indicated that income of household was statistically significant in influencing WTP. The results obtained by other researchers have indicated that income is the main determinant of WTP of a household (Hoehn, 2000; Choe et al., 1996; Kolstad, 2002). These studies indicated that demand for improved environmental quality increases with income. The study further showed that age was positively related to WTP, while household size and education had a negative influence.

Whittington et al. (1990) conducted a CV study to elicit the WTP value of water vending in Laurent village in the rural area of Southern Haiti. A bidding game was used to gather information from the respondents concerning water service and the purpose of using a bidding game was to avoid starting bid bias. In-person interviews were conducted and split sample was

done to test the validity of the responses. The enumerators were tasked to interview every household and the model used to analyse responses was the interval-data model, which is a large sample size tool that uses the method of maximum likelihood to estimate WTP values. The sample was split into two parts to test whether the differences in the wording of payment questions would result in potential strategic responses, which gave differing WTP values. The outcome reflected that there was no starting point bias and no significant differences in the mean WTP value of responses attributable to wording alteration. WTP was found to have positive relation with household income, occupation index, education and the distance to the alternative water sources.

2.3.3.4 Influence of rural versus urban location on eliciting WTP value

Even though KWA is based in a rural area, this study was conducted in urban area because of the payment vehicle of monthly water bill that already exists for urban water supply from the rural wetland. The study used the notion of monthly water bill to elicit WTP for continued water provisioning ecosystem services. The reason being that, in rural area, water is consumed under open access regime which would possibly results into more protest zeroes and lower WTP value. According to (Ramsar Convention Secretariat, 2007), the wetland and its resources may be undervalued and misallocated because of the property rights regimes governing the wetland access and use. However, there is no evidence that shows the importance of splitting sample into rural and urban areas.

The two main locations that are said to bring the differences in the magnitude of elicited WTP are broadly classified as rural and urban. In the two locations, the WTP is found to be determined by the main use of water and economic status. There is an evidence that urban areas tend to generate high WTP values due to their better financial status over rural areas however the importance of water use is likely to prove it another way round. The CVM study conducted in Pakistan by Altaf et al. (1993) in the village of Punjab indicated that water use and the type of water connection have an important role in determining household WTP. The study used a sample size of 450 households to elicit WTP values of people for a private connection to a water system with improved and reliable water service, and the sample was split into two parts. People who did not have a connection to the public water system were interviewed to vote for a private connection to the water system, while those with public water system connections were asked to report their WTP for only an improved reliable water supply. The results indicated that people without public water system connections were more willing to pay for the improved reliable private connection system. The reason for this outcome was that the

respondents were taking much time to fetch water from the distance source. Again, the study area was in a crop production settlement where people would find it important to pay for water for irrigation of their crops.

The study conducted in Swaziland by Farolfi et al. (2007) utilised the notion of CVM to study how rural and urban areas elicited different magnitude of WTP values for an improved domestic water quality and quantity. The sample size of 343 households was interviewed in both rural and urban communities. The study emphasised the importance of water use and type of water connection. The Tobit model was used to report the WTP results of the respondents. The variables, such as household income, time for water collection, age, and female gender were positive and statistically significant. The study showed that the more people consume water, the lower the value they are willing to pay. Furthermore, the households with private water consumption were willing to pay less for larger quantities of water. On water quality estimates in rural area, the variables, such as location of rural households, current water source and household income, were found to be positive and statistically significant in determining WTP.

A study conducted in Ethiopia by Wright (2012) determined WTP for an improved water source in the village of Kigisu. The study used a sample size of 122 households and employed an ordered probit model. The method of value elicitation was the iterative bidding process, which used a probit model to analyse the responses. The mean WTP for the improved water source was found to be 286 Ugandan Shillings (UGX) for 20 litres of public tap water, and 202 UGX for 20 litres of private tap water. The results indicated that the number of children and distance from the water point were positive and statistically significant in determining people's WTP, which means that households with more children and longer distances to the water source, were likely to pay more for the improved water service.

Alaba (2001) conducted a study in Nigeria which focused on the analysis of determinants of demand for in-house water system. The study utilised the households' data obtained from a survey conducted by four local governments of Oyo State. The surveyed area was divided into urban and rural area. The analysis of the data was carried out using the multinomial logit model. The results of socio-economic analysis of urban area showed that educated and high-income households were more likely to possess in-house water systems. Household's education and income were both positive and significant. Analysis of a public system such as public stand-pipe, public boreholes and protected wells available to urban households, showed that income is negative and significant, while other determinants like education and family size were not

significant in explaining the use of a public system. Moreover, time had a negative sign, while water quality had a positive sign in determining a household's choice of an in-house connection. Similar results were also found in the rural area, where income and education were statically significant and positive.

The reviewed literature showed that institutions responsible for providing services plays a major role in the magnitude of WTP value of the resource. The socioeconomic characteristics of the people such as income, gender, education level were also found to have significant role influencing WTP value. The literature further indicated that the location of the service does not contribute significantly in determining the size of WTP value while the time-to-think has implication on WTP value as it distort the results provided that people discussed the CV question before answering.

2.4 RESEARCH GAP

The literature reviewed showed that there is a considerable gap in the conservation of wetlands. Most of the empirical studies had focused intensively on water provision service as an isolated concept from the wetland, that is, the consideration was more on WTP for water supply and not on determining a wetland conservation charge, which is the ultimate aim of this study. This is in contrast with Mungatana and Muchapondwa (2012), in their study on economic valuation of ecosystems in South Sudan, who indicated that the WTP funds of this nature are referred to as conservation funds, and not water provisioning ecosystem service funds. Among the reviewed literature in the context of wetland conservation, there are only a few studies on CVM of wetlands conservation (Grossman, 2010; MacDonald et al., 1998; Yang et al., 2008; Birol et al., 2007; Vidanage et al., 2004); however, these do not consider the case of water supply for domestic consumption. These studies are not sufficient to justify the conservation of wetlands. The literature study revealed that the economic value of a wetland in the aspect of water provisioning services is omitted in many studies, which justifies the conducting of this study to determine the conservation funds of the KWA for a sustainable water supply. This missing value of a wetland means that efficient conservation measures of the wetlands are not yet realised, hence there is still the possibility of the wetland's degradation. Additionally, the literature showed that the property rights formulation and other relevant policies for wetland conservation and management are still a challenge for the sustainable use of the wetlands. The public nature characteristic of the wetland and the open access in the wetland area are not good

factors in the conservation and the management of the wetland, as they intensify the risk of wetland's degradation and loss.

2.5 STUDY HYPOTHESIS

The following hypotheses were formulated for this study:

i. The respondent's WTP is not statistically influenced by the knowledge, attitudes and perceptions of the respondent.The level of respondents' knowledge, attitudes and perceptions is a serious issue in wetland management and conservation. It is believed that knowledge about the wetland influences the attitude and perception of the people. A study conducted by Atreya et al (2015) in Nepal shows that only 18 % of people in the community were participating in conservation of wetlands and an awareness programme, which reflected their attitude towards conservation of the wetland. The study further indicated that meetings, workshops and training played an important role in creating awareness among people. The ratings of the study indicated that 69 % of the migrants and 63 % of the indigenous people rated conservation and better management of the wetland as a good plan, while 28 % of the migrants and 36 % of the indigenous people rated conservation as very good idea. On average, more than 80 % of the people considered conservation of the wetland as good. In essence, this also reflected their positive attitudes towards conservation of the wetland, which emanated from the knowledge of the wetlands. Sah and Heinen (2001) indicated that people are able to pay for resource use if they are participating in the conservation of the resource, as they develop a sense of understanding that determines their decision-making in WTP. Thus, the study tests the abovementioned hypothesis.

ii. The conservation charge for continued water provisioning ecosystem service from KWA is positive under partial open-access regime. Conservation charge is known as the resource rent for the efficient allocation of natural resources. When people pay resource rent, it implicitly reflects the value they place on the resource, which concurrently indicates their level of utility in monetary form. The respondents place the value on the natural resource through their WTP. Policy makers and funding agents should be more interested in the information furnished by a WTP study to help in the provision of goods more closely in line with the consumer preferences underlying the good (Hanemann, 1991). This means that the resource rent generated through WTP measures the level of individual preferences, hence determining whether the rent is

positive or zero. Following the value theory of Smith (1776), the resource rent is one component of the profit derived from the use of a resource and profit is known to be non-negative. Assuming that the natural resource is beneficial to the people, resource rent as defined is also non-negative. The resource rent can be either zero or positive, depending on the conservation regime of the wetland. Under a pure open-access regime, competition drives resource rent to zero (Freeman, 1991; Scott, 1954). When the wetland is under partial open-access and a private regulation regime, the rent is expected to be positive, hence it is hypothesised as indicated above.

iii. The respondent's WTP is not statistically dependent on the institution governing KWA. The conservation of wetland areas is influenced by the regime that governs the wetlands. The government in most cases is not trusted by the public for conservation of the ecosystem, including wetlands. When the people are asked to pay for ecosystem services to avoid their extinction, people refuse on the grounds that it is government's responsibility to deliver free services. This was recorded in the study by Whittington et al. (1998), conducted in three villages in Nigeria on improved public tap water and a private connection system. The results revealed that people reported low WTP for an improved water service because the people said that their government was not trustworthy and that it was the duty of the government to roll out services, free of charge. That is the reason why this study tested the above hypothesis.

iv. Respondents' WTP is not statistically influenced by the socio-economic characteristics of the households. The WTP of the residents for an improved water provisioning ecosystem service is influenced by some key socio-economic characteristics, such as gender, age, income, household size and other factors. According to Moffat et al. (2007), those households with high monthly incomes demand more clean, and high quality, water. Moreover, Choe et al (1996), Hoehn (2000) and Kolstad (2002) have indicated that income is the main determinant of a respondent's WTP and is positive and statistically significant. This means that a household's demand increases with income of the household, that is, the higher the income of the household is, the higher is its demand for water. Alaba (2001) indicated that age is positively related to WTP, implying that older people are more willing to pay for improved water service, as they less energetic for moving around to search for distant, alternative water sources. For justification of the above information, that is why this study tested the abovementioned hypothesis.

2.6 CONCLUSION SUMMARY

The objective of this chapter was to survey theoretical and empirical literature, the knowledge gap, and hypothesis testing. It can be justified that there is a need for assessing the economic value of the wetland in the interest of conservation and management of the wetlands in the provisioning services of water. If there is a missing value in the decision making of the wetland conservation, and wetlands are at risk of degrading.

CHAPTER 3

RESEARCH METHODS

3.1 INTRODUCTION

This chapter explores the diverse range of methods used to pursue this study. Section 3.2 describes the study area where the wetlands are situated. Section 3.3 discusses the sampling design and the methods used to collect data for this study, while section 3.4 describes the survey instrument design and the development for collecting data for the study. Section 3.5 shows how the bids were designed for data collection. Section 3.6 describes how the survey was implemented with the designed instrument of data collection which was the questionnaire, and section 3.7 presents data analysis of the study after data collection. The variable description and the factual household characteristics of the households are presented in sections 3.8 and 3.9, respectively. Lastly, section 3.10 represents the empirical study models used, and the conclusion and summary are set out in section 3.11.

3.2 STUDY AREA

3.2.1 Geographic distribution

The study is based in the Khalong-la-Lithunya wetland area (KWA) in Lesotho. KWA is the rural wetland found in the mountains of Botha-Bothe district and is classified as one of the high altitude wetland areas. It is located in the constituency of Motete and supplies most of the people adjacent to the wetland, and those from the urban area, with its resources such as fibre, wildlife species (mainly plants and animal species), fishing, and recreational and hunting benefits. More importantly, this wetland provides the urban area with a water supply, which is accessible through monthly water allocations and payments. This area is used predominantly by livestock farmers for grazing and is densely populated during livestock seasonal migrations, from autumn to winter. This area is a good area for grazing and is on the elevated area of the mountain. In the immediate vicinity of the KWA there are densely populated cattle posts, with some villages a distance away at the lower part of the wetland area. The lowland is normally used for production purposes, which forces livestock to move to the highland. The water from KWA flows down to the Motete villages through river channels which are used significantly for swimming, washing laundry, irrigation for the nearby vegetable schemes and individuals

in their horticultural gardens, and for household consumption. Some of the water is directed to the biggest water project in Lesotho, the Lesotho Highland Water Project (LHWP). This project serves the residents of Lesotho, and people in South Africa through the export of water.

This wetland area was chosen for the study because it is the most popular and prestigious wetland in Lesotho, owing to its large size and its important contribution to the urban households with in supplying water. KWA is rich in ecological resource endowment as this wetland is distinct, both floristically and structurally, from those found in other parts of the region which has been degrading at a significant rate. It has been an area of interest to researchers and government due to its economic contribution to the country, which has resulted in some investment projects for restoring the KWA. KWA occupies an area 3280 hectares, of which 1332 hectares have been subject to a restoration process by the government of Lesotho since 2007 (Department of Environment, 2009). This wetland area is located at the altitudes between 3100 metres and 3200 metres above sea level. KWA contains the upper and lower catchments which form part of sub-catchment of a main quaternary catchment draining into Motete River which flows into the Moroeroe River, where the government water authority WASA harnesses water for various households in town.

3.2.2 Vegetative endowment

This wetland is distinct, both floristically and structurally, from those found in other parts of the region. There are various unique grasses that grow in these wetlands which are suitable for making Basotho traditional hats and the wetlands are rich in reeds used for roofing. The area also contains special vegetation used for medicinal purposes. Other catchments of KWA are used by inhabitants for fishing purposes. Therefore, the wetland has become a place of many interests, regionally and nationally, for recreation and for scientific studies because of its botanic importance. According to Olaleye et al. (2014), the area is known for having three types of palatable grass for animal grazing, and shrubs and woody plants for sheep and goats to browse. These grasses include *Festuca caprina*, *Merxmuellera disticha* and *Pentaschistis oreodoxa*, while shrubs and woody plants include *Chrysocoma ciliata*, *Erica dominans* and *Euryops evansii*.

The vegetation of this wetland is dominated by the grass *Pentaschistis oreodoxa* and the forb *Haplocarpa nervosa* that covers up to 75 % of the area. The forbs, such as *Isolepis cernua*, *Ranunculus meyeri* and *Cotula radicalis*, are prominent throughout this wetland area. The canopy cover of the wetland ranges between 60 % and 100 %. A total of 21 different plant

species, comprising 14 % grasses and 86 % forbs, have been identified within this wetland, with the average height of the plant species ranging between 2 and 6 cm. Small- to medium-sized erosion dongas are observed within this system.

The catchment slopes are associated with shallow soils and high percentages of surface rock. The soil organic matter is very low due to high runoffs onto the peatland, which has resulted in the degradation of vegetation and a coarse soil texture. According to Carpenter et al. 2001, the extensive grazing has destroyed the roots of the vegetation and canopy of the grasses, which are replaced by annual forbs species. This has a negative impact on the resilience of the system to maintain its ecosystem functions, such as water storage, nutrient cycling and production. In the Lesotho peatlands, the forbs comprise the largest percentage (86-87 %) of species composition. Thus, it seems that the long-term grazing of these systems has affected the composition of species.

3.2.3 Climate

The climate of Lesotho is temperate, consisting of four seasons, namely summer, autumn, winter and spring. The summer season has high precipitation and high temperatures. The winter season is very cold, with snowfall and low rainfall, while autumn and spring are transitional seasons between the two extremes of summer and winter. According to Lesotho Meteorological Services (2008), the mean monthly rain from 1997 to 2007 in Botha-Bothe district ranges from 49.1 mm to 95.6 mm while temperature ranges from 7.6 to 22.4 degree Celsius. The annual precipitation recorded for KWA ranges from 1000 to 3000 mm.

3.2.4 Socio-economic features of population

KWA is inhabited by a sedentary population engaged in agriculture and livestock production. People living around the KWA are engaged in different agricultural production systems which are both crop and livestock based. The crop production is both horticulture and agronomy. The livestock sector consists of rearing cattle, sheep, goats, horses, donkeys, pigs, and poultry. Livestock is kept for both economic and social reasons. The wetland area is used extensively for livestock grazing and water supply for household consumption. This is the only main means of living in this area, as there are no other means like job opportunities. Livestock is kept mainly for social and economic purposes. The source of livelihood is through the sale of live animals and their products, such as milk. Animals are also used for horticultural and agronomical purpose for food security. Animals are also kept for socio-cultural uses, such as paying for

marriage (lobola) and ceremonies. The sheep are of the merino type and are raised for the sale of their wool and slaughter, as well as for ceremonial purposes. The standard of living is very low, as people depend highly on wetlands products for their survival, such as firewood for cooking, and other products.

3.3 SAMPLING DESIGN AND METHODS

The study utilised both purposive and stratified sampling methods for the selection of the urban households, which are getting water from KWA through water and sewage authority (WASA) in Lesotho. KWA is selected from other wetlands because is a prestigious treasure to government, researchers and local communities, being under restoration since 2007, although this has currently come to a halt because of limited government funds. The wetland is also known for its riches in natural resource endowments which benefit most of the surrounding poor rural communities with water, and to a larger extent, the wetland supplies the urban area with water. The main focus of the study was on urban households that use water supplied by the national Water and Sewage Corporation (WASCO), which harnesses water from KWA and supply it through municipality water bill paid by households.

In order to carry out this study, a total number of 204 questionnaires was prepared and administered to various respondents. The sample size of 204 questionnaires was divided into two equal parts to determine the impact of individual WTP when government is collecting conservation funds, and when the private company (Transformation Resource Centre) is collecting conservation funds for KWA management. Different starting bids were also used to test for starting bid biases. This was suggested by the study conducted by Whittington et al. (1989) which indicated that people are less willing to pay when a government is implementing the improvement service because they do not trust the government.

Therefore, a split sample was done to determine the impact of the wetland conservation institution in different environments. According to Whittington (2004), utilising a split sample helps the researcher to gain insight into the question asked of whether the right design choice is made or not. This is further stressed by academic literature to the effect that split sample experiments help to better understand how respondents may react to a CV scenario and elicitation procedure, such as different starting bids (Carson et at., 2003; Whittington et al., 1998). From the contingent valuation questions, the protest zeroes were identified by asking a follow-up question, and they were eliminated to ensure valid and reliable statistical analysis.

3.4 SURVEY INSTRUMENT AND DEVELOPMENT

The development of the survey questionnaire was guided mainly by the specific objectives of this study. According to Whittington et al (1998, 2002, 2004) and NOAA, the invaluable effort of CV survey starts right at the beginning of survey instrument design. The survey instrument was intended to gather information relevant for pursuing the objectives of the study, hence it addresses the research problem. The design of the instrument was also guided by an extensive review of a wide range of publications which included books, past theses, and journals articles. The questionnaire was also designed in collaboration with my research supervisor, whereby a series of drafts were sent to the supervisor for review and necessary alterations were made, based on the target problem of the study.

The survey questionnaire was partitioned into different parts, covering demographic information and economic information in parts one and two, which were included based on literature for choosing necessary variables of interest. Part three was designed to extract information about households' knowledge, attitudes and perceptions towards wetland conservation, and part four elicited information about the reliability of KWA water supply which was aligned with households' WTP. Part five was intended to draw relevant information on households' WTP, or the value they attached to conservation of KWA for continued water provisioning ecosystem services, and last part for debriefing was intended to evaluate the validity and the weakness of the questionnaire in gathering relevant information.

According to Arrow et al. (1993), producing a good CV survey instrument requires substantial development work, such as typically including focus groups, in-depth interviews, pre-test and pilot studies, to help determine the plausibility and understandability of a good CV scenario. The pre-testing of the survey instrument before administering it to the respondents was also a mainstay in this study, whereby more than five households were interviewed in a pilot study to upgrade the instrument. After the pre-testing, the resulting weaknesses and biases were noted and necessary modifications were made to ensure acquiring good, reliable results. Then, three enumerators were trained and coached on how to administer questionnaires. Based on the feedback from pre-testing and thorough training, the questionnaire was accepted to be valid and sound enough to yield relevant and valid information.

Other advice from the proponents of the CVM (Arrow et al 1993; Whittington et al., 1998, 2002, 2004 and NOAA elite) was that a split sample is very useful in CV studies to ensure reliable and consistent results. This is also the case in this study, as the sample size was divided into two equal subsamples of 102 households each. In one subsample, the government was

responsible for conservation of KWA, while in the other subsample, TRC, a private organisation currently active in environmental conservation, was responsible for KWA's conservation for continued water provisioning ecosystem services. The purpose of the split sample was to ascertain whether the identity of the institution governing KWA has an impact on households' WTP a conservation charge. Starting bids were also varied to assess the whether the demand for continued water provisioning ecosystem service possesses features of a market good, demands for which are decreased by an increase in its price (Navrud, 2000).

3.5 BID DESIGN

The crucial issue in the execution of a CV survey is the choice of initial and follow-up bid vectors. The proper design of bids is recommended for efficiency of the estimators because they determine the variance–covariance matrix when they are only the regressors. In order to obtain a preliminary estimate about the WTP distribution, a pilot study was conducted where the two questions covered the backbone of the study. Ten households were consulted and asked about their current monthly water bills and what was their maximum WTP as a conservation charge for continued water provisioning ecosystem service from KWA. On average, the monthly water bill was found to be M300 where M represents the local currency, Maluti. All the households consulted also reported more than 10 % of their monthly water bill as their WTP, and in some extreme cases of high water demand, about five households reported more than 40 % of their monthly water bill as their maximum WTP for conservation of KWA. For the feasibility of the conservation policy, the Ministry of Natural Resources was consulted and it generated information about the total amount of money needed for conservation of KWA in the interest of a continued water provisioning ecosystem service. Using the total number of households benefiting from water supplied by WASA at a cost, the preliminary calculation indicated that a 10 % increment on household monthly water bills would do better. In that regard, three initial values were selected as the starting bids, namely M30, M50 and M70. The smallest bid was 10 % of the monthly water bill, while the highest bid was about 23 % of the monthly water bill, which was the average maximum WTP of the households when the pilot study was conducted. In the case of a 'no' response to the lowest bid, the respondent was presented with a bid that was lower than the lowest bid, while for 'yes' responses, higher bids were asked. The bid design seemed to be a worthwhile implementation, as fewer respondents said 'no' to the lowest bid, while many people reported a maximum WTP that was more than the highest bid. The detailed information about the distribution of bids with respect to the corresponding responses is shown in Chapter four.

3.6 SURVEY IMPLEMENTATION

The questionnaires were administered in the urban area of Botha-Bothe district, where the households which consume water from KWA through WASA were interviewed. The estimated time to administer one questionnaire to a respondent was 30 minutes, on average, and the time was also based on how quickly a respondent understood the contents of the questionnaire. Confidentiality of the information was highly assured to the respondent to relieve reluctance to provide information. The information in the questionnaire was focused mostly on wetlands conservation and how much money the households would be willing to pay for the continued water provisioning ecosystem service from KWA.

For the better implementation of this survey, three enumerators were trained to provide them with the skills for conducting a high quality, in-person interview. Fundamentally, the enumerators were holders of a degree and had experience in survey endeavours, as they had been involved in different household surveys earlier on for government Ministries and private organisations. This is in line with the advice from Whittington (2004) that a researcher is fortunate to find professional enumerators with survey experience to ensure reliable CV results.

Another challenge in administering CV surveys is the problem of translation of the local language in cases where local people are not used to administer questionnaires. For the purpose of this survey, literature has been useful in sharing experiences in the design of a CV study for improving the credibility of CV results. To ensure greater reliably, local enumerators were used, as they are the experts in the local language and the local problems of water shortage. This was also done for security purposes, as the local enumerators are aware of the catastrophic risks in their communities in terms of dogs and the safest time to quit work before dusk. It is also believed that there were no translation problems, as the population of Lesotho is homogeneous and only two languages needed to be used in the questions, namely English as the second language, and Sesotho, which is the local language. Therefore, misunderstanding and misinterpretation of the scenario were eliminated, for all practical purposes.

The backbone of a CV survey relies on the crafting of the CVM scenario. As indicted by literature (Whittington et al., 1998, 2002, 2004), the CV scenario presents a good deal of information to respondents, often including demonstrations by pictures and figures. However, if the CV scenario is not properly crafted, it might confuse or mislead the respondents, hence resulting in unintended policy formulation. For example, the literature shows that an individual who is confused or misled may put the household or members of household at risk. The misinformation and confusion among the study population might result in unintended policy

making that could ultimately harm the respondents or other people. Therefore, the provision of background information in the CV scenario and the description of the hypothetical market have to be clearly dissected, which was also the case in this study.

In order to ensure the proper crafting of the CV scenario, the scenario was partitioned into different sections which included the description of the water shortage problem on the ground, the consequences of the prevailing problem on economic and health aspects, and ultimately, the proposed payment logistics. The responses were recorded for all these sections to ensure the understanding of the scenario and the degree of knowledge about the existing problem of water shortage from KWA.

3.7 DATA ANALYSIS

The objectives in this study were analysed using different statistical methods. The first objective of knowledge on KWA's threats, factors affecting the problem of water availability, and the sustainability of KWA were analysed using frequencies and proportions. The robustness of the results was further analysed using Analysis of Variance, ANOVA, whereby the influence of moderators on respondents' knowledge was tested with chi-square and F-statistics. Other objectives included: to determine whether the conservation charge for Botha-Bothe urban residents is positive for continued water provisioning ecosystem service from KWA; to determine whether the willingness to pay (WTP) of households is dependent on the institution governing KWA; and to determine the socio-economic characteristics that explain variation in WTP for conservation of KWA, which were analysed using the double bounded model as it seemed to fit the data better. The STATA statistical program was used to analyse the binary responses, as it has a built-in routine that utilises the maximum likelihood method of estimation which is a large sample size technique.

3.8 THE VARIABLE DESCRIPTION

The variables used in this study are described in this section. The variables used to determine the mean WTP include the socio-economics variables and the knowledge, attitudes and perceptions variables. The inclusion of these variables in the model was guided by the literature. The descriptive statistics used for these variables are presented in the form of means, standard deviation, and the confidence interval. The variables which were used to capture the constructs of knowledge, attitudes and perceptions were entered into the model as the input

variables that explain the WTP of the households. The WTP estimation was the ultimate output in this study.

The model used to estimate the mean WTP in this study is the double-bounded model. In the econometric estimation of a double-bounded model to determine the willingness to pay, the variable WTP was used as the dependent variable in the form of household mean WTP for wetland conservation for continued water provisioning ecosystem service. The explanatory variables which were used in the government sub-sample include: gender of the respondent, household income of the respondent, age of the respondent, attainment of primary school education by the respondent, attainment of secondary school education by the respondent, attainment of High school education by the respondent, attainment of tertiary education by the respondent, household size of the respondent, attitudes of the respondent towards water shortage from KWA during dry season and knowledge of the respondent about health risk associated with household water shortage from KWA respectively. The explanatory variables which were included in the TRC sub-sample were which denote gender of the respondent, household income of the respondent, age of the respondent, attainment of primary school education by the respondent, attainment of secondary school education by the respondent, attainment of tertiary education by the respondent, household size of the respondent and the attitudes of the respondent towards water shortage from KWA during dry season respectively. These variables differ with the subsample, depending on how they behave in the model. This decision was based on the expected signs and the statistical significance of the variables in alignment with the literature.

The household level of knowledge about the threats of KWA was used to determine the extent to which households know about the threats of KWA. The assessment was done based on the following statements: Overgrazing from KWA can lead to loss of important species found on the wetland; animal trampling in KWA can cause soil erosion on the wetland area; Overharvesting of fibre from KWA can lead to extinction of fibre found on the wetland; Pollution of water from KWA can kill crucial species found in the wetland; too much water drawn from KWA can lead to water shortage from the wetland; conversion of KWA to agricultural activities can lead to drying up of the wetland due to overgrazing ; overharvesting of medicinal plants from KWA may lead to the extinction those important plants found on the wetland**;** Insufficient funding for management of KWA conservation may lead to over-extraction of wetland resources; poor management of KWA may lead to the extinction of the wetland due to over-use of the area; improper formulation of policies that govern wetland use can lead to overharvesting of wetland resources. In order to pursue this purpose, the

respondents were asked to indicate their level of knowledge on factors that promote sustainability of KWA. Respondents were given a six-point Likert scale to show their degree of agreement on KWA conservation factors, namely strongly agree, agree, not sure, disagree, strongly agree and I do not know.

Moreover, in order to capture the attitudes of the respondents toward conservation of KWA, the following statements were used: The conservation of KWA is important to secure water you consume in your household, KWA conservation is crucial to promote habitat of wildlife like rabbits, birds and others, the conservation of KWA is essential for recreational activity such as swimming, aesthetic and others, KWA conservation is helpful to secure alternative source of income through sales of traditional hats (Mokorotlo and tshetshe) from its fibre, the conservation of KWA is essential to protect medicinal plants found in the wetland area, the conservation of KWA is crucial to secure fibre found on the wetland, and KWA conservation is good for flood regulation during heavy rains.

The purpose of including the knowledge and attitudes aspect in this study was to make sure that people know about the various threats to the KWA, factors affecting availability of water from KWA and, the factors promoting sustainability of KWA. The factual level of knowledge about the threats to the wetland will help to determine the attitudes of the respondents. The expectation was that if the level of knowledge was high, the attitudes reflected there would be the factual attitudes which were determined in the light of the knowledge.

3.9 HOUSEHOLD CHARACTERISTICS OF THE SAMPLE

Table 3.1 below summarises the demographic and socio-economic characteristics of the sampled households.

Table 3.1: Demographic and socio-economic characteristics of the respondents

Characteristics	TRC	Government	Total
Gender:			
Female	77(75.5 %)	79(77.5 %)	156(76.5 %)
Male	25(24.5 %)	23(22.5 %)	48(23.5 %)
Age in years:			
20-64 Years	88(86.3 %)	99(97.1 %)	187(91.7 %)
>64 years	14(13.7 %)	3(2.9 %)	17(8.3 %)
Household status:			
Head	47(46.1 %)	46(45.1 %)	93(45.6 %)
Spouse	37(36.3 %)	41(40.2 %)	78(38.2 %)
Daughter	7(6.9 %)	7(6.9 %)	14(6.9 %)
Son	8(7.8 %)	6(5.9 %)	14(6.9 %)
Sibling	3(2.9 %)	2(1.9 %)	5(2.4 %)
Marital status:			
Married	57(55.9 %)	66(64.7 %)	123(60.3 %)
Single	21(20.6 %)	12(11.8 %)	33(16.2 %)
Divorced	4(3.9 %)	3(2.9 %)	7(3.4 %)
Widow/widower	20(19.6 %)	21(20.6 %)	41(20.1 %)
Average Household Size	5(4.9 %)	5(4.9 %)	5(4.9 %)
Average household period lived in years	4(3.9 %)	4(3.9 %)	4(3.9 %)
Education Level:			
None	2(2.0 %)	4(3.9 %)	6(2.9 %)
Primary school	35(34.3 %)	29(28.5 %)	64(31.4 %)
Secondary school	32(31.4 %)	26(25.5 %)	58(28.4 %)
High school	23(22.5 %)	23(22.5 %)	46(22.6 %)
Vocational	2(2.0 %)	1(1.0 %)	3(1.5 %)
Tertiary	8(7.8 %)	19(18.6 %)	27(13.2 %)
Employment:			
Formal	22 (21.6 %)	23(22.5 %)	45(22.1 %)
Informal	4(3.9 %)	7(6.9 %)	11(5.4 %)
Farm	1(1 %)	0(0 %)	1(0.5 %)
Self-employed	56(54.9 %)	53(52.0 %)	109(53.4 %)
Not working	19(18.6 %)	19(18.6 %)	38(18.6 %)
Primary source of income:			
Salary	25(24.5 %)	33(32.4 %)	58(28.4 %)
Self-employed	49(48.0 %)	48(47.1 %)	97(47.5 %)
Rent payment	2(2.0 %)	0(0 %)	2(1.0 %)
Farm	1(1.0 %)	2(2.0 %)	3(1.5 %)
Pension	4(3.9 %)	5(4.9 %)	9(4.4 %)
Spouse working	21(20.6 %)	14(13.7 %)	35(17.2 %)
Total monthly income in Maloti:			
Less than 4000	75(73.5 %)	80(78.4 %)	155(76.0 %)
Between 4000 & 8000	24(23.5 %)	14(13.7 %)	38(18.6 %)
Above 8000	3(2.9 %)	8(7.8 %)	11(5.4 %)

Source: Author's calculations

Note: TRC is the Transformation Resource Centre

The results above indicated that the larger segment of the population was represented by females, representing over 75 % in total. There were also more younger people than older people above 64 years of age. The respondents aged between 20 and 64 years were represented at 91.7 %, while those above 64 years were about 8.3 %.

The number of heads of the households among respondents was high, represented by 45.6 % in total, for both subsamples. This is because the first priority was given to the heads of households, as they are assumed to know much about their households' water problems and their financial status, while the spouses were considered the second best when the head of household was not available. Other members of the household, especially older people, who were knowledgeable for answering the questions, constituted the third priority when the spouse was not available. The average household size for both subsamples was 5 family members. The average period lived at the address was about 4 years, indicating that the respondents know much about water shortages, as it is an annual problem which is regular or seasonal. From the table of summary above, most people had primary school qualifications which are represented by 31.4 % and is higher than other educational levels. This showed that the majority of the respondents had low educational levels, but at least they can read and write. Over 50 % of the respondents are self-employed and they earn around M4000 income on a monthly basis. More than 75 % of the respondents were earning less than M4000, which seemed to be less as compared to other people who are earning more than M8000.

3.10 EMPIRICAL STUDY MODELS

In order to verify the potential influence of socio-economic moderators, which comprise age, income, gender and education, on respondents' knowledge and attitudes toward conservation of KWA, the ANOVA and Chi-square test models were utilised. Moreover, for economic valuation of respondents' mean WTP, the study used the double-bounded and the arithmetic mean to estimate the mean WTP for double bound for the two split samples. In order to obtain the outputs of one-way ANOVA, Chi-square and double bonded (interval data model) tests, STATA 12 was used, while the upper and lower bounds of the mean WTP were determined using a spread sheet to find the arithmetic means of the two split samples.

3.10.1 One-way ANOVA model

The one-way ANOVA method was found relevant in this study for verifying the potential influence of continuous socio-economic moderators, like income and age, on respondents' knowledge and attitudes towards conservation of KWA. This model was chosen in this study because of its user friendliness and because of the two main assumptions that underpin this method which are homogeneity of variance and the random assignment. STATA has an inherent routine that runs the homogeneity of variance tests (chi-square test). This is shown by Bartlett's test of equal variance inherent in STATA, which is an automatic test found in the model of one-way ANOVA which presents its results in the form of chi-square and its probability.

3.10.1.1 Model specification of one-way ANOVA

The one-way ANOVA model uses the extension of t-distribution, which is F-distribution, to find the relationship of the two variables of a specific nature stated earlier. The following Table (3.2) shows the specification of the one-way ANOVA

Table 3.2: ANOVA table (Analysis of variance)

Source	SS	df	Mean	F-Statistics
ESS	SS Between	J-1	$\frac{SS\ Between}{J-1}$	$\frac{MSS\ Between}{MSS\ Within}$
RSS	SS Within	N-1	$\frac{BB\ Within}{N-1}$	
TSS	SS Total	N-1		

Source: Gujarati (2004)

Where:

SS = Sum of squares

DF = Degree of freedom

J = Number of explanatory variables

N = Total number of observations

MS = Mean of squares

3.10.2 Chi-square test model

The study used the chi-square model to verify the potential influence of categorical data socio-economic moderators, namely gender and education, on respondents' knowledge and attitudes towards conservation of KWA. The method was found relevant in this study as it is ruled by the assumption that if either of the two variables is measured on an ordinal scale, then that permits the use of Spearman correlation. The ordinal variables that qualify for a Spearman correlation are in the form of a Likert scale, such as a 7-point scale, 5-point scale, 4-point scale and 3-point scale. Therefore, the variables used also seemed to fit well for this method, as knowledge and attitudes are in the form of 5-point Likert scale.

3.10.2.1 Model specification of chi square model

$$x^2 = \frac{(Observed - Expected)^2}{Expected}$$

Where

x^2 – Chi square statistics

3.10.3 Test of significance (t Test) model

The study used this model to determine the statistical differences of the two mean WTPs from the two split-samples for the government and the privately controlled Transformation Resource Centre (TRC). This test was found relevant in this study because it helps to verify the truth and falsity of the null hypothesis, which says the mean WTP from the two split-samples are equal. This is an alternative and complementary approach to the confidence-interval method of testing statistical hypotheses. The importance of this method is that of testing statistics which are the estimator and the sampling distribution of such statistics under the null hypothesis. The decision to reject or fail to reject a null hypothesis is made on the basis of the value of the test statistics obtained from the data used.

3.10.3.1 Model specification of Test of significance (t Test) model

$$t = \frac{(\widehat{\beta_2} - \beta_2)}{se(\widehat{\beta_2})}$$

$$= \frac{(\widehat{\beta_2} - \beta_2)\sqrt{\sum X_i^2}}{\hat{\sigma}}$$

Where

$\widehat{\beta_2}$– Estimated beta value from the sample

β_2 – True better value

se – Standard error of estimated beta

X_i – Explanatory variables

The above t Test formula follows t distribution with $n - 2$ degree of freedom, the true beta is specified under the null hypothesis, and the estimated beta value is readily computed from the sample as test statistics. Then confidence interval is computed following the t distribution.

3.10.4 The sample mean

The study used the sample mean to determine the lower and the upper bounds of the double-bounded mean WTP of each of the two split samples. The sample mean is calculated by summing up the observations and dividing their sum by the total number of observations. The maximum WTP of the no–yes responses were used to determine the lower bound of the double-bounded mean WTP. In order to determine the upper bound of the double-bonded mean WTP, the maximum WTP of yes–yes responses was used. This method was found useful in this study, as it was the only method that could fit the nature of the data collected and give more reliable estimates.

3.10.4.1 Model specification of sample mean

$$\bar{\boldsymbol{X}} = \frac{\sum \boldsymbol{Xi}}{\boldsymbol{n}}$$

Where

$$\bar{\boldsymbol{X}} = \text{sample mean}$$

$$\sum \boldsymbol{Xi} = \text{sum of observations}$$

$$\boldsymbol{n} = \text{number of observations}$$

3.10.5 Econometric specification of the double bounded model

Since the general form of the WTP for the double bounded model can be expressed as $WTP_{ij} = \mu_i + \varepsilon_{ij}$. The four sets of responses (yes-yes , yes-no, no-yes and no-no) generated from the follow up question and the distributional specifications of WTP permits computation of the probability that samples falls within any of these four sets of responses. Suppose the WTP distribution is characterised by the function of F (B ; θ) where B is the bid amount and θ is the vector of parameters. This implies that the probability of yes-yes response is given by 1- F (B_2 ; θ) and that of yes-no response is given by [1- F (B_2 ; θ)] – [1- F (B_i ; θ)]. Linking up the two with the sample characteristics such that $\mu_i = X'\beta$ and assuming that that ε_{ij} is independently and identically distributed (IID) with zero mean and variance σ_i^2, WTP can be computed by estimating the parameter estimates by methods of Maximum likelihood.

Alternatively, the WTP can be estimated from the random utility model. For example, suppose the deterministic component of the random utility model is $V_i = \alpha_i + \beta_i y$, where y denotes the household income of the respondent. Then the probability that the offered bid vector bounds the individual true WTP can be expressed as P ($\Delta V \geq \Delta\varepsilon$) whereby ΔV denotes the income compensating change in utility corresponding to the provision of wetland conservation for continued water provisioning ecosystem service in this case. This is interpreted as the cumulative distribution function (cdf) of WTP of the representative individual. Invoking different distributional assumption for this cdf, it becomes easy to estimate the expression of WTP.

3.10.6 Model specification of WTP for government sub sample

$$\text{WTP} = \beta_0 + \beta_1 \text{Gender} + \beta_2 \text{Income} + \beta_3 \text{Age} + \beta_4 \text{Educ1} + \beta_5 \text{Educ3} + \beta_6 \text{Educ4} + \beta_7 \text{Educ5} + \beta_8 \text{HHsize} + \beta_9 \text{Dryseason} + \beta_{10} \text{Health} + \varepsilon_i$$

Where

WTP – Willingness to pay variable

βs – The parameters to be estimated

Gender – A dummy variable whereby male=1 or 0 if it is female

Income – Household monthly income

Educ1 – Attainment of primary school education or none by respondent

Educ3 – Attainment of secondary school education by respondent

Educ4 – Attainment of High school education by respondent

Educ5 – Attainment of tertiary education by the respondent

HHsize – Household size of the respondent

Dryseason – Attitudes of respondent towards dry season water shortage from the wetland

Health – Knowledge of the respondent about health risks of water shortage from wetland

ε_i – Unobserved random component

3.10.7 Model specification of WTP for TRC sub sample

$$\text{WTP} = \beta_0 + \beta_1 \text{Gender} + \beta_2 \text{Income} + \beta_3 \text{Age} + \beta_4 \text{Educ1} + \beta_5 \text{Educ2} + \beta_6 \text{Educ4} + \beta_8 \text{HHsize} + \beta_9 \text{Dryseason} + \varepsilon_i$$

Where

WTP – Willingness to pay variable

βs – The parameters to be estimated

Gender – A dummy variable whereby male=1 or 0 if it is female

Income – Household monthly income

Educ1 – Attainment of primary school education or none by respondent

Educ2 – Attainment of secondary school education by respondent

Educ4 – Attainment of tertiary education by the respondent

HHsize – Household size of the respondent

Dryseason – Attitudes of respondent towards dry season water shortage from the wetland

ε_i – Unobserved random component

3.10.8 Estimating the mean WTP of the double bound model

Once the parameters of the above models are estimated through maximum Likelihood procedure, estimation of the mean WTP is possible. It is suffice to calculate

E (Y) = $\overline{X'}\,\hat{\beta}$

Where $\bar{X}$ is the vector of sample average of the regressors and $\hat{\beta}$ is the vector of maximum Likelihood estimates of parameters. After estimation of mean WTP, it is also useful to calculate confidence intervals which give the lower and upper bound of the double bounded mean WTP. In this case of double bounded (interval data model), the computation of average WTP for the target population is - β_0/β_1 if it assumed that the WTP follows a normal distribution.

In this regard, the estimation of the mean WTP when the government is responsible for KWA conservation becomes:

$$\begin{aligned}\mathrm{E(WTP)} = -6.592 + 20.527\overline{Gender} + 0.001\overline{Income} + 0.303\overline{\mathrm{Age}} + 36.355\overline{\mathrm{Educ1}} \\ + 27.483\overline{\mathrm{Educ3}} + 21.722\overline{\mathrm{Educ4}} + 22.943\overline{\mathrm{Educ5}} + 4.740\overline{\mathrm{HHsize}} \\ + 8.350\overline{\mathrm{Dryseason}} + 20.625\overline{\mathrm{Health}}\end{aligned}$$

Similarly, the mean WTP when the TRC is responsible for conservation of KWA becomes:

$$\begin{aligned}\mathrm{E(WTP)} = 99.307 + 3.861\overline{Gender} - 0.002\overline{\mathrm{Income}} - 0.437\overline{\mathrm{Age}} + 20.789\overline{\mathrm{Educ1}} \\ + 21.526\overline{\mathrm{Educ2}} + 17.004\overline{\mathrm{Educ4}} - 3.976\,\overline{\mathrm{HHsize}} + 15.378\overline{\mathrm{Dryseason}}\end{aligned}$$

3.11 CONCLUDING SUMMARY

This section explores and discusses the methodology approach used in this study. KWA is a mountainous wetland, located in the rural area of Botha-Bothe town. This makes the wetland a suitable place for livestock grazing, which exposes the wetland to degradation. In order to value the wetland, the study utilised purposive and simple random sampling for selecting 204 water consumers from KWA. The split sample technique was used, and the two sample groups were developed, which represent the government sub-sample and TRC sub-sample. The reason was to test whether a respondent's WTP is affected by what institution is involved, i.e. whether it is government that should collect the conservation charge, or whether the TRC should be responsible for collecting conservation charge. The binary responses were collected using contingent valuation and STATA was used to analyse the data.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 INTRODUCTION

This chapter describes the set-up for different models used in this study, and their outputs are presented here. This chapter is partitioned into different sections. Section 4.2 displays the outputs of the factual knowledge, attitudes and the perceptions of the respondents, while section 4.3 presents the outputs of the models used to estimate the value of water from KWA. The outputs are presented in the form of regression and the respondents' WTP in the two split-samples are discussed in this section, while section 4.4 displays the outputs of the statistical differences between the mean WTP of the two split-samples, and the t test was used to calculate the results. Sections 4.5 and section 4.6 explore the evaluation of understanding the CV scenario and evaluation of the financial status of the households after the proposed respective interventions. The evaluation of the overall performance of the survey instrument is presented in section 4.7, while section 4.8 discusses the evaluation of the performance of the whole contingent valuation survey. Finally, section 4.9 summarises the results of the whole chapter.

4.2 KNOWLEDGE, ATTITUDES AND PERCEPTIONS

The questions concerning knowledge were asked to assess the degree of knowledge of the respondents about KWA and the water it provides. This was meant to ensure the reliability of the results obtained so as to make sure that the respondents factually know about KWA and the challenges that the wetland is going through. This section is also important to ascertain whether the degree of knowledge has a bearing on a household's WTP. By the same token, the questions on attitudes and perceptions were included to determine the perceptions and the attitudes of the respondents towards conservation of KWA, which are believed to have influences on a respondent's WTP. This section is divided into four sub-sections, which follow.

4.2.1 Respondents factual knowledge on the threats to KWA

The purpose of this section was to determine the respondents' level of knowledge on the threats to KWA. In order to establish the degree of knowledge of the households, the respondents were presented with the following statements: Overgrazing in KWA can lead to loss of important

species found on the wetland; animal trampling in KWA can cause soil erosion on the wetland area; Overharvesting of fibre from KWA can lead to extinction of fibre found on the wetland; Pollution of water from KWA can kill crucial species found in the wetland; too much water drawn from KWA can lead to water shortage from the wetland; conversion of KWA to agriculture activities can lead to drying up of the wetland; overharvest of medicinal plants from KWA may lead to the extinction of those important plants found on the wetland; Insufficient funding for management of KWA conservation may lead to over-extraction of wetland resources; poor management of KWA may lead to the extinction of the wetland due to over-use of the wetland area; improper formulation of policies that govern wetland use can lead to overharvest of wetland resources.

In order to pursue this purpose, the respondents were presented with a six-point Likert scale to indicate their degree of agreement on the threats of KWA, using the options of strongly agree, agree, not sure, disagree, strongly agree, and, I do not know. The statistical results are presented in Table 4.1 below:

Table 4.1: Respondents' knowledge of the threats to KWA

Threats	Conservation body	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Overgrazing from KWA can lead to loss of important species found on the wetland	TRC	89(87.3 %)	10(9.8 %)	1(1.0 %)	0(0 %)	0(0 %)
	Government	88(86.3 %)	12(11.8 %)	2(2.0 %)	0(0 %)	0(0 %)
	Total	177(86.8 %)	22(10.8 %)	3(1.5 %)	0(0 %)	0(0 %)
Animal trampling from KWA can cause soil erosion on the wetland area	TRC	90(88.2 %)	9(8.8 %)	1(1.0 %)	0(0 %)	0(0 %)
	Government	83(81.4 %)	16(15.7 %)	3(2.9 %)	0(0 %)	0(0 %)
	Total	173(84.8 %)	25(12.3 %)	4(2.0 %)	0(0 %)	0(0 %)
Overharvesting of fibre from KWA can lead to extinction of fibre found on the wetland	TRC	88(86.3 %)	11(10.8 %)	1(1.0 %)	0(0 %)	0(0 %)
	Government	78(76.5 %)	22(21.6 %)	2(2.0 %)	0(0 %)	0(0 %)
	Total	166(81.4 %)	33(16.2 %)	3(1.5 %)	0(0 %)	0(0 %)
Pollution of water from KWA can kill crucial species found in the wetland	TRC	86(84.3 %)	13(12.7 %)	1(1.0 %)	0(0 %)	0(0 %)
	Government	81(79.4 %)	19(18.6 %)	2(2.0 %)	0(0 %)	0(0 %)
	Total	167(81.9 %)	32(15.7 %)	3(1.5 %)	0(0 %)	0(0 %)
Too much water drawn from KWA can lead to water shortage from the wetland	TRC	84(82.4 %)	14(13.7 %)	2(2.0 %)	0(0 %)	0(0 %)
	Government	73(71.6 %)	23(22.5 %)	5(4.9 %)	0(0 %)	0(0 %)
	Total	157(78.0 %)	37(36.3 %)	7(6.9 %)	0(0 %)	0(0 %)
Conversion of KWA to agriculture activities can lead to drying up of the wetland	TRC	87(85.3 %)	12(11.8 %)	1(1.0 %)	0(0 %)	0(0 %)
	Government	78(76.5 %)	20(19.6 %)	3(2.9 %)	1(1.0 %)	0(0 %)

	Total	165(80.9 %)	32(15.7 %)	4(2.0 %)	1(0.5 %)	0(0 %)
Overharvest of medicinal plant from KWA may lead to the extinction those important plants found on the wetland	TRC	83(81.4 %)	14(13.7 %)	3(2.9 %)	0(0 %)	0(0 %)
	Government	81(79.4 %)	18(17.6 %)	3(2.9 %)	0(0 %)	0(0 %)
	Total	164(80.4 %)	32(15.7 %)	6(2.9 %)	0(0 %)	0(0 %)
Insufficient funding for management of KWA conservation may lead to over-extraction of wetland resources	TRC	75(73.5 %)	16(15.7 %)	7(6.9 %)	1(1.0 %)	1(1.0 %)
	Government	68(66.7 %)	26(25.5 %)	5(4.9 %)	3(2.9 %)	0(0 %)
	Total	143(70.1 %)	42(20.6 %)	12(5.9 %)	4(2.0 %)	1(0.5 %)
Poor management of KWA may lead to the extinction of the wetland due to over use of the area	TRC	75(73.5 %)	20(19.6 %)	3(2.9 %)	2(2.0 %)	0(0 %)
	Government	72(70.6 %)	22(21.6 %)	5(4.9 %)	3(2.9 %)	0(0 %)
	Total	147(72.1 %)	42(20.6 %)	8(3.9 %)	5(2.5 %)	0(0 %)
Improper formulation of policies that govern wetland use can lead to overharvest of wetland resources	TRC	76(74.5 %)	17(16.7 %)	6(5.9 %)	0(0 %)	1(1.0 %)
	Government	69(67.6 %)	25(25.5 %)	8(7.8 %)	0(0 %)	0(0 %)
	Total	145(71.1 %)	42(20.6 %)	14(68.6 %)	0(0 %)	1(0.5 %)

Source: Author's elaboration

Note: The frequencies are shown outside the brackets, while the percentages are shown inside the brackets

The results in Table 4.1 show that the majority of the respondents know about the threats of KWA. This is shown by the fact that more than 70 % in total of the respondents strongly agree to knowing the threats of KWA. The responses of 'strongly agree' with knowledge of the KWA threats for TRC split-sample is relatively more than that of the government split-sample. This was in line with expectations, as the TRC presents a weekly educational programme on some of the radio stations, sensitising people to environmental safety and threats. Certainly, the high response rate can be attributed to that free education programme. This also implicitly shows that people's interests in environmental issues have increased, as denoted by the higher percentage. Nevertheless, there are about 2 % of respondents who said that they do not know about wetland threats, and it is likely that they do not have radio, because the TRC programme has been a long-standing educational programme.

The statistical analysis further shows that the highest number of people agree that animal grazing and trampling are the main threats of the KWA, as indicated by the figures of over 87 % and 81 % for both TRC and government, respectively. These results are not surprising, as the livestock are the main threats to KWA. More impressively, there are no 'disagree' responses from the respondents on the knowledge of the KWA's threats, and there are only few for those who were 'not sure' and who 'do not know' about the threats of KWA.

Most people indicated their knowledge on KWA threats that cause water shortages, which is the main disaster in this urban area. The statistical proportions show that 82.4 % of respondents for TRC, and 71.6 % respondents for government, strongly agree that KWA degradation results in water shortage. This shows that most people are aware that KWA is the main supply of water in the urban area of Botha-Bothe district. Furthermore, Basotho are believers in traditional medication, hence they strongly agree that over-extraction of medicinal plants from KWA results in the extinction of these medicinal plants. There are 86.3 % of respondents for the TRC sample, and 76.5 % of respondents for government sample, who strongly agree with the threat of over-extraction of medicinal plants, and there no people who disagreed.

Moreover, there is also a high response rate, agreeing with the threat of insufficient funds for management of KWA. There are 73.5 % of respondents for the TRC sub-sample, and 70.6 % of respondents for the government split-sample, who indicated that insufficient funds for KWA conservation can result in wetland degradation. This is true, as was also shown by the Department of Wetland Conservation during consultations which noted that the KWA improvement attempts fell through, as the funds ran out half way through the wetland rehabilitation process, which started in 2007. More respondents also revealed that improper

policy formulation has an enormous impact on KWA degradation. This was affirmed by 74.5 % of respondents for the TRC sub-sample, and 67.6 % of respondents for the government split-sample, and it can also be supported by the failure of KWA restoration attempts starting in 2007, which prompts a conclusion that the policy was not worthwhile being implemented as it stood only a little chance of success. However, there are relatively few responses which disagree with this issue, and this shown by a proportion of 0.5 % in total. Although it was indicated earlier that most of respondents have primary school education, they might not understand policy formulation all that well. Overall, these are rather impressive results, as the larger segment of the respondents strongly agree with the KWA threats, discussed above. Therefore, confidence can be gained that the study had targeted relevant people who know much about the KWA and its threats.

To further investigate the robustness of the results, chi-square (x^2) tests and a one-way Analysis of variance (ANOVA) were used to verify the potential influence of socio-economic variables, namely gender, education, age and income on knowledge of the households about the threats of KWA. Most of the variables like income and age, which were designed to operationally capture this objective, seemed to be statistically significant, which is shown by the results of the x^2 tests that fail to reject the null hypothesis of equal variation of households' knowledge with socio-economic variables. The chi-square (x^2) was used where the two variables are categorical, while the ANOVA F-test was used where one variable was categorical, while the other variable was continuous, and in this case income and age were continuous. The results of the x^2 and F-test are reported in Table 4.2 below.

Table 4.2: Influence of gender, education, age and income on the respondents' knowledge of KWA threats

Threats	Gender	Education	Age	Income
Overgrazing from KWA can lead to loss of important species found on the wetland	2.062 (0.560)	7.236 (0.951)	0.47 (0.998)	1.13 (0.291)
Animal trampling from KWA can cause soil erosion on the wetland area	2.982 (0.394)	8.832 (0.886)	0.45 (0.999)	1.17 (0.248)
Overharvesting of fibre from KWA can lead to extinction of fibre found on the wetland	1.763 (0.623)	6.913 (0.960)	0.45 (0.999)	1.11 (0.317)
Pollution of water from KWA can kill crucial species found in the wetland	3.107 (0.375)	9.257 (0.864)	0.39 (1.000)	1.03 (0.430)
Too much water drawn from KWA can lead to water shortage from the wetland	5.083 (0.279)	20.148 (0.449)	0.73 (0.890)	0.93 (0.592)
Conversion of KWA to agriculture activities can lead to drying up of the wetland	2.900 (0.575)	14.074 (0.827)	0.42 (1.000)	1.49 (0.045)**
Overharvest of medicinal plant from KWA may lead to the extinction those important plants found on the wetland	2.278 (0.517)	12.275 (0.658)	0.41 (1.000)	1.10 (0.337)
Insufficient funding for management of KWA conservation may lead to over-extraction of wetland resources	12.609 (0.027)**	28.955 (0.266)	0.64 (0.958)	0.76 (0.840)
Poor management of KWA may lead to the extinction of the wetland due to over use of the area	4.796 (0.309)	18.796 (0.535)	0.49 (0.997)	0.92 (0.605)
Improper formulation of policies that govern wetland use can lead to overharvest of wetland resources	6.376 (0.173)	11.261 (0.939)	0.61 (0.972)	0.86 (0.711)

Source: Author's elaboration

*Note: *, ** and ***show the statistical levels of significance, at 10 %, 5 % and 1 %, respectively*

The results above show that gender and income are statistically important in influencing the knowledge of the respondent about the threats of KWA. This is shown by chi-square and the one-way ANOVA chi-square together with their p-value in brackets. The results above show that households with lower incomes are more likely to have knowledge about the threats of KWA. This is shown by the chi-square value of 1.49, with the ANOVA F probability of 0.45.

This shows that the knowledge of 'conversion of KWA to agriculture activities can lead to drying up of the wetland' is not independent of income. The implication is that a relationship does exist between the knowledge of the variable 'conversion of KWA to agriculture activities can lead to drying up of the wetland' and the level of household income, and the relationship is significant at 5 %. This further indicates that the variance between the level of knowledge and the level of income is not equal, hence their means are not equal. However, this test does not give information about the strength and the direction of the relationship between two variables. In order to uncover this information, complimentary tests, namely the Sidak, Bopnferroni and Scheffe comparisons, were run and the values were found to be negative and statistically significant. These tests were used because of their multi-functional nature, as they go further by reducing the likelihood of a Type I error which rejects the null hypothesis when it is true. The problem with these tests is that they are vulnerable to increasing the likelihood of favouring a type II error, which rejects a null hypothesis when it is true. In this case, the results show that the poorer the person is, the more likely he or she is to be aware of the conversion of KWA to agriculture activities that lead to drying up of the wetland. This is understandable, as the poorer people depend more on the wetland resource, hence they tend to know more about the wetland degradation activities. Poor people in the town regularly go to the wetland to fetch fibre for traditional hats that they sell to tourists and other people in town. This is also reinforced by the findings of Masiyandima et al. (2005) that southern African wetlands are famous for supporting the livelihood of resource-poor households.

Furthermore, thae study from Uganda shows that about 5 million people in Uganda depend highly on wetlands for water supply in rural areas, the value of which amounts to US$25 million per annum. The study further indicated that US$100 000 per year is accrued to wetlands benefits from goods and products derived from wetlands in Uganda. These include fish farming, papyrus harvesting and crop cultivating. When a wetland is degraded, ending up completely dry, it is attributable to the conversion of wetland to non-wetland uses, as a result of human activity, while wetland degradation is the impairment of wetland functions as a result of human activity (Moser et al., 1998).

For the gender variable, only one variable seems to be statistically significant in showing a relationship between the variable of 'insufficient funding for management of KWA conservation may lead to over-extraction of wetland resources' and gender, while the rest are not significant in determining the knowledge of different sexes. This is not surprising, as the TRC weekly educational programme on media platforms, like radio, is a public good, meaning both males and females have access to consume that information equally. This was also the

case in the study conducted by Mungatana and Ahimbisibwe (2012) in Uganda in the Budogo Forest Reserve (BFR). The same results were found by Mahlalela (2014) in the valuation of wetland fibre in the Lawuba wetland in Swaziland. Nevertheless, the relationship of the two variables of 'insufficient funding for management of KWA conservation may lead to over-extraction of wetland resources' and gender is statistically significant at 5 %.

The variables of education and age do not have significant influence in determining knowledge on wetland threats as shown by the results. These variables have expected signs, but they are statistically insignificant. These results correspond with the findings of Mungatana and Ahimbisibwe (2012) in Uganda in the Budogo Forest Reserve, and by Mahlalela (2014) in the valuation of wetland fibre in the Lawuba wetland in Swaziland. The former found that gender and age did not have impact on the awareness of invasion of S. spectabilis and its potential to compromise conservation in the BFR, and the later confirmed the same in the knowledge of the benefits of conserving the Lawuba wetland. On the basis of this evidence, the two variables are not important in explaining the knowledge of individuals. This is still not surprising in this context because most of the environmental awareness campaigns, including the TRC educational programmes, are available to everyone within that the reach of the network. This is also the case with age, as different age classes are not denied access to the environmental issue campaign.

The children and older people have an equal likelihood of hearing about the degrading of the wetland, therefore the educational campaign should target everyone, regardless of their age. As indicated by Olaleye (2012), most destruction of wetlands is attributable to overgrazing by livestock which are looked after by the herdboys of different ages. Therefore, class of age is not important in determining the knowledge of KWA threats.

4.2.2 Awareness of factors promoting sustainability of KWA

The purpose of this section was to establish whether the respondents were aware of the factors that promote KWA sustainability. The following questions were asked to establish the knowledge of respondents on the conservation measures of KWA: Drawing of water from KWA should be controlled by charging fees; grazing should be managed by paying grazing fees; animal trampling from KWA must be controlled by fencing; harvest of medicinal plants from KWA should be regulated by licensing the users; hunting of wildlife from KWA should be protected through tax; it is not a waste of money to pay stewards from KWA to regulate entrance into the wetland; it is not only the responsibility of the government to conserve KWA

for peoples' benefits, and it is the responsibility of each household to contribute for KWA's management for securing sustainable water supply in each household.

In order to pursue this purpose, the respondents were asked to indicate their levels of knowledge on factors that promote sustainability of KWA, which are shown in Table 4.3 below. Respondents were given a six-point Likert scale to show their degree of agreement on KWA conservation factors, namely strongly agree, agree, not sure, disagree, strongly agree, and, I do not know. The results are presented in the form of statistical analysis.

Table 4.3: Awareness of the factors that promote sustainability of KWA

Factors	Organisation	Strongly agree	Agree	Not sure	Disagree	Strongly agree	Don't know
Drawing of water from KWA should be controlled by charging fees	TRC	75(73.5 %)	7(6.9 %)	3(2.9 %)	8(7.8 %)	7(6.9 %)	2(2.0 %)
	Government	66(64.7 %)	10(9.8 %)	8(7.8 %)	9(8.8 %)	9(8.8 %)	0(0 %)
	Total	141(67.1 %)	17(8.3 %)	11(5.4 %)	17(8.3 %)	16(7.8 %)	2(1.0 %)
Grazing should be managed by paying grazing fees	TRC	78(76.5 %)	7(6.9 %)	6(5.9 %)	3(2.9 %)	6(5.9 %)	2(2.0 %)
	Government	66(64.7 %)	9(8.8 %)	9(8.8 %)	14(13.7 %)	4(3.9 %)	0(0 %)
	Total	144(70.6 %)	16(7.8 %)	15(7.4 %)	17(8.3 %)	10(4.9 %)	2(1.0 %)
Animal trampling from KWA must be controlled by fencing	TRC	96(94.1 %)	2(2.0 %)	0(0 %)	2(2.0 %)	0(0 %)	2(2.0 %)
	Government	83(81.4 %)	14(13.7 %)	5(4.9 %)	0(0 %)	0(0 %)	0(0 %)
	Total	179(87.7 %)	16(7.8 %)	5(2.5 %)	2(1.0 %)	0(0 %)	2(1.0 %)
Harvest of medicinal plants from KWA should be regulated by licencing the users	TRC	90(88.2 %)	8(7.8 %)	1(1.0 %)	0(0 %)	1(1.0 %)	2(2.0 %)
	Government	84(82.4 %)	9(8.8 %)	4(3.9 %)	5(4.9 %)	0(0 %)	0(0 %)
	Total	174(85.3 %)	17(8.3 %)	5(2.5 %)	5(4.9 %)	1(0.5 %)	2(1.0 %)
Hunting of wildlife from KWA should be protected through tax	TRC	82(80.4 %)	10(9.8 %)	3(2.9 %)	3(2.9 %)	2(2.0 %)	2(2.0 %)
	Government	78(76.5 %)	14(13.7 %)	6(5.9 %)	4(3.9 %)	0(0 %)	0(0 %)
	Total	160(78.4 %)	24(11.8 %)	9(4.4 %)	7(3.4 %)	2(1.0 %)	2(1.0 %)
It is not a waste of money to pay stewards from KWA to regulate entrance into the wetland	TRC	85(83.5 %)	12(11.8 %)	2(2.0 %)	1(1.0 %)	0(0 %)	2(2.0 %)
	Government	85(83.5 %)	8(7.8 %)	4(3.9 %)	2(2.0 %)	3(2.9 %)	0(0 %)
	Total	170(83.3 %)	20(9.8 %)	6(2.9 %)	3(1.5 %)		

						3(1.5 %)	2(1.0 %)
It is not only the responsibility of the government to conserve KWA for peoples' benefits	TRC	86(84.3 %)	8(7.8 %)	1(1.0 %)	3(2.9 %)	2(2.0 %)	2(2.0 %)
	Government	82(80.4 %)	11(10.8 %)	4(3.9 %)	3(2.9 %)	2(2.0 %)	0(0 %)
	Total	168(82.4 %)	19(9.3 %)	5(2.5 %)	6(2.9 %)	4(2.0 %)	2(1.0 %)
It is the responsibility of each household to contribute for KWA's management for securing sustainable water supply in each household.	TRC	75(73.5 %)	14(13.7 %)	2(2.0 %)	5(4.9 %)	4(3.9 %)	2(2.0 %)
	Government	77(75.5 %)	14(13.7 %)	5(4.9 %)	5(4.9 %)	1(1.0 %)	0(0 %)
	Total	152(74.5 %)	28(13.7 %)	7(3.4 %)	10(4.9 %)	5(2.5 %)	2(1.0 %)

Source: Author's elaboration

Note: The frequencies are shown outside the brackets, while the percentages are shown inside the brackets

The conclusion that can be drawn from these results is that the respondents have a high level of awareness concerning the factors that promote sustainability of KWA. Generally, the proportion of 'strongly agree' is greater than 70 % in total, for both split samples. There are relatively very few respondents who 'disagree' with the conservation factors. As indicated earlier, some of the respondents were farmers, so it likely that they were disagreeing in favour of their animals to secure continued access to grazing on KWA. However, this number is very low and it does not overshadow the fact that more people indicated their knowledge on the conservation aspect of KWA.

To further investigate the robustness of the results, chi-square (x^2) tests and a one-way Analysis of Variance (ANOVA) were used to verify the potential influence of the socio-economic variables of gender, education, age and income, on the knowledge of the households about the threats of KWA. Most of the variables, like income and age which were designed to operationally capture this objective, seemed to be statistically significant, which is shown by the results of the x^2 tests which fail to reject the null hypothesis of equal variation of households' knowledge concerning socio-economic variables. The chi-square (x^2) test was used where the two variables are categorical, while the ANOVA F-test was used where one variable was categorical, while the other variable was continuous, and in this case, income and age were continuous. The results of the x^2 and F-test are reported in Table 4.4 below:

Table 4.4: Influence of gender, education, age and income on the respondents' knowledge about the factors promoting sustainability of KWA

Variables	Gender	Education	Age	Income
Drawing of water from KWA should be controlled by charging fees	54.67 (0.041)**	29.924 (0.227)	0.68 (0.936)	1.21 (0.207)
Grazing should be managed by paying grazing fees	9.485 (0.091)*	37.730 (0.049)**	1.10 (0.325)	1.06 (0.383)
Animal trampling from KWA must be controlled by fencing	2.621 (0.623)	24.336 (0.228)	0.52 (0.995)	1.01 (0.464)
Harvest of medicinal plants from KWA should be regulated by licencing the users	1.455 (0.918)	46.698 (0.005)***	0.59 (0.978)	0.84 (0.740)
Hunting of wildlife from KWA should be protected through tax	7.734 (0.172)	36.765 (0.061)*	0.83 (0.768)	1.12 (0.310)
It is not a waste of money to pay stewards from KWA to regulate entrance into the wetland	8.053 (0.153)	19.519 (0.772)	0.50 (0.996)	1.86 (0.004)***
It is not only the responsibility of the government to conserve KWA for peoples' benefits	4.736 (0.449)	12.209 (0.985)	0.96 (0.555)	1.45 (0.056)*
It is the responsibility of each household to contribute for KWA's management for securing sustainable water supply in each household.	5.379 (0.371)	19.107 (0.792)	0.70 (0.916)	1.17 (0.248)

Source: Author's elaboration

*Note: *, ** and ***show the statistical levels of significance, at 10 %, 5 % and 1 %, respectively*

From the above results, income seems to be statistically significant in determining the knowledge on the factors affecting sustainability of KWA. The relationship between the variable of 'It is not a waste of money to pay stewards from KWA to regulate entrance into the wetland' and level of income is statistically significant at 1 %. This was also the case in the conservation of Lawuba wetland studied by Mahlalela (2014), where the variable of 'it is not the waste of money and resource to conserve wetland even when people are poor and are short of land' was found to have relationship with income that was statistically significant at 1 %. The relationship of another variable of 'it is not only the responsibility of the government to conserve KWA for peoples' benefits' and level of income was statistically significant at 10 %.

This shows that a family with a lower income is likely to be more knowledgeable about conservation of KWA. The probability of this relationship is attributable to the factor of poverty, stated earlier that they depend heavily on wetland for their living. This is also in line with findings which indicated that in Craigieburn in South Africa, 73 % of the households around that wetland made use of the wetland's provisioning ecosystem services hence tend to know more about the threats and conservation of the wetland. Of these households, 63 % were from the lowest wealth group and received only occasional incomes, with many dependents relying on that wetland (Adekola at al., 2012).

It also makes logical sense that the people who depend heavily on a wetland may demand conservation of the wetland so as to sustain their livelihood. This is also in line with the two variables, which are statistically significant, that there has to be money for wetland stewards to regulate entrance in the wetland site, and that it is not only the responsibility of government to conserve wetland. People seem to understand conservation and its importance in their livelihoods. The study conducted by Rahman et al (2012) showed that poverty resulted in a decrease in fishing resources in the coastal wetland of Bangladesh, which forced people to resort to other alternative means of survival, such as poultry, livestock and crop production. This shows that the use of that wetland was undergoing tremendous pressure that resulted in unsustainable harvests of wetland resources. This should serve as a wake-up call for most poor people and serve as an incentive to conserve, for their own good.

The gender variable is also statistically significant in influencing the knowledge of factors affecting sustainability of KWA. The relationship between the two variables of 'drawing of water from KWA should be controlled by charging fees' and gender is statistically significant at the level of 5 %. Another variable of knowledge, 'grazing should be managed by paying grazing fees' appears to have a statistical relationship of 10 % with gender. This suggests that women have more knowledge about the conservation of the wetland. The reason might be that women constitute the higher proportion in this study, numbering 75.5 %. Another reason was that most of the males were not present during the survey because they are breadwinners, working in the neighbouring country of South Africa, hence they do not have access to local knowledge through KWA local media.

Moreover, the education variable is found to be significant in influencing the level of knowledge in factors affecting the conservation of KWA. Education was found to have positive sign and statistically significant, which means that knowledge of wetland conservation increases with the level of education. In essence, this shows that the more educated people are

able to understand the factors affecting wetland conservation. This is shown by the relationship between the variable of knowledge stated as 'grazing should be managed by paying grazing fees' and education, which is statistically significant at the level of 5 %. This is understandable, as many people who do not have livestock reside in town where the study was done, and the wetland is a rural-based ecosystem, so people would want animals to be taxed through grazing fee. It might be the case that the more educated people know much about the destruction caused by animals and the measures to control overgrazing. Another point might be that the less educated people are the main users of the wetlands through livestock grazing, so they could hardly speak against livestock needs. Accordingly, education plays an important role in the knowledge of wetland conservation. This is not surprising as in most occasions educated people are expected to have considerable knowledge about environmental issues including wetland conservation.

Another variable, 'Harvest of medicinal plants from KWA should be regulated by licencing the users', was also found to have a statistical relationship with education, at a level of significance of 1 %. This is brought about by the increasing concern about the illegal harvesting of medicinal plants, which are also sold in South Africa, so the government has been raising awareness on that issue. Therefore, people with higher levels of education are able to understand quickly and willing to accept innovations. Accordingly, people with higher levels of education have more knowledge about the conservation of the wetland. Moreover, the variable of 'hunting of wildlife from KWA should be protected through tax' is also statistically related with education, at the level of significance of 10 %. This issue of extinction of wildlife has received great attention from scholars, worldwide, and from the government, which called for more research on conserving wildlife. Therefore, there is no doubt that educated people are better able to learn about the conservation of wetland in favour of wildlife. The variable of age seems to have no influence on the conservation measures for the wetland. This is shown by the reasons laid earlier in this study.

4.2.3 Knowledge about the availability of water from KWA

The purpose of this section was to ascertain whether the respondents factually knew that the problem of water availability can be mitigated by KWA conservation. The following questions were asked to establish the knowledge of respondents on the problem of water availability from KWA which is consumed in their households: There is a problem of water shortage which can be mitigated by conservation of KWA; there is a problem of water-borne diseases which can

be eliminated by conservation of KWA; there is a shortage of irrigation water that can be addressed by conservation of KWA; there is a problem with expensive alternative water sources which can be addressed by conserving KWA; there is a problem of reduced crop production that can be eliminated by conserving KWA; there is a problem of using wasted water which can be solved by conservation of KWA and there is a problem of far, alternative water sources that can be solved by conservation of KWA.

To determine the respondents' knowledge on the availability of water, they were asked to show their degree of agreement on the following statements using a six-point Likert scale, namely strongly agree, agree, not sure, disagree, strongly disagree, and, I do not know.

Table 4.5: knowledge on water availability from KWA

Statements	Organisation	Strongly agree	Agree	Not sure	Disagree	Don't know
There is a problem of water shortage which can be mitigated by conservation of KWA	TRC	94(92.2 %)	4(3.9 %)	4(3.9 %)	0(0 %)	0(0 %)
	Government	93(91.2 %)	7(6.9 %)	2(2.0 %)	0(0 %)	0(0 %)
	Total	187(91.7 %)	11(5.4 %)	6(2.9 %)	0(0 %)	0(0 %)
There is a problem of water borne diseases which can be eliminated by conservation of KWA	TRC	92(90.2 %)	5(4.9 %)	5(49 %)	0(0 %)	0(0 %)
	Government	93(91.2 %)	7(6.9 %)	2(2.0 %)	0(0 %)	0(0 %)
	Total	185(90.7 %)	12(5.9 %)	7(3.4 %)	0(0 %)	0(0 %)
There is a shortage of irrigation water that can be addressed by conservation of KWA	TRC	94(92.2 %)	5(4.9 %)	3(2.9 %)	0(0 %)	0(0 %)
	Government	90(88.2 %)	10(9.8 %)	2(2.0 %)	0(0 %)	0(0 %)
	Total	184(90.2 %)	15(7.4 %)	5(2.6 %)	0(0 %)	0(0 %)
There is a problem expensive alternative water source which can be addressed by conserving KWA	TRC	85(83.3 %)	11(10.8 %)	6(5.9 %)	0(0 %)	0(0 %)
	Government	87(85.3 %)	12(11.8 %)	3(2.9 %)	0(0 %)	0(0 %)
	Total	172(84.3 %)	23(11.3 %)	9(4.4 %)	0(0 %)	0(0 %)
There is a problem of reduce crop production that can be eliminated by conserving KWA	TRC	91(89.2 %)	7(6.9 %)	4(3.9 %)	0(0 %)	0(0 %)
	Government	87(85.3 %)	13(12.7 %)	2(2.0 %)	0(0 %)	0(0 %)
	Total	178(87.3 %)	20(9.8 %)	6(2.9 %)	0(0 %)	0(0 %)
There is a problem of using wasted water which can be solved by conservation of KWA	TRC	88(86.3 %)	3(2.9 %)	4(3.9 %)	7(6.9 %)	0(0 %)
	Government	81(79.4 %)	12(11.8 %)	2(2.0 %)	6(5.9 %)	1(1.0 %)
	Total	169(82.8 %)	15(7.4 %)	6(2.9 %)	13(6.4 %)	1(0.5 %)
There is a problem of far alternative water source that can be solved by conservation of KWA	TRC	90(88.2 %)	7(6.9 %)	3(2.9 %)	2(2.0 %)	0(0 %)
	Government	82(80.4 %)	15(14.7 %)	3(2.9 %)	1(1.0 %)	1(1.0 %)
	Total	172(84.3 %)	22(10.8 %)	6(2.9 %)	3(1.5 %)	1(0.5 %)

Source: Author's elaboration

Note: The frequencies are shown outside the brackets, while the percentages are shown inside the brackets.

From the statistical results, it possible to conclude that the respondents know about the problem of availability of water and the conservation measures that can mitigate the problem. This is indicated by the considerably high 'strongly agree' response rate, which is greater than 80 % in total for both split samples. The 'strongly disagree' column is deleted intentionally, as there were no responses under that option. However, there are relatively very few responses on the 'disagree' option, specifically with the two statements which say 'there is a problem of using wasted water which can be solved by conservation of KWA and that there is a problem of the far (distant) alternative water sources that can be solved by conservation of KWA', which are 6.4 % and 1.5 % in total for the two split samples.

To further investigate the robustness of the results, chi-square (x^2) tests and a one-way Analysis of Variance (ANOVA) were used verify the potential influence of the socio-economic variables of gender, education, age and income on knowledge of the households about the threats of KWA. Most of the variables, like income and age which were designed to operationally capture this objective, seemed to be statistically significant, which is shown by the results of the x^2 tests which fail to reject the null hypothesis of equal variation of households' knowledge with socio-economic variables. The chi-square (x^2) was used where the two variables are categorical, while the ANOVA F-test was used where one variable was categorical, while the other variable was continuous, and in this case income and age were continuous. The results of the x^2 and F-test are reported in Table 4.6 below:

Table 4.6: Influence of gender, education, age and income on the respondents' knowledge about the factors affecting the problem of availability of water of KWA

Variables	Gender	Education	Age	Income
There is a problem of water shortage which can be mitigated by conservation of KWA	5.706 (0.058)*	8.028 (0.626)	0.81 (0.789)	1.24 (0.174)
There is a problem of water borne diseases which can be eliminated by conservation of KWA	4.056 (0.132)	6.018 (0.814)	1.13 (0.290)	0.97 (0.529)
There is a shortage of irrigation water that can be addressed by conservation of KWA	1.730 (0.421)	5.738 (0.837)	0.75 (0.281)	0.93 (0.591)
There is a problem expensive alternative water source which can be addressed by conserving KWA	2.579 (0.275)	8.213 (0.608)	0.80 (0.807)	0.67 (0.931)
There is a problem of reduce crop production that can be eliminated by conserving KWA	6.480 (0.039)**	15.506 (0.115)	0.52 (0.994)	0.95 (0.558)
There is a problem of using wasted water which can be solved by conservation of KWA	2.687 (0.612)	15.603 (0.741)	1.53 (0.030)**	0.90 (0.645)
There is a problem of far alternative water source that can be solved by conservation of KWA	1.944 (0.746)	12.321 (0.905)	1.08 (0.352)	0.55 (0.987)

Source: Author's elaboration

*Note: *, ** and ***shows the statistical level of significance at 10 %, 5 % and 1 % respectively*

From the above results, the variable of gender seems to have influence on the knowledge about the availability of water. This suggests that females have greater knowledge than men do on the availability of water. This is shown be the relationship between the variable of knowledge on the variable 'there is a problem of water shortage which can be mitigated by conservation of KWA' and gender, which is statistically significant at the level of 10 %. These results are not amazing as the women are responsible for cooking and fetching water for the family, so they are more likely to know more about the water shortage in the household. Another variable on knowledge, 'there is a problem of reduced crop production that can be eliminated by conserving KWA', was also found to have statistical relationship with gender, at the level of significance of 5 %. Again, this is not surprising as more women have catering businesses, so they grow horticultural crops to meet customers' dietary demands on a daily basis. Therefore, women would be expected to know much about effects of problems of water on crop production.

Other variables, like education, age and income, were found to be insignificant in influencing the knowledge of people about the availability of water. These results suggest that knowledge of availability of water in the household does not depend on education and age. This shows that the water availability problem is a family problem, so everyone in the family experiences the problem, regardless of education and age. Children are also told about the consequences of the water shortage problem at school, including about hygienic measures to take. The factor of income also does not have a bearing on the knowledge about the water problem in the family.

4.2.4 Attitudes towards conservation of KWA

The purpose of this section was to determine the respondents' attitudes towards the conservation of KWA. In the earlier statistical analysis, the study showed that the respondents factually know about the threats, the factors promoting sustainability of KWA, and the problem of water availability and the conservation measures. Since the respondents demonstrated high levels of factual knowledge on those aspects which were shown by statistical analysis, it becomes reasonable for the study to ask questions exploring their attitudes towards conservation of KWA. To achieve this objective, the study asked respondents to indicate their level of agreement with the following statements: The conservation of KWA is important to secure water you consume in your household, KWA conservation is crucial to promote habitat of wildlife like rabbit, birds and others, the conservation of KWA is essential for recreational activity such as swimming, aesthetic and others, KWA conservation is helpful to secure alternative source of income through sales of traditional hats (Mokorotlo, tshetshe and others) from its fibre, the conservation of KWA is essential to protect medicinal plants found in the wetland area, the conservation of KWA is crucial to secure fibre found on the wetland, and KWA conservation is good for flood regulation during heavy rains.

The six-point Likert scale offered the following choices: strongly agree, agree, not sure, disagree, strongly disagree, and, I do not know. The statistical results are reported in Table 4.7 below, where the aforementioned variables were used to capture the construct attitude.

Table 4.7: Attitudes towards conservation of KWA

Conservation	Organisation	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Don't know
The conservation of KWA is important to secure water you consume in your household	TRC	91(89.2 %)	5(4.9 %)	5(4.9 %)	0(0.0 %)	0(0 %)	1(1 %)
	Government	93(91.2 %)	8(7.8 %)	1(1.0 %)	0(0.0 %)	0(0 %)	0(0 %)
	Total	184(90.2 %)	13(6.4 %)	6(2.9 %)	0(0.0 %)	0(0 %)	1(0.5 %)
KWA conservation is crucial to promote habitant of wildlife like rabbit, birds, etc.	TRC	81(79.4 %)	8(7.8 %)	10(9.8 %)	2(2.0 %)	0(0 %)	1(1 %)
	Government	78(76.5 %)	17(16.7 %)	3(2.9 %)	3(2.9 %)	1(1.0 %)	0(0 %)
	Total	159(77.9 %)	25(12.3 %)	13(6.4 %)	5(2.5 %)	1(0.5 %)	1(0.5 %)
The conservation of KWA is essential for recreational activity such as swimming, aesthetic, etc.	TRC	72(70.6 %)	10(9.8 %)	9(8.8 %)	7(6.9 %)	3(2.9 %)	1(1 %)
	Government	73(71.6 %)	17(16.7 %)	6(5.9 %)	4(3.9 %)	2(2.0 %)	0(0 %)
	Total	145(71.1 %)	27(13.2 %)	15(7.4 %)	11(5.4 %)	5(2.5 %)	1(0.5 %)
KWA conservation is helpful to secure alternative source of income through sales of traditional hats (Mokorotlo, tshetshe etc.) from its fibre	TRC	88(86.3 %)	8(7.8 %)	5(4.9 %)	0(0.0 %)	0(0 %)	1(1 %)
	Government	86(84.3 %)	14(13.7 %)	2(2.0 %)	0(0.0 %)	0(0 %)	0(0 %)
	Total	174(85.3 %)	22(10.8 %)	7(3.4 %)	0(0 %)	0(0 %)	1(0.5 %)
The conservation of KWA is essential to protect medicinal plants found in the wetland area	TRC	90(88.2 %)	7(6.9 %)	3(2.9 %)	0(0 %)	0(0 %)	1(1 %)
	Government	88(86.3 %)	12(11.8 %)	2(2.0 %)	0(0 %)	0(0 %)	0(0 %)
	Total	178(87.3 %)	19(9.3 %)	5(2.5 %)	0(0 %)	0(0 %)	1(0.5 %)
The conservation of KWA is crucial to secure fibre found on the wetland	TRC	84(82.4 %)	12(11.8 %)	4(3.9 %)	0(0 %)	0(0 %)	2(2.0 %)
	Government	81(79.4 %)	18(17.6 %)	3(2.9 %)	0(0 %)	0(0 %)	0(0 %)
	Total	165(80.9 %)	30(14.7 %)	7(3.4 %)	0(0 %)	0(0 %)	2(1.0 %)

KWA conservation is good for flood regulation during heavy rains	TRC	81(79.4 %)	13(12.7 %)	6(5.9 %)	0(0 %)	0(0 %)	2(2.0 %)
	Government	75(73.5 %)	19(18.6 %)	8(7.8 %)	0(0 %)	0(0 %)	0(0 %)
	Total	156(76.5 %)	32(15.7 %)	14(6.9 %)	0(0 %)	0(0 %)	2(1.0 %)

Source: Author's elaboration

Note: The frequencies are shown outside the brackets, while the percentages are shown inside the brackets

From the statistical results, the study established that the respondents have adequate factual knowledge about the threats of KWA, knowledge about factors promoting sustainability of KWA, and knowledge about the conservation benefits of KWA. By the same token, the study confidently concludes that the respondents have better, positive attitudes towards conservation KWA.

To further investigate the robustness of the results, chi-square (x^2) tests and a one-way Analysis of Variance (ANOVA) were used to verify the potential influence of socio-economic variables of gender, education, age and income on attitudes of the households towards conservation of KWA. Most of the variables, like income and age which were designed to operationally capture this objective, seemed to be statistically significant, which is shown by the results of the x^2 tests which fail to reject the null hypothesis of equal variation of households' attitudes towards conservation of KWA with socio-economic variables. The chi-square (x^2) was used where the two variables are categorical, while the ANOVA F-test was used where one variable was categorical, while the other variable was continuous, and in this case income and age were continuous. The results of the x^2 and F-test are reported in Table 4.8 below.

Table 4.8: Influence of gender, education, age and income on the respondents' attitudes towards conservation of KWA

Variables	Gender	Education	Age	Income
The conservation of KWA is important to secure water you consume in your household	2.8543 (0.415)	6.835 (0.962)	1.02 (0.455)	1.93 (0.002)***
KWA conservation is crucial to promote habitant of wildlife like rabbit, birds etc.	4.976 (0.419)	15.237 (0.936)	1.08 (0.349)	2.02 (0.001)***
The conservation of KWA is essential for recreational activity such as swimming, aesthetic etc.	3.069 (0.689)	27.695 (0.322)	1.06 (0.393)	1.85 (0.004)***
KWA conservation is helpful to secure alternative source of income through sales of traditional hats (Mokorotlo, tshetshe etc.) from its fibre	3.110 (0.375)	16.96 (0.321)	0.72 (0.905)	1.63 (0.018)**
The conservation of KWA is essential to protect medicinal plants found in the wetland area	3.090 (0.378)	7.024 (0.957)	0.48 (0.997)	1.45 (0.055)*
The conservation of KWA is crucial to secure fibre found on the wetland	2.073 (0.557)	6.601 (0.968)	0.70 (0.920)	1.17 (0.249)
KWA conservation is good for flood regulation during heavy rains	2.148 (0.542)	19.949 (0.174)	0.75 (0.870)	1.25 (0.184)

Source: Author's elaboration

*Note: *, ** and ***shows the statistical levels of significance, at 10 %, 5 % and 1 %, respectively*

From the results above, gender does not seem to have influence on the respondent's attitude toward conservation of KWA. These results are not surprising, as the attitudes are not determined by being a male or female. This shows that women and men are not different in terms of their attitudes towards conservation of KWA. This also makes sense, as the study was done in an urban area where the respondents were not direct, daily users of the wetland, like those in the rural area are. In the rural areas, the men use the wetlands more often for their animal grazing, which was not the case in this study.

Education appears to have no influence on the respondents' attitudes towards wetland conservation. This variable has an expected sign and it is statistically insignificant in

influencing the attitudes of respondents towards conservation. The results suggest that attitudes are not stimulated by education, but rather the attitude is an internal and natural characteristic. In order for a person to hold attitudes towards something, it will depend on the tastes and preferences of that individual. Attitudes are influenced by upbringing and life experiences, which suggests that if people are involved directly in the conservation of wetlands, they are likely to develop favourable conservation attitudes.

The variable of age was found to have the expected positive sign, but it is statistically insignificant in determining respondents' attitudes toward conservation. This is not surprising, as the age variable was also found insignificant in the studies conducted by Sah and Heinen (2001) and Mahlalela (2014) in capturing attitudes. Therefore, this study is not an exception when the age variable is also not statistically significant in determining the attitudes of the respondents towards conservation of KWA. Attitudes do not grow with age, but rather the two are independent, as attitudes are determined by the underlying preferences of individuals.

The variable for income was found to have the expected sign and it was statistically significant in capturing attitude. This suggests that the households with lower incomes are more likely to have positive attitudes towards conservation so as to sustain the wetland to reap continued benefits from the wetlands. This relationship is statistically significant at the level of 1 % for the variables 'the conservation of KWA is important to secure water you consume in your household', 'KWA conservation is crucial to promote habitant of wildlife like rabbit, birds and others' and 'the conservation of KWA is essential for recreational activity such as swimming, aesthetic and others'. The statistical relationship was also seen with the variable 'KWA conservation is helpful to secure alternative source of income through sales of traditional hats (Mokorotlo, tshetshe, etc.) from its fibre' at the significance level of 5 %, while the variable 'the conservation of KWA is essential to protect medicinal plants found in the wetland area' show a statistical relationship with income at a significance level of 1 %. With this evidence, it can be said that poorer people are more likely to have positive attitudes towards conservation than affluent people do. More interestingly, these results are in line with the findings of other studies which captured relationships between income and attitudes. The study conducted by Mahlalela (2014) on Lawuba wetland valuation in Swaziland indicated that income had the expected sign and it was statistically significant in influencing attitudes towards conservation of Lawuba wetlands. Another study which holds the same view was done by Mironga (2005) in Kenya, which found that income was an important variable in influencing attitude toward conservation of wetland in Akisii district.

The level of people's knowledge, attitudes and perceptions is a serious issue in wetland management and conservation. The study conducted by Atreya et al (2015) in Nepal shows that only 18 % of community people were participating in conservation of wetlands and an awareness programme. The study further indicates that meetings, workshops, training, seedling plantation and clean-up play an important role in creating awareness. The ratings of the study indicate that 69 % of the migrant people, and 63 % of the indigenous people, rated conservation as good, while 28 % of the migrant people and 36 % of the indigenous people rated conservation as very good.

4.3 ECONOMIC VALUATION OF WATER FROM KWA

4.3.1 Contingent valuation method

The purpose of this section is to determine the WTP for the sustainable water supply in the urban area of the Botha-Bothe district. To pursue this objective, the estimation of WTP was done using the dichotomous model in STATA. The dataset of the two split samples was used to estimate each mean WTP for sustainable water supply for urban households. The questionnaire used dichotomous questions with a follow-up question, that is, a bidding game was used to elicit individual WTP.

Before estimating WTP for each subsample, it is important to explore the distribution of the initial bids of the data set.

4.3.1.1 Distribution of the amount of initial bid

Environmental economists consider that environmental goods resemble market goods which respond to the law of demand. The law of demand shows negative relationship between price and quantity demanded, ceteris paribus. In the case of environmental goods, the prices are equated to the bids predetermined by the researcher, while the quantity demanded is showed by the response rates to those bids. Therefore, it is recommended that the distribution of first bid (bid1) responses should be ascertained. It is important to check whether the contingent valuation data reveal that individuals are sensible to the bid amount, which will be shown by a lower proportion of 'yes' responses as the amount of bids increase.

4.3.2 WTP for wetland conservation by government

Table 4.9: Proportions of bid1 responses

Response 1	**Bid1**			
	30	50	70	Total
No	15	16	18	49
	(44.12)	(47.06)	(52.94)	(48.04)
Yes	19	18	16	53
	(55.88)	(52.94)	(47.06)	(51.96)
Total	34	34	34	102

Note: The numbers in parenthesis are the percentages and frequencies above

From the results shown in Table 4.9 above, it will be seen that there is a total number of 102 respondents, which was divided into three groups with different starting bids, each group with exactly the same number of respondents. The 'yes' response rate appears to decrease with the increase in the amount given in the bids. This is not surprising, as the increase in bids renders the good under consideration to become expensive, hence reducing the responses which vote for the bids. According to Navrud (2000), the price sensitivity towards the environmental good under consideration can be tested in a binary discrete choice format by observing the behaviour or responses attributable to the increase in random prices predetermined by the researcher. This implies that the higher the cost (bids) of the KWA's water go, the lower the demand for the water will be, which is also in line with the law of demand. The results furthermore show that there more than 50 % of respondents gave 'yes', rather than 'no' responses. Almost 52 % of the respondents, in total, said 'yes' to the initial bids. Therefore, it is reasonable to proceed with the further analysis and the econometric estimation of WTP.

4.3.1.2 Econometric estimation of double-bounded model without covariates

Table 4.10: Estimates of Beta and Sigma

	Coefficient	**Std. Error**	**z**	**P>z**	**95 % Conf. Interval**	
Beta	76.75953	3.660609	20.97	0.000	69.58487	83.9342
Sigma	22.13211	3.138302	7.05	0.000	15.98116	28.28307

Number of observations = 68 **Log likelihood = -64.48**

Source: Author's elaboration

The above results of the double bound methods show the estimation of the WTP without the covariates. Since the double bound command directly estimates β hat, the formula of WTP is $Z\hat{\beta}$. Therefore, in this case WTP is represented by Beta estimate and it is approximately 76 Maloti. The WTP is also statistically significant. In order to explore the importance of socio-

economic factors, the knowledge, attitudes and other factors that capture perception of the respondents, the WTP is estimated below with the socio-economic covariates.

4.3.3 Econometric estimation of double-bonded with covariates

After performing descriptive analysis, it is easier to see the distribution of data and the model relevant to fit the data. The preliminary analysis of the descriptive statistics above permits econometric estimation of mean WTP using socio-economic characteristics, as the data seemed to behave well for further analysis. It is also advisable to remove protest zero bids before estimating the mean WTP which is also the case in this study. The protest bids are those zero bids given for reasons other than zero value being placed on the resource under consideration (Bolt et al., 2005). For example, a respondent may refuse to indicate any WTP amount for conserving wetland for continued water provisioning ecosystem service, for the reasons that it is a public good or it is the responsibility of government to provide improved wetland services. For these reasons, the respondent is taken as protesting against the programme of wetland improvement. The results of the double-bounded model after removal of protest bids are presented in Table 4.10 below:

Table 4.11: Influence of socio-economic factors on WTP

Variables	Coefficient	Std. Error	z	P>z	95 % Conf. Interval	
Gender	20.52711	6.770494	3.03	0.002	7.257184	33.79703
Income	0.0014221	0.0010415	1.37	0.172	-0.0006193	0.0034635
Age	0.3034492	0.283532	1.07	0.285	-0.2522634	0.8591618
Education: Primary	36.35526	17.64738	2.06	0.039	1.767028	70.94349
Secondary	27.4836	8.381862	3.28	0.001	11.05546	43.91175
High schol	21.72237	6.342191	3.43	0.001	9.291909	34.15284
Tertiary	22.9426	9.781645	2.35	0.019	3.77093	42.11427
Health awareness	20.6251	8.057262	2.56	0.010	4.833152	36.41704
Household size	4.739894	1.603081	2.96	0.003	1.597912	7.881875
Dry season problem	8.350197	5.978899	1.40	0.163	-3.368231	20.06862
Constant	-6.592433	18.75809	-0.35	0.725	-43.35761	30.17274
Sigma	14.70366	2.179591	6.75	0.000	10.43174	18.97558

Number of observations = 67 **Wald chi2 (10) = 37.92** **Probability chi2 = 0.000**

Source: Authors elaboration

In estimating the determinants of WTP for continued water provisioning ecosystem service from KWA, some variables were dropped off because they were not statistically significant. The statistical results set out above show the significance of the covariates included in the model. This is shown by the Wald chi2 (10) of 37.92 with the probability of 0.000, showing the overall statistical significance of the model. Gender coefficient has positive sign and it is statistically significant in determining respondents' WTP. This shows that males were more willing to pay than females for the proposed programme of wetland conservation. This is not surprising, as the WTP was meant to conserve the wetlands which could work in favour of animal grazing or water supply at the cattle posts during livestock seasonal migration, as the men value animals very highly in Lesotho. Besides, it is men who extract fibre for traditional

hat-making in the mountains where the wetland lies, as it is not a safe place for women, and this could influence men to be receptive to the conservation policy of the KWA. Income also has the expected positive sign and this is in line with the literature (Whittington et al, 1990, 1991; Khan et al., 2010) which shows that the more income a household has, the more the household is WTP for improved service. This shows that wetland conservation is a normal good to these beneficiaries of KWA, as economic theory states that the purchase of normal goods increases with the income of a household. Moreover, age was found to have the expected positive sign, although it is insignificant in determining WTP. Education has the expected positive signs and it is statistically significant in influencing households' WTP, which means that as people get more educated, their understanding of improved services is expected to be higher, hence they are more WTP for conservation of KWA. These results are in line with the studies (Whittington et al., 1989, 1990, 1991; Farolfi et al., 2007; Wright, 2012) which revealed that education increases the awareness of people and renders them more receptive to innovation or improvement policies. Moreover, the household size has a positive sign, which is in accordance with the study conducted by Wright (2012) and Birol et al. (2007) for sustainable wetland management in Cyprus. These studies justified the view that the greater the number of children there are in a household, the more the household is WTP to have improved services. It can be indicated that as the number of a household's members increases, the workload of water collection attributable to increased water consumption also increases, hence leading to a greater WTP for an improved service so as to avoid travelling to distant alternative water sources, like rivers and wells. The health awareness variable has a positive sign and it is statistically significant in influencing households' WTP. These results are not surprising, as Khan et al (2010) indicated that education and awareness through mass media plays a crucial role in households' WTP, and the two were found to be positively and significantly related to WTP. Greater awareness about health problems implies that people would wish to pay more to avoid these health risks, which could lead to deaths in extreme situations. The dry seasonal problem also seems to have an impact on households' WTP. The variable has a positive sign and it is statistically significant in determining WTP. Households show greater WTP for a continued water provisioning ecosystem service from KWA during the dry season, which is normally in September in Lesotho. The seasonal water shortage seemed to cause more inconvenience than regular water shortages do, as people adapt faster to regular water problems than they do to sporadic water shortages. Regular water cuts prompt people to develop contingency plans for accessing alternative water source on time, hence their stress is lower during water shortages, as they would buy tanks or collect water during the rainy season.

4.3.4 Econometric estimation of WTP

The next step is to estimate the mean WTP for the households using the above-indicated socio-economic, knowledge and attitudinal variables. The study used the Krinsky and Robb confidence interval method of estimation, which was proved to be relevant in estimating more reliable mean WTPs than other methods, like arithmetic sample mean determination methods. The results are given in Table 4.11 below.

Table 4.12: Constructing Krinsky and Robb Confidence interval for WTP for Government

	Coefficient	Std. Error	z	P>z	95 % Conf. Interval	
WTP	78.80216	3.433189	22.95	0.000	72.07323	85.53109
Lower bound	M38.21					
Upper bound	M92.89					

Source: Authors elaboration

The above results demonstrate a great deal of information about the mean WTP estimation which is the welfare measure. For instance, the estimation of welfare measure without the covariates is lower (M76.76) while the inclusion of socio-economic, knowledge and attitudinal factors in the analysis inflated the welfare measure to M78.80. This results are not particular surprising as the previous studies (Wright, 2012; Birol et al., 2007; Farolfi et al., 2007; Khan et al., 2010) also justify that these factors affect respondent WTP. The mean WTP for the government subsample is M78.80, which reflects the additional charge on top of a household's monthly water bill that each household was willing to pay to the Water and Sewage Authority (WASA) of Lesotho. This indicates that households were willing to pay M78.80, on average, as a conservation charge for a continued water provisioning ecosystem service from KWA when the government was hypothesised to be responsible for collection of conservation funds for KWA. The mean WTP value appears to have been estimated precisely, as the 95 % confidence interval seemed is narrower. This indicates that there is 95 % confidence that the true mean value of the population lies between the two values of M72.07 and M85.53. This confidence interval is partly attributable to the symmetry of the percentage of 'yes' frequency distribution. The study went further to estimate the conservation charge per litre, which indicted that, on average, each household would be expected to pay M0.011 per litre (or M0.21 per 20-litre jerry can) as a conservation charge on top of their monthly water bill, which should be directed to the government's Ministry of Natural Resources as the administrative unit for wetland conservation. This would take place only if the conservation policy is implemented.

In order to give more sense to the estimated conservation charge, the monthly water bill that households currently pay to WASA is M300, on average, per 7500 litres consumed by a person on monthly basis, which reflects M0.04 per litre (or M0.80 per 20-litre jerry can). The proposed increment seemed to be reasonable, as a new monthly water bill would rise to M0.045 per litre (or M1.01 per 20-litre jerry can), as compared with the charges of other alternative water source, like supermarkets, which people use during times of water shortages.

The double-bounded mean WTP of M78.80 is found to lie between the two WTP values of the lower bound and the upper bound, which are M38.21 and M92.89, respectively. The range between the two values seemed to be wider than the confidence interval values given by the built-in routine of the STATA program, at 95 % confidence level, which is assumed to be more reliable than the former is. The built-in routine of maximum likelihood estimation utilises the socio-economic characteristics to generate the confidence interval range, while the arithmetic mean estimation is calculated from the average WTP of no–yes and yes–yes responses to the bid values. Therefore, the confidence interval of the built-in routine that estimates the mean WTP will receive more attention than the arithmetic sample mean values will.

4.3.5 WTP for wetland conservation by TRC

Table 4.13: Distribution of bid1 responses

Response1	**Bid1**			
	30	50	70	Total
No	10 (29.41)	14 (41.18)	18 (52.94)	42 (41.18)
Yes	24 (70.59)	20 (58.82)	16 (47.06)	60 (58.82)
Total	34	34	34	102

Note: The numbers in parenthesis are the percentages and frequencies above

The distribution of initial bids shows a decrease with the increase in the amount of bids for ‘yes’ responses. This shows that the respondents are rational when faced with increasing cost for the service. The ‘no’ responses show an increase with the increase in the amount of bids, which indicates that the higher the cost of the conservation service is, the higher the number of respondents are not willing to pay for conservation. This is in line with expectation because as the bids increase, the service becomes expensive, hence people vote against the service or good under consideration. The response rate for ‘yes’ is also higher than ‘no’ responses. Almost 59 % in total answered ‘yes’ to the bids. These results are also in line with the hypothesis which states that starting bids have impact on the response rate of WTP. Therefore, it is possible to

continue with further analysis and the econometric estimation of the WTP as the distribution of Bid1 (starting bids) are in line with prior expectation.

4.3.5.1 Contingent valuation using dichotomous questions with follow-up

4.3.5.1.1 Econometric estimation using the double-bonded (interval data model)

After descriptive statistics and initial bid distribution, the double-bounded model was found to fit this data well. This is a reliable model, as it allows the efficient use of data to estimate WTP under the assumption that there is a single valuation function behind both answers of *Yes* and *No*. The double-bound command is used for direct estimation of β and σ using a maximum likelihood method. The econometric estimation of the model is set out below.

4.3.5.1.2 Econometric estimation of double-bounded model without covariates

Table 4.14: Estimates of Beta and Sigma

	Coefficient	**Std. Error**	**z**	**P>z**	**95 % Conf. Interval**	
Beta	82.79677	4.780889	17.32	0.000	73.4264	92.16714
Sigma	24.36518	4.036196	6.04	0.000	16.45438	32.27598
Number of observations = 61			**Log likelihood = -52.11**			

Source: Author's elaboration

The statistical results above indicate that, when the private organisation (TRC) is collecting funds for KWA conservation to secure water supply, people are more willing to pay. This is shown by the WTP of approximately M83 when covariates are excluded, which is higher than when government is entrusted with KWA conservation responsibility. The WTP coefficient is also positive and statistically significant as expected. The screening mechanism was also employed before the analysis of the data to remove the zero protests. The next step is to determine whether the socio-economic factors, respondents' knowledge, attitudes and perceptions have statistical bearing on WTP, and the model below in Table 4.15 shows the display of these results.

4.3.5.1.1 Econometric estimation of double-bonded with covariates

Table 4.15: Influence of socio-economic factors on WTP

Variables	Coefficient	Std. Err.	z	P>z	95 % Conf. Interval	
Gender	3.860899	6.86247	0.56	0.574	-9.589295	17.31109
Income	-0.0021979	0.000916	-2.40	0.016	-0.003993	-0.0004026
Age	-0.4371287	0.2719817	-1.61	0.108	-0.970203	0.0959457
Household size	-3.976282	1.604658	-2.48	0.013	-7.121354	-0.8312095
Education: Primary	20.78851	8.910747	2.33	0.020	3.323767	38.25326
Secondary	21.52552	8.368994	2.57	0.010	5.122595	37.92845
Tertiary	17.00419	10.68857	1.59	0.112	-3.945017	37.95341
Dry season problem	15.37786	7.149554	2.15	0.031	1.364992	29.39073
Constant	99.30726	17.71024	5.61	0.000	64.59582	134.0187
Sigma	17.77957	3.071972	5.79	0.000	11.75862	23.80053
Number of observation = 61	Wald chi2 (8) = 20.11		Probability chi2 = 0.0099			

Source: Author's elaboration

The above results demonstrate analytically that the socio-economic variables have considerable implication on the mean welfare measure of the households in conserving KWA for continued water provisioning ecosystem service. In estimating these socio-economic factors for this sub-sample, other variables were not statistically significant and a decision to eliminate them was taken. From the results shown above, the covariates seem to be statistically significant in determining WTP with Wald chi2 of 20.11 and probability of 0.0099. This shows that the aforementioned variables confirm the prior expectation and cannot be excluded from the model, as they are statistically relevant. Gender coefficient has a positive sign, but it is not statistically significant in determining WTP. The income coefficient is significant in determining respondents' WTP and it shows that the WTP increases with a decrease in income. The possible reason for this result might be that poorer people wish to save money in the long run by indicating high WTP for conservation of KWA for continued water provisioning ecosystem service from KWA, as the alternative water sources are very distant and expensive during water shortages. People with more money do have their means of transport to fetch water from distant alternative water sources and can afford the expensive water sold in supermarkets hence they are less willing to pay more to conserve wetland for water provisioning ecosystem service. Other studies (Alaba, 2001; Kaliba et al., n.d.) have indicated that income has a negative effect on respondents' WTP, confirming that poorer people are more

WTP for improved services than wealthier people are so as to secure good services and less spending in the long run. In this case, age is not significant in determining respondents' WTP. Education appears to be positively and significantly correlated with respondents' WTP. This suggests that people with greater education or knowledge are more WTP for conservation of wetland for continued water provisioning ecosystem service from KWA. These results are not surprising, as the people with greater education have more knowledge of economic and health hazards and so would be more WTP to minimise the impact of water shortages on their health. However, tertiary education does not seem to have a significant impact on a respondent's WTP. The previous findings (Khan et al., 2010; Alaba, 2001; Whittington et al., 1991) also indicated that people with greater education are more WTP for an improved service, hence reporting high WTP. There is also a negative and significant relationship between household size and WTP. The suggestion for these results is that households with fewer members are more WTP to pay for improved services because their expenditure is lower, as compared with households with more members. As a household's size increases, the expenditure of the household increases proportionally, which makes it difficult for them to afford to pay the higher conservation funds reported in the form of WTP. This relationship between household size and WTP was expected and it is in accordance with the previous findings (Moffat et al., 2007; Alaba, 2001) which ascertained that households with fewer family members are more WTP for improved services, which is shown by the negative sign of household size. The experience of household seasonal water shortages is positive and significant in determining respondents' WTP. The possible explanation is that people experiencing regular water cuts resort to contingency plans for finding alternative means of obtaining water, thus minimise the severity of the problem of regular water shortages hence they are not willing to pay more to conserve wetland for continued water supply. People experiencing seasonal water shortages delay in adapting to seasonal water shortages, as these are sporadic occurrences and they are not prepared for them. The study conducted by Whittington et al (1990) in Nigeria revealed that people's WTP for improved water service increases during a dry season. However, these results contradict the findings of Whittington et al (1989) in a CVM study conducted in Nigeria, where households experiencing seasonal water cuts reported low WTP, indicating that it is a sporadic occurrence which does not have a much greater negative impact than regular water cuts do.

4.3.5.1.2 Econometric estimation of WTP

Table 4.16: Constructing Krinsky and Robb Confidence interval for WTP for TRC

	Coefficient	Std.Error	z	P>z	95 % Conf. Interval	
WTP	83.09	4.346253	19.31	0.000	75.38746	92.42446
Lower bound	M32.94					
Upper bound	M98.00					

Source: Author's elaboration

The above results demonstrate that mean WTP for the TRC sub sample is M83.09, which reflects a WTP for conservation of KWA for continued water provisioning ecosystem service from KWA, and it is higher than that of the government subsample. Additionally, the double bounded model demonstrated noticeably a bit sensitive to inclusion of socio-economic variables as the welfare measure inflated and the confidence interval becomes narrower. The results are not particularly surprising as the literature (Whittington et al 1989, 1990, 2004; Alaba, 2001, Moffat et al., 2007) justifies that demographic variables have considerable impact on respondent WTP. Without covariates the mean WTP and confident interval stood at M82.80 (M73.43; M92.17) and the estimates changed to M83.09 (M75.39; M92.42). The mean WTP is the estimate of primary interest as it is welfare measure and the latter seemed to be estimated with high efficiency demonstrated by narrower confidence interval. This indicates that people were more willing to pay M83.09, on average, on top of their monthly water bill when TRC was hypothesised to be in charge of collection of conservation funds. For the TRC subsample, the confidence interval at 95 % confidence level is narrow, indicating precision of estimation. This shows that there is a 95 % probability that the confidence interval (M75.34: M92.42) contains the true value of the population mean. For purpose of policy recommendation and greater understanding, the amount of WTP was attenuated to consumption of water per litre. Using the monthly water consumption of 7500litres/day per person set by the standards of World Health Organisation, the mean WTP amount of M83.09 was converted to the additional amount of money corresponding to litres. The use of simple arithmetic for the above information reflects that each household is supposed to pay M0.011 per litre (or M0.22 per 20-litre jerry can) as a conservation charge on top of their regular monthly water bill, and this charge should be directed to the TRC as the administrative unit for wetland conservation. However, this will hold only if the conservation policy is enacted for the continued water provisioning ecosystem service from KWA. The conservation charge was further compared with the current price for water set by WASA. The current price for water was found to be M300 per household, on average, including a water standing charge. This amount is translated

into M0.04 per litre (or M0.80 per 20-litre jerry can) using the standards of the WHO of daily water consumption. The increment over the regular water charge seemed to be reasonable, as it inflates a current monthly water bill to M0.051 per litre.

In order to give more sense to the mean WTP value of M83.08, the lower and the upper bounds were calculated using a sample mean formula. This was found to be more informative than just knowing that the single best estimate of the mean WTP is M83.08, without giving it more meaning. As the study used double-bounded estimates of the mean WTP, it can be shown that the estimated mean value is bounded by the two extreme values of lower and upper bounds, which are M23.94 indicating the lower bound, and M98.00 indicating the upper bound.

The confidence interval of the mean WTP at 95 % confidence level appears to give a more accurate range for the two bounding values than the sample mean values do, which have some justification. The narrow range of the confidence interval is determined within the built-in routine that gives the maximum likelihood estimation of the socio-economic parameters, which relies on relevant determinants of WTP, whereas the arithmetic sample mean value is computed disregarding relevant socio-economic factors, as it focuses only on the average value of no–yes WTP and yes–yes WTP from which to determine the lower and the upper bounds. Therefore, the confidence interval from the built-in routine is more reliable than the arithmetic mean value is.

A comparison of mean WTP measures for the TRC and the government sub samples, the TRC which is the private organisation was found to have higher mean WTP measure (M83.09) for wetland conservation for continued water provisioning ecosystem service than government (78.80). In both sub samples, the socio-economic characteristics were found to be statistically significant in bringing the variation in WTP measure of welfare which answer the hypothesis which stated as follows: the respondent's WTP is not statistically dependent on governance institution of KWA. These preliminary results reject this null hypothesis and conclude the governance institution has impact on respondents' WTP. In fact, the results show that TRC should be the governance body for conservation of KWA as opposed to government which is determined by the higher mean WTP of the respondents. To further justify the point, the t test was conducted on the two mean welfare measure to test for their statistical difference and the results are presented in table 4.17 below.

4.4 TESTING FOR STATISTICAL DIFFERENCE OF WTP FROM TWO SAMPLES

The mean WTP of the two sub-samples for the government and for the private organisation (TRC) were found to be different in magnitude. For greater justification of this difference, the study went further by testing the statistical difference of the two values of the mean WTP from each subsample. The t test was used and it assumes equal variance of the two mean WTPs. The t test results are presented in table 4.17 below.

Table 4.17: Statistical difference of mean WTP using t test

Variables	Observations	Mean	Std. Err.	Std. Dev.	95 % Conf. Interval	
TRC WTP	102	83.69755	1.524493	15.39662	80.67337	86.72173
Government WTP	102	72.21865	2.162335	21.83851	67.92916	76.50814
Combined	204	77.9581	1.379708	19.70617	75.2377	80.67849
difference		11.4789	2.645708		6.262155	16.69565
t value	4.34					
Degree of freedom	202					

Source: Author's elaboration

Note: Difference= mean (TRC WTP) – mean (Government WTP)

Ho: Diff=0 Ha1: Diff<0 Ha2: Diff=0 Ha3: Diff>0

Pr(T-t)=1.000 Pr(|T|>|t|)=0.000 Pr(T>t)=0.000

Where

Diff – Difference of the two mean values.

The unpaired t test results show that, the hypothesis that the difference of the two mean WTPs is equal to zero is rejected with a probability of 0.0000, showing that the positive difference of the two welfare measures is statistically significant. The test statistics for the unpaired t test is 4.34 which rejects the null hypothesis that mean WTP_{TRC} – mean WTP_{GOV} = 0 at 1% level of significance. Therefore, the mean WTP of the two sub samples are statistically different, indicating that the TRC subsample has a higher mean WTP, which is not by chance. One possible explanation for the lower mean WTP for the government subsample is that the TRC is a private organisation and people prefer it when services are delivered by private organisations. It was further shown by Whittington et al. (1989) in a study conducted in three villages of Nigeria on improved public tap water and a private connection system. Their results

revealed that people reported low WTP for an improved water service because people said that their government was not trustworthy and it is also the responsibility of their government to roll out services freely. The lower mean WTP for the government subsample can also be attributed to more protest zeroes, which were eliminated before the analysis. There are about 19 % of protest zeroes which were detected and eliminated from the analysis of the government subsample, as compared with the 6 % of protest zeroes discarded from the analysis of the TRC subsample. The magnitude of the protest zeroes for the two subsamples is justifiable on the solid ground that the greater protest zeroes for the government subsample result into people reporting lower WTP.

4.5 EVALUATING THE UNDERSTANDING OF CV SURVEY SCENARIO

As indicated earlier in Chapter three, the backbone of a CV survey relies on the crafting of the CVM scenario. As indicted by literature (Whittington et al., 1998, 2002, 2004), the CV scenario presents a good deal of information to respondents which might distort the credibility of the entire CV survey, if it is not well crafted.

In order to ensure the proper crafting of the CV scenario, the scenario was partitioned into different sections which included the description of the water shortage problem on the ground, the consequences of the prevailing problem on economic and health aspect, and ultimately the proposed payment logistics. The responses were recorded for all these sections to ensure an understanding of the scenario and the degree of knowledge about the existing problem. To determine understanding of the scenario by the respondents, a statistical description is displayed in Table 4.18.

Table 4.18: Statistics of CV scenario responses

Questions	Option	TRC	Government	Total
Is this the accurate description that water shortage in your household is due to insufficient funds for KWA conservation	Yes	98(96.08 %)	96(94.12 %)	194(95.10 %)
	No	1(0.98 %)	0(0.00 %)	1(0.49 %)
	Not sure	3(2.94 %)	6(5.88 %)	9(4.41 %)
Is this the accurate description that water shortage in your household is due to poor management of KWA	Yes	100(98.0 %)	99(97.06 %)	199(97.55 %)
	No	0(0.00 %)	2(1.96 %)	2(0.98 %)
	Not sure	2(1.96 %)	1(0.98 %)	3(1.47 %)
Is this the accurate description that water shortage from your tap results into far alternative water source	Yes	101(99.0 %)	102(100 %)	203(99.51)
	No	1(0.98 %)	0(0.00 %)	1(0.49 %)
Is this the accurate description that water shortage on your tap results into dirty alternative water source	Yes	101(99.0 %)	102(100 %)	203(99.51 %)
	No	1(0.98 %)	0(0.00 %)	1(0.49 %)
Is this the accurate description that water shortage on your tap results into health problem	Yes	100(98.0 %)	100(98.0 %)	200(98.04)
	Not sure	2(1.96 %)	2(1.96 %)	4(1.96 %)
Is this the accurate description that water shortage on your tap results into economic problem	Yes	100(98.0 %)	99(97.06 %)	199(97.55 %)
	Not sure	2(1.96 %)	5(97.55 %)	5(2.45 %)
Do you agree that government/TRC can solve the problem of water shortage through conserving KWA	Yes	85(83.33 %)	74(72.55 %)	159(77.94 %)
	No	5(4.90 %)	28(27.45 %)	33(16.18 %)
	Not sure	12(11.79 %)	0(0.00 %)	12(5.88 %)

Source: Author's elaboration

Note: The frequencies are shown outside the parenthesis, while the percentages are shown inside the parenthesis.

Generally, the results above show a large number of 'yes' responses to all the questions asked in the CV scenario, including the felt problem of water shortages experienced in this urban community. The results show that the description of the water shortage problem was stated clearly, as shown by the high response rate to the 'yes' option. Out of 204 respondents, 95 % agreed that the water shortages in the urban area of Botha-Bothe district is brought about by insufficient funds for KWA conservation, while approximately 98 % of the respondents agreed that the shortages of water in their households are attributable to poor management of KWA. Moreover, the respondents appeared to understand the economic and health consequences of water shortage in their households. Almost 100 % of respondents agreed that the problem of water shortage results in having to use dirty alternative water sources, and 98 % indicated that water shortage results in health problems, like diseases. This is not surprising because when there is no water in their taps, the alternative water sources are wells which are not secured properly to avoid contamination. In extreme situations, people share water sources with their animals that drink directly from the wells, which shows that there is high likelihood of catching water-borne diseases. The results further show that there were approximately 97.6 % of

respondents who were concerned about the economic consequences of water shortages. These results are not surprising, as most of the people interviewed were running catering business and it costs them more to obtain alternative water sources, and the opportunity costs of fetching water from distant alternative water sources was very high, as a result of which they lose many customers. This is because they have to close their businesses for considerable periods of time in order to fetch water. Lastly, there are more than 50 % of the respondents who agree that either of the two wetland conservation bodies, namely government or the TRC, could implement the conservation policy. The reason for this is that people seem to be desperate for water. However, in terms of the magnitude of the 'yes' response as to which of the organisations should implement the conservation policy, the TRC votes overweigh the government votes which justifies that TRC is should take a lead in implementing conservation policy of KWA. The conclusion that can be drawn from these results is that, generally, the respondents appear to understand the CV scenario as they indicated justifiable knowledge about the prevailing problems in their community. These results are still consistent with the results from the section on knowledge, perceptions and attitudes, as the response rate was also very high in that section. From the results set out above, it can be said that the proposed conservation policy of KWA is worth being implemented, as the response rate is far beyond 50 %, showing that most people agree with the proposed change. However, such decision is multidimensional, as it depends on exploring other statistical analyses found in the remainder of this study, such as the financial analysis of the respondents after the implementation of this conservation policy, and the debriefing question analysis. This means that all these sections are complimentary to decision making and policy formulation.

4.6 ASSESSMENT OF FINANCIAL STATUS OF THE HOUSEHOLDS AFTER PROPOSED INTERVENTION

In order to ensure that the responses obtained from this study are valid enough to be translated into policy formulation, the financial questions relating to the households of the respondents were included. The purpose of this section was to ensure that the proposed wetland conservation policy would not financially cripple the families of the respondents. Whittington et al (1998) indicates that respondents have to understand that the proposed change will only take place after their economic commitments. Therefore, this section was found to be necessary to evaluate the households' financial status, after the respondents' economic commitment. Moreover, the Hicksian measure of welfare change indicates that, after their economic commitment, the respondent should remain with the same utility as before the intervention,

which further renders this section important. The results for this section are reported below in Table 4.19.

Table 4.10: Statistics on financial fitness of the households

Questions	Options	TRC	Government	Total
Considering your monthly household budget will you afford to pay for basic needs if the programme is implemented	Yes No Not sure	70(83.3 %) 10(11.9 %) 4(4.76 %)	66(97.06 %) 2(2.94 %) 0(0.00 %)	136(89.5 %) 12(7.89 %) 4(2.63 %)
Considering your monthly household budget will you not afford to pay for public utility if the programme is implemented	No Yes	74(88.1 %) 10(11.9 %)	64(95.52 %) 3(4.48 %)	138(91.39 %) 13(8.61 %)
Considering your monthly household budget will you not afford to pay for school fees if the programme is implemented	No Yes	67(79.8 %) 17(20.2 %)	55(82.09 %) 12(17.91 %)	122(80.79 %) 29(19.21 %)
Considering your monthly household budget will you not afford to pay for durable goods if the programme is implemented	No Yes	62(74.7 %) 21(25.3 %)	49(73.13 %) 18(26.87 %)	111(74.00 %) 39(26.00 %)
Considering your monthly household budget will you not have enough disposable income if the programme is implemented	No Yes	69(82.1 %) 15(17.9 %)	62(92.54 %) 5(7.46 %)	131(86.75 %) 20(13.25 %)

Source: Author's elaboration

Note: The frequencies are shown outside the parenthesis, while the percentages are shown inside the parenthesis.

The results from the above table show that most respondents agreed to the proposed programme of continued water provisioning ecosystem service from KWA, as it would not incapacitate their households in the areas of basic needs, public utility, school fees and durable goods. The purpose of this section was to evaluate whether the households would remain in their initial statuses after the new financial commitment. Of the households in the TRC subsample, 83 % would still manage to meet their daily basic need requirements, while about 88 % in government subsample would manage to meet their daily basic need requirements. There are only very few people who would not be able to afford to pay for the new service, who comprise only 7.89 %, in total. Furthermore, about 91.4 % of respondents stated that their households would still afford public utilities, like water bills and electricity bill. Over 80 % of respondents would still afford the school fees for children, while 74 % of respondents seemed able to afford durable goods after the implementation of the proposed intervention. More impressively, more that 86 % of respondents showed that they would have sufficient disposable income after the implementation of the intervention. This information is sufficient to conclude that most households would remain financially fit after the implementation of this new policy.

4.7 EVALUATING OVERALL PERFORMANCE OF THE SURVEY INSTRUMENT THROUGH DEBRIEFING QUESTIONS

As indicated earlier in the survey instrument development and survey implementation section, all the necessary attempts were made to ensure the reliability and validity of results. However, there is a possibility that what is on the ground might differ from what the questionnaire was intended to reflect. As an additional part of assessing the overall performance of each session of the interviews, debriefing questions were asked to assess the respondents' responses. The questions were divided into four parts, which were questions testing the level of understanding of the respondents, questions testing whether there were difficult questions or not, questions testing the support of the respondents for the proposed programme, and questions on the reliability of the answers given by the respondent. This part was for the interviewer to complete, in collaboration with the respondents. The results from this part are reported below in Table 4.20.

Table 4.20: Results of debriefing questions

Questions	Options	TRC	Government	Total
Did the respondent understand all the questions	Very well	82(80.39 %)	93(91.18 %)	175(85.78 %)
	Well	12(11.76 %)	4(3.92 %)	16(7.84 %)
	Understand	7(6.86 %)	4(3.92 %)	11(5.39))
	Not understood	0(0.00 %)	1(0.98 %)	1(0.49 %)
	Not well	1(0.98 %)	0(0.00 %)	1(0.49 %)
Were there tricky questions to the respondents	No	84(82.35 %)	87(85.29 %)	171(83.82 %)
	Yes	18(17.65 %)	15(14.71 %)	33(16.18 %)
How was the level of support of the respondents towards questions and survey in general	Very	73(71.57 %)	82(80.39 %)	155(75.98 %)
	Moderately	11(10.78 %)	6(5.88 %)	17(8.33 %)
	Supportive	18(17.65 %)	11(10.78 %)	29(14.22 %)
	Not supportive	0(0.00)	3(2.94 %)	3(1.47 %)
What was the level of reliability of the responses given by the respondents	Very reliable	79(77.45 %)	88(86.27 %)	167(81.86 %)
	Moderately	10(9.80 %)	6(5.88 %)	16(7.84 %)
	Reliable	11(10.78 %)	7(6.86 %)	18(8.82 %)
	Not reliable	2(1.96 %)	1(0.98 %)	3(1.47 %)

Source: Author's elaboration

Note: The frequencies are shown outside the brackets, while the percentages are shown inside the brackets.

From the above table, it can be seen that the evaluation results of the entire interview process are highly promising for policy formulation. The debriefing questions scored high votes under the four subsections of whether the respondents understood all the questions and the proposed plan, whether there were tricky questions for the respondents, whether the respondents were supportive of the proposed plan, and whether the responses given by the respondents were reliable. The statistical analysis shows that more than 85 % of the households appeared to understand all the questions and the proposed plan 'very well', while 7.84 % understood 'well' and 5.39 % 'understood' the question. The overall percentage of the people who understood all the questions goes beyond 99 %. This is not surprising, as the larger segments of the respondents seemed to understand the local problem and the planned intervention from the scenario description.

Moreover, there are about 83.8 % of the respondents who indicated that there were no tricky questions, while only a few (16.2 %) indicated that there were a few tricky questions. The reasons recorded concerned the monthly income generated and the personal information. Most of the respondents do not record their monthly budget and expenditure. This seemed to make sense, as most of the people are busy in catering work, which demands daily expenditure for cooking items. Another problem was that respondents did not want the interviewer to inquire

into their privacy, such as recording their age, and sometimes older people tend to forget their age, or might not know their actual age. Lastly, the reliability question was asked to assess the responses obtained, and interestingly, there were 81.9 % of the respondents whose responses were very reliable, while 7.84 % were moderately reliable, 8.82 % were reliable, and only less than 1.5 % were not reliable. The results were based on the level of reliability of responses made by interviewer after every round of interview. This is not surprising, as the reliability goes together with level of understanding and the degree of support that the respondents show during the interview. The results from these sections indicate that questionnaire design was far reaching in its effect, as it yielded desirable outcomes.

4.8 CONCLUDING SUMMARY

The conclusion that can be drawn from the overall results in this study is that there is considerable evidence to indicate that the households in the urban area of Botha-Bothe district have high levels of knowledge about the threat to KWA. The households also seem to have high knowledge on the factors that affect the sustainability of KWA and the problem of water shortages from KWA. Confidently, the households have positive attitudes towards the conservation of KWA. The incomes of the households appear to play a pivotal role in the knowledge of the households about the factors which promote the sustainability of KWA and also in the positive attitudes of the people. Gender also appears to take a lead in the knowledge of problems affecting water availability from KWA. The women have greater knowledge about the problem of water availability in their households, as they are responsible for the routine work of fetching water and cooking. The main influence of the knowledge about the factors promoting the sustainability of KWA are education, and to a lesser extent, income and gender. Education appears to dominate in this construct, as the people with higher levels of education appeared to have greater knowledge of the factors promoting sustainability. With no doubt, the concept of ‘sustainability’ seems to represent a technical word that is easily understood by better educated people, while the less educated people seem to struggle to understand it. The water from KWA appears to play an important role in the lives of many people in this town, as they reported high WTP from the two sub-samples. Nevertheless, the sub-sample of people under the proposed TRC regime for the conservation of KWA reported a high WTP of M83.09, while the other sub-sample for the proposed government’s regime of KWA conservation reported a WTP M78.80. The former has a lower bound of WTP of M78 with an upper bound of M101, while the latter has a lower bound of WTP of M75 and an upper bound of M97. The bounds are extremely narrow, which gives more confidence that these are reliable estimates.

The mean WTP for the two split samples was further justified by the use of a t test which rejected the null hypothesis of equal means of the two split samples. This suggests that the difference of the two estimates is not by chance, but rather the difference is statistically significant. The analysis of the financial and debriefing questions also gives high confidence that the households support the proposed plan of improving the wetland for a sustainable water supply. This was shown by the high rate of responses of support and understanding of the plan. Generally speaking, it can be shown that the households support the proposed plan and that they are willing to pay for it, meaning the implementation of wetland conservation could easily flourish in this area.

This is reflected by the high mean WTP of M83.09 as a conservation charge by the TRC for KWA, while the government subsample resulted in a mean WTP M78.80, which is lower than the former is. Because of this higher mean WTP, it can be shown that the TRC should receive the monthly income of M0.011 per litre (or M0.22 per 20-litre jerry can) on top of households' regular water bill collected by WASA as the conservation charge for the KWA's sustainable wetland management. Another conclusion that can be drawn from this chapter is that respondents were unreceptive towards high starting bids. The higher the starting bid was, the lower the 'yes' responses were to purchase the improve service. It can be explained that the higher the price of an environmental good is, the lower the quantity demanded for the consumption of that good will be.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This study was designed with the two key objectives, (i) to estimate the level of conservation charge households are WTP to secure a water provisioning ecosystem service from KWA, and (ii) to test whether the identity of the institution governing KWA significantly influences the level of the conservation charge. The study also established the respondents' levels of factual knowledge on the threats to the sustainability of KWA for a continued water provisioning ecosystem service. The attitudes, opinions and perceptions of the respondents were also captured in the analysis. These were assumed to have influence on respondents' WTP a conservation charge to secure water provisioning services. Various, different statistical analyses were performed in this study. The robustness of the statistical results in the area of knowledge, perceptions and attitudes was investigated through the use of Chi-square tests and the one-way Analysis of Variance (ANOVA) to verify the potential influence of certain moderators, being age, gender, education and income, on the aforementioned constructs of knowledge, perceptions and attitudes. The study also aimed at estimating the mean WTP (conservation charge) for a continued water provisioning ecosystem service from KWA for both subsamples of government and TRC, for which the double-bounded model was used. The double-bounded model was used to estimate the mean WTP, and the lower and upper bounds of the mean WTP were estimated using the sample arithmetic mean. This was done for both subsamples and further statistical tests were performed using t tests to assess the statistical difference of the two subsamples. This chapter presents the overall conclusion on the findings of the study and recommendations and policy implications of the findings. Finally, the study explores the limitations and the areas for future research.

5.2 CONCLUSION OF THE STUDY

Owing to the evidence set out in this text, this study concludes the following: First, there is satisfactory evidence, that the respondents have high levels of factual knowledge on the threats to the sustainability of KWA for continued water provisioning ecosystem service. This was shown by the higher percentage of the respondents who indicated their level of knowledge, attitudes and perceptions towards conservation of KWA on the five-point Likert scale. Over

80 % of the respondents indicated that they strongly agree that they know about the challenges KWA is currently facing and of the remedial actions proposed. The respondents also indicated positive attitudes, opinions, and perceptions that are receptive to a policy that improves their *status quo* concerning water shortage from KWA.

Impressive results were also found concerning the influence of socio-economic characteristics on respondents' levels of knowledge, attitudes and perceptions. This evidence was drawn from the results produced by one-way ANOVA. The results showed that respondents have positive attitudes and perceptions towards conservation of KWA, which appeared to be influenced by their socio-economic characteristics. The income of the households appeared to be a driving force in all constructs of knowledge, attitudes and perceptions. The results showed that households with lower incomes are likely to have more knowledge, positive perception and attitudes towards the conservation of KWA.

Again, gender was found to have a bearing in the aforementioned constructs, where women have considerable knowledge about the threats and the factors that affect the availability of water from KWA. Women were also found to have more positive attitudes towards conservation than men, as they are the main users of water for housekeeping and cooking. The implication of these results is that women are more knowledgeable about the threats of KWA and the factors affecting the problem of availability of water and the sustainability of KWA. This is also followed by the fact that the broader segment of the target sample were women, as most of the men are the breadwinners and they were not available during the time of survey.

Education was also found to have a bearing on the construct of knowledge about the factors that affect the conservation of the wetland. The results indicated that the higher the level of education is, the more the respondent is aware of the factors that affect the conservation of the wetland. It can be shown that a higher level of education increases knowledge and understanding about wetland conservation. Moreover, higher levels of knowledge, perceptions and attitudes towards the conservation of KWA appeared to have a bearing on the WTP a conservation charge for a continued water provisioning ecosystem service from KWA. The conservation charge was found to be positive for both subsamples, which could be attributed to positive attitudes and high knowledge about the factors that affect sustainability of KWA.

Mean WTP of the two subsamples were found to be M78.80 per household per month (UB M92.89 and LB M38.21) when the government was responsible for conservation in KWA (equivalent to M0.011 per litre or M0.21 per 20-litre jerry can), and M83.09 per household per month (UB M98.00 and LB M32.94) when the TRC was responsible for conservation and

management in KWA (equivalent to M0.011 per litre or M0.22 per 20-litre jerry can). Nevertheless, the mean WTP for the TRC subsample was greater than that of the government subsample. The mean WTP in this context is known as the conservation charge for a continued water provisioning ecosystem service from KWA. When the t test was used to verify the statistical difference of the two mean WTPs, the null hypothesis of equality of the two mean WTP values was rejected at the 1 % level (t= 4.34 and p = 0.000), suggesting that the identity of the institution responsible for conservation management in KWA significantly influences households' WTP. In an institutional sense, the TRC is found to be an effective private organisation that should be entrusted with the conservation responsibility of KWA to ensure desirable stewardship of the wetland's conservation, transparency and accountability.

Double-bounded models, differentiated by institution responsible for conservation management in KWA, were used to econometrically determine factors that influence households' WTP. The socio-economic characteristics that explain variation in WTP appear to have justifiable signs and most of them are significant in explaining WTP, as shown in Chapter 4. Results for government sub sample showed that WTP was positively related to the following variables: income, age, education, whether household had experienced seasonal water shortages, knowledge of health risks associated with water shortages, household size (the greater the number of household members, the greater the WTP value) and gender (males had higher WTP). These results were consistent with prior expectations and the literature. For TRC sub sample the WTP was found to be positively related to the following variables: education and attitudes towards whether household seasonal water shortage (during dry season). Household size, income and age were found to be negatively related to respondents' WTP. Therefore, it can be concluded that socio-economic characteristics do have considerable effect in determining the magnitude of respondents' WTP.

With the aforementioned evidence and the outcome of the analyses of this study, it is therefore justifiable that this study is done at the bequest of government, donor funds, policy makers and decision makers. The results demonstrated the appropriateness of the proposed conservation charge as a resource rent for the use of the wetland resources. The estimation of the conservation charge seemed to be more precise, as indicated by the narrow range of the confidence interval within which it lies. Moreover, the TRC sub sample was found to have higher WTP than the government sub sample. The conclusion that can be drawn here is that TRC should be responsible for KWA conservation. This conclusion is guided by the literature which indicates that high quality institutions that generate positive RR should is at the heart of good governance of wetland conservation. This is also in line with what was found on the

ground, as many respondents did not trust government services as compared to private organisation. This is also in line with the findings of Whittington et al (1998) which indicated that people report lower WTP when the government is providing the improved services.

5.3 RECOMMENDATION AND POLICY IMPLICATIONS

The findings of this study have revealed that the conservation and management of KWA wetland can be viewed through an institutional lens. In solving the wetlands problems, the government has to embark upon setting up economically sustainable institutions that limit the discretion and authority of government to divert it to a political context. There must also be mechanisms and incentives for different branches and levels of enforcement to impose sanctions on intruders into the wetlands, regardless of their friendships and relationships. Moreover, the allocation of grazing quotas to ranch members should also be strictly considered when the allocation of grazing permits is made for seasonal migration of animals.

Another institutional reform proposed by this study is the formulation of a well-defined property rights regime, as well as intensifying the capacity of currently available educational programmes to strengthen the knowledge, attitudes and the perceptions of the community people who benefit from wetland use. It is through these approaches that the trade-off between wetland use and its development can be balanced. The wetland and grazing are inextricably related entities, but in many cases, wetland conservation and grazing policies do not coincide. Therefore, when it comes to conservation of the wetlands, the two have to be independently regulated to ensure the sustainable use of the wetland that will sustain human livelihoods, hence an efficient allocation of wetland resources is required, rather than allowing them to be compromised through livestock grazing.

On the basis of the above evidence, three key recommendations follow. First, subject to extensive stakeholder consultation, the Water and Sewerage Authority (WASA) of Lesotho should consider adding to the regular monthly water bill, a resource conservation charge amounting to at least M0.011 per litre of water delivered to urban households in the Botha-Bothe district. Instead of charging M0.04 per litre of water delivered to customers, which is the current water charge, WASA should charge customers at least M0.051 per litre of water delivered to customers on monthly basis. Second, WASA should consider instituting a policy that isolates the conservation charge from the M0.51 per litre, and should explicitly invest it in mitigating the resource conservation challenges in KWA, which is currently attributed to uncontrolled animal overgrazing and human activities. This conservation charge should be

used to support activities that secure sustainable water provisioning ecosystem services from KWA. For efficient and effective service, the proposed institution should have stand-alone policies that will guide the proper stewardship of the wetland use, rather than incorporating other aspects of natural resources, which are not part of the wetland. Finally, WASA should consider engaging TRC directly in converting the proceeds from the conservation charge to tangible resource conservation outcomes in KWA, given that households expressed higher WTP when TRC was responsible for its conservation management. The wetland is currently under the custody of the government's Ministry of Natural Resources which was partly engaged in the restoration process in KWA, commencing in 2007, but which has come to a halt because of financial limitations.

The strategies and mitigation measures for wetland conservation suggested herein sound laudable and worthwhile implementing, but if they are implemented partly, or to some extent with limited effort, they will stand little chance of success. The study realised that the wetlands possess public good characteristics, which have led to open access for grazing and public harvesting of the resources. The destruction of the wetland resources has vast implication for livelihoods, poverty alleviation, and food security. In order to respond to these unsustainable practices, there is need for the formulation of the institutions that capture the economic value of the wetlands. It is through these kinds of conservation institutions that the social and the private costs will converge, hence securing the sustainable use of the wetland. These institutions would ensure that the open-access nature of the wetland is eliminated, as there will be no opportunistic behaviour like free riding by encroachers. These institutions will lead to the formulation of a policy agenda that aims at competing market liberalisation process and this institutional reform for the wetland will further help to bring about the necessary change in the economic, social and the administration of the wetland's use.

As an area for future research, this study has uncovered a number of issues to guide future researchers. The water provisioning service of KWA seems to play a vital role in the lives and conservation of the wetland, so there is still an interest to value the other services of the wetlands to strengthen the importance and the need for wetland conservation. It could be in the interest of the government and other stakeholders to know about the total value of this wetland ecosystem for the purpose of prioritising the improvement of the wetland, as they are many competing alternatives for the limited budget.

5.4 LIMITATIONS OF THE STUDY AND THE AREA FOR FURTHER RESEARCH

The scope of the study was confined to estimating the mean WTP a conservation charge for KWA for a continued water provisioning ecosystem service in the urban area of the Botha-Bothe district. The mean WTP value of the two subsamples used in this study do not reflect the true value of the mean WTP for the population of the whole district which receives water services from WASA. In order to ascertain the true conservation value, the whole population of Botha-Bothe district which receive water from WASA has to be determined and interrogated. This study used the data from only 11 communities around the town, which were selected randomly, and it did not cover the entire community footprint. Therefore, in one way or the other, the WTP estimates herein do not reflect the true total value.

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Appendix

Table 1: Summary of dichotomous response variables

Name of variables	Definitions
bid1	Initial bid in Lesotho Maluti
bid2	Second bid in Lesotho Maluti
max bid	Maximum WTP bid in Lesotho Maluti
Resp1	Response to bid1
Resp2	Response to bid2
nn	=1 if the response to the WTP questions was no, no
ny	=1 if the response to the WTP questions was no, yes
yn	=1 if the response to the WTP questions was yes, no
yy	=1 if the response to the WTP questions was yes, yes

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Natural and Agricultural Sciences

Informed consent for participation in an academic research study

Department of Agricultural Economics, Extension and rural development

The economic value of Khalong-la-Lithunya wetland area (KWA) in sustaining water supply in Botha-Bothe district, Lesotho

You are kindly invited to take part in this academic research study to be submitted as a partial fulfilment of the Masters Degree Program which is conducted by Jacob Greffiths from the University of Pretoria, South Africa. The main purpose of this study is to investigate the value that each urban household attaches to the conservation of Kalong-la-Lithunya wetland area (KWA) for the purpose of securing sustainable domestic water supply.

Please note the following:

- Confidentiality is highly respected in this study, therefore, this study is meant to be anonymous survey on which the name of the participant will not appear on the questionnaire and answers will be treated as confidential.
- Your sincere responses are highly appreciated and honoured in this survey. However you may choose not to participate or stop participating at any time without any frustrations.
- The outcomes of this study will be used for policy formulation and academic purpose and may be published on journal. The summary of the findings will be provided to you upon request.
- Please answer all questions as completely and honestly as you can. This is expected to take few minutes of your time.
- Please contact my supervisor, Prof Eric Mungatana (eric.mungatana@up.ac.za), if you have any question or comment regarding this study
- Please sign below to indicate that you have read and understood information provided above. This will also indicate your consent in participating in this study voluntarily.

Participant's signature ---------- **Date** ----------

SURVEY QUESTIONNAIRE

PART A: GENERAL INFORMATION

The purpose of this section is to gather general information about the interview

1. Name of interviewee: ----------
2. Start time : ----------
3. Finish time : ----------
4. Interview date : ----------
5. Participant's gender : ----------

PART B HOUSEHOLD KNOWLEDGE, ATTITUDES, OPINIONS AND PERCEPTIONS ON WETLAND CONSERVATION

This section seeks to find out your knowledge, attitudes and the perceptions on wetlands benefits, conservation, conversion and degradation

i)Attitudes/ perceptions about conservation

3. Please indicate your level of agreement with the following statement on Khalong-la-Lithunya (KWA) wetland: Please use the following codes for the whole part B: 1= Strongly agree, 2= Agree, 3= not sure, 4= Disagree, 5= Strongly disagree 6= Don't know

statements	Responses
The conservation of KWA is important to secure water you consume in your household	
KWA conservation is crucial to promote habitant of wildlife like rabbit, birds etc	
The conservation of KWA is essential for recreational activity such as swimming, aesthetic etc	
KWA conservation is helpful to secure alternative source of income through sales of traditional hats (Mokorotlo, tshetshe etc.) from its fibre	
The conservation of KWA is essential to protect medicinal plants found in the wetland area	
The conservation of KWA is crucial to secure fibre found on the wetland	
KWA conservation is good for flood regulation during heavy rains	

ii) **Threats to the sustainability of KWA**

4. There are human and animal activities that enhance the ability of KWA to provide benefits KWA and some which deteriorate that ability. Please show your level of awareness about the following listed threats to the sustainability of KWA.

Threats	Responses
Overgrazing from KWA can lead to loss of important species found on the wetland	
Animal trampling from KWA can cause soil erosion on the wetland area	
Overharvesting of fibre from KWA can lead to extinction of fibre found on the wetland	
Pollution of water from KWA can kill crucial species found in the wetland	
Too much water drawn from KWA can lead to water shortage from the wetland	
Conversion of KWA to agriculture activities can lead to drying up of the wetland	
Overharvest of medicinal plant from KWA may lead to the extinction those important plants found on the wetland	
Insufficient funding for management of KWA conservation may lead to over-extraction of wetland resources	
Poor management of KWA may lead to the extinction of the wetland due to over use of the area	
Improper formulation of policies that govern wetland use can lead to overharvest of wetland resources	

iii) **Factors that promote sustainability of KWA**

5. This section seeks your level of agreement on the factors that promote sustainability of KWA: Please indicate your level of agreement on the following statement on KWA

Statement	Responses
Drawing of water from KWA should be controlled by charging fees	
Grazing should be managed by paying grazing fees	
Animal trampling from KWA must be controlled by fencing	
Harvest of medicinal plants from KWA should be regulated by licencing the users	
Hunting of wildlife from KWA should be protected through tax	
It is not a waste of money to pay stewards from KWA to regulate entrance into the wetland	
It is not only the responsibility of the government to conserve KWA for peoples' benefits	
It is the responsibility of each household to contribute for KWA's management for securing sustainable water supply in each household.	

PART C URBAN WATER RELIABILITY

This section seeks to investigate reliability of water supply in the urban households and how the households can associate it with KWA conservation. Please indicate your level of agreement based on the following statements relating to KWA. *Fill in the table below using the following codes:*

1= strongly agree, 2= Agree, 3= not sure, 4= Disagree, 5= Strongly disagree 6= Don't know

statements	Responses
There is a problem of water shortage which can be mitigated by conservation of KWA	
There is a problem of water borne diseases which can be eliminated by conservation of KWA	
There is a shortage of irrigation water that can be addressed by conservation of KWA	
There is a problem expensive alternative water source which can be addressed by conserving KWA	
There is a problem of reduce crop production that can be eliminated by conserving KWA	
There is a problem of using wasted water which can be solved by conservation of KWA	
There is a problem of far alternative water source that can be solved by conservation of KWA	

PART D **Eliciting the Willingness-to-pay for improved and sustainable quality water supply**

The water system in the urban area of Botha-Bothe district is consistently failing to supply enough water to the urban community for quite some years now because of insufficient funds and poor maintenance of the KWA. This is the main system that urban community relies entirely on for daily water demand. Amazingly this water system is experiencing stress and pressure to supply this community with enough water which has resulted into persistent complaints of more than 60 % of people due to water shortage which do not meet their daily water demand. This problem is even worse during dry season (Spring) whereby other households go without water for the whole day or get water only afternoon. Other households use river water which is greatly contaminated and is very far away from their households while other households get additional water from supermarket which is very expensive and cutting through their limited monthly disposable income. Moreover, some people resort to use urine for irrigation of their horticultural plants and use dirty water for animal house keeping.

1. Is this the accurate description of the status of water supply on this area?

   1=YES 2=NO 3=NOT SURE

2. If **NO,** explain why: _____

The research has shown that this water shortage is caused by the following:

- Uncontrolled animal grazing on the wetland which pollute water
- Uncontrolled animal trampling which make the soil more compact disabling KWA to release enough water
- Over-extraction and waste of water from KWA due to lack of stewards for regulating entrance into the wetland area
- Soil erosion due to overgrazed area which reduced the size of the wetland
- Lack of reservoirs on the wetland such as properly constructed wetland ponds

3. Do you agree that the shortage of water you are experiencing in your household is due to poor management of KWA wetland?

1=YES 2=NO 3=NOT SURE

4. If N**O**, explain why? _____

I would like to describe a government plan to safeguard against further shortage of water for your household consumption in order to mitigate serious health and economic problem associated with this unreliable water supply. First let me give you the background

The human body is the most sensitive part of our life which can easily be affected by shortage of water supply to maintain it. Shortage of water can lead to dirty water use as small amount of water can be used for several purposes such as washing dishes, cleaning, bathing and others without discarding water with the intention of saving water. This can lead to severe waterborne diseases caused by the Escherichia coli (E coli) which contaminate water and transmit diseases such as cholera and diarrhoea via contaminated water which can ultimately lead to death. Unclean (dirty) water can also be infected by worms sometimes such as Ascaris and hookworms which have potential of transmitting severe diseases when water is used. The shortage of water, in addition to huge economic loss caused by low water based production such as agricultural produce, can lead to uncleanliness of the house and food consumed in the household which has high potential of transmitting germs or pathogens which are the carriers of disease causing organisms. However, these problems are only associated with the shortage of water leading to uncleanliness.

5. Do you agree that the description of the healthy and economic impact of water shortage? 1=YES 2=NO 3=NOT SURE

6. If **NO**, explain why? _____

In order to rescue individual's loss of life and economic losses, the **government of Lesotho** has proposed the wetland conservation and management program to guarantee and secure sustainable water supply to this community. I am conducting this survey to find out whether the proposed plan means anything to you.

Here is how the new proposed program would work

This is the current state of KWA

As you can see in the picture, this is the current state of KWA which is an open access area for livestock grazing and free extraction area. The area is unfenced and the water is polluted because of free movement of livestock as there is no regulation of entry and exit. The land is becoming bare owing to vegetative loss due to animal overgrazing and trampling. The water also seems to diminish due to poor management system. The animals make the soil compact with their heavy hooves hence expose more water drains down and the other one evaporate which reduce water supply to the communities.

This is the expected state of KWA if the programme is approved

As shown in the picture, this is how KWA will look like after improvement. **The government** will improve the area of 1332 hectares of KWA to enhance biological purification of water before reaching ultimate consumers and is expected to increase water supply by more than double of the current water supply. KWA will be fenced and purification systems will be installed inside water as shown by pipes inside water. This will further improve vegetation as shown in rectangular fence. The offices will be set up at the entrance point as shown for regulation of entry and exit.

7. Do you agree that the **government** will implement a program that enhance sustainable water supply from KWA? 1= YES 2= NO

8. If **NO**, explain why? _____

If the program become successful and approved, the payment logistics are as follows:

All the households in this community are expected to pay a monthly charge in order to supplement the **government budget** in restoring KWA to secure enough water supply. Because all households in this community will be involved in sharing the burden of costs to secure reliable and sustainable water supply, I am using this survey to find whether it means anything to your household. So far I have found that some households vote for the program while others vote against the program. Those who vote for this program state that this program worth money to secure improved sustainable water supply to avoid health and economic loss in their lives while those voting against it state that there is no need for money to secure sustainable water supply. At present, the preliminary calculations show that it is possible to sustain this program if each household can pay the total of **M50** on top of its monthly water bill as long as they consume WASCO water from KWA.

For the program to be implemented, the households' contributions must be beyond a certain threshold. In order to guarantee sustainable water supply, the collected funds will be directed to Ministry of **Natural Resource** and it will be used for KWA conservation and management. Remember that upon implementation of this program, your household budget will be affected as you have other financial obligations to meet like food, school fees, clothes etc.

1. Considering your income and expenditure, if the program costs your household **M50** extra charges from your monthly water bill, would you vote for it or against it?

   1= YES (Go to 2) 2= NO (Go to 5) **cost M50** _____

2. What if it turned out that the final cost estimates showed that each household pay extra charge of **M70**? Would your household vote for it or against it?

   1= YES (Go to 3 and 4) 2= NO (Go to 4) **cost M70** _____

3. Recall that in Q2, you stated that you were WTP **M70**, What would be your maximum willingness to pay on top of your monthly water bill? **M**_____

4. Why did you choose to vote for the proposed program*?* **Vote YES** _____

   i. It will increase water supply and sustainability ( )

   ii. It will protect wetlands against further degradation ( )

   iii. It will improve our health and hygiene ( )

   iv. Other (specify): _____

   _____

5. What if it turned out that your household have to pay extra charge of **M30**, would your household vote for it or against it?

   1= YES (Go to 6 and 7) 2= NO (Go to 8) **cost M30** _____

6. Recall that in Q5, you stated that you were WTP **M30**, What would be your maximum willingness to pay on top of your monthly water bill? **M**_____

7. Why did you choose to vote for the proposed program*?* **Vote YES** _____

i. It will increase water supply and sustainability ( )
ii. It will protect wetlands against further degradation ( )
iii. It will improve our health and hygiene ( )
iv. Other (specify): _____

_____

8. Why did you choose to vote against the proposed program? **Vote NO** _____

i. It does not worth that much ( )
ii. It is a public good hence government responsibility ( )
iii. I cannot afford it ( )
iv. Other (Specify) _____

_____

PART E: SOCIO-ECONOMIC CHARACTERISTICS OF HOUSEHOLD

9. Personal information:
This section seeks personal information of the respondent

Please provide the following information about the household members

Status in the family	Relation to head	Marital status	HH size	Period lived in this HH	Highest Education level	Employment status	Primary source of income	Total monthly income(M)	Age

Codes						
HH status	Gender	Marital status	Period lived in HH	Educational status	Employment	Main source of inc
Head=1 Spouse=2 Daughter=3 Son=4 Others=5_____	Male=1 Female=2	Married=1 Single=2 Divorced=3 Widow/Widower=4 Other=5_____	<year=1 >1year=2 >5 years=3 >10years=4	None=1 Primary School=2 High School=4 Vocational school=6 Tertiary =7	Formal employment=1 Informal employment=2 Farm=3 Self-employed=4 Other=5_____	Salary=1 Self-employed=2 Rent Payments=3 Farm=4 Pension=5 Other=6_____

10. Since you voted for this program, considering your income and expenditure, do you think your household would afford to pay for basic needs like food, clothes and water upon implementation of this program?

1=YES 2=NO 3=NOT SURE

11. Which of the following statements would best describe your family's financial situation after implementation of the program?

a. We do not have enough money

b. We have money for food but cannot pay for public utilities like water and electricity

c. We can afford food and public utilities but it is difficult to pay for school fees

d. We can afford food, public utilities and pay for school fees but cannot afford to buy durable goods like TV, fridge…

e. We have enough money to pay for our needs and can also afford to buy durable goods.

Other (specify)_____

PART E DEBRIEFING

This part assesses specific problems in the questionnaire and seeks to what extend the questionnaire performed well.

12. In your own opinion did the respondent understand all the questions? Rank the following level of understanding by putting numbers

a) Very well understood ( ) b) Well understood ( ) c) Understood ( ) d) Not understood ( ) e) Not well under stood ( )

13. Were there questions that were tricky to the respondents?

a) Yes ( ) b) NO ( )

What was the problem? Specify_____

_____

_____

14. How was the reaction of the respondent towards questions and survey in general?

a) Very Supportive ( ) b) Moderately supportive ( ) c) Supportive ( ) d) Not supportive ( ) e) completely not supportive ( )

15. How do you rank the reliability of the responses given to you by the respondents? Please put numbers on the following for ranking starting with 1 for high rank

a) Very reliable ( ) b) Moderately reliable ( ) c) Reliable ( ) d) Not reliable ( ) e) Not reliable at all ( )

What are the reasons for not being reliable? Specify _____

_____

_____