An Investigation into water trading as an appropriate instrument to promote equitable resource sharing in the Mhlatuze catchment: A Case Study

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Submitted in partial fulfilment of the academic requirements for the degree of Master in Environment and Development, University of KwaZulu-Natal

Pietermaritzburg December 2009

DECLARATION

I Brendon Longhurst declare that

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Abstract

Water resources are a crucial resource in a large proportion of economic activity, both in rural and urban areas and resource sharing has become an increasingly important concept to achieve equitable distribution of scarce resources which are social-ecological, socio-economic and political in their nature (Breen *et al.*, 2003). Water scarcity and the increased demand from high value water users have decreased opportunities for increased stakeholder participation. The National Water Act of 1998 is part of environmental legislation promulgated to redress the historical inequitable access to natural resources. Previous studies (Versfeld, 2000; Schreiner and van Koppen, 2001; Armitage *et al*., 1999; van Wyk *et al.,* 2006) have indicated that the current allocation mechanism of compulsory licensing, mainly in the agricultural sector, has not resulted in meaningful resource sharing or empowerment[1] as agriculture does not seem to perform as well as other water use sectors in terms of provision of economic benefits. Within the context of striving for greater equity and empowerment in resource sharing, the key issues of participatory governance of water resources in creating sustainable revenue from sharing water resources are evaluated in this study as a basis for the aim of investigating water trading as a suitable allocation mechanism to promote equitable water resource sharing.

Resource sharing will "ultimately rest on negotiated trade-offs between resource users" (van Wyk *et al.*, 2006:9) and there are therefore two considerations for achieving equity in water allocation: capacity through legislative means, and stakeholder perception of how access to resources can be beneficial, which will in turn "influence how human behaviour, and ultimately resource use patterns, evolve" (van Wyk *et al.*, 2006:7). Traditionally, water has been allocated as a usufructuary resource in value chains, such as agriculture, forestry, mining and industry, in addition to fulfilling its function within the Reserve for ecological and basic human needs. Water thus becomes an integral part of a value chain which extends from allocation and conservation of water resources, through various production functions, culminating in the consumption and disposal functions associated with products created from use of water, in other words, a tradable economic commodity (Backeberg, 1997).

The objectives which guide this research are focussed on understanding the dynamics of the water

[1] Empowerment in this dissertation is defined as procedures and legislation which improve access to, and use of, resources in order to create beneficial outcomes for the previously disadvantaged groups in South Africa.

value chain and status of resource sharing, and whether water trading can promote empowerment through increased resource sharing and creation of benefits. The objectives are:

I. Using value chain methods to understand the status of resource sharing in the Mhlatuze Catchment.
II. Using a value chain method of analysis to identify constraints to empowerment of rural communities within the water sector, and identify how water trading as an allocation mechanism could provide potential solutions.
III. Investigate the stakeholder perception of the suitability of water trading in promoting resource sharing through empowerment.

Using the value chain methodology to understand the dynamics driving stakeholder participation and production functions, the resulting water sector map was used to identify flow of benefits and constraints in creating benefits from access to water. Further analysis of the value chain explored the possibility of enhancing governance through increasing subjective, objective and competency based capacity. Inductive qualitative research investigated the acceptance of water trading as an allocation mechanism which could improve empowerment in the context of resource sharing. This methodology could be replicated to investigate the potential of any resource allocation policy.

Preliminary literature reviews revealed the Mhlatuze catchment as a suitable case study area as it is an over-allocated system (Versfeld, 2000; Pott *et al*., 2005) in which the compulsory licensing mechanism is being implemented. The majority of economic activity still takes place through commercial agriculture and industry in the middle and lower catchment, although demand for water exceeds supply within these groups of participants, whilst the majority of the population resides in the upper catchment. The sector map identified the status of the stakeholders and the extent to which they participated and interacted within the value chain. Semi-structured interviews were then conducted with previously identified participants selected from each of the main groups in the value chain to determine whether there was understanding of the empowerment possibilities presented by water trading as an allocation mechanism.

The findings of the sector study showed that the rural poor communities were an integral part of the water value chain, although the status of creation of benefits was limited to those who had access to additional resources to create revenue from water use. Analysis of the value chain indicated that benefits could be created from water trading without having to increase the resource base, important

in the context of scarce resources. In addition, the ability of poor communities to participate in the value chain through water trading, as opposed to traditional resource hungry production functions, has the potential to create meaningful empowerment in terms of improving the confidence, opportunity and capacity of these stakeholders to participate in creating benefits. The discussions with stakeholders indicated that water trading as an allocation mechanism would more likely lead to empowerment of previously disadvantaged communities whilst not adversely affecting current value chain actors by disenfranchising them of a necessary resource as could happen through compulsory re-allocation.

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List of Abbreviations and Acronyms

CMA	**Catchment Management Agency**
CMS	**Catchment Manageme nt strategy**
WUA	**Water User Association**
DWAF	**Department of Water Affairs and Forestry**
NWRS	**National Water Resources Strategy**
NWA	**National Water Act**
WMA	**Water Managment Area**
VCA	**Value Chain Analysis**

1 Chapter 1: Introduction, background and context

1.1 *Introduction*

Water is an increasingly scarce resource and vital to the sustainability of all aspects of life and economic growth. All societal groups, as a result, are affected by the allocation of water resources and their ability to benefit from access to water. Resource sharing amongst all stakeholders becomes then a central concept in sustainable development. The Bruntland Commission defined sustainable development as the "satisfaction of present needs without compromising the ability of future generations to satisfy theirs" (United Nations Environment Programme, 2005: 4). To generate sustainable development, water allocation needs to take into consideration economic efficiency, equity and ecological integrity.

A complex question is how the poorer communities get their fair share of benefits from participation in water resource access and management in an already over allocated river catchment. Armitage *et al.* (1999) suggests that market trading of water would have beneficial effects on efficient use of water, particularly in catchments which are stressed in terms of water resources, and more importantly that access to resources by previously disadvantaged communities would improve, thus redressing equity challenges. A qualitative investigation of water resource allocation mechanisms could provide a better insight into the constraints affecting resource sharing in the poorer communities within the catchment.

Previous quantitative studies undertaken by Pott *et al.* (2005) and Armitage *et al.* (1999) assessing the feasibility of implementing water management systems indicated that there is currently little re-distribution of resources being realized in the context of achieving equity in water management. Water allocation in these study areas is currently based on the compulsory licensing system. The studies suggest that redistribution of resources could be implemented better through utilizing water trading as an implementing tool.

The "recognition that water has an economic value and, therefore, should be considered as an economic good" (Backeberg, 1997) establishes the use of water trading as an economic tool. The use of an economic mechanism for water allocation would enable greater flexibility of water usage to create revenue, could encourage greater stakeholder participation in resource management, hence

increasing the equity of poorer stakeholders in resource sharing. Market trading of water entitlements could be instrumental in ensuring economic sustainability of resource use by creating a greater revenue stream from access to water resources than is achieved through traditional methods such as agriculture. Moreover, the system has greater potential to address the issues of efficiency of water use, ensuring more emphasis on protecting the ecological integrity of the catchment.

This dissertation investigates the understanding of, and the acceptance of the potential benefits from, increasing resource sharing through utilising water trading as a mechanism for water allocation within the context of creating empowerment. The main premise is that water is treated as an economic good since it has value, and therefore it can be measured as such. The potential effects of water trading as an allocation mechanism can then be demonstrated by;

- identifying the main participants in the water resource sector and their status within the water sector
- investigation of opportunities and constraints to create benefits from water entitlements
- the acceptance and suitability of water trading as an allocation mechanism within the context of creating greater empowerment through promoting resource sharing.

More than half of the major catchments in South Africa are over-allocated in the context of water resources, particularly the catchments which have concentrations of industry and agricultural activity. The use of available water (surface and groundwater) in South Africa (Department of Water Affairs (DWAF), 2004b) is shown in Table 1 below. The table indicates the reconciliation of availability, and requirements for water in the 19 designated **W**ater **M**anagement **A**rea's (WMA's) for the year 2000.

Table 1: Reconciliation of requirements and availability of SA water for year 2000 (Million m3/annum)

Water Management Area (WMA)	**Reliable Local Yield**	**Transfers in**	**Local Requirements**	**Transfers out**	**Balance**
Limpopo	261	18	322	0	**(23)**
Luvuvhu/Letaba	310	0	333	13	**(36)**
Crocodile West & Marlco	716	519	1184	10	**41**
Olifants	609	172	967	8	**(194)**
Inkomati	897	0	844	311	**(258)**
Usutu to Mhlatuze	1110	40	717	114	**319**
Thukela	737	0	334	505	**(103)**
Upper Vaal	1130	1311	1045	1379	**17**
Middle Vaal	50	829	369	502	**8**
Lower Vaal	126	548	643	0	**31**
Mvoti to Umzimkulu	523	34	798	0	**(241)**
Mzimvubu to Keiskamma	854	0	374	0	**480**
Upper Orange	4447	2	958	3149	**332**
Lower Orange	(962)	2035	1028	54	**(9)**
Fish to Tsitsikamma	418	575	898	0	**95**
Gouritz	275	0	337	1	**(63)**
Olifants/Doring	335	3	373	0	**(35)**
Breede	865	1	633	196	**38**
Berg	505	194	704	0	**(5)**
Total for SA	**13227**	**0**	**12871**	**170**	**186**

Source: DWAF, 2004b

In 53 % of the WMAs in South Africa in the year 2000, water allowances were over allocated (seen by the negative balances shown in brackets in Table 1) and another 16 % were stressed in terms of available supply and demand for water (DWAF, 2004b). Under the current compulsory licensing mechanism of water allocation, only those catchments not fully allocated in terms of water entitlements have any capacity for further supply driven development. This indicates that the main areas in which development can be supported by readily available resources are the WMAs which have positive balances to allocate. The majority of catchments in South Africa (53%) therefore need

to encourage more efficient use of water within the catchment to develop further and increase their base of economically active stakeholders. Treating water as an economic good (Backeberg, 2006) would seem to be a viable way to encourage more efficient usage of water, utilizing water trading as a mechanism within the water allocation institutional arrangement.

1.2 *Research Problem*

The 1998 NWA has provided the policy framework for water allocation and management for implementation by the Department of Water Affairs and Forestry (DWAF) with the aim of achieving efficiency, equity and ecological integrity in the water sector. DWAF set out the following guidelines for water allocation in the draft position paper (2005;8);

- "redress past imbalances in water allocations" (DWAF, 2005;8)
- "support re-allocation through capacity building processes which allow beneficiaries to improve food security and enterprise development" (DWAF, 2005;8)
- "contribute to black economic empowerment and gender equity"(DWAF, 2005;8)
- "correspond to local and national planning initiatives"(DWAF, 2005;8)
- "take into account existing efficient water uses"(DWAF, 2005;8)
- "protect the reserve for ecological and basic needs"(DWAF, 2005;8)
- "support mechanisms which will decrease administrative costs and time delays on water allocation and encourage effective management of resources"(DWAF, 2005;8)

It is in the context of these imperatives, and against a background of increasing water demand, that water allocation should be implemented and this sets the framework for this dissertation. There are two main mechanisms for re-allocation of water entitlements mentioned in the 1998 NWA;

i) compulsory licensing (currently employed to re-allocate water), and
ii) water trading

Traditionally, water has been converted to economic value through the use of water as a physical production input, and allocations are still skewed towards commercial agriculture and industry (Schreiner and van Koppen, 2001). Under the chosen allocation mechanism of compulsory licensing (Armitage *et al*., 1999), creating benefits from water requires not only access to water, but access to other physical inputs, such as land, financial and human resources, such as money, skills and knowledge, to produce saleable goods. Thus, according to recent studies, the participation in the

value chain is still limited to those stakeholders who have access to these additional resources, and this in essence is what has stunted empowerment in this sector (Pott *et al*, 2005). Armitage *et al*.(1999:301) further state that equity objectives can only be tackled by government intervention, as existing water users perceive that they would "sacrifice capital investment" should they sell off water rights. This lack of willingness by existing water allocation holders to enter market trading of water is partly due to entrenched perceptions of outrights ownership of resource rights, and the inflexibility of existing allocation and resource use mechanisms. The value chain for water needs to be more integrated in terms of governance of resources, not only to improve efficiency, but to empower all stakeholders (Kaplinsky and Morris, 2006). Trading of water entitlements would allow for stakeholders with or without physical access to water or the additional resources, to participate in the value chain and benefit from "income from potential water rentals or sales to industry" (Armitage et al., 1999;301), and also encourage water management to be conducted at all levels of the value chain, thereby increasing potential holistic empowerment throughout the water resource sector.

Whilst market related trading of water (assuming water is an economic input used to create revenue streams) would seem to be the mechanism most likely to satisfy the underlying principles of economic efficiency and protection of ecological integrity, the issue of equity needs to be investigated in terms of perceived empowerment for previously disadvantaged individuals. The poorer community's acceptance of how water trading can lead to empowerment will depend on their perceptions of empowerment, the opportunities present in the value chain to achieve empowerment, as well as acceptance of the allocation mechanism.

Initial literature review of studies conducted on water trading in South Africa (Pott *et al* (2005), Armitage *et al.* (1999), Dallimore (2002) and Claasen *et al.*(2005)) indicated insufficient understanding from stakeholders in the water sector of how to create benefits from water allocations. The Mhlatuze Catchment is one of the first catchments in South Africa to be selected for implementation of compulsory licensing (Pott *et al*, 2005), but both mechanisms have been used in the catchment. Post the NWA of 1998, the allocation in the Mhlatuze is still skewed (Claasen *et al*., 2005) as the previously disadvantaged do not have access to the additional resources required to create benefits. Trading of entitlements, thereby increasing the efficiency of water use without utilising additional resources (Armitage *et al.*, 1999), could be perceived by the stakeholders to be one way to achieve empowerment. The dimensions of empowerment are described by Cook (1997)

in a Development Cube Model, and elements of these dimensions can be used in analysis of the effectiveness of the allocation mechanism. Lessons learned from the case study could be used to guide the process in other similar catchments in South Africa.

1.3 *Research Aim*

The aim of the research is to conduct an investigation into stakeholder acceptance of water trading as a mechanism to equitably allocate water resources, within the context of creating empowerment (Cook, 1997) in the case study area, the Mhlatuze catchment.

1.4 *Research Objectives*

The following specific objectives of this research were identified to direct the literature review and to conduct qualitative research to establish stakeholder relationships in the water sector, and levels of empowerment in the context of water ownership and usage.

I. Using value chain methods to understand the status of resource sharing in the Mhlatuze Catchment.
II. Using a value chain method of analysis to identify constraints to empowerment of rural communities within the water sector, and identify how water trading as an allocation mechanism could provide potential solutions.
III. Investigate the stakeholder perception of the suitability of water trading in promoting resource sharing through empowerment.

1.5 *Methods*

The methods employed in this research consisted of three phases, a literature review, qualitative research to determine the status of resource sharing in the case study area, and an analysis and discussion of the results in the context of holistic empowerment and resource allocation.

The literature review was aimed at understanding the background of water resource sharing in South Africa, the imperatives of the existing legislation and the allocation mechanisms proposed. The review also identified the opportunities, existing and perceived, for stakeholders to benefit from resources, and how allocation mechanisms can encourage resource sharing. A review of appropriate research tools was undertaken to establish the most useful methodological format to undertake

qualitative research through interaction with the stakeholders.

Inductive qualitative research was aimed at generating knowledge (Patton, 2002) of the status of resources sharing in the case study area. The data was analysed using value chain analysis, constructing a sector map to describe stakeholders, supporting structures and the existing relationships within the water sector, and analysis of how the flow of benefits could result in increased empowerment for poor communities.The value chain analysis was conducted in a specific geographic area, as the research investigates empirical data within a specific socio-economic context. Yin (2003; 13) states that the case study method is suited to research because contextual conditions are "highly pertinent to the phenomenon of study."

The initial investigation into the status of water resource sharing requires a specific context within which to test the suitability of an implementation tool for water allocation. The research questions are analysed and discussed within the context and framework of holistic empowerment to determine whether the water trading tool will improve empowerment through water resource sharing, specifically focussing on the poorer rural social groups. The choice of case study area of the Mhlatuze Catchment is explained in the next section.

1.6 *Case study area: Mhlatuze Catchment*

In order to investigate water trading as an instrument to promote equitable water resource sharing, a case study evaluating the Mhlatuze catchment will be presented in Chapter 4. The catchment is currently classified as "stressed" (Versfeld, 2000) in terms of being over-allocated in terms of water resources. The conflicting demands for water by high value water users in the downstream sections of the catchment and existence of poor communities in the upstream areas with little access to resources make this a good case study area. A discriminant analysis of potential buy-in for water trading to take place in a portion of the Mhlatuze Catchment, the Nkwaleni Valley undertaken by Armitage, Nieuwoudt and Backeberg was published in 1999, and gave indications that, although a significant portion of existing water users were willing to purchase water, there were no willing sellers. Armitage *et al.* (1999) attributed this to the fact that the current users generally used their whole allocation, and where this was not the case, the potential buyers did not have a higher value use for water than the non-buyers. Therefore, there was little incentive to sell unused allocations. In addition, the unused water is re-allocated back to DWAF, reducing potential value of water.

The Mhlatuze catchment is over-allocated (Pott *et al*, 2005) but previous studies in the catchment by Pott *et al* (2005) and Armitage *et al.* (1999) indicate that this may be an entitlement over-allocation, implying that some entitlements are not fully utilized, and therefore the allocation mechanism is inefficient. Commercial agricultural (40 % in 2000, DWAF, 2004b) and industrial sectors (36.5 % in 2000, DWAF, 2004b) in the downstream sections of the catchment make up the majority of water use in the catchment. Rural[2] demand, made up of rural households and smallholder farmers, was only 3.5 % of total requirements in 2000 (DWAF, 2004b). This is an indication of skewed water use in a stressed catchment, indicating the need for a more efficient and equitable water allocation mechanism.

The Mhlatuze catchment system is relatively simple, and relies mainly on the Goudetrouw Dam for water storage and the Mhlatuze and Mfuli rivers for surface water sources. Investigations into the possible effects of different interventions in the management process are more easily understood than in more complex catchments.

The Mhlatuze Catchment is one of the first in South Africa to have the compulsory licensing process implemented, and there is therefore some prior knowledge of this system amongst stakeholders. The introduction of the concept of water trading as an alternative allocation mechanism enabled participants in the research to compare this system with the compulsory licensing system that is in operation in terms of achieving meaningful resource sharing.

1.7 *Sequence of Chapters*

This dissertation consists of five chapters, briefly outlined here. The first chapter sets the background and context for water resource sharing in South Africa, describes the research problem and the objectives of the research in achieving the research aim. The methodology then describes the research process and proposed outcomes of each process. The case study selection criteria are then described, culminating in the selection of a case study area.

The literature review in Chapter 2 provides the policy background and socio-economic context for the research and the rationale for the research aim. The literature review also interrogates the pros and cons of the two identified water allocation mechanisms in order to gain knowledge of how

[2] In this Dissertation, the term "rural" refers specifically to the homeland regions of KwaZulu-Natal

these mechanisms could be implemented within the context of the policy imperatives. Different aspects of empowerment are included in the following section to gain an understanding of how holistic empowerment can lead to increased resource sharing. Value chain analysis is researched in this section to discuss the suitability of this tool in investigating resource allocation in a dynamic and often policy driven environment. Since value chain analysis is not confined by strict parameters, it allows the uncovering of the dynamic flow of economic, social, organisational and coercive activities between groups of stakeholders in the productive environment focussed on resource use. Value Chain Analysis (VCA) plots the flow of goods or services up and down the chain, so different measurement criteria, such as poverty indices, efficiency indices, can be used in the analysis to understand implications of interventions on achieving different concurrent policy imperatives. The literature review of VCAs also interrogated the different types of value chain to assist in understanding the drivers of the value chain, what factors affect the sectors sustainability and determinants of income distribution within the sector. The use of VCA as an analytical tool for determining the suitability of an allocation mechanism can then investigate the mechanism in terms of achieving the outcome most suited to the stakeholder's needs and desires.

The methodology in Chapter 3 describes the process used to formulate and analyse the value chain. The value chain is formulated by developing a matrix, using semi-structured interviews of stakeholders identified through preliminary empirical research, to identify participants, supporters and their role in the value chain. The matrix is then translated into a flow diagram, depicted using a sector map showing the stakeholder groups. Further interviews and discussions with stakeholders enabled mapping of their levels of power, the benefits they create, current and potential interactions between the stakeholders, how outcomes are distributed, and the potential to increase the value of outcomes.

The presentation and discussion of the results of the value chain analysis are presented in Chapter 4. The value chain was depicted as a sector map assist to visualise the extent to which particular sets of stakeholders are actively participating in the sector, interacting and sharing in the benefits created. The sector map also identifies the marketing channels through which value is being added to the resource, thus allowing the identification of opportunities and constraints for participants to create socio-economic benefits through participation and interactions within the value chain. The stakeholders' views of issues and challenges in the context of empowerment are taken into account

in the analysis through semi-structured discussions with stakeholders.

2 Chapter 2: Literature Review

2.1 *Policy Context: Water Allocation Reform in South Africa*

In 1994, South Africa established a new majority rule government, which necessitated legislative reform to encourage more equitable development amongst previously disadvantaged individuals utilising natural resources. The National Water Act of 1998 (NWA) established the legislative framework for management of water resources.

The history of inequitable access to and use of, water resources drives the policy intent of the South African government (van Wyk *et. al*., 2006). The challenges are the efficient and equitable re-allocation of water rights to reflect the principles of National Environmental Management Act (NEMA) of 1998, and the South African constitution, whilst minimalising the effect of re-allocation from previous water rights holders.

Currently, the NWA (sections 43-48) proposes Compulsory Licensing as a mechanism to:

- "achieve a fair allocation of water from a resource that is under stress or to achieve equity in allocations
- promote beneficial use of water in the public interest
- to facilitate efficient management of the water resource
- To protect water resource quality" (DWAF, 2005; 7).

The NWA of 1998 is therefore committed to facilitate the allocation of water resources according to the economic principles, described within the Dublin Water use Principles of 1992 and NEMA, of economic efficiency, equitable access and protecting ecological integrity for sustainable use.

Throughout the literature review contained in this dissertation, reference to economic efficiency has been used to explain the optimal use or allocation of a water resource in the public interest (DWAF, 2005), whereas equitable allocation refers to the fairness of distribution of a resource between stakeholders, considering historical, geographical and gender based issues (Dallimore, 2002). Economic efficiency and equity are principles which guide water resource management and are both pertinent to the challenge of water resource sharing, but there are conflicts in allocations based on any single principle. Therefore mechanisms which address these issues together are required, and in the context of empowerment (Cook, 1997) could lead to resource sharing for poor

communities through participation in the water sector value chain (Armitage *et al.*, 1999).

2.2 *Allocation Mechanisms*

There are two basic allocation mechanisms available for water resources: the market mechanism (or pricing mechanism) and "command and control style allocations" (Dallimore, 2002). The market mechanism is essentially an information flow accessible to all stakeholders in order to determine their own values for water, whether on the demand or supply side and will occur in a free market situation with no interference. Command and control allocations are not necessarily driven by market demand and supply but more by government policy. Practically, most water allocations will be a combination of the two mechanisms as "Economics cannot prove that governments ought or ought not to interfere with the price mechanism" (Lipsey, 1983; 128).

2.2.1 Compulsory Licensing

The current mechanism proposed by DWAF to promote "fair allocation of water" (van Niekerk, 2006) in South Africa is that of Compulsory Licensing. This mechanism highlights the command and control nature of government decision making and imposes equity of allocation, via reallocating water entitlements to previously disadvantaged individuals, as the primary goal. The flaw here is that allocation becomes primarily a supply function of water, (Dallimore, 2002) not a demand function. In other words, the available resource is allocated in a manner which reflects the required demographics of policy makers, and not allocated according to demand for the resource determined by economic and social requirements (Backeberg, 1997). This supply function basis for resource allocation is unsustainable for a scarce resource and only addresses the issue of equitable ownership of resources, not resource sharing in a manner which "promotes the beneficial use of water in the public interest" (DWAF, 2005; 7).

Van Niekerk (2006) highlights the disadvantages of compulsory licensing as:

- licenses are granted once off based on current information in a changing, dynamic and inter-related management environment
- the reserve requirement must be accurately determined once off
- administrative and human resources costs
- non-adaptive management implications

2.2.2 The Water Trading Mechanism

The suitability of the market mechanism for water resource allocation is based on the economic theory that price competition between users of the resource will result in an efficient and socially equitable allocation of water (Nieuwoudt, 2002). The theory put forward by mainstream economists is that, not only does the pricing mechanism result in efficiency in production and consumption of a resource, but efficient allocations are also "socially just" (Dallimore, 2002;104). Fairness of water allocation will occur where social welfare is maximized. According to "mainstream economic theory" (Dallimore, 2002; 104) this can be achieved through the pricing, or market mechanism.

This theory of maximizing social welfare is prominent in the DWAF framework for water allocation where the mechanism for water allocation should "promote beneficial use of water in the public interest" (DWAF, 2005). By public interest the policy makers mean that water allocations should be "to the benefit of the public and the nation as a whole" and "balance the broader public interest with the rights of the individual, including commitment to equity" (DWAF, 2005;7).

The market mechanism, in reality, has the potential to fail. "Market failure does not mean that nothing good has happened, only that the best attainable outcome has not been achieved" (Lipsey, 1983; 467). Dallimore (2002) identifies the following main potential causes of market failure:

- common property rights
  Common property rights can lead to a scenario where utilization of the water is not regulated by the market, as there are no defined property rights. Therefore the decision making process regarding use of water is not based on economic efficiency, but rather on each stakeholder "pursuing his own best interest" (Hardin (1968), quoted by Dallimore, 2002). This can result in overexploitation of water resources.
- imperfect information and lack of capacity
  Imperfect access to information affects efficient and informed decision making regarding the best utilization of water resources as pricing of the resource occurs in an imperfect market place. Commodity pricing requires perfect information in order to impose a correct value for trading.
- market concentration (or geographic resource distribution)
  The geographic distribution of the stakeholders and resources in an area could affect access to water resources. This gives rise to a situation where few consumers control the water

market due to access and infrastructure. On the supply side, monopoly can distort the market pricing mechanism through imperfect competition conditions.

- Externalities (or lack of participation in water resource management).
  These are discrepancies which arise in the value of a resource due to the difference between the "private cost" and "social cost" of the resource (Lipsey, 1983;468). Lipsey (1983;468) defines private cost as "the value of the best alternative uses of the resources available to the producer" and social cost as "the value of the best alternative uses of the resources that is available to the whole society". Essentially the discrepancies lead to a market failure from a social standpoint as efficiency of resource allocation by demand from private users does not necessarily cover the social costs which are "external to the decision making process" (Lipsey, 1983;468). Externalities arise, according to Dallimore (2002) where property rights are poorly defined, therefore are difficult to include in the cost-benefit analysis of the water market. Externalities will also arise where factors such as pollution, conservation and exploitation, and inequality of water resource ownership are not included in the market pricing mechanism (Dallimore, 2002).

DWAF, however, although identifying the same two imperatives of efficiency of allocation of water and equity of water resource ownership, propose to achieve this through the "command and control" (Dallimore, 2002) style of allocation rather than through the market mechanism. In part this is due to the potential failure of the market mechanism as described above.

2.2.3 Advantages of Water Trading

Water trading, as an alternative mechanism for allocating water entitlements, has several potential advantages, outlined by Armitage *et al* (1999):

- Water trading encourages the highest value use for water leading to efficiency of resource use
- The trading mechanism allows for flexibility in decision making in response to market forces in agricultural commodities and changes water demand functions
- Resources sharing is achieved as reallocation of water entitlements requires the permission of the entitlement holder
- Access to information is improved through market mechanisms

- Individual entitlement holders will increase their personal capacity in decision making regarding the use or tradability of water entitlements
- The institutional framework surrounding a water market will ensure characteristics of security of ownership and thus stimulate secondary financial markets.
- Security of a water market will also stimulate innovations in water saving technologies. The value of innovations will mirror the value placed on water.

If water trading exists in an environment which facilitates the process efficiently and transparently, the combined land and water asset value should increase due to the high demand for water (Woolston, 2004) and this will contribute positively to the overall economical situation. This issue will positively affect the municipal rating base, which is dependent on the land values, and promote beneficial use of water "in the public interest" (DWAF, 2005: 7).

Versfeld (2000) agrees that a water trading mechanism could lead to increased efficiency of water use and result in economic growth and resource sharing, but cautions that, due to the scarcity of the resource, trading of water entitlements to more efficient and high value users may entrench water entitlements amongst these stakeholders. The CMA would have to use its authority to re-allocate entitlements, an unpopular and unlikely scenario where the CMA is managed mainly by the existing water users. "This means that such water will never become accessible to the rural poor" (Versfeld, 2000). Versfeld seems to concentrate his views on the permanent trade of water (see Types of trade later in this chapter). This is yet another argument in favour of ensuring that the rural poor realize economic benefit from water entitlements, either through traditional agricultural use, or creating a revenue stream through short term leasing of their entitlement.

Initially, allocation of water resources should entail a full audit of the water resources in the WMA's and current allocation patterns within each area. This will allow the CMA of each area to make allocation decisions on an informed basis with minimal institutional interference (Pott, 2006). In stressed catchments, reallocation from historical water users will require negotiation (Armitage *et al,* 1999) to redress past inequities, and then to trust in the water market system to effect fair water distribution and the benefits that flow from equitable resource sharing. The framework provided by the NWA of 1998 will effect a participative and informed implementation process via the CMA.

The CMA structures need to regulate water trading efficiently in order to control the transaction

costs in the market. Free market mechanisms such as water trading may not address the needs of all targeted groups, such as the DWAF proposals concentrating on pro-poor and previously disadvantaged do, but conversely, political policies do not necessarily determine the needs of the individual as would participation in free market decision making.

In South Africa, the industrial, mining and manufacturing sectors are the growth engine of the economy, so the demands for water are shifting away from traditional uses such as irrigation towards higher value users (Versfeld, 2000). This counts against the proposed anthropocentric re-allocation of water to rural poor for agricultural use as water could "provide a far better return on investment if allocated elsewhere" (Versfeld, 2000;6). The framework for water allocation thus becomes more crucial in overall water resource management, as does the need for entitlement holders to have alternative opportunities to create revenue from the water entitlements. To create alternative opportunities, resource allocation requires an efficient and secure mechanism and framework to operate within.

The use of water trading as an economic tool to achieve efficiency of water use would have more flexibility to operate within the dynamic environment of water resources. This system has the principle of "use-it-or-bank-it" (Pott et al, 2005) would encourage the water users to more efficiently use their water as they would be able to use the water market arrangement to bank their surplus entitlements for later use, or to trade with other stakeholders requiring higher value water. This allows the entitlement holders to base their water use decisions on "the full opportunity cost of their water use" (Armitage, 1999:32), thus encouraging economic efficiency of water use.

2.3 *Types of Water Trading*

There are basically two types of market (Bjornland, 2004;4) for trading the underlying entitlement to access water. The first market is the trading of long-term entitlements to access water which is commonly referred to as a "permanent or formal market" (Bjornland, 2004;4). According to Nieuwoudt (2002), this system has been introduced into South Africa, but not for the purposes of addressing the issues surrounding resource sharing for rural communities. Permanent trading takes place when the increase in the consumption and demand for water, such as through the process of increased urbanization or industrialization in downstream areas, leads to a higher value use for the water than through previous agricultural value in rural areas. The rural entitlement holders can trade their water entitlements to high value users on a permanent basis, but are compensated for the loss

of water ownership by creating revenue from the water entitlements. This process leads to reallocation of water resources from rural areas to urban areas, resulting in a skewed pattern of ownership but not decreasing the equity of benefits accrued from resource sharing and limiting the decrease in economic activity and development in the rural areas (Bjornland, 2004).

The second market is the trading of the right to utilize water but not the right to ownership of the underlying entitlement for access to water. This market consists of demand and supply functions which allow leasing the water entitlements over short time periods, and would create flexibility in the water market for water users if the framework allowed for such trades and the transaction costs were kept minimal. The leasing market would also be most likely to satisfy the requirements of rural water entitlement owners as they would be able to participate in the dynamic market of water resources without giving up ownership to their water access entitlement. The leasing of entitlements option would require that the water is fractionally allocated to allow the entitlement holder to be flexible in terms of leasing volumes and leasing time periods.

In the Australian water market, the administrative mechanisms supporting the system have allowed a more "divisible nature" (Woolston, 2004) of water entitlements, thereby allowing entitlement holders to engage in trade of a permanent nature, where the entitlement ownership is altered, a temporary nature where the underlying entitlement does not change hands, and a lease basis for a specified period of time to another user. All trades require the administrative system to be efficient, secure and timeous to allow the participants in the market to take advantage of seasonal dynamics prevalent in economic sectors reliant on water for economic efficiency.

2.4 *Principles of Water Resource Sharing*

CSIR (2007; 1) alludes to the fact that implementation of policies and mechanisms to promote efficient, equitable and ecologically sustainable water resource management lies in the model of "decentralized decision-making specifically designed to promote democracy via a process of participatory decision-making". Resource sharing, through stakeholder's interaction, is part of the promotion of sustainable development of water resources implemented through allocation mechanisms. The objective of water allocation mechanisms is to "ensure the equitable, efficient and sustainable deployment of water resources to support socio-economic development" (CSIR, 2007: 1). Thus a sustainable process of water allocation, ensured by implementing appropriate mechanisms, represents participation in resource sharing.

The CSIR (2007) developed a governance framework to address the issues explained above, similar to those developed in the causal framework developed in this research, explained in the section on Methodology. The framework is based on a "trialogue hypothesis" (CSIR, 2007:1) which came to the conclusion that good governance of a resource depends on the existence of effective processes to drive a policy, in this case a water allocation mechanism, as well as "effective interfaces between the processes" (CSIR, 2007:2). Thus, by interrogating the efficiency of these interfaces, and the acceptability of their outcomes, a reasonable conclusion can be drawn as to whether the allocation mechanism will be able to result in increased resource sharing.

The issues identified in each of the processes by stakeholders were identified in the causal framework used in this research. Investigating the three principles as effective interfaces between processes should give an indication of how the water trading allocation mechanism can resolve the issues, and therefore encourage resource sharing.

2.4.1 Processes of Governance of Water Resources

CSIR (2007) quoted Turton *et al*, (2007) as stating "water governance is the process of informed decision-making that enables trade-offs between competing users of a given resource so as to balance protection [of that resource] with beneficial use in such a way as to mitigate conflict, enhance equity, ensure sustainability and hold officials accountable". Turton *et al* (2007), it can be surmised, also recommended a water allocation process which is governed through interaction of the principles of economic efficiency, equity and ecological integrity. These interactions highlight the importance of participative governance of the water sector in order to achieve the goals of efficiency, equity and ecological integrity in water resource management. The governance framework (Figure 1) indicates the processes, described in the next section, which are part of the management of resources to achieve these goals.

2.4.1.1 Water Resource- Managing Demand

Managing demand for the resource requires monitoring and evaluation of the water resource, the water inflows and outflow requirements to service demands and requirements placed upon the resource by basic social and economic functions, ecological requirements and commercial demand

for agricultural, industrial and urban usage (Versfeld, 2000). This is made more difficult by the dynamic and interrelated nature of water resources and the socio-economic and ecological environments in which the demand is created.

Demand for water is influenced by the price for water, potential benefits created by water use, infrastructure available for water use, access to complimentary goods and services, and sociological factors such as class, education, level of income, and geographical situation (Lipsey, 1983).

2.4.1.2 Policy Makers – Managing Relationships

Managing relationships is essential in integrated resource management, due to the interrelated nature of the demand functions and the diverse responsibility amongst the different stakeholders for efficient water management. Policy making for resource allocation has been devolved to stakeholder level (via the Catchment Management Agency, NWA, 1998), thus requiring increased capacity amongst stakeholders.

The policy making process is influenced by the stakeholder structure, relative socio-political and economic influences of the stakeholders, conformance with other wider policy decisions (such as international treaties, national resource policies), correcting historical imbalances in water access and allocation, and co-operative environmental governance (NEMA, 1998: sections 40-41; Rogers *et al,* 2002; Briscoe, 1996)).

2.4.1.3 Socio-economic process – capacity and learning

The socio-economic process to improve resource sharing involves increasing the capacity of the stakeholders in order to participate in integrated water resource management at a societal level. The process also necessitates increasing society's ability to benefit from resource sharing through improved integration in decision-making, revenue creation and improving standard of living.
The socio-economic process is influenced by levels of education, standards of living, acceptability of the concept of resource sharing, access to goods and services to produce benefits from water use, fairness of allocation, security of tenure, flexible opportunities to create benefits and participation in decision-making processes (Le Moigne *et al*, 1997; Rogers *et al,* 2002; Briscoe, 1996).

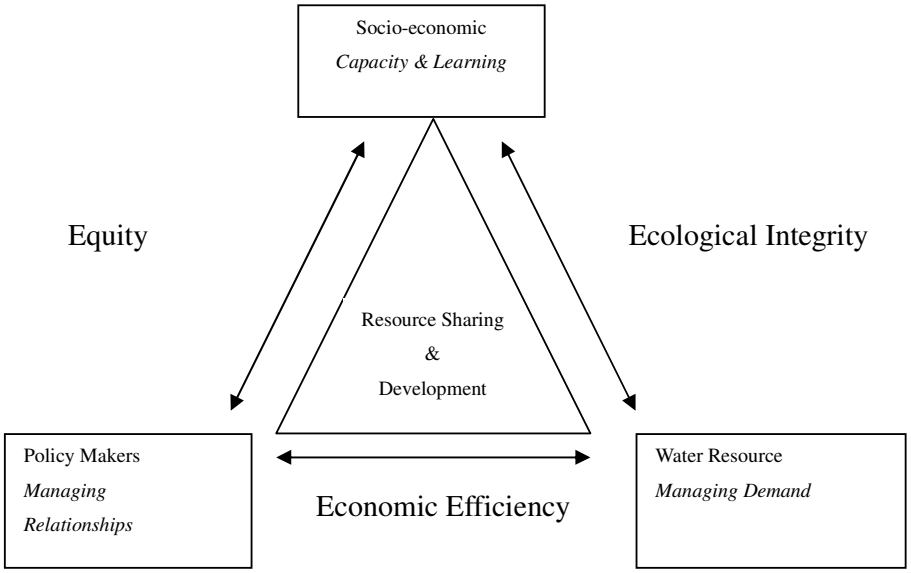


Figure 1: Trialogue Framework for Governance (CSIR, 2007)

2.4.2 Importance of Principles of Allocation - Trialogue Interfaces

This section discusses how the allocation principles are effective interfaces, or boundaries, between the three governance processes aimed at promoting resource sharing (Figure 1, Sourced from CSIR, 2007).

Economic efficiency acts as the interface between the processes of demand management for the water resource, managing stakeholder relationships. Demand for water will influence the decision making regarding allocation policy for the resource, therefore requiring interaction between stakeholders. All stakeholder relationships need to be managed in an integrated fashion in order to effectively manage demand for water. Economic efficiency gives an indication of the requirements for each sector to create sustainable revenue, resulting in the best allocation of the resource for the benefit of society as a whole (NWA, 1998). Thus, economic efficiency is the common boundary (or interface) between managing relationships of stakeholders in the resource, and managing demand for the resource.

Policy-making in the field of water resources is an integrated function requiring the participation of all stakeholders. Relationship management therefore becomes vital to the concept of resource

sharing. In order to effectively manage the demand function for water, there is a need to ensure sufficient capacity amongst the stakeholders and therefore manage the relationships between these stakeholders for efficient decision making processes and policy decisions. Equity is the interface between increasing capacity of the stakeholders and managing relationships between stakeholders.

Increased capacity within society to create revenue from water normally results in increased demand for development in the catchment. Greater demand has a bigger impact on the sustainability and ecological integrity of the water resource. It is in this way that the integrity of the ecology is a pertinent interface between increasing capacity of the stakeholders and managing demand for water resources. Capacity and increase in knowledge of stakeholders is an integral part of development of the resource. More development will result in higher demand for water, leading to higher water value. Although higher water value more efficiently allocates water to economic uses, the harder it will be to allocate water to the basic reserve[3] unless it is part of the trading mechanism.

2.5 *Required Outcomes of Water Resource Sharing*

Traditionally water resource sharing in South Africa, and other countries with similar hydrographic and demographic profiles, and the benefits accruing from it, have been gained through investment in increasing agricultural production by reallocating productive and relatively non-productive land to agricultural use (Bjornland, 2004). This change in land use patterns in the catchment could lead to a change in demand functions for water and may place more pressure on the water resource without resulting in net economic or social gain for the catchment. A positive change in socio-economic gain could result in more equitable resource sharing, particularly for poorer communities, but only if increased participation is translated into a revenue stream to quantify benefits. Existing stakeholders in water resources may be reluctant to participate in resource sharing due to the "perceived risk of losing a resource-related power base" (van Wyk *et al*., 2006;108), whilst potential new participants, argue van Wyk *et al*. (2006) may not have the confidence, skills or awareness of existing opportunities to participate. These perceived capacity shortcomings are researched in the context of improving empowerment through resource sharing in the case study area.

[3] The basic reserve is that portion of water resources allocated (through the National Water Resource Strategy) for basic ecological and human needs before water is made available for traditional economic uses.

One mechanism by which water allocations could be transformed into a revenue stream, without intensive requirements for capital investment and capacity building in rural communities, is through introducing water trading as " a key instrument in achieving the more efficient and sustainable use of … limited water resources" (Woolston, 2004; Abstract). The issue of creating a revenue stream will imply investigating ways in which revenue from water trading is efficiently distributed to the beneficiaries and the implications this has for participation in resource management in the Mhlatuze case study area.

A mechanism such as water trading, if implemented with the appropriate registration systems and accounting procedures, could allow the three economic principles to act as efficient interfaces between the processes of demand management, relationship management for the stakeholders, and increasing the socio-economic capacity of the water resource. This would encourage resource sharing through relying on a free market system for water allocation, devolving management responsibility to the stakeholders and promoting stakeholder participation in resource management, thus enabling stakeholders to actively benefit from water resources. The next section presents discussion of the value of water resources against a background of policy initiatives and in the context of creating meaningful benefits through empowerment.

2.5.1 The value of water resources

In this section, water as an economic good is discussed, in terms of water use and total economic benefit realized by water use. This, according to Briscoe (1996; 2), depends on the "interaction of three critical factors---the value of water, the use cost of water, and the opportunity cost of the resource". This then should have bearing on the allocation of water resources between sectors of the economy in order to maximize economic efficiency. Allocation of water resources through an economic, market related mechanism is likely to result in increased prices for water, simply due to the interaction of high demand and limited supply of the commodity (Lipsey, 1983).

The tradability of water allocations will, according to Briscoe (1996), result in an increase in the value of water due to the increased opportunity costs for water as it can be traded across sectors. If water can only be used by the individual holding a water entitlement, the opportunity cost of that water is minimal; limited to the different uses that individual has for turning water into revenue

(Lecler, 2006). Typically, for small scale farmers this opportunity cost is smaller than for more resource rich stakeholders. As water allocations are allowed to be leased or sold to other users, the opportunity cost, and therefore cost of the water rises as more users across different economic sectors are able to lease or buy that water allocation. The concept of opportunity cost holds for all three economic principles in terms of economic value, equity value and ecological value.

The next sections will discuss how treating water as an economic good for purposes of resource allocation is beneficial in promoting resource sharing.

2.5.2 Economic Efficiency

Effective management of water resources includes "the management of water as an economic resource" (Briscoe, 1996:2). The value of water will depend on the benefits which can be derived from the use of water. Efficient allocation of water will occur, in economic terms, when the price for water equals the marginal cost of water (Lipsey 1983, chapter 23). In other words, reallocation will occur when the benefit obtained from a unit of water is greater than the cost of that unit of water. Lipsey (1983) further explains that economic efficiency in resource allocation will occur "when it is impossible to change the allocation to make someone better off without making someone else worse off". This will occur only in an atmosphere of perfect market competition. The driving force behind resource markets is a function of supply and demand, an argument put forward by Ricardo D., who in the case of land, argued that the price for the resource is derived from the benefits created through the use of that resource (Lipsey, 1983). Thus, the price for water is derived from the innovative use of water to create revenues exceeding the cost of water. The value derived from productive use of water over and above the price necessary to keep water in its present use is defined as the economic rent.

In the context of allocation of resources, economic rent for resources arises as a result of unequal access to, ownership or control over scarce resources (Ricardo in Kaplinsky and Morris, 2006) creating competition for water (Backeberg, 1997). The concept of economic rent is essential for the sustainability of creating revenue from water resources, as the flexibility of revenue creation opportunities will drive derived demand. The creation of revenue from these opportunities requires the enhancement of core competencies within the stakeholders of the productive value chain, and

horizontal interaction between groups of stakeholders (Kaplinsky and Morris, 2006).

In the case of irrigated agriculture, one of the biggest users of water, the value of water is low for the agronomic crops such as grains, timber and sugar cane, such as found in the upper and mid-reaches of the Mhlatuze catchment. In high value agriculture, such as fruit and horticultural sectors, the value of water is much higher (Briscoe, 1996). Briscoe (1996) contends also that the value of water, from studies done in the Western United States, increases going from agriculture to environmental uses, to industry and ultimately the municipal water supply. This is backed by a study conducted by Hassan R.M *et al.* (2002; 5) which found that the "direct economic benefits from water use in forestry" was lower than that generated by irrigated agriculture. As is shown by the sector map analyses in the following sections, this direct benefit does not necessarily reflect the full benefits in value adding upstream and downstream of the activity.

In the context of water allocation mechanisms, would this total economic benefit value be improved through water trading to create a more efficient use for water overall? The common measure for gains in economic efficiency through market related resource allocation is the concept of elasticity. This is measured by the percentage change in demand for the resource resulting from a percentage change in the price of that good (Lipsey, 1983). In water stressed areas, such as the Mhlatuze catchment, market related water trading would likely increase the prices of water due to the force of increased demand on finite supply of the resource. Briscoe (1996; 7) refers to literature assessing the reaction of users to the change in price of water and states that "demand is inelastic with respect to price". This would imply that the demand for water does not change proportionately with the increase in price of water. In fact, as Briscoe (1996) argues, demand is reduced when price is increased when the price elasticity is negative, as with water. This implies that a market related allocation mechanism will re-allocate water to higher value, more economically efficient use. The resource will be put to its' "most valuable uses" (Rogers *et al.*, 2001; 2) and therefore contribute to the sustainability of that resource. Conventional wisdom holds that raising prices of a basic good is "regressive and therefore reduces equity" (Rogers *et al*, 2001; 2). Rogers *et al.* (2001) contend that the price increases inevitable with treating water as an economic good, as opposed to a public good, can improve equity, depending on the mechanisms in place, as previously discussed in Chapter 2.2.

2.5.3 Equity and Empowerment

Bjornland (2004) contends that the rural poor may not have access to the necessary resources and knowledge to convert water to meaningful revenue streams ("resource empowerment" (van Wyk *et al*., 2006; 25)) and achieve equity of resource use. The trialogue for governance (Figure 1) describes equity as being the interface between increasing capacities of stakeholders and managing their relationships in terms of access to, and use of, resources.

Increasing equity of resource sharing implies increased participation of stakeholders, which should, under a market based allocation mechanism, result in more varied demand uses for water, some at higher levels in the value chain. This situation can lead to an overall increase in the value of the resource through increased demand and rising opportunity costs for alternative water uses (Rogers *et.al*. 2001). The effects of higher resource values of course can impact the poorer communities negatively, but if the water tariffs are set according to all economic criteria (Rogers *et al.* 2001), then this scenario would more likely improve efficiency of water use. The higher value of water can be utilized to improve infrastructure and provide services to those areas previously without utilities. This may have the effect of increasing supply of water, thus allowing more communities access to water sources, thereby allowing for increased re-allocation to previously water poor communities. Re-allocation of water resources will encourage increased management capacity within the poorer stakeholder communities and introduce into these communities higher levels of technological monitoring and management techniques (Rogers *et al.,* 2001). Increased education and capacity building is an important factor of improving the value chain in the context of equity in resource sharing.

2.5.4 Ecological Integrity and Sustainability

The assumption that market related water allocation mechanisms will increase the value for water in a supply constricted situation implies that water will be used for its most efficient use. This in turn suggests that overall demand for water will decrease, thereby making improving conservation in terms of greater available water supply. Price increases will also, according to Rogers *et al.* (2001) "provide economic incentives to reduce water losses" thereby improving the ecological sustainability of the resource by reducing demands on the resource base. The separation of water

property rights from those of land and the establishment of the Reserve to meet basic human and ecological needs has established the environment as a legitimate user of water, and potentially then a participant in the value chain for water (Freeman, 2005).

Allocating water using a market mechanism could add to the ecological sustainability of the resource by encouraging recycling of water, particularly in the mining and industrial sector due to the increased cost saving accruing to sectors that practice recycling (Briscoe, 1996). This improves both the quality of the resource and the quantity of water available for use. In addition, the participation of the ecological reserve in the value chain could improve sustainability through combined decision making processes between all stakeholders.

The trialogue framework for governance (Figure 1) has resource sharing at the centre of the interactions resulting from economic efficiency, equity and sustainability of use of water resources. Allocation of water resources amongst stakeholders should then encourage resource sharing through increased participation in governance of the resource. The mechanism by which resources are allocated should allow the relationships described by the Trialogue (Figure 1) to flourish, and van Wyk *et al*. (2006; 9) argue that these relationships are characterised by "trust, empowerment, and shared rules and norms". In other words, empowerment needs to take place to create sustainable trade-offs in resource governance.

> *"The ultimate success of the 1997 water policy is likely to rest not so much on economic and technical issues, but more on the capacity to develop and implement good governance systems. All the necessary tools have been provided in policy and legislation to promote transparency, to ensure that power over the allocation and management of water does not become concentrated in the hands of the political elite, and to ensure that all people of the country have equitable access to water and the benefits that water provides, including improved health and economic development" (Mackay, 2003; 79).*

The following section discusses the areas of empowerment within the framework described by Cook (1997) in van Wyk et.al. (2006).

2.5.5 Areas of Empowerment

Participation is a critical element in the process of redressing inequities of the past in water allocation (Goldin, 2009), one of the main aims of the NWA of 1998. Societies need to manage demand for water, and "demands are in turn organised and regulated via social systems that seek to reconcile diverse needs and preferences (Van Wyk *et.al*., 2006; 8) When actors are excluded from

interaction, the potential linkages between actors in the sector are restricted, so empowerment to participate in resource sharing is essential. Cook (1997) proposed, in his model for empowerment, that increased capacity needed to take place in three distinct areas to result in "holistic empowerment".

The improvement of equity through increased resource sharing requires the stakeholders to build capacity in the areas of building confidence, the ability to identify and take advantage of opportunities offered, and to improve competence to participate in the empowerment process (van Wyk *et al*., 2006). According to Strandberg (2001; 4) who conceptualises empowerment for women as a strategy for poverty eradication, "Empowerment processes can be facilitated by outsiders, but must be driven by the [beneficiaries] themselves". The management of relationships, as previously discussed, can lead to empowerment in this manner. Cook's model (1997) described the need for "capacity enhancement in three distinct areas" (Van Wyk *et.al*, 2006; 25), although Van Wyk *et.al* (2006) adds an additional area of empowerment:

- Resource Empowerment
- Competence (accessing the skills and knowledge to foster ability to create benefits from resource sharing)
- Objective Empowerment (concerned with creating opportunities from sharing in resources and developing responsibility to participate)
- Subjective Empowerment (confidence to participate in creating benefits from resources)

Holistic empowerment, according to Cook (1997) can be depicted by the following diagram (Figure 2, sourced from Strandberg, 2001; 4) which helps to clarify the levels of empowerment which it is necessary to achieve in order to create benefits from access to resources.

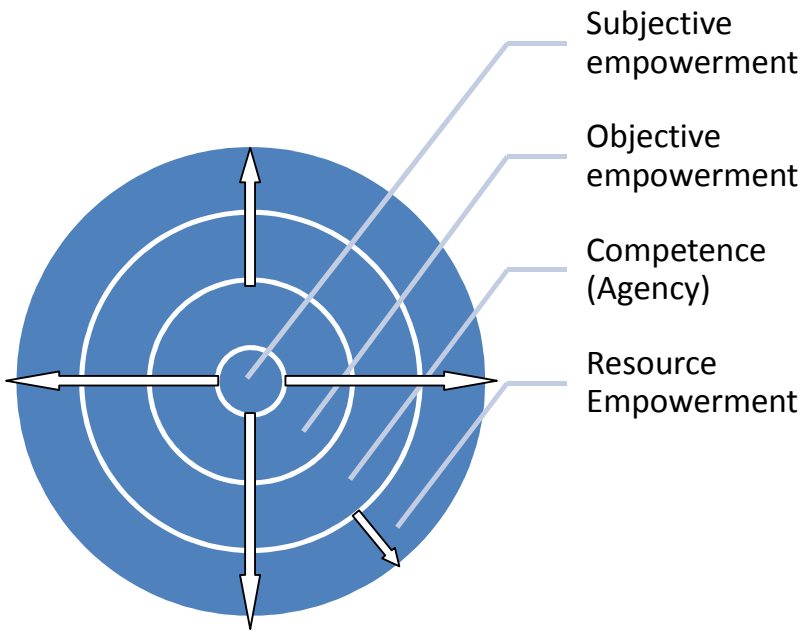


Figure 2: Empowerment Process (Source: Strandberg, 2001; 4)

2.5.5.1 Resource Empowerment

Resource empowerment "refers to the manner in which resources (eg. time, money, equipment) enable participation in collective endeavours" (Van Wyk *et.al*, 2006; 25). This dimension of empowerment is endogenous to the process of water usage, but is directly dependent on the participants' legal status, ownership of and access to critical factors of production in the different value chains which enables the actors to benefit from resources (Ribot and Peluso, 2003). The indicators used to gauge the power distribution (access to key assets) (M4P, 2008) which is determined by resource empowerment in the sector analysis used in this research are:

a) share of chain value added activities,
b) control over resource allocation,
c) geographic positioning, and
d) control over key technology.

Resource empowerment through providing the means to access by allocation, in addition to physical access, gives the beneficiaries the opportunity to make decisions based on opportunity cost of deploying that resource to create benefits according to their specific livelihood strategy (Scoones, 1998). Resource provision is therefore the base for the empowerment process which "enables the

individual to act as an agent of change in his or her own life" (Kiiti *et.al*., 2009; 5). Resource empowerment creates the base for empowerment based on competence or agency.

2.5.5.2 Competence

The dimension of competence, or agency, is based on possession of the necessary skills, knowledge and attitude (Cook, 1997) to actively participate in creating benefits from empowerment (van Wyk *et. al*., 2006) and focuses on the capacity of the community to affect change (Kiiti *et.al*., 2009). Goldin (2009; 155) in her analysis of integrated catchment management in the Breede-Overburg WMA, states that "participation, knowledge, power and agency are critical components of the attitudinal construct of social capital", and these form the dimension of competence in the context of empowerment. Furthermore, Goldin (2009; 156) explains that "the absence of knowledge, the unequal power relationships between water users and the inhibition of agency thwart the procedure of participation".

The ability to participate and benefit from resources depends on the actors awareness of the rules and norms which govern the interactions between different actors in different functions of the value chain sets (Strandberg, 2001) and so knowledge is a critical factor in determining who can create benefits from access to resources (Goldin, 2009). "Access to knowledge is important in shaping who can benefit from resources" (Ribot and Peluso, 2003; 168), but there are historical barriers to gaining knowledge (under education of rural communities as a remnant of the previous system of apartheid government) and the system of governance and linkages within the water sector limits transfer of knowledge to the actors who are interacting. Knowledge transfer occurs through interaction and mutually beneficial linkages between actors in the sector. Information regarding formal and informal rules regulating access and sustainability in the sector are inherent in the contractual and business relationships formed in the sector, and this knowledge is transferred only when there is a benefit accruing to one of the parties. Knowledge transfer enables actors in the water sector to make choices and decisions regarding the trade-offs required to participate in creating benefits from water use. Access to knowledge also enables users to "be active agents in the forums" (Goldin, 2009; 159), and thus begin sharing in the information flows and trust building through interaction between user groups and value chains.

Control over knowledge and information can add additional leverage to control over resources, and access to knowledge forms part of the level of power in the context of governance (Kaplinsky and

Morris, 2006). The preclusion of certain groups of actors from critical decision-making institutional nodes fosters a lack of trust in the allocation process as the knowledge used in this process is not transferred to non-participatory groups. In addition, these institutional nodes tend to form the power base of the sector, and whilst power may be distributed equitably within groups in the water sector, it is not distributed across groups (Goldin, 2009). The holders of critical information can use this to retain access to resources (Ribot and Peluso, 2003), thus precluding groups from participation.

The ability to benefit from access to resources is also dependent on the skills set required to identify opportunities available to create benefits. This implies having industry and market related knowledge (Ribot and Peluso, 2003), ability to make decisions based on beneficial trade-offs (Scoones, 1998) and the technical knowledge required for production. Skills are in part transferred between actors as part of continued and sustainable interaction with higher skilled actors, and development of skills is part of the socio-economic capacity and learning dimension of the Trialogue of Governance (Figure 1). The ability to make knowledge based choices regarding water management and creating benefits from water use allows participants to become "responsible agents in the domain of water" (Goldin, 2009; 159). The institutional and formal regulations within the sector also contribute to the agency dimension, particularly regarding water allocation.

2.5.5.3 Objective Empowerment

The dimension of objective empowerment describes the opportunities offered by access to resources, governance of the resource value chains and sense of responsibility to participate (Van Wyk *et. al.*, 2006), and "describes the individual's movement from oppression to influence and opportunity in organisational terms (Cook, 1997; 288). The opportunities offered relate to the ability to create benefits (resulting from increase in resource empowerment and competence), both tangible, such as revenue, and non-tangible, such as social within the laws and norms regulating the scope of activities in the sector (Strandberg, 2001; Ribot and Peluso, 2003). Cook (1997) maintains that objective empowerment takes place through exposure to the allocation strategies and frameworks, inclusion in knowledge flows and decision making forums, and belonging to affirming organisations within the sector.

There are formal (legislatively backed) and informal (determined by the value chain governance) rules and regulations in any sector, and these can either motivate participation, or exclude certain groups of participants (Cook, 1997). Rules are set both by actors inside and outside the value chains

(Kaplinsky and Morris, 2006) and involves agreements between suppliers and buyers of products generated from water use. Direct value chains involving monopolistic buying rules may lead to disadvantaging the producers as rules are communicated within the existing supply chain, implying that the opportunity, or potential to enter into the value chain, is compromised due to lack of information and access to supply contracts by non-conformity to informal quality rules. The existence of restrictive rules and regulations can impede objective empowerment (Cook, 1997). The informal rules, especially in the agricultural based value chains, also include minimum supply contracts from processing companies involving specific crop types, thus limiting the opportunity for small growers who do not have access to additional land and capital resources to enter in to the value chain (Ribot and Peluso, 2003). Removal of "organisational obstacles" (Cook, 1997: 290) can be achieved through participatory management of resources.

The level of a group's or individuals' participation in the water sector is a result of the sense of responsibility that actors feel towards required effort to identify and create opportunities for beneficiation from water use. This is a social construct made up of attitudinal and power based components (Goldin, 2009) gained through building relationships and trust. Responsibility is a function of knowledge of the sector in which they operate and the sense of agency, or competence to make decisions. Interaction of rural communities in the water sector allows for greater ability to make decisions for the benefit of all stakeholders, as they are the focus group for equitable re-allocation of water resources (NWA of 1998). Increased interaction in decision making can create a sense of belonging (Strandberg, 2001), which fosters a stronger sense of responsibility to participate in the functions of the value chain sets (Goldin, 2009).

Opportunity to participate is therefore a function of access to resources, access to information and knowledge, access to skills and knowledge and conformity of formal and informal rules and regulations within the value chain sets.

2.5.5.4 Subjective Empowerment

Access to resources, knowledge and skills required to identify and make decisions on opportunities that exist to create benefits are the basic dimensions described in the empowerment process, but the focus groups still need to have the willingness to participate. This dimension of the empowerment process requires confidence (subjective empowerment), motivation and reliance on the individuals

own initiative (Cook, 1997; Van Wyk *et. al*., 2006) to actively participate in creating benefits (social, economic, political, cultural) or improving livelihoods through access to, and use of, resources (Merrey *et al.*, 2005). The space for poor community's activity and agency is limited by their own perception of what they can or cannot do (Strandberg, 2001), and they need to gain the capacity and confidence to participate in such a way as to achieve their livelihood objectives (Anderson, 2000). Mackay (2003) also argues that subjective empowerment also applies to the formal governance frameworks put in place to encourage empowerment.

The dimensions of empowerment are relevant to the allocation of water resources as the stakeholders depend not only on the resource itself, but on other stakeholders to balance their needs and identify beneficial trade-offs, as per their own livelihood strategies (Cook, 1997; Merrey *et.al*., 2005). Van Wyk *et.al*. (2006) argue that only when co-operative behaviour accompanied by mutual trust and understanding between stakeholders becomes "pervasive and the benefits of it are realised, resource allocation and use will rely less on command-and-control means and legal economic instruments" (Van wyk *et.al*., 2006: 11). An understanding of the socio-economic and ecological development issues within the water resource management discourse is vital for the rural communities to develop subjective empowerment (Cook, 1997).

2.6 *Value Chains and Sector Maps: suitability as an analytical tool for qualitative research.*

2.6.1 Introduction

The policy objectives of re-allocation of water resources are clear in terms of creating an environment within which resource sharing can take place, more importantly encouraging increased equity of water use. It is then clear also that the previously disadvantaged communities need to become active participants in the productive use of water (Versfeld, 2000). Value chain analysis (VCA) investigates "dynamic linkages between productive activities" (Kaplinsky and Morris, 2006:2) and can "take us further than traditional modes of economic and social analysis" (Kaplinsky and Morris, 2006:2). The dynamic nature of water resource supply and demand necessitates an analytical tool which allows the uncovering of the dynamic flow of economic, organisational and coercive activities between stakeholders or participants in the productive environment focussed on water use.

Value chain analysis is useful as a tool in understanding the policy environment which provides for efficient allocation of resources within the local economy and can assist also in analysing the benefits and constraints of allocation mechanisms within the context of promoting resource sharing (Donor Committee for Enterprise Development, 2007).

2.6.2 Definitions

Water, as an economic good (Backeberg, 2006) has an economic value on its own in addition to its value as an input to create revenue from production functions (Lipsey, 1983), and therefore the investigation of water trading should take place in the parameters of those sectors which create revenue from water use. The investigation results would assist in identifying the effect on relieving constraints on the stakeholder groups of free marketing of water within the value chain, thereby informing the stakeholders of the how market based allocation would result in more equitable resource sharing. Kaplinsky and Morris (2006:13) note that analysis of the value chain forces the research to consider not only the efficiency of the production link in the chain, but also the factors that determine the participation of different groups of stakeholders in the sector.

2.6.3 Key Concepts for Value Chain Analysis

In order for the value chain to provide an analytical structure, as opposed to a descriptive construct, Kaplinsky and Morris (2006:25) advise that three important concepts need to be recognised;

- that value chains are repositories for economic rent, and these rents are dynamic (Kaplinsky, 1998),
- some degree of governance is required for the value chain to function (van Wyk *et al.*, 2006), and
- there are different types of value chains.

2.6.3.1 Economic Rent

The concept of economic rent arises from the differential productivity of factors of production and barriers to entry. The factors of production, such as capacity, infrastructure and technology are

endogenous forms of rent, and speak to the stakeholders ability to create revenue, whilst access to resources (or resource rents) are exogenous. If the resource rents are exogenous and the scarcity of resources act as a barrier to entry (Lipsey, 1983), then implementing a flexible allocation mechanism to increase access to water to stakeholders should then allow the value chain to become more productive, providing more opportunities for the participants. Provision of these opportunities can then result in stakeholders improving their endogenous factors of production. Transfer of resources, or relational rents (Kaplinsky and Morris, 2006), between participants with different levels of capacity to create revenue, can then also lead to revenue streams within the value chain. Demand for the water is created by those stakeholders who operate higher up the value chain, and this creates the opportunity for participants, who lack the required factors of production to create high values, to trade resources up the value chain whilst developing their own capacity through interaction with the high value water users.

2.6.3.2 Governance

Various activities along the value chain are subject to some form of governance (Gereffi, 1994) which controls the repetitive linkages along the value chain. Co-ordination of linkage activities can take place between the groups of participants, with additional exogenous governance in the form of policy being implemented at the necessary stages of the value chain. Thus, “power asymmetry is central to value chain governance' (Kaplinsky and Morris, 2006:29) where the key actors in the value chain take responsibility for the inter-firm division of resources and ensure adequate capacity exists for particular participants to upgrade their activities. Governance therefore ensures sustainability and growth within the value chain, and the allocation of resources is a “nodal point of governance” (Kaplinsky and Morris, 2006: 29) where the division of an essential input amongst competing uses takes place.

The current allocation mechanism in South Africa is a form of legislative governance which allocates water on the basis of re-dressing inequities and not on “ the basis of participation in the value chain” (Kaplinsky and Morris, 2006:30), so allocation does not necessarily reflect the demand and supply functions projected by the value chain. In the pursuit of equity, compulsory licensing has the effect then of penalising economically viable water users in favour of participants who may not possess the necessary factors of production to create sustainable revenue. This can also lead to a low degree of trust (Humphrey *et al.*, 1998) and lessen the willingness of existing participants to

include and empower new entrants into the value chain. Pott *et al*. (2005), Versfeld (2000 and Armitage *et al.* (1999) recommend a combination of governance which would allow allocation of water to be conducted under conditions where the value chain participants define rules for participation, thus endogenising the allocation process through the capacity to trade resources in the value chain.

2.6.3.3 Types of Value Chain

Gereffi (1994) described two different types of value chains. The first is buyer-driven, where the governance role is controlled by large buyers at the apex of the value chain, such as the retail industry. The second is producer-driven, where the governance role is fulfilled by key producers who co-ordinate the forward and backward linkages in the value chain.

The water value chain is currently more attuned to being producer-driven, resulting in more vertical integration in the value chain through capitalising on economies of scale and skills ownership, thus creating barriers to entry and focussing the use of water within few participants. The buyer-driven value chain is more horizontally integrated, creating an environment for increasing equity of ownership and improving skills and capacity of participants in terms of ability to create benefits. Kaplinsky and Morris (2006) stress the importance of increasing the links in a value chain as they represent the inherent skills and capacity vital to the efficient operation and co-ordination of production functions within the value chain.

2.6.4 Opportunities for Increasing Empowerment in Value Chains

The sustainability of participation in a value chain depends on the capacity to innovate, and therefore the ability to learn (Kaplinsky and Morris, 2006), thereby progressing in the value chain relative to competitors. Innovation requires flexibility, which, Bjornland (2004) claims is essential in terms of the institutional framework and within the governance of the value chain, to enable the poor to maximise their economic benefits. This would also lead to empowerment in terms of building their social capacity and ability to participate in the value chain in a sustainable and competitive manner (Bjornland, 2004). Participation in the value chain leads to group interaction, which in itself creates upgrading processes in terms of building capacity to form linkages, interact

and learn. Cook (1997) suggested the need to enhance capacity subjectively, objectively and through increased competence, critical to holistic empowerment through resource sharing (van Wyk *et al.*, 2006).

2.6.5 Identifying Income Distribution in Value Chains

Economic analysis undertaken by Armitage *et al.*(1999) indicate that the income distribution is concentrated amongst the existing water users in the Nkwaleni Valley, and inequities should be addressed by government policy. Kaplinsky and Morris (2006) state that the value chain analysis can help explain the "disjuncture between the spread of activities and incomes" (Kaplinsky and Morris, 2006: 41) in three main ways: First, the value chain is mapped, indicating the range of activities and the revenue streams (or outcomes) created by different participants. Kaplinsky and Morris (2006: 41) state that "no other form of analysis provides this synoptic overview of earnings in linked activities". Second, the analysis of the value chain indicates how participants are linked to the final forward linked product markets, and can therefore provide indications of the upgrade in capacity required to create sustainable revenue streams. Thirdly, the institutional interventions required to improve the income distribution patterns can be identified, making this tool suitable for the purposes of investigating the suitability of water trading as an allocation mechanism in the context of improving resource sharing. These attributes of value chain analysis are discussed below.

2.6.5.1 Distribution of Outcomes in Value Chains

The concept of economic rent (Lipsey, 1983) is important in explaining why some activities are rewarded better than others, or the incidence of income distribution. Barriers to entry limit competition and increase profitability, but profitability does not fully explain the distribution of outcomes in value chains (Kaplan and Kaplinsky, 1998; Dolan *et al.,* 2000).

The outcomes realised in value chains by participants are distributed according to income from capital investment, deployment of labour and skills, and according to natural resource ownership (Kaplinsky and Morris, 2006). The incomes sustained in different areas of the value chain are indications of how outcomes are distributed amongst the participants, thereby also indicating the equity of beneficiation from participation and resource ownership. The value chain does not only

indicate gross value of sales at each link, but the value added benefits accruing to participants which could be non-profit linked or health and social welfare benefits (Freeman, 2005).

2.6.5.2 The Determinants of Income Distribution in Value Chains

As discussed in the previous sections on economic efficiency and economic rent, the determinants of income distribution are rent and barriers to entry (Lipsey, 1983). Value chain analysis can assist in identifying the "nature of entry barriers in each of the links, and … the coordination of inter-link activities" (Kaplinsky and Morris, 2006: 43). The analysis relates well to dynamic environments, such as the water sector, and is able to focus on inter-link relationships, guiding analysis on non-income related outcomes. In particular, value chain analysis allows for the investigation of potential impacts of exogenous factors, such as allocation policy, on the distribution of outcomes, and since the stakeholders are driven by the benefits accruing to them, the mechanism which benefits the majority of stakeholders in their best interests will be the most efficient in water allocation (Buchanan, 1986).

2.6.5.3 Leverage of Power in Value Chain Dynamics

There are four main reasons identified by Kaplinsky and Morris (2006) why the value chain analysis can assist in identifying the correct institutional mechanism and intervention to improve the distribution of outcomes or benefits to stakeholders:

- activities which can sustain incomes are identified
- by analysing the dynamics of distributional outcomes and barriers to entry in the water sector, activities within the value chain which are subject to competition or increasing barriers to entry are identified, allowing stakeholders to plan accordingly
- Value chain analysis identifies which participants' behaviour or activities need to be modified to create change in the distribution of sustainable benefits
- Value chain analysis identifies supporting actors to the sector and the leverage which can be applied to improve the value chain performance according to the criteria being considered, in this case improving empowerment to achieve greater resource sharing.

2.6.6 Summary; The Suitability of Value Chain Analysis in Investigating Resource Allocation

In summary of the main points discussed above, the value chain analysis allows an investigation of the "determinants of income distribution" (Kaplinsky and Morris, 2006:46) which have an effect on the equitable distribution of benefits from resource use and allocation. The overview of the whole dynamic value chain provided through this type of analysis can assist in identifying the potential opportunities for increased resource sharing through flexible allocation.

Value chain analysis can interrogate the determinants of resource ownership and empowerment opportunities through identifying the beneficial linkages and interactions between participants. The results of the study can then conclude where the best opportunities for participants lie in the value chain as a whole. The method of analysis of the value chain is guided by the objectives of the research, namely investigating the potential benefits created by allocating water resource through a market based mechanism in the context of creating empowerment. This is particularly important in the case of researching water resources, where the forward and backward linkages branch into several different economic and social sectors, and the research required is variable in terms of criteria being applied. In essence, the value chain analysis provides a "meeting ground" (Wood, 2001:41) for participants and supporting actors in a sector to investigate how best to implement decisions aimed at improving equitable distribution of outcomes in sector which has several different production systems. The outcome generated by trading resources allows the beneficiaries to become less dependent on other immoveable factors of production such as land whilst participating in some part of the value chain, increasing opportunities for holistic empowerment (Cook, 1997).

3 Chapter 3: Research Design and Methods

3.1 *Introduction*

The aim of this dissertation is to conduct an investigation into the appropriateness of water trading as an instrument to promote equitable sharing of water resources. The specific focus of the research is therefore on the acceptance of the potential of water trading in achieving increased empowerment in the context of the case study area. The specific objectives of the research were:

1. Using value chain methods to understand the status of resource sharing in the Mhlatuze Catchment.
    - The determination of the status of resource sharing sets the background for the following research objectives
2. Using a value chain method of analysis to identify constraints to empowerment of rural communities within the water sector, and identify how water trading as an allocation mechanism could provide potential solutions.
    - This second objective uses the empowerment discourse to set the context for analysis of the suitability of a resource re-allocation mechanism in resolving constraints to achieving levels of resource sharing acceptable within the governance of the water sector.
3. Investigate the stakeholder perception of the suitability of water trading in promoting resource sharing through empowerment.
    - The third objective takes the analysis results and interrogates the acceptability by stakeholders of the ability of water trading to achieve their expectations.

The research design explains the selected method of research, sampling methods and analysis instruments.

3.2 *Research Design*

The research is mainly qualitative, and data was gained through semi-structured interviews with much room for open ended discourse with value chain participants and key supporters. The value chain analysis focussed on governance and relationships within the chain, utilising Cooks 1997 Empowerment Model as a framework to assist in the interpretation of the results and inform stakeholders how empowerment can be achieved through participation in the water sector. Therefore, the investigation of creating revenue streams was not limited to pure economic benefit,

but addressed the notion of holistic empowerment through resource sharing (Cook, 1997). Value chain analysis was chosen as an appropriate analysis tool to investigate resource sharing due to the different measurement criteria that can be applied in the context of empowerment. The analysis could then contribute context and background to the stakeholders' discussions in terms of describing status and potential for creating benefits. The value chain analysis consisted of constructing a sector map, indicating the different markets, stakeholders and supporting actors making up the value chain for converting water to benefits. The map not only described the status of benefit creation, but the inter-relationships and potential for increasing participation at various focal nodes and between different chains within the sector.

3.2.1 Value Chain Analysis in the Water Sector

In conducting value chain research, context is important as production functions, markets and participation differ according to industry and locale, particularly in the case of resource use. The key analytical issues have been described in the previous section as being barriers to entry, rents governance, upgrading and knowledge (Roduner, 2005). The value chain can be analysed by doing a detailed intensive sector analysis, or analysis based on "participatory principles" (Roduner, 2005; 13). The different levels of analysis are described by Roduner (2005) in Figure 3 below, and the research conducted in this dissertation was designed toward the Rapid and Participatory Approach due to financial and time constraints of the researcher.

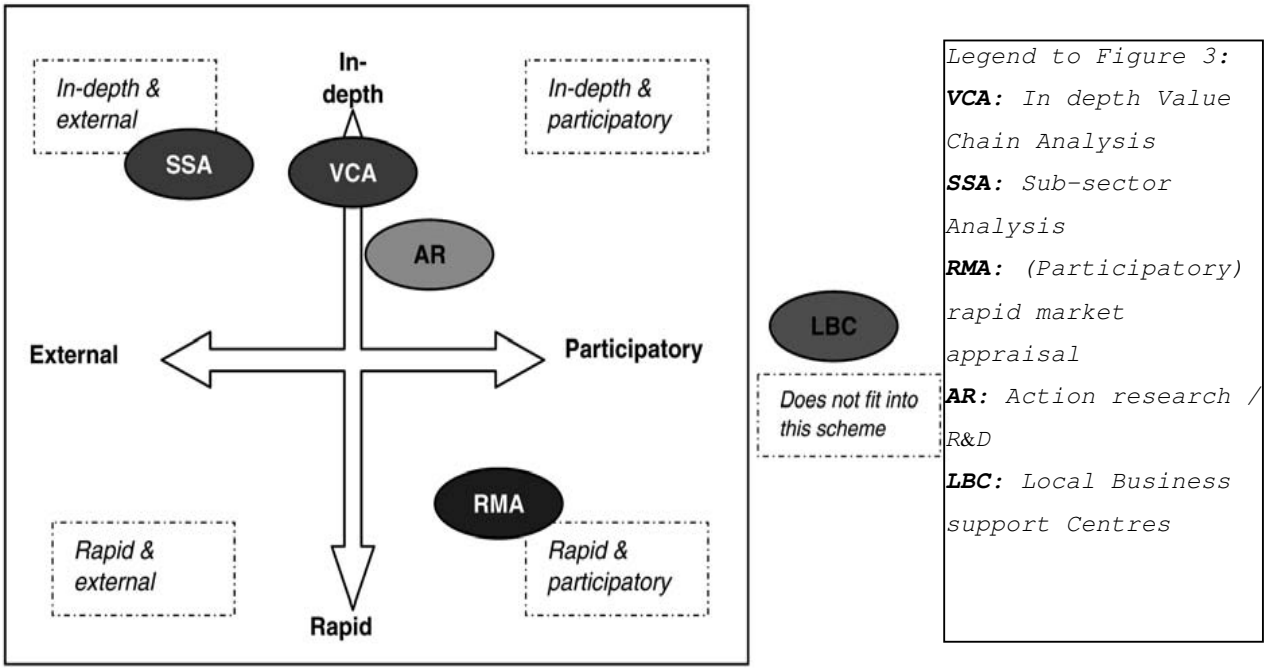


Figure 3: Value Chain Analysis Methods (sourced from Roduner, 2005; 13)

The research has been designed to identify the existing actors, the level of interaction between the actors and the means of creating benefits within the specified water sector value chain (M4P, 2009). The value chain analysis required mapping of the value chain in a specific geographic context, governance of the value chain and the existing relationships, both in economic terms, to analyse distribution of outcomes, and within an empowerment discourse utilising Cooks' model (1997) as a framework. According to Roduner (2005;13) the same challenges face value chain analysis in any context, these being "availability of information, reliability of information and cost/benefit/time balance", and these issues are instrumental in guiding the research methods. The in-depth VCA method was used, with some external resources, such as statistical information and previous studies utilised.

3.3 *The Case Study Area*

South Africa is divided into 19 separate Water Management Areas (WMAs) for water management purposes by DWAF. The Mhlatuze catchment (Appendix 1) forms part of WMA 6 (Usutu to Mhlatuze WMA) which is situated in KwaZulu-Natal (DWAF, 2003) and falls under the uMhlatuze

Municipality. In the CSIR-Environmentek report (2005), DWAF has identified the Mhlatuze catchment to be one of the first catchments to implement a CMA in order to integrate and devolve strategic water resource management to stakeholder level in the catchment. The main land uses in the Mhlatuze catchment are forestry (15.5%), commercial agriculture (14%), other (including industries and mining) (46%), rural settlements (19.5%) and urban settlement (2.7%) (Claasen *et al.*, 2005). The land use figures indicate that rural settlements account for the second largest land use, highlighting the challenges of reallocation of water resources to address equity and development issues.

Claasen *et al.* (2005; 88) state that "about 50 % of the Mhlatuze catchment is communally owned with rural communities only allocated 3-7 percent of water use", indicating that there is inadequate access to the vital resource. Schreiner and van Koppen (2001) indicate that the primary goal of the government and DWAF is to use the NWA of 1998 to combat poverty through implementation of water allocation mechanisms aimed at promoting efficiency, equitable access and protecting the ecological integrity of the resource through sustainable use.

In the Mhlatuze sub-area, there is sufficient water supply to meet the current demand, although this is due to water transfers from the Tugela catchment, but DWAF (2004a) state that the resource has been over-allocated. The Mhlatuze catchment is classified as "stressed" (DWAF, 2004b), meaning that the supply of water into the catchment (without water transfers from other catchments) is unable to sufficiently meet the increasing demand placed upon the water by high value users downstream in the Empangeni and Richards Bay industrial sectors.

3.3.1 Equity of Resource Access and Population Distribution in Mhlatuze

According to DWAF (2004c) "431 000 people live in the Mhlatuze River Catchment". The urban population (26%) is distributed mainly in the cities of Empangeni and Richards Bay and the peri-urban and rural populations (74 %) are concentrated around the smaller towns and Traditional Authority Areas of Dube, Khoza, Mkhwanazi North and South, and Zungu-Madlebe. The Mhlatuze Municipality portion of the catchment has a population of 340 000 consisting of 39 000 households, of which about 37 % are rural (Claasen *et al*, 2005). The distribution of the population settlement patterns and existing infrastructure in the Mhlatuze sub-area can be seen in Appendix 2 (Letty, 2005).

3.3.2 Access to Land

There is clearly a pattern of rural and peri urban settlement in the less serviced areas (indicated in Appendix 2, Letty, 2005) and poorer agricultural land (shown in Appendix 5, Letty, 2005). This population distribution pattern is an indication of the previous inequitable resource sharing policies governing land ownership and land use. This is borne out by the fact that, as is shown in Appendix 3, the Traditional Authority Areas are also focused in the rural areas with little infrastructure and little agricultural activity. The Traditional Authorities play an important role in access to land through their control and allocation of the Ingonyama Trust land.

3.3.3 Access to Water Resources

There are few accessible water resources in the Mhlatuze catchment, and when the pattern of rural and peri-urban population settlement is overlayed onto the main water resource map (Appendix 4, Letty 2005 from Connor and Associates, 2005)), there is further evidence of the inequities in resources sharing, namely the lack of settlement in those areas with access to water resources. The majority of river and groundwater resources in the catchment are accessed by commercial farming, occupying the riparian areas of the main rivers and owning the boreholes.

3.3.4 Income Distribution

There is a tendency discernible from the water resource map towards urbanisation around the main economic centres and areas of mining leases, indicating that the main form of income for this portion of the population is gained from employment in mining and industry. In Table 2 (Letty, 2005), which indicates the income brackets for each traditional area and the percentage of households in each category, the effects inequities in resource sharing can be seen. There are high percentages of households with no income in the tribal authority areas (average of 30.2 % in the whole rural area). Although these areas are classified as rural/peri-urban (Appendix 3, Letty, 2005), there are a "number of very densely populated areas located within the traditional tribal areas" (Letty, 2005:2). Considering the high percentage of households with no income, and that the biggest percentage of households in rural areas fall within the low income brackets, the low levels of income generation in rural areas is evident. When coupled with the land use maps (Appendix 5) which indicate low levels of agricultural activity in these tribal areas, the results of inequities in resource sharing can be seen.

Table 2:Household Income Distribution in Traditional Authority Areas (Letty, 2005)

TRADITIONAL AUTHORITY	HOUSEHOLD ANNUAL INCOME BRACKETS (R)							
	No income	0 - 4801	4801 - 9600	9601 – 19200	19200 – 38400	38401 – 76800	76801 – 153600	> 153600
DUBE	33.78	9.58	17.32	19.40	13.41	4.88	1.23	0.41
KHOZA	36.32	7.41	16.23	18.28	13.70	5.81	1.66	0.58
MKHWANAZI NORTH	32.56	5.41	22.42	16.21	12.44	6.49	2.68	1.79
MKHWANAZI SOUTH	22.80	8.30	10.74	13.58	16.39	14.90	9.22	4.08
ZUNGU-MADLEBE	25.58	6.73	16.16	16.74	15.91	11.00	5.39	2.50

Table 3 (Letty, 2005) shows the percentage of economic population in the tribal areas who are employed. This may be evidence of the urban migration from tribal authority areas into the industrial and mining zones, indicating that the main sources of income into the tribal authority areas is employment rather than revenue creation in the rural/peri-urban areas. This does not take into account the self-employed rural population (Letty, 2005)

The majority of the population is settled in areas where it is difficult to access water resources (see appendix 4). The difficulty of access to water resources through geographical situation of the population and the lack of infrastructure in the rural areas makes creating a revenue stream through physical use of resources very difficult within the current socio-economic status of the Mhlatuze catchment.

Table 3: Employment Distribution in Rural Areas (sourced from Letty, 2005)

TRADITIONAL AUTHORITY AREA	Percentage of economic population employed
DUBE	45
KHOZA	46
MKHWANAZI NORTH	35
MKHWANAZI SOUTH	57
ZUNGU-MADLEBE	48

The average unemployment rate in the rural populations of the Mhlatuze catchment is over 53 %

(Letty, 2005), highlighting the need for alternative revenue streams within the rural areas. The research methods described in the next section are aimed at identifying potential within the water sector for creating alternative revenue, and increasing holistic empowerment, through utilising a flexible allocation mechanism for increasing access to, and use of, water resources.

3.4 *Research Methods*

3.4.1 Introduction

In order to start a value chain analysis, the choice of commodity and the appropriate value chain needs to be prioritised for analysis. The objectives previously stated include involving value chain actors in a learning process in analysing the value chain. The literature review of the current water resources in the Mhlatuze Catchment, and telephonic discussions with the Umhlatuze Municipality helped to identify key actors and representatives who have relevant knowledge and adequate representation in the value chain to assess the value chain priority. Once the selection of value chains was made, the sector was mapped prior to analysis of the value chain governance and coordination, and distribution of outcomes, the combination of which would offer the best analysis in the context of promoting resource sharing (van Wyk *et al*. 2006).

The process of developing a sector map involved identifying value chains for water to "understand their dynamics and interdependencies" (Roduner, 2005:7). The value chain analysis (VCA) can "identify how poor people can play a larger and more lucrative role in a particular value chain and how a value chains structure or characteristics can be changed to enable it to grow in pro-poor ways"(The Donor Committee for Enterprise Development, 2007:1). Kaplinsky and Morris (2006:25) explain that the "value chain analysis method plots the flow of goods and services up and down the chain, and between different chains". This is valuable in investigating the extent to which a particular set of actors in a sector are sharing in the benefits created within the sector.

The VCA also analyses the interrelationships between actors, or participants, indicating the extent to which certain groups participate in sharing the resources within that sector. Therefore the analyses indicates the status of each stakeholder within the value chain and potential empowerment opportunities within the framework of Cooks 1997 Empowerment Model. The water value chain was mapped to identify possible bottlenecks in the sector, identifying socio-economic development needs which should be addressed in order to improve the empowerment status of the stakeholder

groups in the value chain. Kaplinsky and Morris (2006) contend that in order for the value chain to provide an analytical tool, as opposed to heuristic, three important components of value chains need to be recognised:

- " Value chains are repositories for rent, and these rents are dynamic"
- " Effectively functioning value chains involve some degree of governance"
- "There are different types of value chains" (Kaplinsky and Morris, 2006:25).

If these components are not recognised, the value chain becomes a "descriptive construct" (Kaplinsky and Morris, 2006:25). This, however, has value as it helps to understand the distribution of returns arising from participation in the value chain functions. Revenue is created from innovative use of the resource which provides returns greater than the cost of the resource. Creation of revenue streams therefore accrue to those who can protect themselves from competition and overcome barriers to entry arising from pursuance of economic rent.

In the case of water resources, barriers to entry arise from the scarcity and allocation of scarce water resources. Constraints are access to, and capacity to use the resource, leading to "resource rents" (Kaplinsky and Morris, 2006:28) which are exogenous to the value chain. Activities between groups, leading to "relational rents" (Kaplinsky and Morris, 2006:26), also enable creation of economic rent and revenue streams, emphasising the importance of interaction between participants. The main objective of the value chain analysis in the case of water resources is then to analyse the value chain in the context of governance (Kaplinsky and Morris, 2006), as this relates to the power of the participant in the value chain to take particular actions to participate, and the capacity to create self empowerment to participate through the value chain or between value chains utilising the resource. In addition, according to Kaplinsky and Morris (2006) the extent of the power gained may be related to the size and position of the participant in terms of production of marketable goods and ownership of the base resource. Utilising a flexible mechanism to allocate water resources should therefore lead to a more efficient and equitable distribution of access to, and revenue creation from, water, resulting in greater overall empowerment opportunities for the participants in the sector.

Creating a map to reflect the different dimensions of the value chain presents a format to more easily understanding the variables which reflect the research questions. The mapping exercise of value chain analysis therefore has the following objectives (Kaplinsky and Morris, 2006, Roduner, 2005; Gerreffi, 1994);

- gain an overview of the value chains in the water sector
- identify and locate the position of the previously disadvantaged poor communities
- gain an understanding of the interactions between participants
- demonstrate interdependencies between actors and processes within and between the value chains
- Create awareness of potential to improve participation and interaction amongst actors within the context of empowerment.

Kaplinsky and Morris (2006) and Porter (1985) emphasise the importance of mapping the correct dimensions, based on available resources (Roduner, 2005), the scope and objective of the research. Key questions investigated by desktop research and used in open interviews with the value chain actors can guide what dimensions to map for the value chains selected. The following key questions were used for mapping and analysis and formulated into an interviewee questionnaire (Appendix 6), based on literature review of past studies of the water sector in the Mhlatuze Catchment (Armitage et al., 1999; Backeberg, 1997; Bjornland, 2004; Schreiner and von Koppen, 2001; Versfeld, 2000) and based on steps recommended by Lusby and Panlibuton (2004).

i. What value chains are prevalent in the chosen commodity sector?
ii. What are the core processes in the water value chain set?
    - This describes what processes occur from allocation of resource through to final use, or consumption of the resource to produce marketable product. The distribution of income can be calculated at each level of the value chain to indicate potential for creating revenue streams.
iii. Who are the actors and what are their roles in the value chains?
    - The actors involved are categorised by their level of participation and involvement in governance of the value chain set, and take into account their size, income ranking and activities.
iv. What volume of products, number of actors and employment are created from water use?
    - Once the product flow is mapped, the volume of product gives an indication of the size of the different channels in the value chain which use water. Finding out the number of actors at each stage will indicate where the main economic activity occurs in the value chain in terms of employment potential, and the position of poor communities in the chain.

v. What is the geographical flow of water use?
   - This assists in analysing challenges posed by accessibility to water for poor communities to create revenue streams.

vi. What are the flows of product, information and knowledge in the value chain and how do the poor communities access and utilise them?
   - The products at each stage of the value chain are identified, and the flows of information and knowledge between actors are mapped. These generally will flow both ways, and are central to the objective of holistic empowerment (Cook, 1997; van Wyk *et al.*, 2006). The value of products changes at each level of the value chain or between value chains, indicating potential for entry into, or upgrading for the actors in the chain.

vii. What is the system of coordination of water allocation and usage within the value chain?
   - This assists in analysing the linkages and relationships that exist between actors (horizontal integration), and how interaction benefits different sets of actors, and the effect of services supplied by supporters on the value chain. The system of co-ordination essentially indicates the prevalence of governance, institutional and between actors in the value chain.

viii. What are the key constraints and barriers at each level and potential solutions?
   - Initial identification of constraints to greater involvement of the poorer rural stakeholders in the water sector in the context of increasing empowerment and possible solutions offered, thus providing a base to conduct the research for objective 3.

ix. What is the stakeholder perception of how access to water allocation can result in empowerment?

x. Do the stakeholders consider water trading to be the most suitable allocation mechanism to create empowerment from the water resources?

Identification of constraints and barriers to entry can be made at all process levels of the value chain and potential solutions can be identified within the context of governance of the resource within the value chain. Analysis of the value chain will also give an indication of which options are within reach of the poor communities in terms of knowledge, levels of investment and access to additional resources required.

The method of research follows a set of value chain research tools designed to organise and analyse

evidence collected from documentation and records, at the same time encourage participation from the stakeholders in the water sector, thus using as many sources as possible to achieve the objectives (Yin, 2003). The tools are based on methods for research suggested by Kaplinsky and Morris (2006), Porter (1985) and an on-line pro-poor forum (M4P, 2009) specifically designed to assist value chain practitioners to access best practice resources for value chain analysis.

3.4.2 Mapping the Water Sector

Objective 1: Using value chain methods to understand the status of resource sharing in the Mhlatuze Catchment.

The following steps make up the methods to achieve the first objective through sector mapping:

- Prioritise the value chains within the water sector
- Identify the core processes in the selected value chains
- Identify the main actors and activities in the value chain processes
- Map the value chains within the water sector

Once these steps are complete, the resulting water sector map should give a clear indication of the status of water resource sharing in the Mhlatuze Catchment. This in turn will guide the rest of the research in selecting the participants and information required to complete the next two objectives.

3.4.2.1 Prioritising the Value Chains

The primary area of research, investigating the suitability of the allocating mechanism in promoting water resource sharing, determined the point of entry for the value chain analysis (Kaplinsky and Morris, 2006). The criteria to base the selection of the value chains therefore reflects the concept of resource allocation as a tool to promote resource sharing and empowerment, especially amongst the point of entry group of participants,the previously disadvantaged communities. The initial process is to prioritise the value chains by considering the criteria tabled in Table 4, based on the potential for poor communities to participate in creating revenue streams from water resources.

3.4.2.1.1 Determine Criteria

This criterion is first discussed with the stakeholders and then weighted to determine the criteria perceived to be most relevant. Inclusion of participants at this stage of the process strengthens their understanding of the potential value chains selected. The criteria are proportionately weighted as

per the stakeholder's perceptions of importance in achieving holistic empowerment.

Table 4: Selection Criteria for Value Chain Identification

CRITERIA	Sub-Criteria
Potential to empower through resource sharing	Status of integration of value chain
50.00%	Ease of identifying opportunities for creating revenue streams
	Potential for improving skills and knowledge
	Potential to foster greater confidence in resource use
	Barriers to entry
	Availability of resources ("resource empowerment", van Wyk *et al*., 2006;25)
	Potential to satisfy criteria set out by Government resource policy
Structure of value chain	Value adding potential
40.00%	Number of different products produced
	Potential for scaling up
	Potential to leverage resources and investment
	Potential for involving large numbers of actors
Environmental Sustainability 10.00%	Catchment hydrology management

This table is then used in the open interview processes, with the questionnaire (Appendix 6) for participants to rate activities within the water sector in terms of their ability to meet the criteria. This ranking will enable the research to select the most appropriate activities, or value chains, which stakeholders perceive to have the best potential for creating empowerment. The method to determine the activities is described in the following section.

3.4.2.1.2 Identification of Activities in the Water Sector

The next step is to determine the potential activities in the case study area within the water resource sector. This was achieved through mainly a desktop literature review, with confirmations from the participants in the case study area of what activities could be achieved by poor communities by gaining access to water resources. The nature of this study in targeting the water resources as a sector determined that broad categories of activities which utilise water in the Mhlatuze catchment be identified ie. agriculture (sugar cane, fruit, and intensive such as vegetables), industry, urban and ecological (Brown and Woodhouse, 2004).

Semi-structured interviews with selected stakeholders identified the main activities (Kaplinsky and Morris, 2006) in the water resources sector. The following socio-economic sectors were selected following the literature review and initial contact with value chain supporters and approached for participation in the interview process (the entry points into the value chains);

- Mining and Industry
- Commercial agriculture (sugar cane, fruit, vegetables)
- Rural small scale farmers and agricultural co-ops (sugar cane, fruit, vegetables)
- Water authorities (Urban consumption and ecological reserve strategy)
- Financial sector

The Water authorities (DWAF and Umhlatuze Municipality) were initially approached as they control the institutional policies and mechanisms governing water allocations. The next participants were the commercial actors, as they have the most extensive knowledge and experience in converting water use to sustainable revenue. The financial sector was approached in the context of supporting participants through production and capital finance in terms of the credibility and security of water entitlements under the water trading mechanism. Finally, rural farmers and communities were involved in discussions in the context empowerment opportunities which could be created through resource sharing.

3.4.2.1.3 Ranking of Activities

The activities identified in the previous section are then added into Table 4 to allow for the activities to be ranked by research participants, as per the example in Table 5. The ranking of activities will then form a basis for choosing the value chains which stakeholders in the water sector claim have

the best potential to create empowerment opportunities.

Table 5: Participatory Activity Priority Setting

CRITERIA	Sub-Criteria	Activity 1 (eg agriculture)	Activity 2
Potential to empower through resource sharing	Status of integration of value chain	RANKING 1-5	
50.00%	Ease of identifying opportunities for creating revenue streams		
Structure of value chain	Value adding potential		
40.00%	Number of different products produced		
Environmental Sustainability 10.00%	Catchment hydrology management		

Once the stakeholders have ranked the different activities, or value chains, the most highly ranked value chains within the water sector will be prioritised and selected for the mapping process to determine the status of resource sharing and potential to improve empowerment as determined by the stakeholders. The next step is to identify the core processes within the value chains to determine how water as an input, is transformed into benefits.

3.4.2.2 Identify the Core Processes in the Selected Value Chains

This step researches what processes occur from start to finish creating benefits from the input through to final consumption of the end product created from the use of that input. Each value chain selected may have individual processes through which added value will be realised by the actors in the value chain in the context of holistic empowerment.

A basic tool for mapping core processes of the value chain set selected in the water sector is shown in Figure 4. The core processes are populated by the participants in the value chains in order to correctly represent the individual value chains. As an input into different value chains, the core processes will represent the flow of water utilised by different actors through the different selected value chains within the water sector. The method for identifying the main actors in the selected value chains is described in the next section.

Figure 4: Example of Mapping Core Processes

3.4.2.3 Identify the Main Actors in the Value Chain Processes

Once the core processes in the different value chains have been mapped, the next step is to identify the people, or entities, involved in the value chain (Figure 5). Each value chain has core processes and specific activities which the actors perform within that value chain. The main aim is to understand where there is potential for upgrading, or increased participation, and to gain a better insight into the status of each actor in terms of access to and use of water as a resource to improve empowerment.

Process	**Resources** ⇨	**Storage** ⇨	**Allocation** ⇨	**Delivery** ⇨	**Treatment** ⇨	**Usage** ⇨	**Disposal,**
Actors							
Activities							
Support Services							

Figure 5: Example of Mapping Activities Undertaken by Actors from Core Processes

3.4.2.4 Mapping the Selected Value Chains within the Water Sector

Once the value chains for converting water to benefits have been selected, and the actors and activities have been identified, the next task is then to "put numbers and values to the variables under investigation" (Kaplinsky and Morris, 2006;53). In this dissertation, the mapping function will consist of the processes being represented on the vertical axis (y-axis), and the allocation of water between value chains as determined by the NWRS in the NWA of 1998 represented on the horizontal axis (x-axis). The product thus flows vertically up the value chain processes, being transformed or used and gaining value as it moves through each process, until it reaches the end market. In the case of water resources, the end markets are the activities which use the water as part of an essential input. Each activity has a different opportunity cost for water and this trend in the case study of the Mhlatuze Catchment follows the geographic flow of water from the upstream rural users to the downstream industrial and urban users. In addition, it is necessary to include within the sector map the value chain supporters (business development, finance) to whom the issue of water trading will have an effect on how they support the actors, and the value chain influencers (legislative and regulatory frameworks), whose policy and framework compliance speaks directly to the choice of allocation mechanism.

The results of the mapping exercise are depicted in a sector map and matrix, to be analysed using Cook's model of empowerment as a framework in the following section. An example of the sector map is shown in Figure 6. There are clearly 4 channels (value chains) through which the products flow in this example (indicated on the top of the diagram), emanating from two sources (indicated on the bottom x-axis). The product moves up the processes (y-axis) from source to use and disposal. As can be seen, there may be different actors involved in different value chains utilising the same source product to create benefits in different end markets. The coordinating mechanisms, or resource flows, are indicated with arrows, depicting which actors are interacting through which channels. The resource gains value as it is sold up the value chain, unless it is traded with other actors without being further processed (horizontally), for example sub-contracting processes or leasing resources.

The sector map is described in the results section, depicting the different value chains structures which are pertinent to the research, and a sector matrix is developed to summarise the results. The mapping exercise provides a basis for undertaking further analysis of the water sector. In particular, the initial part of the research enabled determination of the actors in the value chain sets, their position and involvement in different functions, and possible challenges and opportunities. In the

context of the research aim, the matrix guides the analysis phase of research in terms of the actors to be included and what information gaps need to be investigated to determine the status of resource sharing in the water sector, the suitability of water trading to improve this status in the context of

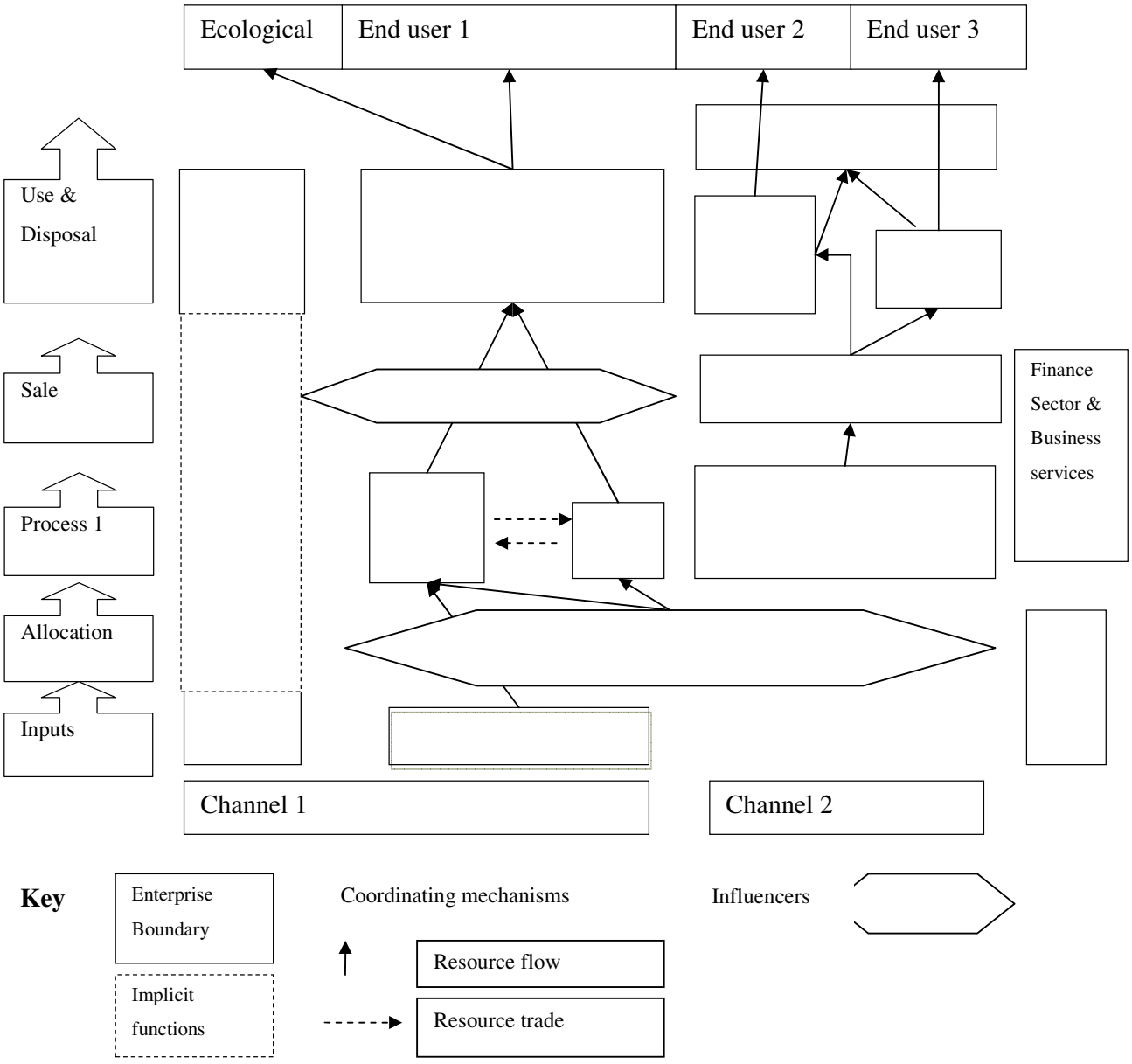


Figure 6: Example of Sector Map showing Usage Channels, Functions and Actors

empowerment of rural communities.

The sector map describes the structures of the sector and guides the following qualitative and quantitative analysis of the structure.

3.5 *Analysis of the Water Resource Value Chain*

Analysis methods used in this research are pertinent to the rural community empowerment focus of this study. The analyses tools are based on the valuechain4poor Tool book for Practitioners (M4P, 2008) and are mainly qualitative, including analysis of the governance, identifying the linkages, relationships and trust which exist in the value chain sets, analysis of power distribution amongst actors or groups of actors. The analysis will make use of one quantitative tool, the analysis of income distribution. The analysis phase of research directly speaks to achieving objective 2, re-stated below.

Objective 2: Using a value chain method of analysis to identify constraints to empowerment of rural communities within the water sector, and identify how water trading as an allocation mechanism could provide potential solutions.

3.5.1 Analysis of Governance

Integrated governance of resources affects the perceptions of the context under which the stakeholders participate in the value chain, and this perception will "exert a large influence on how human behaviours, and ultimately resource use patterns, evolve" (van Wyk *et al.*, 2006; 7). Governance is therefore a part of value chain analysis in the water resources sector. The main objective of analysing value chains in the context of governance is to understand how the chain is coordinated including actors and mechanisms of resource distribution (ie. access to and capacity to use the resources). Once the mapping process is complete an investigation of the impact of the formal (statutory government) and informal (non-statutory civil society) transactions (van Wyk *et al.*, 2006; Kaplinsky and Morris, 2006) on the actors, particularly in this case study the previously disadvantaged poorer communities, can be undertaken. This includes assessing how different groups of value chain participants perceive leverage opportunities, through integration in the value chain, of adequate forms of support to assist in achieving empowerment through access to water resources (Van Wilgen *et al*., 2003).

Governance analysis concentrated on the following aspects of value chain analysis:

- Determination of supply and demand conditions of the value chain
- The dominant coordination arrangements
- Analysis of how poor communities participate in the value chain

- Identification of the rules and regulations within the value chain and how they impact the empowerment imbalance within the water sector
- Analyse participants awareness and knowledge of rules and potential gaps
- Analyse how knowledge and information flow through the value chain to determine how participants are supported in achieving competency within the value chain.
- Equitable distribution of outcomes resulting from water trading, empowering different actors to determine the distribution (allocation) of the resource within the value chain.

Most rules governing water resources are externally set (Kaplinsky and Morris, 2006) such as the compulsory licensing mechanism of allocation, thus not allowing integrated decision making opportunities to occur within the different groups of actors. The allocation of water needs then to be assessed in terms of "the extent to which producers are helped to achieve these rules" (Kaplinsky and Morris, 2006:71). Van Wyk *et al*. (2006) argued that true resource sharing would take place through holistic empowerment of the participants, as only by achieving subjective, objective and competence based empowerment can all participants of the value chain make decisions based on the opportunities and trade-offs required to create benefits. By using Cook's empowerment criteria as a framework to analyse the value chain, the research was focussed on the opportunities within the water sector which could lead to equitable resource use based on greater knowledge and ability, and not the more narrow analysis based on social, economic or political aspects of equitable resource distribution.

3.5.2 Linkages within the Water Sector

The analysis of relationships between actors and organisations involves identifying the linkages which exists between the entities, and questioning why these relationships exist. Actors in the value chains create relationships as they benefit from them, so part of this phase of analysis is to identify the potential benefits the target group gains from different existing, or potential, linkages within the sector. The linkages are depicted as vertical linkages, relationships between actors up and down the value chains (indicating the presence of sale transactions), or horizontal linkages, relationships between actors at the same level of a value chain (indicative of mobility of physical and human resources, information and coordination of production functions).There are four steps to this analysis of relationships.

i. The target groups for comparison are selected on the basis of who the main water users are

compared to the target group.

ii. Identify the dimensions of analysis of horizontal and vertical linkages to demonstrate the relationship, if any, the groups have with other actors in the sector, including direct participants and supporting actors.

iii. Survey of the actors in the sector to determine the extent of their linkages

iv. Analyse the results of the survey. The qualitative data can be transformed into quantitative indicators by assigning numeric values.

The identification of relationships and linkages allows a determination of the power distribution in the sector. Power in the case of water resources is the level of concentration and access to key assets in the control of a limited number of actors, normally resulting from historical imbalance of access. The indicators used in this analysis are discussed further in the following sections investigating the status of resource sharing and potential of water trading to improve the status of the rural communities in the water sector in the context of empowerment.

3.5.3 Identification of Power Distribution within the Water Sector

Power is defined within the M4P tool 4 for value chain analysis (accessed 2008; 4) as being "directly related the level of concentration and access to key assets in the hands of a limited number of actors". The measurement of power distribution is therefore relevant to analysing the levels of empowerment of target groups within the water sector. Assets can be measured in terms of tangible (land, water) or non-tangible (knowledge, skills, relationships) and the greater the actor's access to assets, the more capacity they will have to influence others and control the decision making, especially regards to resource allocation and sector governance.

The indicators selected to measure levels of power of actors, or groups of actors, are dependent on the focus of the study, and availability of data. In this study of water usage in the Mhlatuze Catchment, the key governors in the sector for power chosen are the share of the chain value added, since it reflects the actors share of total chain activities, and can be measured by Gross Domestic Product in the Mhlatuze Catchment economy, and the control over physical assets of land and water allocation, as these form the base inputs for most of the value chain sets in the sector. The value of the indicators is extracted from desktop research and inductive interviews with chosen participants, and then presented in a spreadsheet (Table 13). In addition, it may be beneficial to calculate the concentration of groups of actors in terms of determining the percentage of assets controlled. This analysis will be used in the discussions of current levels of, and potential to improve, holistic

empowerment. The distribution of power will affect all areas of empowerment.

3.5.4 Discussion of Resource Sharing and Potential of Water Trading to Increase Empowerment

The indicators used in this stage of analysis are based on the empowerment discourse of resource sharing. Each area of empowerment requires an indicator to measure the actual outcomes of increasing levels of resource sharing (discussed in the literature review, 2.5.3), then the potential for the water trading mechanism to improve these indicators (and hence empowerment) will be demonstrated.

3.5.4.1 Resource Empowerment

The indicators used to gauge the power distribution (access to key assets) and governance (M4P, 2008), which are determined by resource empowerment in the sector analysis, are:

a) share of chain value added activities,
b) control over resource allocation,
c) geographic positioning, and
d) control over key technology.

3.5.4.2 Competence

The outer influence phase of holistic empowerment (Competence) has been discussed in the literature review (section 2.5.3). The indicators for levels of competence are both qualitative (flows of skills, knowledge and participation in governance) and quantitative (access to support services to create benefits), and the indicators can be over-layed onto the sector map to determine the positioning of the different participating groups within the sector and within each value chain. In addition, the positioning of each group of stakeholders in terms of participation in the functions of the value chains, and the scope of their participation, gives an indication of their willingness to participate and perceptions of opportunities existing. The positioning of the groups in the sector is determined by which functions the groups participate in and what benefit is created for the groups by their participation (Kaplinsky and Morris, 2006).The indicators which are described below demonstrate the level of competence at which the focus group operates within the sector:

- Current level of participation in the value chain activities (agency)
- Access to support services (such as finance, extension services)
- Beneficial relationships with other actors in the value chains and between value chains

(sharing of knowledge and trust in interactions)

3.5.4.3 Objective Empowerment

The subjective phase is dependent on objective empowerment, which describes the opportunities offered by access to resources, and to have a sense of responsibility to participate (Van Wyk *et. al.*, 2006). The level of objective empowerment which exists in the water sector is determined by the overall governance of the sector. The analysis of governance in the sector through understanding the informal and formal co-ordination of functions and mechanisms to create benefits in the different value chains will identify opportunities which exist within the sector for upgrading and participation in benefit creation (Kaplinsky and Morris, 2006) through access to water. The data for this is mainly qualitative in nature. The aim of devolving the level of governance in the sector to include all stakeholders is to encourage outlying groups in the sector to actively participate by being able to influence and take advantage of opportunities presented as they can identify these and understand the potential benefits that can be created (van Wyk *et. al.*, 2006).

3.5.4.4 Subjective Empowerment

The empowerment process requires confidence (subjective empowerment). The indicator for subjective empowerment is qualitative in nature and is provided through stakeholder participation in the value chain prioritising exercise. The indicators are expressed as the willingness to accept the potential trade-offs and benefits from taking on opportunities presented through participating in the use of water authorisations to create benefits, and are qualitative in nature, presented in the prioritising and ranking process of constructing the sector map. The determination of subjective empowerment in this research is aimed at achieving the third objective re-iterated below;

Objective 3: Investigate the stakeholder perception of the suitability of water trading in promoting resource sharing through empowerment

3.6 *Summary of Proposed Methods*

The methods for research described in this chapter are aimed at investigating the current level of

resource sharing in the water resource sector, and potential for creating empowerment through increasing levels of resource sharing by improving stakeholder participation in governance of the water sector. Increased devolution of governance of the water sector to the lowest levels of participation could be better achieved through a demand driven market related allocation process, as opposed to a supply driven institutionally governed allocation process.

Table 6 summarises the key questions asked in researching the objectives described above, and the issues to be addressed in each of the questions, and the data sources proposed for researching each specific question. The questionnaire which guided the interviews and discussions (Appendix 6) was designed to identify the functions, actors, interactions, levels of perceived empowerment and identification of constraints and possible solutions offered by allocation through market trading to the constraints.

Table 6: Summary of Methods and Data Sources for Value Chain Case Study

Key Question Sequence	**Issue to be Addressed**	**Data Sources**	**Method**
What are the prevalent value chains in the sector	Which value chain has the best potential for increased participation and empowerment for rural poor communities?	Economic reports Stakeholder participation	Prioritising and rank the value chains according to selected criteria
What are the core processes in the water value chain?	Different processes for creating benefits from water Proportion of water allocations currently used in each process	Statistical and economic reports Primary research	Identify core processes for creating benefits from water resources
Who are the actors and what are their roles in the value chain?	Where do participants fit in the chain What is the current inequity in access to production factors What benefits do poor communities create Willingness to participate	Economic reports Primary Research	Identify and map actors and activitites within the selected value chains

Key Question Sequence	**Issue to be Addressed**	**Data Sources**	**Method**
What are the flows of product, information and knowledge in the value chain and how do the poor communities access and utilise them?	Horizontal and vertical interactions Willingness to participate	Primary research Previous studies of the case study area	Mapping of actors, activities, relationships and linkages between participants, highlighting the poor community participation.
What volume of products, number of actors and employment are created from water use?	Participant size Potential influence on value chain Potential for creating empowerment	Primary research Economic reports Social reports	Populate the sector map with relevant data
What is the system of coordination of water allocations and usage within the value chain?	Support and Interaction with poor communities Water authority policy	Government policy Primary research	Identify points and boundaries on the map which coordinate these functions
What is the geographical distribution of water use?	Current access to water resources Access to land Access to infrastructure	Primary Research Statistical Research (census reports)	Identify accessibility of resources to different stakeholder groups
What are the key constraints and barriers at each level and potential solutions?	Subjective empowerment Objective empowerment Competence Resource Empowerment	Primary research applied within framework for empowerment	Sector map analysis

4 Chapter 4: Results, Analysis and Discussion

4.1 *Introduction*

With scarce water resources and increasing competition for water, presently allocated mainly to irrigated agriculture and industry, the value chain method of research had the following objectives:

- Using value chain methods to understand the status of resource sharing in the Mhlatuze Catchment.
- Using a value chain method of analysis to identify constraints to empowerment of rural communities within the water sector, and identify how water trading as an allocation mechanism could provide potential solutions.
- Investigate the stakeholder perception of the suitability of water trading in promoting resource sharing through empowerment.

The research results are relevant to the status of resource sharing in the selected case study area of the Mhlatuze Catchment. The effects of allocation of water use entitlements aimed at promoting equity are evaluated in the context of increasing holistic empowerment amongst stakeholders whilst protecting the sustainability of the economic sectors drawing on water as a productive input to their value chains. The value chain method of depicting water demand, supply and usage was aimed at understanding how stakeholders within the value chain interact and how governance can be integrated to increase empowerment. The results of the research are presented in the form of a sector map and stakeholder matrices as described in the section on research methods in Chapter 3. Each step described in that chapter is aimed at achieving in part the objectives described above to give a complete picture of linkages and interrelationships between stakeholders involved in the process of adding value to water. The status of participation in the water sector is summarized for the relevant value chain sets which utilize water in the sector, then these results are used to prioritise the value chains perceived to have best empowerments potential. The participation of the focus group, rural communities, in resource sharing in the Mhlatuze catchment is described for each value chain, then analysed in terms of participation in governance of the selected value chains, the existing interactions and linkages and the distribution of power amongst actors in the value chains. This method of analysis allows concurrent discussion of challenges and potential solutions within

the empowerment discourse for mechanisms to increase resource sharing in terms of equity, economic efficiency and ecological sustainability. The main water user groups in the Mhlatuze Catchment, and individuals within these groups, were consulted in the research process to achieve these results:

- Nkwaleni Irrigation Board
- Heatonville Irrigation Board
- uThungulu Municipality
- Small Growers sugar cane co-operative
- Citrus Academy
- Nkwaleni Citrus Growers

4.2 *Mapping the Water Sector*

The sector mapping exercise was aimed at research into participation in the water resources sector. The objective is re-stated.

Objective 1: The Status of Resource Sharing in the Mhlatuze Catchment

This objective establishes the background for further qualitative research analysis by identifying the status of resource sharing in the case study area utilising the value chain identification and sector mapping method described in Chapter 3.The main objectives of the mapping exercise were to not only understand the status of water resource sharing, but to create a platform for interviewees to understand the background and potential for creating benefits from water allocation. The first objective seeks to achieve the following:

- gain an overview of the value chains in the water sector
- identify and locate the position of the previously disadvantaged poor communities
- gain an understanding of the interactions between participants
- demonstrate interdependencies between actors and processes within and between the value chains

- create awareness of potential to improve participation and interaction amongst actors within the governance framework

In order to identify the status of resource sharing through sector mapping, the following steps were undertaken. First, the value chains within the sector were identified and prioritised according to criteria set out by participants in the research. This was followed by identifying the core processes in the value chain set, the actors involved and the activities they perform within the value chains. In addition, support services to the actors considered vital to the performance of the value chain are identified. These results of these steps were mapped in a flow chart type map to understand where different participant groups are situated in the sector, and the linkages and interaction between actors complete the mapping and evaluation of the status of resource sharing. These results of these steps are described in the following sections.

4.2.1 Prioritising the Value Chain

This research was guided by the first key question "what value chains are prevalent in the chosen commodity sector?" ((i) Chapter 3;42) and was qualitative in nature, therefore required interaction and inclusion of the stakeholders in the water sector to ensure the appropriate value chains within the sector were identified for analysis. The intention was to identify the key criteria for value chain selection most appropriate for analysis within the sector. The stakeholders participating in this stage of the research were drawn from the Water Authorities and Municipal level, the thinking being that the regulatory bodies would have accurate knowledge of the information required to prioritise the value chains within the water sector, and which stakeholders were represented within the value chains. The prioritising process is necessary to make allocation choices for scarce resources.

4.2.1.1 Determine Criteria

The key entry point proposed in this research for the value chain analysis is promoting empowerment of rural poor communities through equitable resource sharing amongst stakeholders in the Mhlatuze Catchment. The following qualitative criteria were selected through desktop research on water use patterns within the Mhlatuze Catchment, and with participation from the following:

- Mr. H. De Villiers, an Executive Committee member of the Uthungulu District Municipality which forms the main economically active portion of the Mhlatuze River Catchment,
- Mr. S. Shandu who is the Small Growers Marketing Officer for a farming co-operative in the Mhlatuze Catchment, representing the small scale farming interests,
- Mr. Claude Boardman, a commercial irrigated sugar cane farmer,
- Mr. Zodwa Duma from the Land Care Programme who assess and implement agricultural empowerment projects financed by the KZN Department of Agriculture,
- Mr. J. Chadwick from the Citrus Academy, a mentoring group for promoting empowerment in the citrus sub-sector.
- Mr. S. Mosai from Mhlatuze Water.

The research participants agreed that the main criteria which most accurately would describe the current resource sharing status needed to address levels of empowerment, the potential for the participation and improvement within the value chain, and the ecological sustainability of the value chain, since water is a finite resource. These criteria (Table 7) are the main guide for selecting appropriate value chains for mapping, and are further broken down into sub-criteria to facilitate meaningful participation from selected interviewees.

Table 7: Value Chain Selection Criteria with Sub-criteria and Weighting

CRITERIA	**Sub-Criteria**	**Research Objective**
Potential to empower through resource sharing	Status of integration of value chain	1
60.00% Weighting	Ease of identifying opportunities for creating revenue streams	2
	Potential for improving skills and knowledge	2
	Potential to foster greater confidence in resource use	2
	Barriers to entry	2
	Availability of resources	1
	Potential to satisfy criteria set out by Government resource policy	1
Structure of value chain	Value adding potential	1
30.00% Weighting	Number of different products produced	1

CRITERIA	Sub-Criteria	Research Objective
	Potential for scaling up	2
	Potential to leverage resources and investment	2
	Potential for involving large numbers of actors	2
Environmental Sustainability 10.00% Weighting	Catchment hydrology management	2

The criteria in the table have been proportionately weighted according to levels of importance in decision making for resource allocation within the value chains, and therefore the higher the weighting, the greater influence the criteria has on the ranking of the value chains. The sub-criteria listed in Table 7 indicate the determinants for success for participants within the value chains which were determined by the research participants described above.

According to the stakeholders included in this initial portion of the research the potential for activities to promote empowerment through resource sharing was the most important set of criteria (60 % weighting) for selecting a value chain, followed by the structure of the value chain (30 % weighting) and then the environmental sustainability of the activities in the value chain (10 % weighting).

The main activities identified in the water sector in the Mhlatuze Catchment are ranked by research participants in the following section according to the criteria selected above. These were used to determine which value chains have the most potential in the context of the empowerment discourse.

4.2.1.2 Identification of Potential Activities in the Water Sector

A list of potential activities which use water as an essential input in the Mhlatuze Catchment was developed through desktop research using data from DWAF, B. Letty from Institute for Natural resources (who conducted studies in the Mhlatuze Catchment determining the Agricultural Status Quo of the Uthungulu District (Letty, 2005)) and participation from value chain actors in the regulatory supporting role,

Table 8 indicates the main water usage in the Mhlatuze Catchment, identifying the main water utilizing activities in the catchment, and therefore determines the potential value chain selection for the water sector.

Table 8: Water Requirements in the Mhlatuze Catchment (Claasen et.al, 2005; 95 sourced from DWAF, 2003)

Economic Activities	**Water Requirements (million m^3/annum)**	**Water Requirements (%)**
Agriculture:		
Irrigated Area	130.6	19.94
Dryland Sugar Cane	23.1	3.53
Forestry:		
Afforestation	43.1	6.58
Alien Vegetation	84.8	12.94
Ecological Reserve	271.4	41.43
Domestic:		
Urban	10.4	1.59
Rural	6.5	0.99
Other:		
Mining	44.9	6.85
Other Industry	40.3	6.15
Total	**655.1**	**100**

As can be seen from the information in Table 8, the domestic rural sector demand is less than 1 % of the total requirements for the Mhlatuze Catchment, indicating the low levels of resource ownership and resource sharing prevalent in the rural areas. According to Schreiner and van Koppen (2001: 395) “in the Mhlatuze basin, more than 97 % of available water resources are used by less than 10 % of the population”, which reinforces the claims of inequity in resource sharing. The main issue emanating from comparing these figures is that the measurable rural demand of 1 % indicated to allocation hierarchies in the past that water resources were not being demanded or utilized and managed in an economically efficient manner, thus were not allocated in these areas.

The policies governing water allocation before the NWA of 1998 allocated water according to ability to generate revenue from water resource utilization, which of course was bundled with the right to own and use land, or riparian rights, resting in the hands of the privileged minority protected by apartheid laws of the time. Development of infrastructure in the Mhlatuze was concentrated on the commercial farming areas (Mosai pers.comm, 2008), such as the Nkwaleni Irrigation District. In these areas, development of infrastructure was based on allocations of water

rights, which depended on the land characteristics of each farm. Thus the Nkwaleni Irrigation Board allocated, and regulated, water rights according to potential irrigable area and "riparian rights, provided it was within 2 km of the river" (Armitage *et al.* 1999:305; Brook, pers.comm, 2009). Of course the irrigable land and that close to the river was distributed amongst white commercial farmers and the previously disadvantaged rural communities resided in areas further from the river. The distance from the river and the lack of infrastructure contributes to the lack of perceived water demand in rural areas.

The main value chains utilising water as an essential resource indicated in Table 8 are the ecological reserve, agriculture, industry, urban and afforestation. These activities then were ranked (Table 9) using the criteria described above and the weighting under each value chain activity given for each sub-criterion. In addition to the main activities indicated in Table 9, agriculture was split into commercial and rural small scale value chains. There will be supply and demand trade-offs between the ecological, econocentric and anthropocentric activities placed on the resource, and the potential solutions through interaction between these competing uses for water provided by a flexible allocation mechanism (Backeberg, 1997).

4.2.1.3 Ranking of Activities

The weighting of selected criteria aimed at achieving the objectives of this research are indicated in Table 8, and the following matrix in Table 9 ranks each value chain activity through participatory qualitative research from selected actors in each value chain. The ranking exercise was undertaken with water sector participants who ranked the activities according to potential of the activity to meet the selected criteria, from 1 (poor potential) to 5 (good potential). The participants represented the commercial and small scale agricultural sector, industry, Municipal (Urban), financial supporters (banks), and governance consultants. The participants were asked to populate the Activity Prioritising sheet within the context of their own sub-sectors within the water sector, and the scores indicated the extent to which each participating actor perceived the ability of those activities to satisfy the selected criteria. Table 9 reflects the averages of these responses into the priority settings representing each value chain activity within the water sector.

Table 9: Participatory Activity Priority Setting Results for the Water Sector

CRITERIA	Sub-Criteria	Commercial Agriculture	Rural Small scale Agriculture	Industry	Urban	Forestry	Environment
Potential to empower through resource sharing 60.00% Weighting	Status of integration of value chain	4	5	2	1	3	2
	Ease of identifying opportunities for creating revenue streams	4	3	2	1	2	3
	Potential for improving skills and knowledge	4	3	3	1	2	3
	Potential to foster greater confidence in resource use	3	4	2	1	2	3
	Barriers to entry	3	3	1	1	2	3
	Availability of resources	3	2	1	1	2	3
	Potential to satisfy Government resource policy	4	5	2	1	3	4
Sub-Total Empowerment		**3.6**	**3.4**	**1.9**	**1**	**2.3**	**3**
Structure of value chain 30.00% Weighting	Value adding potential	4	3	3	1	3	3
	Number of different products produced	3	3	2	1	3	2
	Potential for scaling up	3	3	3	1	2	2
	Potential to leverage resources	4	3	3	1	3	3
	Potential for involving large numbers of actors	4	4	3	1	4	4
Sub-Total Chain Structure		**3.6**	**3.2**	**2.8**	**1**	**3**	**2.8**
Environmental Sustainability 10.00% Weighting	Catchment hydrology management	4	3	1	3	3	5

CRITERIA	Sub-Criteria	Commercial Agriculture	Rural Small scale Agriculture	Industry	Urban	Forestry	Environment
RANKING		3.64	3.3	2.08	0.48	1.65	3.14

The results of the prioritisation of value chains (Table 9) in terms of achieving increased empowerment through resource sharing indicated that agriculture was the most likely value chain to promote the creation of benefits for the participants. Part of the reason for this, according to Mpongose (2007) is that the rural communities have a culture of agricultural development and hence are most motivated to participate in this value chain. This is clearly indicated in the higher rankings given to agriculture for "the potential to foster greater confidence in resource use" and is indicative of the status of perceived subjective empowerment opportunities in the different value chains.

Industry scored low in the empowerment prioritising exercise mainly due to high barriers to entry (result of low resource empowerment and competencies of the rural communities), low numbers of individual participants and inflexibility of physical access for use of water entitlements to create benefits. This value chain, however, is one of the largest employers in the catchment and thus scores well in the value chain structure prioritising (indicative of objective empowerment), assisted by the potential of manufacturing and industry to leverage resources for growth (de Villiers, 2006). The high scoring of the value chain structure indicates that industry is dependent on the vertical and horizontal linkages and interactions for its operations, thus placing high value on inputs and input supply, an indication of the dependence of industry on inputs such as water (Claasen *et al*., 2005). The forestry value chain scored low, mainly due to the low potential for empowerment scores, indicating that there are significant perceived barriers to entry into the value chain. The value chain structure scores above average as there are many products and co-products which can be produced in the value chain and the production functions can be diversified within the value chain to include different groups of actors at different levels of the value chain.

The environmental value chain scored relatively high in this exercise mainly due to the rural nature of adding value to the water services infrastructure, and the low levels of additional resources required to add value. The main value adding activity is tourism according to de Villiers (2006), but the indications are that there is a growing need for environmental conservation to become part of

the watershed management strategy to ensure quality and quantity of water supply for other high value users. One of the questions asked by rural communities regarding this is how they would benefit from this activity (Jiyane pers.comm, 2007). This question is addressed once the water sector is mapped and the constraints and potential benefits are identified.

The prioritising exercise has indicated that, within the current governance of the water sector, the stakeholders are of the collective opinion that they can best create a flow of benefits and benefit from empowerment opportunities through participation in the agricultural and environmental value chains. The other value chains do not rate highly in terms of perceived ability to achieve empowerment or integration into the value chain.

The value chains prioritised in Table 9, backed up by the desktop research above, within the water sector to be mapped for analysis are:

- commercial agriculture,
- small scale agriculture,
- urban,
- industry, and
- environmental.

The first step in mapping the value chains for the water sector is to identify the core processes in the selected value chains.

4.2.2 Core Processes in the Selected Value Chains

The core processes in the value chains refer to the processes that occur from inputs to the final consumption and disposal of the end products and co-products. In the case of water resources, the processes include consumption and disposal within the specified activity, the actors and linkages within that activity and the governance of water allocation, both formal and informal. The value chains prioritised by participants in the water sector were finalised in the previous section. The second key question described in the method of research, “what are the core processes?” prompts this step ((ii) Chapter 3, section 3.4.1).

Since the focus is on the status of resource sharing, the selected value chains will consider the processes around supply and allocation of water as an input into these processes. The core processes in the value chain (Figure 7) have been distinguished through the desktop research, input provided by DWAF, participants from the commercial agricultural and from the industrial sectors in the case study area. The resulting processes essentially are the same for all water user activities, although the level of integration in the value chain will differ for actors as some are able to control more than one of the processes due to their level of holistic empowerment (van Wyk *et al*., 2006). Since the context of the research is within the empowerment discourse, the core processes are arranged to represent increasing opportunity for stakeholders to participate, control and utilise the water for creating benefits within the context of Cook's Empowerment Model (1997). The initial process of provision of resources is a basic environmental function and therefore this level of the process does not provide any opportunity for actors to become involved, whereas the top end of the value chain allows actors to almost fully control the process, thus providing more opportunities for empowerment.

Figure 7: Core Processes in Water Use; The Mhlatuze Catchment

Water resource supply is deemed to be an activity provided by the environment, and forms the basic process input for use up the value chains. The available resources are allocated according to the NWRS to determine The Reserve (ecological and basic human needs) and the Allocable Amount (DWAF, 2004). The allocable amount is then allocated through the compulsory licencing mechanism (Pott pers.comm , 2006; Armitage *et al*, 1999) amongst mainly existing water licence holders. The resource needs to be harnessed and managed in terms of demand and supply, so storage is the next function, allowing water allocation holders to be more flexible in the use of water according to their demand. In order to utilise the water allocation, the user needs to have access to the resource, and additional infrastructure to deliver the water to the point of use. In the case of agriculture, this infrastructure is provided by the farmer, co-operative or the irrigation boards (pumping and canals)(Chadwick, pers.comm, 2007), and in the case of downstream users,

the infrastructure is mainly provided by DWAF and Mhlatuze Water. In the downstream use scenario, the water is treated for consumptive purposes before sale and usage, but in the rural and upstream agricultural uses, this is not necessary. The function of using water as an input can be expanded into a separate set of value chains in order to investigate the actual processes of creating revenue from water in combination with other factors of production within the different value chains. Since this research is focussed more on the empowerment aspects of resource sharing within the water sector, these processes are left as a generic representation of the water sector value chain set, and constitute the revenue boundary.

4.2.3 Identifying the Main Actors in the Value Chain Processes

Distinguishing the actors in the selected value chains and mapping them is prompted by the third question in the section on methods of research, " who are the actors and what are their roles in the value chain?" ((iii) Chapter 3, p46). The actors are categorised and mapped against the core processes they are involved in according to their main occupation and size. Table 10 lists the actors whom indicate participate in each separate process in the water value chain, and this is further developed by adding the specific activities undertaken by the actors interviewed. The main actors are then be mapped out against the core processes they participate in, thus giving a visual representation of the participatory structure in the water value chain and hence a map of which stakeholders currently participate in resource sharing.

Table 10: Actors and Activities in the Water Sector

Process	**Resource Availability** ⇨	**Allocation** ⇨	**Storage** ⇨	**Access** ⇨	**Usage** ⇨	**Disposal, run-off & recycling**
Actors	Environment CMA DWAF	CMA WUA DWAF	CMA Commercial Farmers uMhlatuze Municipality Environment	Commercial farmers Industry Forestry Rural Communities Mhlatuze Water	Municipal Industry Irrigation famers Environment Tourism Millers and Processors	Municipal Industry Agri-forestry

Process	Resource Availability ⇨	Allocation ⇨	Storage ⇨	Access ⇨	Usage ⇨	Disposal, run-off & recycling
Activities	Finite Supply Ecological processes governing quality and quantity Institutional Frameworks	Monitoring use of existing licences Allocation of water to new beneficiaries Assessment of existing licence use Compliance with NWRS	Storage infrastructure Groundwater availability Authorisation for storage Ensuring quality and quantity of water sources	Abstraction Construct & maintain delivery network Authorisation for groundwater abstraction	Growing Harvesting Transport Value Added processing Domestic water use Sawmilling	Waste Treatment Run-off management Hydrology Management
Support Services	NWRS		Financial services DWAF – authorization for construction and storage	Contracting Services for Infrastructural development	Financial Sector Input suppliers Business development services Marketing & Retail Tourism promoters	DWAF

Table 10 also indicates support services the participants indicated are availed to them by entities which influence, but do not take part, in the actual activities of the value chains in the water sector. These services form an integral part of the water sector and associated value chains as they form part of the governance structure which affects the ability to use water effectively to create benefits.

The support services involved in the initial processes mainly influence the framework under which the NWRS is formulated and the NWA of 1998 legislation. The NWA of 1998, through the CMA, governs re-allocation of water to the previously disadvantaged communities, one of the main

driving forces behind the water allocation process (Pott pers.comm , 2006), effectively legislating them to be active participants in the water sector. The framework for water allocation governance does not seem to take into account the additional resources or support services required for actors to create benefits from the ownership of water allocation by participating in any of the value chains operating within the water sector. These additional resources required vary depending on the value chain. Resources required to benefit from inclusion in the agricultural based value chains (according to Chadwick, pers.comm, 2007, and Cordes M., pers.comm, 2008, of the Fresh Produce Academy, who are both actively involved in training participants in the citrus production sub-sector of the agricultural value chain) include access to land, financial resources, access to water and water delivery infrastructure, skills and knowledge for agricultural production, access to marketing channels and the willingness to participate in the overall governance structure of the value chain.

The supporting services which are more involved in supplying these additional resources, such as the finance sector, were contacted, and they have specific requirements regarding the legality of ownership, access to, and ownership of, additional physical resources and infrastructure which, according to Dillon (pers.comm, 2007) from First National Bank (Head of Emerging Agricultural Development), are not being met by potential previously disadvantaged participants, or actors, in the value chains. These additional resources are essential to creating benefits from participation in the water sector (Dillon, pers.comm., 2007) or the "economic value of the water allocation itself should be secured through ability to easily trade ownership of water between participants in the same value chain, or between value chains in the sector" (Mullins pers.comm, 2006).

4.2.4 Mapping the Selected Value Chains within the Water Sector

In Figure 8, the core processes already identified for the selected value chains in the water sector are represented vertically (y-axis) and the channels through which water resources are supplied are represented horizontally (x-axis). The amount of water available for allocation, sale and use through these channels is determined by the NWRS, through DWAF, which describes how water resources will be protected, used, developed, conserved, managed and controlled. The channels identified within the NWRS are:

- The Reserve, consisting of the Ecological Reserve and the Basic Human Needs Reserve,

- Allocable Amount, the amount of water available in each water management area determined by the National Water Resource Strategy,
- Strategic use (for example power generation),
- Inter-Catchment transfers and
- International Obligations (pre-determined through international sharing agreements (DWAF, 2006).

All the value chains identified in the prioritizing steps operate within the Reserve and Allocable Amount, which essentially provide the "supply conditions" (de Villiers pers comm., 2006.) under which the water allocation mechanism will operate, utilising the potential water resources available in the catchment. The institutional process of water allocation through the Compulsory Licensing mechanism implemented in the Mhlatuze Catchment (Pott *et.al*., 2005) requires water users to apply for authorisation to use water, thus creating a nodal point in the process of water use, and each licence contains privileges pertaining to the priority attached to the water use in terms of the NWRS, and general availability of water (Pott *et al*., 2005). But not all the allocations are fully utilised (Chadwick, pers.comm, 2008), thus leading to a situation in the Mhlatuze catchment where the water allocations do not necessarily represent the water usage (Armitage *et al.*, 1999). This has created inefficiency in use of water allocations and resulted in precluding other potential actors in the sector from gaining access to pre-allocated resources (Pott, pers.comm, 2006), as indicated by Mpongose (pers.comm, 2006), a farmer in the uThungulu Municipal area, who claims he "cannot get water allocated to [his] cane farm as there are no allocations left in the area". This situation is further exacerbated by the fact that there are no horizontal interactions present in the sector map, which would indicate interaction and transfer of resources between actors in the same value chains, or between value chains, meaning that there is no inter-trading of underutilised resources, an observation backed up by Armitage *et.al.* (1999). Mpongose further laments that he cannot get spare water from the commercial farmers who "always seem to have water in their dam, although I cannot get the finance to build a pipe to get the water to my farm". The water allocations are not necessarily utilised by the highest value user in the water sector (Armitage *et al.*, 1999), but by the existing water entitlement owner, regardless of the cost/benefit ratios. This situation arises in the Mhlatuze Catchment, according to Pott (pers. comm.,2006) due to the compulsory allocation mechanism encouraging a "use-it-or-lose-it" attitude (Pott *et. al*., 2005: 29).

The nodes represent the potential bottlenecks for creating resource flow and benefits from utilising

water effectively, and thus these are the main sources of leverage for creating opportunities for previously disadvantaged communities to participate in and benefit from the water sector. The institutional nodes in the sector map occur within the allocation function, and the geographical nodes occurs within the storage function, affecting physical access to water resources based on geographical siting of the participant groups. The administrative nodes are governed by existing legislative framework (the NWRS) promulgated by the NWA of 1998. The NWA, through its objectives aimed at achieving greater racial equity, seeks to institute mechanisms to re-allocate water to expand the participation of black farmers and decrease the domain of previously advantaged farmers (Backeberg, pers. comm., 2007).The sector map indicates that this would not improve the efficiency of water use as the geographical nodes restrict rural communities from physically accessing water resources.

The current economic status of rural communities indicated on the sector map is such that they realise less benefit than their commercial counterparts from access to water, and hence would not utilize the water as efficiently. The sector map is populated with statistical information relating to the fourth question posed in the research methods (Chapter 3, section 3.4.1), "What volume of products, number of actors and employment are created from water use?" and this information describes the status of resource sharing in the Mhlatuze catchment in terms of economic and social participation.

The sector map also indicates the general geographical locale of the different value chains and activities in the water sector (relating to question (v), Chapter 3, section 3.4.1), as this has a direct bearing on the physical accessibility to usage and the impact on disposal activities. Generally, the forestry activities take place in the upper catchment and lower catchment areas and have an effect on stream flow reduction more than access to water, thus affecting the availability of water in downstream activities. The rural poor communities are situated in the upper and middle sections of the catchment (Futureworks, 2005) mainly in areas distanced from available water sources (appendix 5) and upstream of major dams. Agricultural activities are generally sited along rivers in the middle sections of the catchment, downstream of major dams and quaternary catchments, thus allowing the agricultural value chains the best potential in terms of physically accessing water. Industry and urban activities are situated in the lower portion of the catchment, making them most vulnerable to reduced water flow and quality resulting from activities further upstream. They are, however, situated in the portion of the catchment with greatest access and delivery infrastructure for

water resources.

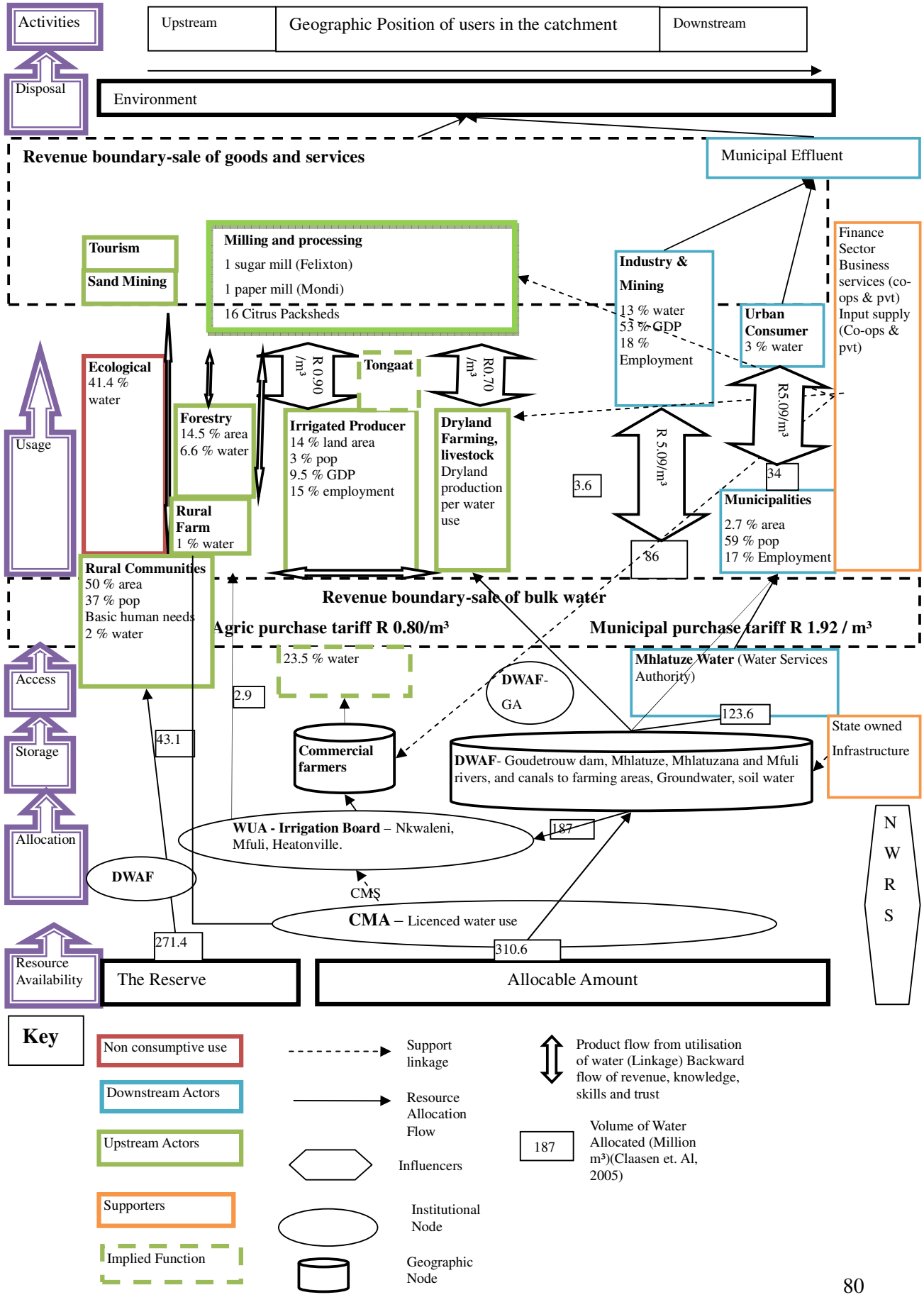


Figure 8: The Sector Map for Water Resources: The Mhlatuze catchment

Definitions used in the analysis and discussion of the sector map:

- **Function**: The production function which adds value to the product flow up the value chain from raw material to consumption.
- **Actor:** Entities or participants who are involved in the value chain set and influence value chain governance through participation. Size of the text box proportionally indicates level of participation by value added at that production function.
- **Supporter:** Entities which provide support services to the actors to enable them to participate, including additional physical resources (inputs) and services necessary to add value, such as financial, advisory and development services.
- **Influencers:** Regulatory and administrative entities which influence value chain governance though legislative frameworks and value chain governance.
- **Relationship:** A social connection between two parties.
- **Linkages:** A business relationship, either vertically (along the value chain) or horizontally (between actors at the same level of the value chain), between two parties of the value chain or sector.
- **Trust:** Social capital formed between two parties enabling more efficient linkage through reduction of transaction costs.

4.2.5 Status of Water Resource Sharing in the Mhlatuze Catchment: Description of the Sector Map

The sector map (Figure 8) is generated utilising the results from review of previous studies of the Mhlatuze Catchment (Versfeld, 2000; Claasen *et al.*, 2005; DWAF, 2004c; DWAF, 2003; Pott *et al.*, 2005), literature review and statistics (Statistics SA, 2009), and interaction with stakeholders regarding the previously selected criteria used to achieve the mapping function. To re-cap, the main value chains selected by participants in the research as most likely to create benefits for stakeholders within the water sector were agriculture (mainly sugar cane and citrus) and environmental value chains. The sector map (Figure 8) has included the other main value chains utilising water as an input in order to investigate the potential for interactions between value chains which have capacity building potential (depicted as horizontal linkages in the sector map). These interactions are only possible if the products within that function are tradable between actors, institutionally, according to the governance of the sector and according to perceived gain from

stakeholders.

In order to explain the sector map, the actors, linkages and interactions in the different value chains will be addressed separately. The geographic flow of water is depicted in the sector map (according to question (v) posed in the research methods) indicating that the environmental reserve is a water use present throughout the catchment, but generally, upstream to downstream users are forestry, agriculture and rural communities, and industry and urban present mainly in the downstream sections (Mosai pers. comm.., 2008). This geographic flow is important in considering the water quality and quantity needs of downstream users who have the greatest potential for growing value chains in the sector (Versfeld, 2000) and creating higher value added uses than the upstream users. The geographic positioning of participants relative to water sources affects the resource empowerment area of resource sharing, resource empowerment.

The flow of water as an economic resource described in the sector map is determined by the functions, activities and interactions which make up the value chains which exist within the water sector. The Reserve and Allocable Amount of water within the catchment is determined initially by DWAF (Armitage *et al.*, 1999) by analysis of hydrological supply and demand conditions in the catchment management area and in accordance with the National Water Resources Strategy (DWAF, 2004a). The main usage channels (or value chains) in the Mhlatuze Catchment, according to volume of water allocated in 2003 (Claasen *et al*., 2005 referencing DWAF, 2003; 95) are environmental (271 million m³/annum), agricultural (156 million m³/annum), rural (6.5 million m³ /annum), mining and industrial (84 million m³/annum) and urban (10.4 million m³/annum) and alien vegetation (84.8 million m³/annum).
In the case of the rural poor communities, access to water resources and participation in the sector is limited to

- The Reserve value chain, through access to basic human needs and participation in tourism ventures.
- The agricultural value chain through small scale farming, where participation is indicated by the size of the relevant box on the sector map and positioning in the different value adding functions. The rural groups are positioned at the bottom of the usage function (Shandu pers. comm, 2006), indicating low levels of participation in terms of value adding to water use. In addition, there are few horizontal linkages indicating creation of benefits between actors in the value chain, with the exception being the sale of product to the commercial agricultural

actors and processing facilities. There are no horizontal linkages between different value chains, indicating no opportunities exist to create benefits from trading water as a resource input between value chains, or usages.

The Mhlatuze Catchment "comprises more than 50 % communally held land, whilst some 90 % of the people live on this land" (Versfeld, 2000; 7). The settlement patterns are reflected in Appendix 1, and the water resources indicated in Appendix 3 give an indication of the lack of access of rural communities to water resources. Less than 1 % is allocated annually from the allocable amount for domestic rural use, according to Versfeld (2000), whilst 65 % is allocated to existing irrigation, 27 % to industry and the balance to urban needs. The combination of land settlement patterns, lack of access to existing resources and the current allocation of water resources highlights the inequity in resource sharing and participation in the main activities and functions of the sector, as is indicated on the sector map. The current contributions to GDP, employment, and populations of the different sectors (DWAF, 2003; Statistics SA, 2009) are indicated with the actors. These statistics give an indication of the contributions each value chain makes to the economic and social well-being of the catchment, and the resources they utilise in doing so.

4.2.5.1.1 The Agricultural Value Chain

The agricultural value chain (presented as green text boxes in Figure 8) is dominated by sugar cane, forestry and citrus in terms of volumes of water required, and the spatial organisation within the catchment of these activities is indicated in Appendix 4. The commercial agricultural value chain actors are generally situated in close proximity to the rivers within the catchment, allowing for ease of access to vital water resources. These value chains exist mainly in the upstream and mid-stream portions of the Mhlatuze Catchment. The allocation and use of water in these value chains then would have the greatest affect on the volumes and quality of water in the downstream sections, and thus the efficiency with which the allocations are utilised, and the disposal functions, are very important to the high value downstream actors in the manufacturing, industrial and urban value chains in terms of ensuring availability and quality of water (Mosai pers. comm., 2008).

The allocations are determined through applications to the CMA by actors, and are granted on the basis of land use and crop requirements. Thus the existing water users are typically existing actors in the agricultural value chains who already have access to the additional land and financial

resources (through supporting services) to create benefits from water use. The value chain shows a relatively small proportion of rural communities actively involved in utilisation of water within this sub-sector. Comments from S. Shandu from the Small Growers Co-op (2006) and Z. Duma from the Land Care Programme, both organisations which assist small scale rural farmers and communities to create empowerment through agricultural and infrastructural development, indicate that one of the main reasons for the small proportion of rural farmers is the fact that the majority of rural land in the Mhlatuze Catchment is communally owned. The issue is that individuals cannot use land as collateral for leveraging other resources, such as finance, and they do not have permanence of tenure, rather a "Right to Occupy" the land which is granted by the Nkosi (Zulu word for Chief) of the area (Mpongose, 2006). In these circumstances individuals are not motivated to develop the infrastructure required to access and utilise water for irrigation to create a revenue stream. This status of land tenure decreases the confidence of the rural communities to participate in land related economic activities and creates an effective barrier to entry (Mkhabela pers.comm, 2007).

The storage functions consist of two geographic nodes, on-farm storage (in the case of many commercial farmers (Versfeld, 2000), or rivers, canals and dams controlled by DWAF. On-farm storage allows the water user to better regulate his off-take and use of water according to requirements, but, as Versfeld (2000) points out, the infrastructure required for storage needs finance. Finance for this type of storage and delivery system requires collateral and permanence of resource ownership in order to be economically sustainable (Dillon, 2006). Since the rural communities lack this ownership of resources, they tend to rely on government owned and implemented storage, delivery and irrigation schemes to participate in the agricultural value chain.

Water is then abstracted from these access points and utilised for irrigation to produce agricultural products. Armitage *et al.*(1999) identify the cost of water in 1997 for sugar cane irrigation farmers in the Nkwaleni valley as R135 / 12 600 m³ allocated for 1 hectare of irrigation per annum, plus those farmers irrigating from canals paid an extra R 34/ha for additional maintenance of the water delivery system. This is a small portion of the variable costs associated with sugar cane, which the industry norm in 1997 was R 5 560/ha for irrigated cane. Statistics SA (2009) identify the cost of water as R 0.80 per m³ for irrigated agriculture. The efficiency with which water is used can be seen from the production per water use values calculated by Statistics SA (2009):

- Irrigated agriculture returns R 0.90 per m³ used, a small profit margin of only R0.10 per m³,

although the allocations are based on 12 600 m³ per hectare (Armitage *et al.*, 1999), whereas

- dryland farming returns R0.70 per m³ of water used, based on soil moisture used

The spatial description of land use in appendix 4 of the Mhlatuze Municipal areas indicates that the rural communities generally are distanced from access to open water sources and therefore find it difficult to abstract water (Mpongose, 2006). In addition, comments Mpongose (2006) the lack of existing infrastructure in the form of electricity make it difficult for groundwater extraction and DWAF (on behalf of the government) do not have the capacity to deliver the water to where the rural communities are situated. In the Mhlatuze Catchment, the majority of irrigation (categorized as controlled water use) is used for commercial sugar cane and outlying small scale sugar cane growers (DWAF, 2003) and commercial citrus orchards, with some co-operatives situated in the Nkwaleni Valley which are owned by commercial farmers and small scale growers. In contrast, in the forestry value chain water use is categorized as an activity which reduces stream flows, and so does not require physical access to water resources, but still needs to apply for a forestry licence which takes into account the water use function in allocation considerations (Swart, pers comm., 2008).

Crops are then harvested and sold to the processors, sugar milling companies in the case of sugar cane, citrus pack houses in the citrus value chain, and sawmills, paper mills and furniture manufacturers in the forestry value chain. These interactions are represented by vertical linkages between actors in the sector map. The intensive financial and human resources capital nature of the processing function precludes producers from value adding on-farm, and thus the primary producers are limited in the benefits they can create in this particular value chain. The captive nature of the sugar cane value chain makes it difficult for participants to create horizontal linkages within the current structure of the water sector. Similarly, the citrus value chain is also captive, and consists mainly of primary producers who then send their produce to pack houses who further add value to the product through grading and packaging for sale through the retail outlets. The processing actors have no horizontal linkages and so act in competition with each other. In the Mhlatuze Catchment, the existing citrus commercial farmers are shareholders in the processing function, but smaller producers generally sell to these entities and thus realise a lower value for their produce. The rural farmers are more prevalent in the sugar cane value chain than the citrus value chain due to the high capital input required for citrus production. The rural farmers have limited access to water sources, due to their geographic positioning relative to water sources, and lack of delivery infrastructure to operate irrigation functions and no horizontal linkages with other farming entities.

Within the agricultural value chains in the water use sector, the higher value uses are citrus (Chadwick, pers.comm, 2007), mainly situated in the mid-catchment sections of the Nkwaleni Valley, followed by sugar cane. High value horticultural crops are grown, but are limited due to the distance from produce markets (Cordes, pers.comm, 2008). Water allocations in the Mhlatuze Catchment "do not seem to take the end use value into account" (Chadwick, pers.comm, 2007). This statement would indicate that the water allocation mechanism is institutionally driven, an observation supported by the fact that the nodal points on the sector map (which indicate a potential governance bottleneck in the flow of product in a sector) are directly influenced by institutional governance through DWAF and the Mhlatuze CMA. The CMA should be the democratic market place of ideas and a key centre for developing key trading principles and norms. Currently the representation in the CMA does not reflect all stakeholder groups, and this limits the ability of the participants to govern the flow of resources through these bottlenecks (Cordes, pers.comm, 2008), hence affecting effectiveness in water allocation to address the perceived requirements for empowerment of the stakeholders.

The revenue stream generated by the value of end products, according to all farmers interviewed, has a definite impact on the acceptable price charged for water as an input, and the product flows indicate the water users who create highest value from usage are the ones who can create most benefits. This, however, does not take into account the additional financial resources required to produce in these high value markets, or the holistic capacity required by participants described by Cook (1997). According to Chadwick (pers.comm, 2007), the capital required to establish citrus, the per hectare production finance requirements and the time lag (about 3 years) between financing and realising income (Claasen *et al.*, 2005) are additional barriers to entry over and above water availability for a crop which requires 90 % of its' water requirement from irrigation (Armitage *et al.,* 1999). New participants in the citrus industry also lack (Chadwick pers.comm, 2007), the capacity to utilise the resources to create benefits, affecting the ability to create empowerment through enhancing capacity relating to competence (Cook, 1997).

The sector map (Figure 8) indicates that there is potential for increased interaction between actors as the value chains are very isolated, mainly due to historical economic and social segregation. There is little current horizontal interaction between existing actors, which indicates that the resources will tend to remain within the value chain they were originally allocated to, thus

decreasing the flexibility for resource utilisation and optimal determination of the best use and highest socio-economic value for that resource. The allocation of water through the nodal point at the CMA level indicates a constraint for re-allocation to other water uses, due to the current governance structure, as the value chain represents mainly existing commercial producers who have access to, and in many cases ownership of, infrastructure required to store, abstract and utilise water. Setting up water trading at these institutional nodes would enable stakeholders to make decisions regarding water use, if the political will was present. In addition, these commercial actors have access to the additional resources required to create benefits, which the rural communities do not, due to the lack of linkages with supporting actors. Dillon (pers comm., 2007) explained that, from the financial sectors viewpoint, there was not enough collateral offered by rural poor communities to enable the lending institutions to support them in economic ventures, due to the fact that the majority of this stakeholder group do not have title deeds to the land they are trying to develop, and the water allocation mechanism of compulsory licensing is not of sufficient integrity to ensure that the water will be available. Thus the rural communities constitute a small portion of the agricultural value chain, and the only interaction with the other actors in the value chain is through sale of raw product for processing through commercial outlets. This would indicate that the rural actors are not realising the full benefit from production functions due to lack of holistic empowerment and access to resources. The allocation of water resources is governed at this stage by a vertically integrated set of value chain rules. Compulsory licensing, as an allocation mechanism, requires that the nodal point would be governed by external value chain institutional influencers (Pott, 2006), thus reducing the capacity of the value chain actors to participate in resource allocation. Reducing the capacity of the value chain actors to participate in the governance of resource allocation within the water sector has a negative impact on the holistic empowerment of the sector participants (Strandberg, 2001), as resources are not optimally allocated for “the benefit of all” (Pott, 2006).

4.2.5.1.2 Industry and Urban Value Chains

The industrial and urban value chains identified in Figure 8 are allocated water through DWAF, who then supply the Water Board (Mhlatuze Water) (Mosai, 2008) who in turn supplies the Municipalities and other outlying industries. DWAF also supply direct according to requirements specified by the Municipalities in the Catchment, in the case of urban use, and applications for water usage from the industrial sector (de Villiers, 2006). Statistics SA (2009) identify the cost to the Municipalities of water as R1.92 per m³. The uMhlatuze Municipality onward sells that water at

R 5.09 per m³ after purification and delivery functions are performed.

The actors in this value chain consist of capital intensive commercial organisations and there is little participation from rural communities aside from labour as an input, as the manufacturing and urban value chains contribute to over 34 % of employment in the catchment (Statistics SA, 2009) whilst utilising approximately 13 % of the allocable water by volume (DWAF, 2003). This value chain is more relational, and thus can create opportunities in terms of backward supply linkages to the manufacturing firms, but not many opportunities in terms of participating in manufacturing due to high financial and market related barriers to entry (Fischer, 2006). The water use costs are high (de Villiers, 2006), but there are no opportunity costs due to the in-elastic nature of water use in the production functions in manufacturing, and non-tradability of the water resource between value chains. Thus governance of the value chain is limited to the manufacturers and consumer requirements. There is little scope for rural poor communities to participate in this value chain at this point in time. The ability to trade water use across value chains would provide the mechanism for these marginalised groups to benefit from the industrial value chain. Similarly, the urban use of water provides no scope for participation from the rural communities groups at this time due to the vertical nature of the value chain and the institutionalised governance of the chain through Municipalities and DWAF. The devolution of water management to stakeholder level through participation in the CMA could improve vertical integration of marginalised groups. This corroborates the results previously presented in the prioritising exercise in Table 9.

4.2.5.1.3 Environmental Value Chain

The environmental value chain is allocated water by DWAF through the NWRS framework, where the needs of the environment and basic human requirements in terms of water resources are calculated by DWAF and allocated accordingly. There is currently no value attached to the environmental and human needs requirements (Pott, 2007). This value chain depends on the ecological state of the catchment as it is primarily focussed on tourism as a source of revenue creation. The creation of benefits therefore is created through non-invasive use of water resources, but still relies on the quality and quantity of water, particularly surface water such as dams and rivers, to create benefits through tourism (Mhlangu, 2006). Permission for use of these water sources is gained through licence applications to DWAF, and thus there is still an effective allocation node governed by DWAF according to institutional frameworks. The ability to create benefits in this value chain depends on the actors' ability to access, promote and use water resources

to attract business. Currently, the main actors in this value chain are existing commercial operators who realise more benefits from use than the rural actors due to their more advanced skills, knowledge and competence within the tourism value chain. The tourism based licences are non-tradeable and therefore the benefits realised by actors in this value chain are limited to the actual actors themselves. There is very little interaction between actors in this value chain at this moment, apart from limited sub-contracting of tourism operators by larger tourism groups.

Functions such as alien invasive control are undertaken by government (Claasen *et al*, 2005), but these could be part of the participative management under the right mechanism, as the downstream usage depends on upstream management. As can be seen on the sector map, the environmental value chain overlaps with the agricultural value chain in use of resources, mainly the forestry value chain which is utilised in tourism (birding, biking etc.), and this is the limit of interaction between value chains. All disposal functions of water, such as run-off, pollution, sewerage disposal, involve the environment as an actor, and thus this function is vital to the whole sector. The sense of responsibility shown by current influential stakeholders is low as they expect the environmental services to cope with abuse, or the government to deal with it.

4.2.6 Summary of Results for Objective 1: The Status of Resource Sharing in the Mhlatuze Catchment

Table 11 provides a summary of the findings as to the status of resource sharing, identifying limitations and opportunities for improvement which could result in empowerment in the Mhlatuze Catchment according to the criteria used for the research. In addition to the findings presented above, the identified constraints and potential solutions have been added in preparation for the following analysis phase of research.

Table 11: Matrix indicating Resource Sharing, Limitations and Opportunities for Empowerment in the Mhlatuze Catchment

Process	**Resource Availability** ⇨	**Allocation** ⇨	**Storage** ⇨	**Access** ⇨	**Usage** ⇨	**Disposal, run-off & recycling**
Input	Water	MWRS & CMS Participative Governance	Infrastructure	Infrastructure Delivery	Production inputs Skills and knowledge Marketing expertise	Knowledge Willingness to participate
Activities	Finite Supply NWRS	Monitoring water use Allocation of water	Storage Allocation Supply	Construct & maintain delivery network Abstraction	Growing Harvesting Transport Value Added processing Domestic water use Sawmilling	Waste Treatment Run-off management Hydrology Management
Outputs	Water resources	Re-Allocation according to empowerment potential	Ability to utilize water in a flexible manner in a dynamic sector	Potential to participate in creating benefits	Raw produce Value added products Tourism business	
Actors	Environment DWAF	CMA WUA DWAF	CMA Commercial Farmers uMhlatuze Municipality Environment	Commercial farmers Industry Forestry Small Scale Farmers Municipal	Municipal Industry Irrigation famers Environment & Basic needs Tourism Millers and processors	Municipal Industry Agri-forestry
Participation of rural poor communities	Lobbying	Legislated re-allocation goals Limited participation in CMAs and WUAs	Limited	Limited to communities close to water source and infrastructure	Small scale agriculture Market Gardening	Alien Invasive Control

Process	**Resource Availability** ⇨	**Allocation** ⇨	**Storage** ⇨	**Access** ⇨	**Usage** ⇨	**Disposal, run-off & recycling**
Process	**Resource Availability** ⇨	**Allocation** ⇨	**Storage** ⇨	**Access** ⇨	**Usage** ⇨	**Disposal, run-off & recycling**
Challenges or constraints	Geographic locale compared to rural communities Over-allocated catchment resources	Acquiring allocations Satisfaction of institutional strategy Existing inequity of allocation	Lack of Infrastructure	Inequitable access geographically Lack of infrastructure	Lack of competence Lack of access to complimentary production resources Lack of confidence to enter value chain	No accountability for hydrological degradation Lack of ecological conservation knowledge
Possible solutions	More flexible "virtual" water use Allocate according to actual usage	Flexibility of use of allocation mechanism Increase confidence to have ability to utilise water for benefits	Improve rural infrastructure Improve flexibility of revenue creation	Improve infrastructure Improve mobility of resource use Increase opportunities for beneficiation Increase confidence to promote equity through sharing	Increase vertical integration of value chains Improve knowledge and skills through horizontal linkages Improve scope of opportunities to create benefits from water allocation Improve access to and ownership of complimentary resources	Create benefit flow from conservation and protection measures Increase sense of responsibility through knowledge and opportunity

The sector matrix indicates that the majority of constraints perceived to exist in the water sector in terms of the levels of resource sharing for rural communities and farmers are related to governance, access to suitable infrastructure for using water, and access to additional tangible and non-tangible resources required to create benefits from water use. The analysis of these results focuses on these areas of participation for the rural communities and farmers in the water sector as they are the most likely to have an effect on the levels of empowerment.

4.3 *Analysis and Discussion of the Results of the Sector Mapping Exercise for the Water Sector in the Context of Empowerment*

The analysis of the sector map is undertaken according to the second research objective which is re-stated as a point of clarity.

Objective 2: Using a value chain method of analysis to identify constraints to empowerment of rural communities within the water sector, and identify how water trading as an allocation mechanism could provide potential solutions.

Analysis methods were described in Chapter 3, and include:

- analysis of the governance within the water sector,
- identifying the linkages, relationships and trust which exist in the value chain sets,
- identifying the distribution of power amongst the actors or groups of actors, and
- determining the income distribution.

The sector map (Figure 8) illustrates the institutional and geographic bottlenecks which act as constraints to participation for groups whom do not have access to allocation or physical provision of water, and these have been identified by stakeholders as areas where intervention would lead to greater involvement of rural communities in resource beneficiation at all process levels. Table 11 sets out the perceived constraints and feasible solutions identified by stakeholders, and the participation within the sector of the rural poor communities.

The development of the matrix in Table 11 provides a basis for undertaking an analysis of the potential for water trading to foster an environment for creating holistic empowerment opportunities for rural communities within the water sector. The constraints and potential solutions identified in the sector mapping exercise and presented in the matrix above are analysed initially in the context of governance, to assess the impact of value chain coordination, regulations and control on the positioning and participation of the rural communities, and then in the context of potential for empowerment in each of the previously described areas of empowerment. The value chains previously identified in the prioritizing exercise by stakeholders as being the most likely to create empowerment for rural poor communities are the agricultural value chain and the environmental value chain, therefore the following analysis is conducted within these two value chains, with comparisons where necessary to other value chains competing for the same resources. The first

three analyses are qualitative in nature, and based on data from desktop research and participatory interviews with stakeholders in the water sector in the Mhlatuze Catchment.

4.3.1 Analysis of Governance

Analysis of governance aims to investigate the rules which govern the value chain sets, the system of coordination between actors, the regulations and control mechanisms which govern their functions and interactions. Analysis of the official and informal governance structures will clarify the levels of participation and interaction of rural poor communities present in the value chains selected.

4.3.1.1 Demand and Supply Conditions of the Value Chain

The water sector under the compulsory licensing mechanism of allocation is dominated by the supply constraints of finite water availability. The demand for water is determined by the usage function in the sector map, partially governed by the opportunities within the revenue boundary and partially by the physical constraints such as seasonality of agricultural production and climate. The ability for participants to create benefits depends on access to additional factors of production and support services (Backeberg, 2007). The rural communities have low levels of access to additional resources and little linkages and interaction with value chain supporters (Shandu, 2006). As a result, demand for water therefore does not necessarily correlate with the most efficient allocation for water, and the dominant coordination arrangements become an essential constraint to achieving equity and empowerment.

Actors require resources such as land, water, machinery, labour and other inputs to produce goods and services, thereby creating a flow of benefits. The demand for any inputs, such as water "depends therefore on the existence of demand for the goods that it helps to make" (Lipsey, 1983: 351). The derived demand for water as an input into the agricultural sector prioritised is illustrated qualitatively in the following flow diagram (Figure 9). The qualitative concept of who is likely to have greatest demand for water as an input reflected in this diagram is backed up by the data gleaned from the interview questionnaire (Appendix 6). Those producers who firstly produce crops which have a value adding facility as a contracted buyer, and who secondly produce crops for those processors whom have strong and steady markets have the greatest opportunity to produce under contract and therefore have the strongest demand driven production. The organised nature of the

processing companies has a notable influence on the strength of the primary producers who supply them. Thus, this relationship between organised markets and primary producers creates stable and safe opportunities within the value chain for participants.

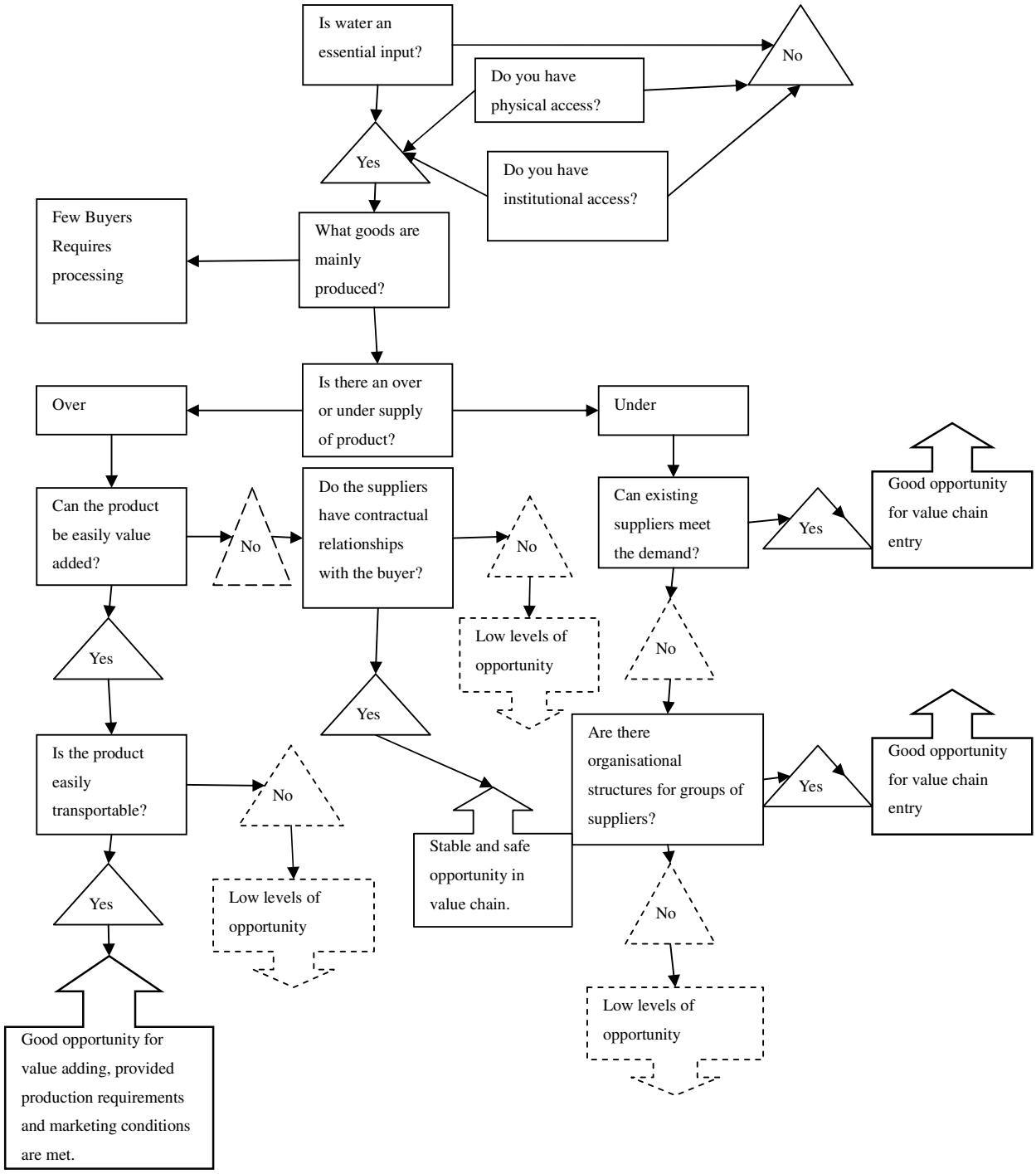


Figure 9: Demand Conditions and Opportunities for Agricultural Production, implying Derived Demand for Water as an Input

The demand for water allocations is dependent on the derived demand for products, and in the agricultural value chain in the Mhlatuze Catchment, this is mainly sugar cane, due to high levels of capital requirement and skills for other irrigated crops, such as citrus and horticulture (Chadwick, 2007). The demand for water then is ultimately dependent on the dominant coordination arrangement in the water sector which clearly is the commercial farming sector.

4.3.1.2 Dominant Coordination Arrangements Affecting Water Allocation

Allocation of water, as previously explained, is undertaken by institutions comprising the CMA and DWAF, and thus the allocation function of water entitlements is coordinated through institutional nodes in the sector map. Demand for water is considered under the framework of the NWRS and CMS, and allocations are made accordingly. In addition, water allocations must take into account the ability of entitlement holders to utilize water for creating benefits so as not to result in a situation where allocations are not used (Pott, pers comm., 2006) and thus the geographic nodes which coordinate access to water resources impact the effectiveness of the allocation mechanism in achieving its goals of equity, efficiency and sustainability in water resource allocation.

The rural poor communities, as represented in the sector map, do not have a large presence in the selected value chains, and those that are participating are primarily low value users of water under the schedule 1 authorisation (domestic or small garden purposes), or through general authorisations (for livestock and game) and few under water licenses (R 135 per 12 600 m^3.ha (Armitage *et al.*, 1999)). This is mainly because the main agricultural value chains present in the Mhlatuze which rely on water as an essential input (irrigated sugar cane and citrus) are directed value chains. A directed value chain describes a value chain where there is a major buyer of the end product in the area (Felixton Sugar Mill, 16 citrus pack houses) exerting major influence over the producer base regarding value chain governance. As the sector map indicates, this results in a high level of vertical value chain coordination, decreasing opportunities for new participants into the sector. The producer then is left to function only at the lower value level of the value chain as a price taker, and provide raw produce to the higher level value adding agro-industries in the form of the Felixton Sugar Mill and the commercial citrus pack houses.

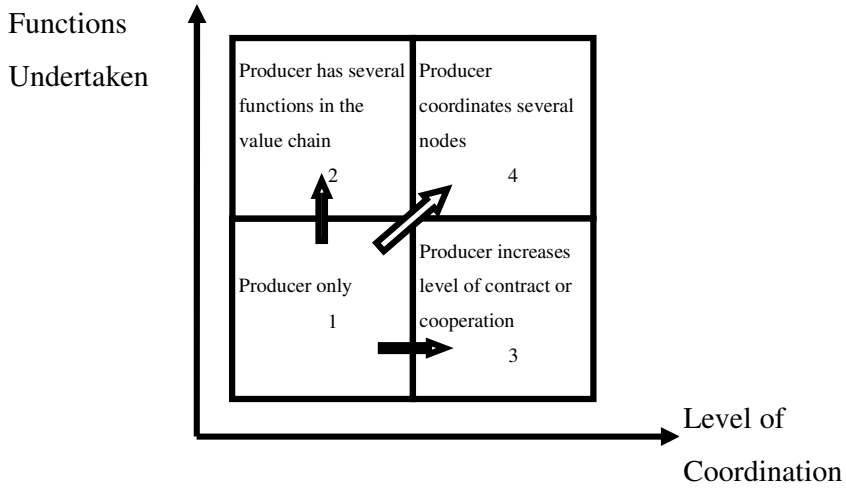
4.3.1.3 Analysis of Rural Poor Community Participation in the Value Chain Sets.

The governance structure in which few processors and commercial farming units dominate the

process of water allocation and use of water in the value chains as described in the previous section, are in part due to a lack of off-take alternatives for marketing of produce is due to the sophisticated sugar and citrus retail sector standards, rules and regulations set by the market (Chadwick, 2007; Matthews, 2008), and in part due to the lack of participation of other actors, including the rural communities and farmers, in the coordination of the value chain.

The sugar industry has specific marketing history whereby the main retail market for sugar is refined granular sugar (Matthews, 2008) and the sugar industry is highly regulated in terms of pricing and marketing. In addition, Matthews informs that the export of sugar from South Africa is governed by international marketing regulations. The citrus industry is also mainly aimed at export, and the regulations governing the sale of citrus are subject to, not only marketing standards and treaties, but by phytosanitary, disease and pest control rules and regulations which preclude primary producers based on their inability to meet these industry governance mechanisms. Additional influence over the rural poor communities positioning in the agricultural value chains, therefore, are high barriers to entry resulting from extremely high capital requirements to meet marketing and institutional regulatory control.

Figure 10 offers an example of possible positions of participants in the value chains in terms of functions undertaken and levels of coordination in the value chains. Under the current value chain governance structure, rural communities only undertake one function (usage for production) in the water value chain, but do not take on additional functions (value add) due to geographic constraints to water access, financial constraints accessing complimentary production resources and relatively low skill levels (de Villiers, 2006). The rural poor communities therefore are positioned in quadrant 1 of the areas of participation (Figure 10), resulting in low levels of governance of water allocation within the water sector.



(1) Entering the chain (⟶ 1)
(2) Improving on existing production activities (1 ⟶ 1)
(3) Adding value by taking on more functions (1 ⟶ 2)
(4) Increasing contractualisation (1 ⟶ 3)
(5) Coordinating a chain segment (1 ⟶ 4)

Figure 10: Functions and Coordination Levels of Producers in Value Chains (source; M4P, 2008)

The analysis of governance of the value chains in the water sector allows the analysis of the participation of rural poor communities (Figure 10) in water resource sharing in the context of the areas of empowerment. In the next phase of analysis, the geographical and social linkages are identified between actors in the water sector value chain sets, and with supporting actors. The linkages between the rural poor communities and other actors are of particular interest to assess the impact these linkages have on the communities.

4.3.2 Linkages within the Water Sector

The analysis of linkages involves identifying the linkages between actors, the reason for these linkages and whether they are beneficial (guided by question (vi) in Chapter 3, p47). Strengthening the linkages with different actors and supporting actors and services in the sector can lead to solutions to other constraints through market expansion, improvement in knowledge through interactions, improvement in ability to utilize resources through increased opportunities and access to additional resources.

The research is based on gauging the potential of rural poor communities to participate in, and create sustainable benefits from, the water sector through access to water allocations. The groups previously identified in the sector mapping exercise were grouped according to activity and level of

participation in the value chain sets. The main agricultural value chain actor, commercial farmers, and the target group, rural communities and farmers, are approached in the survey to determine linkages within the chain. The comparison is made between rural communities (previously disadvantaged in terms of access to water allocations) and existing commercial farmers (whom currently have access to the majority of water allocations in the Mhlatuze Catchment). These two groups, 5 from each group, indicated in the interviews their linkages with other actors in the sector, and this information is used to populate this chart. The perceived extent of the relationships is indicated in Table 12, rated from 0 (no respondents indicated linkages) to 5 (all respondents indicated linkages) and used in the survey instrument.

Table 12: Survey Results on Agricultural Value Chain Linkages in the Mhlatuze Water Sector

Participant	**Rating of Linkage: Rural Community & Farmers (Participant)**	**Linkage between Participants**	**Rating of Linkage: Commercial Farmers (Participant)**
Rural Community	4	Culture of assistance	1
Rural Farmer	5	Local linkages and farmer organisations	1
Farmer Coop	2	Some assistance with credit and input supply. Market assistance in the citrus industry	3
Commercial Farmer	1	Mainly a source of employment and related benefits. Lack of trust	5
Industry Association	1	Low interaction due to low levels of output	4
Input Trader	1	Low interaction due to low levels of output. Low levels of trust from trader regarding farmers' ability to pay.	5
Private Processor	0	No interaction, processor sources from trader. Lack of trust from processor regarding fulfilment of contracts.	5
Wholesaler	1	Low interaction due to low levels of output. Lack of trust from the farmer as to fair pricing.	3
Export	0	No interaction, export sourced from processor	3
Retailer	1	Low interaction due to low levels of output	2
Private water source	0	No infrastructure	3
State owned water source	2	Only those close to surface or groundwater sources	3
CMA	0	Low representation and no participation in decision making due to non-attendance (lack of responsibility and willingness)	3

WUA	1	Low level of representation due to low numbers of irrigators and lack of interest	4
Development banks	1	Limited capacity in terms of assistance and finance	2
Commercial Banks	0	No collateral	4
Private extension services	0	Cannot access as not part of market agreements	4
Government extension services	2	Not enough capacity to service large rural areas	2
Local Government Administration	1	Lack of response to requests for assistance . Lack of trust.	3
Provincial Government Administration	1	Lack of response to requests for assistance. Lack of trust.	2

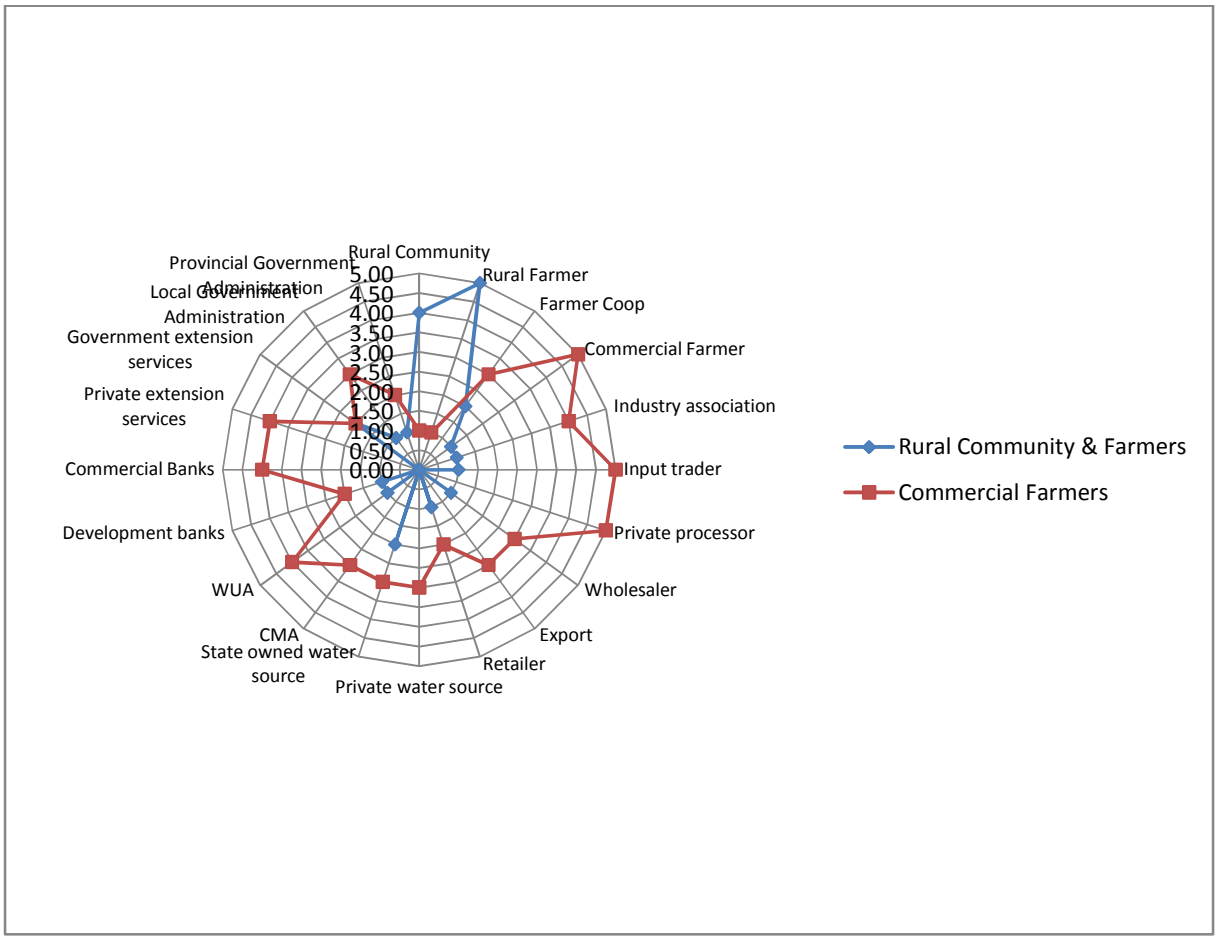


Figure 11: Linkage between Different Organisations; The Mhlatuze Catchment

Figure 11 indicates that within the agricultural value chain prioritized by respondents in the research interviews, rural communities have far fewer linkages with beneficial organizations (such as support services in finance and input supply and end markets for produce such as processors and

retail) than the commercial farmers, who are historically empowered and can access water and production inputs and support services to provide long standing marketing agreements. In addition, specific licensed use for water determined at the institutional nodes (WUAs and CMAs) would appear to be bias towards those entities in the sector which participate in the institutional decision making processes, in this case the commercial farmers. The inflexible nature of compulsory licensing also implies that these licence holders have low opportunity costs associated with water use, as the opportunity cost is limited to what they themselves can do with the water to create benefits, without being able to value add through vertical or horizontal linkages in the sector. It is clear then that by increasing the linkages by devolving the level of institutional allocation to involve rural communities, using an allocation mechanism which promotes resource sharing through increased opportunity for access and usage, would encourage increased interaction and thus more efficient water use and creation of greater overall benefits. This is further discussed in the following sections discussing the participation of rural communities in water resource sharing in the context of empowerment.

4.3.3 Identification of Power Distribution in the Water Sector

The power distribution within the sector relates to access to key tangible and non-tangible assets in the sector. An indicator used to determine the power distribution is the level of access to key assets (land and water), which are required to create benefits from resource sharing. The previous section described the rural communities and farmers' lack of access to tangible assets such as titled arable land and allocable water (2 %), which sits still mainly in the hands of few white commercial farmers(23.5 % water allocations). Brook (2009) from the Nkwaleni Irrigation Board suggested that the level of ownership of land and water for small growers is less than 1 %, and there was no water allocated to the rural communities and farmers in 2005 in that area. The commercial farmers therefore still have access to most of the physical resources, and historically the intangible resources such as knowledge, agricultural and financial skill, which allow these groups of actors to control governance of the value chains and command power over most of the water allocations. Suitable indicators for demonstrating the level of power attributable to an actor, or key governors, in the water sector are:

- Access to water allocations and land (control over key assets), and
- share of chain value added, measured in percentage of GDP and levels of employment for the Mhlatuze Catchment.

The actors are ranked in decreasing order according to the information used in the sector map (Figure 8) and the information is put into a spreadsheet together with the chosen indicators (horizontal). Each group of actors assigns a value (sourced from the open interview results in Table 12, and information contained in the sector mapping exercise, Figure 8) to the indicator in order to understand how the key assets or resources are concentrated among actors. In this research, the actors have been grouped due to time constraints in being able to interview all actors in the value chain. The score attributed to each level is shown below each level. The access to land indicator is split into three levels, scoring highest to lowest in terms of the ability to use land to create benefits. In other words, title ownership of land allows actors to access a full range of supporting functions of production, scope of decision making ability and ability to determine opportunity cost involved in creating benefits, whereas access to land without ownership limits access to, and control of, the supporting functions of production (Mkhabela, 2007). Access to water is similarly shown on three levels, decreasing the scores according to levels of control over institutional nodes (allocation in terms of volumes required), geographic nodes (physical access to volumes allocated) and limited access. The share of value chain added then indicates the influence which that group of actors can have over the governance of the value chain.

Table 13: Concentration of Key Governors in the Agricultural Value Chain

	Land Use	Access to water	Share of value chain added % GDP / % Employment
Processing Companies	negligible		30 % 13 %
Commercial Sugar Farmers (105 farmers)	26 504 ha	23.5 %	9.5 % 15 %
Commercial Citrus Growers	357 ha	1 %	13 %
Small Cane Growers (6422)	8543 ha	<1 %	.05 %
Rural Communities	Mainly Livestock and subsistence	<2 %	Negligible

Table 13 combined information from the Citrus Growers Association (Chadwick, 2007), SA Canegrowers (Groome, 2006). There is a clear indication that the power distribution in terms of value chain governance is skewed heavily towards the processing companies, as they control the production contracts and value added market. However, the concentration of key assets in the agricultural value chain lies with the commercial farmers in the Mhlatuze Catchment. The number of small growers heavily outweigh the commercial growers, and they control 30 % of the sugar cane land, but have less than 1 % access to water for irrigation, implying most of the small growers are dry land producers (more than R 7 000 per ha difference in income). This relates to their low

level of contribution to the GDP of the Catchment. The positive relationships between access to these key assets and improving value chain position, levels of participative governance and creation of beneficial linkage to foster greater resource sharing, as previously explained in the analyses of these areas, would imply that skewed distribution of power to the commercial sector will impede empowerment of rural communities and small growers.

4.4 *Discussion of Resource Sharing and Potential of Water Trading to Enhance Empowerment*

Analysis of the water sector has allowed the identification of constraints and possible solutions to creating increased participation of rural communities and farmers in the use of water resources. Through devolution of governance and power amongst actors in the value chain sets, the negative effects that the institutional and geographic nodes have on participation of marginalized groups can be challenged. The inclusion of rural communities in participation through access to water allocations and access to means to create benefits will increase the overall efficiency of the water sector whilst improving equity through participatory empowerment. The potential of allocation of water through a market based mechanism to increase equity is discussed against the background of sector analysis and within the empowerment discourse. The discussion expands on the sector analysis through the following process:

- describing the area of empowerment,
- determining the status of empowerment of the rural communities by discussing indicators and analysis relevant to that area of empowerment and,
- Offering arguments for potential solutions as to how the status can be improved by using the water trading mechanism for water allocation.

The discussion offers a summary of how water trading can improve holistic empowerment of rural communities, and how this can result in a more efficient, sustainable and equitable water resources sector.

4.4.1 Resource Empowerment

Resource empowerment has been defined by Van Wyk *et al.* (2006; 25) as “the manner in which resources enable participation in collective endeavours”. In terms of access to resources, the rural poor communities (37 % of the population) have access to 50 % of the total land area, but less than 1 % of the allocable water. The data map in Appendix 4 shows that the majority of land available to

these communities is not close to available water sources, and most of the value adding activity that takes place is livestock grazing (schedule 1 water allocation (DWAF, 2005). The indicators used to gauge resource empowerment in the sector analysis are:

a) share of chain value added activities and support services,
b) control over resource allocation,
c) geographic positioning, and
d) control over key technology.

4.4.1.1 Status of Resource Empowerment

a) The sector map (Figure 8) illustrates that the rural communities and rural farmers occupy the lower level functions of the selected agricultural and environmental value chains and have a small share of value added activities as they are limited to the primary production phase of water usage. The rural communities do not participate in the storage of water and therefore cannot utilize water to effectively meet the seasonal water demands of agricultural production, thus limiting them in participating in higher value crop production.
   The lack of secure ownership of essential resources for agricultural production, land and water, relegates the rural communities and small scale farmers to low levels of value adding in the chain as they are not able to access the additional financial, mechanical and input related resources due to lack of collateral these supporters require for supply of goods and services (Dillon, 2006).

b) The rural communities have little control over resource allocation due to their lack of presence in that function of the agricultural value chain sets. The relatively low price of water is not a barrier to entry so much as the institutional and geographical bottlenecks. The institutional bodies, the CMA and WUA who control the institutional node of water allocations, consist of representatives from the stakeholders in the water sector. Consequently, the less participation, the less influence the groups can have over allocation of water, and this is one of the challenges the rural communities face (identified in Table11 as a constraint). Allocation of controlled water use licenses requires that the user have access to the necessary functions of production, such as arable land. The map in Figure 12 indicates that most of the rural communities are situated in historically degraded land not suited for crop production (Matthews, 2008; Mpongose, 2006), and when compared to the map in Appendix 3 (indicating Traditional Tribal Authority land) many of these areas are under communal ownership. This denies individuals within the rural

communities to gain title to the land and thus apply for controlled use licences. In addition, without title to land, the availability of financial and input supply support services are lessened due to increased risk for credit suppliers (Dillon, 2006). This is an indication that the re-allocation of water licences in isolation cannot have the desired empowerment effect without addressing the issues of access to other vital and complimentary production resources at the same time (Dillon, 2006). Improving resource empowerment is therefore a key area in terms of increased participation opportunities in creating benefits from water allocation, and hence the allocation mechanism implemented needs to operate within the overall governance of the sector, which is mainly market oriented. The market drives benefits created from resource use, and therefore should be the driving force behind the allocation of water resources, otherwise there is an externality within the sector which creates a bottleneck where allocation is governed by a different set of rules to the value chain, illustrated in the sector map by the institutional node.

c) The spatial distribution of the groups of actors included in the sector map (Figure 8) is indicated in the geographic sector map below (Figure 12). This map highlights the geographic challenges facing rural communities with regards to accessing water resources, an externality represented in the sector map as the geographic node. This spatial sector map also highlights the potential impact that rural communities can have on volumes and quality of water available to downstream users, and the increased opportunity costs to traditional agricultural use that exist if water could be leased or sold to any other water user. The opportunity cost increases with the usage value of water, implying that the opportunity cost which exists with trading water to urban and industrial users (mainly the lower end of the catchment) is higher than that which exists only trading within the WUA, which has smaller numbers of users with similar values for use. The spatial distribution of actors and functions is illustrated in the map below (Figure 12).

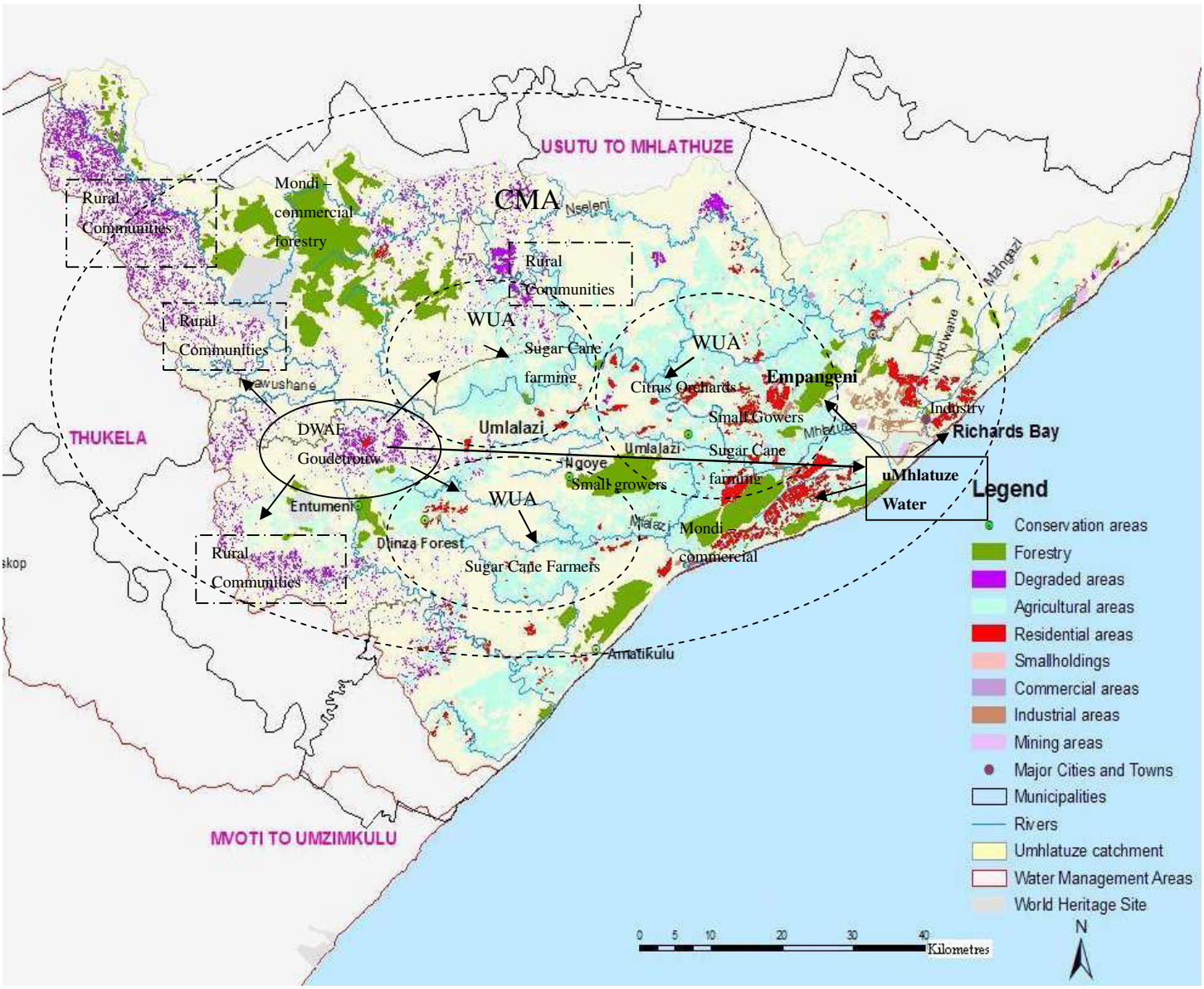


Figure 12: Geographic Sector Map for the Mlhatuze Catchment

In the context of resource empowerment, few rural communities indicate linkages with private or government owned water sources (Figure 11), few linkages with the institutional controllers of water allocations (WUAs and CMAs), few linkages with other production function suppliers, low levels of interaction with financial institutions, especially the private banks. The spatial sector map (Figure 12) illustrates the institutional (DWAF, CMA, WUA) nodes and the geographic nodes

(Goudetrouw dam, rivers and private dams) present in the allocation and use of water. As can be determined from Figure 12, the water use takes place in those areas with easy access, whilst the majority of rural communities are in spatially distant areas to the water sources, mainly in the upper catchment. The small growers are situated in the middle and lower catchment, with reasonable opportunity to physically access resources, but these areas are also the main commercial farming areas which are "over-allocated" (Pott *et al.*, 2005) in terms of water resources due to historical allocation trends and land ownership allowing commercial farmers to meet the application criteria for allocation of water for irrigation use.

d) The sector map (Figure 8), the linkage graph (Figure 11) and the table indicating control over key governors in the value chain (Table 13) showing distribution of power indicate that rural communities and farmers have little ownership of key technologies through the functions of the water value chain sets such as water storage and delivery and value added processing. This limits their ability to participate in governance of the sector, and utilize additional resources to create sustainable benefits and upgrade their status in the value chains.

4.4.1.2 Potential Solutions Offered by Water Trading as an Allocation Mechanism within the Area of Resource Empowerment

a) The main constraints to participation for rural communities in the context of resource empowerment exist in the water allocation function (a node in the sector map, Figure 8), and access to additional complimentary resources (such as titled land). The current water allocation function is undertaken by representative institutions (the CMA and WUA), under the compulsory licensing mechanism. This limits the ability of use of allocations to change between water uses in response to changes in the value chain environment as the mechanism is inflexible and allocations are awarded for specific uses. In order for rural communities to upgrade to gain a bigger share of value added activities, they need to access higher function levels in the value chain. This requires higher levels of skills, knowledge (addressed in the next section under agency) and technology. This would be a long term goal for these communities and not achievable in the medium term. However, the ability to trade resources allows them to access higher value levels of water usage and thus potentially gain better value for their resources than they themselves could create. A water trading allocation mechanism would allow the allocation holder the decision making capability to gauge the opportunity cost of using or trading the water, thus leading to a more efficient and equitable allocation of resources.

b) The lack of presence of rural actors in the allocation function, as mentioned above, is a constraint to upgrading their participation in the value chain. Allocation of water is based on the ability of the applicant to utilise the water. In other words, the applicant should have access to the other production functions, such as land, finance, skills etc. The additional flexibility of water allocation under the market based mechanism would allow actors to use the tradability of water entitlements to apply for allocations and make decisions to create benefits from use of water allocations based on a more diverse set of demand functions. Greater variability of use results in higher opportunity costs for water as an input resulting in more efficient overall use of water (Rogers *et al.*, 2001). The ability to trade water across value chains into sectors with higher opportunity costs would enable non-participatory actors to take part in the allocation function greater negotiation leverage. This would enable the rural communities to become more involved in governance of the sector through participation in multiple functions and increased levels of coordination through increased economic and social interaction.

c) Water trading enables the allocation holder to become less dependent on spatial positioning according to water sources, as they would be able to trade virtual allocations without physically accessing the water (as indicated in Table 11), but conversely a lack of access to water would decrease the opportunity cost of water to the entitlement holders as they have less alternative uses for the allocation. The opportunity for non-participants in the sector then would be limited to those who currently have physical access to water. The ability to trade water allocations could, however, also lead to development of storage and delivery infrastructure in areas previously lacking by actors with access to more support services and additional tangible and non-tangible resources, which require greater volumes of water allocation, but are precluded from applying due to institutional allocation limitations. Rural communities have the support of institutional frameworks to gain access to water allocations, whilst existing commercial actors in the chain, such as commercial farmers, or across chains, such as industry, have the capacity to utilize these allocations more efficiently and sustainably in the current environment. This could open up the opportunity for the rural communities to upgrade, or add value by taking on more functions (see Figure 10) in the value chains, by leveraging infrastructural development based on water resource supply contracts with willing buyers. Previous studies in the Mhlatuze Catchment (Armitage *et al.*, 1999) have shown that the majority of actors interested in buying

water at that point in time are large scale sugar cane farmers who can create "favourable returns from irrigation" (Armitage *et al.,* 1999; 107), and these farmers also tend to "have a greater portion of their total arable area that can be developed for irrigation purposes than non-buyers". This scenario would suit the sugar value chain as a whole as the development of water infrastructure in non-serviced areas would allow small scale farmers to enter into the value chain, thus expanding the supply base for the processors, increasing the viability of the industry and complying with NWA of 1998 framework and legislation. The same result was not found for citrus, but this is an indication of prohibitive additional capital requirements, skills for production and access to technology.

d) Encouraging resource sharing through empowerment allows the rural communities the potential to access more functions of the water sector value chains and, through vertical linkages and integration, allows the lower level actors in the chain to upgrade themselves (see Figure 10), and increase their horizontal linkages into other value chains, thus participating in collective value adding to water resources. The ability to trade water allocations would enable small growers to apply for allocation, knowing they have the opportunity to participate in the value chain without necessarily having access to the key economic factors of production, thus creating a revenue stream, whilst slowly gaining power through controlling key assets.

4.4.2 Empowerment through Increasing Competence

The competence area of empowerment includes the following facets of empowerment, knowledge, power and agency. This area of empowerment can also be described as the ability of the target group to take advantage of opportunities available to them to create benefits. Acquiring knowledge and skills are central to creating benefit from use of resources, which is an integral part of expanding empowerment created through increased access to resources. The features of power and knowledge ascribe to participants the ability to be active agents in the governance of the sector. The key indicators used in determining levels of competence are:

a) Knowledge and trust resulting from beneficial linkages and access to support services (such as finance, extension services)
b) More equitable distribution of power between actors within the value chains and between value chains.
c) Current attitude towards participation in the value chain activities

4.4.2.1 Status of Empowerment Through Competence

a) The current level of participation of the rural communities in the primary production functions only of the agricultural value chain implies that this group not only lacks the resource empowerment necessary to increase their levels of participation (discussed in the previous section), but the level at which they participate requires has relatively low levels of competence in terms of knowledge and skills. In fact, as (Mpongose, 2006) remarked "most rural communities have knowledge of farming, but what they do not have are the knowledge and skills to make decisions on what to plant and where to sell it", and under the current water allocation mechanism of compulsory licensing in the Mhlatuze Catchment, the main sources of knowledge for rural communities are mainly of a scientific nature, thus justifying state control over resource allocation. The exclusion of new actors restricts the flow of information and introduction of different views, thus creating a vicious circle of lack of knowledge resulting in exclusion, and exclusion inhibiting levels of knowledge.

   The number of vertical linkages between actors operating within different functions will result in dissipation of required knowledge up and down the value chain. In other words, the coordination of functions within the agricultural value chain ensures that lower level suppliers meet the requirements set by the higher level processors, resulting in the high level actors creating a path of knowledge to enable producers to deliver the product they require to sustain their existence in the value chain.

   Figure 11 illustrates the lack of linkages between rural communities and support services such as extension assistance both private and government, low levels of interaction with input providers who impart knowledge regarding the production functions as part of their business, low levels of interaction with direct markets who impart knowledge and skills in order to maintain supply. Knowledge is vital to the determination of how benefits can be created from water resource allocation and access, and the institutional nodes and geographic nodes illustrated in the sector map (Figure 8) also present bottlenecks for the distribution of knowledge resulting from lack of participation in these functions by the rural communities.

   The low numbers of linkages between rural groups and other groups and supporting actors

in the value chain has led to instances of mistrust, as indicated in Table 12. There is a lack of trust with actors operating at higher levels of the value chain, such as wholesalers, due to lack of information on market pricing. Processors, particularly in the sugar cane, citrus and forestry value chains (Matthews, 2008), such as in the Mhlatuze Catchment, traditionally operate on a delivery contract basis in order to ensure supply. These contracts are based on quantity, quality and price of produce delivered, and can be used as a form of collateral, or risk minimisation strategy by financial and credit companies to support the producer. The results in Table 13 indicate that there is a lack of trust between the processors and rural farmers in terms of failure to deliver according to contract. This becomes an additional constraint to existing participants and a barrier to entry for potential participants.

b) Power distribution is acting as a barrier to entry for active participation of the rural communities, but participation is the only means of increasing power for lower level actors through increasing their activity (agency) in functions of the value chain (vertical linkages) and increasing their access and use of water resources (horizontal growth in the sector and the horizontal linkages with supporting actors). The inhibition of agency, or active participation, in the water sector is demonstrated by the low level of benefits created from large numbers of rural communities involved agriculture (Strandberg, 2001). This is demonstrated by the skewed distribution of power (Table 13) where lack of benefits created, more than lack of access to key value chain governors, is an indication that power distribution in the Mhlatuze catchment reflects more on the capacity to utilise resources rather than ownership of them.

c) The current levels of participation of rural communities and farmers has been discussed as a part of determining their levels of resource empowerment, but this section discusses the position of these groups in the context of attitude towards participation, or decision-making. The lack of participation in the decision making functions regarding the allocation of water resources (institutional and geographic nodes), and the low levels of co-ordinated decision making in the governance of the value chain (rural community participation only in the primary production function of the usage of water) is an indication of the reliance of the rural groups on centralised authority to take decisions. This is endemic of their acceptance of low levels of agency, as one rural respondent mentioned:

"we do not have the power to participate in the decision making in meetings for allocation of water because we are too small, but the government has promised we will have land and water"

The skewed power distribution within the agricultural value chain towards large processing companies and their traditional commercial supply chain acts as a barrier to entry as the direct nature of the value chain ensures historical relationships are held sacred (Matthews, 2008) and new relationships are hard to foster. This creates an attitude amongst non-participants, as Mpongose (2006) mentioned, of hopelessness in terms of potential to break into the supply chain, also backed up by the data contained in Table 12. This non-committal attitude is also noticeable in the low levels of integration within the decision making allocation functions. This can lead to a spiral of mistrust of the system of allocation and limited interaction with the participating actors.

4.4.2.2 Potential Solutions offered by Water Trading as an Allocation Mechanism

a) Knowledge sharing and trust between actors in a value chain are essential to fostering participation at all levels of the value chain, and encouraging resource sharing amongst participants. The ownership of a tradable allocation, as mentioned in the section on resource empowerment, allows the entitlement holder to make decisions regarding usage or trade of that resource. A tradable resource would create more asset based leverage for interactions between actors and supporters of the value chain in terms of ownership of production functions reducing the risk of reneging on contractual obligations, increased asset base for credit, and reduced risk for establishment of relationships and linkages. Tradability also would increase the levels of contract or cooperation (see Figure 10) through negotiation with actors possessing greater knowledge and skill levels, which filter down to the supplier of resources as a part of ensuring supply. Therefore, by using the water trading allocation mechanism, the rural actors would be more confident in entering the value chain.
b) Distribution of power issues within the agricultural value chain, explained in part b) above, are a function of non-participation in the areas of bottlenecks (allocation and delivery) and lack of vertical linkages and interaction to create benefits. By encouraging rural entities to enter into the value chains and participate in greater functions, the distribution of power will change. The concentration of power in the water sector illustrated in Table13 indicates that

by increasing the level of water resource sharing in favour of the rural actors, the additional margins accruing to these numbers of farmers from agricultural use, or trading of water allocations, could substantially improve the equity of distribution of power. The water trading mechanism would enable these rural actors to utilise their allocations to the best benefit, whilst still making the resource available at realistic economic cost for other participants to rent or buy, thus not affecting the efficiency of the value chain.

c) A paradigm change is needed where existing participants need to realise that the encouragement of a participation of more diverse groups of actors will benefit the water sector as a whole, as participation would result in greater dissemination of information, knowledge, will to increase skill levels and ultimately efficiency through more equitable levels of resource sharing. The attitudes of those currently with greatest resource access, control of key assets in the value chain are seen as vital to their survival. In fact, if water was allocated under the trading mechanism, this would not be so much of an issue as the actual pricing of the water. Malcolm Easton (2006) from the Heatonville Irrigation Board revealed that the issue of additional actors in the water sector for the existing power base was more based on sharing finite supplies with more users. Whilst this is a valid point, the economics of market based goods would ensure that the water use would tend towards the highest benefit, whether it be economic or social, and thus there would be water available for use, but with higher opportunity costs attached due to increased variability of use for tradable allocations. In the Mhlatuze Catchment, according to Pott *et al.* (2005), there is a case of over-allocation of water due to it's' non-economically driven cost base, and so the scenario of water trading should lead to more efficient overall use of water, whilst encouraging participation of new actors.

4.4.3 Objective Empowerment

In the context of Objective Empowerment (relating to responsibility and opportunity), a suitable quantitative indicator used is income distribution along the selected value chains as this provides the start for determining income generation opportunities for the target group of participants (M4P, accessed 2008). The current ability of the rural communities to identify opportunities is a qualitative indicator of objective empowerment. Qualitative indicators suited to analysis of objective empowerment also relate to the understanding of responsibility for conservation of water resources and potential benefits that can be gained from the environment or from downstream users who access clean water for use. This information was extracted from the questionnaire responses (Appendix 6) obtained in the research process, and the solution to challenges noted is the potential

of trading water entitlements to other actors within the agricultural value chain and across value chains.

4.4.3.1 Status of Objective Empowerment

The status of objective empowerment, previously described as the opportunities available within the agricultural value chain prioritised for the focus group to move from "oppression to influence" (Cook, 1997: 288), is determined within the current governance structure of the water sector in the Mhlatuze Catchment. The opportunities need to be identified, part of the dimension of increased competence and agency described above, and allow the rural communities to improve their position in the value chain complying with the formal and informal rules of the value chain (institutional frameworks which exist for allocation of resources and informal regulations) vertical linkage marketing opportunities, vertical integration opportunities to access higher production functions, geographic aspects and horizontal linkages and beneficial interactions with other value chains in the water sector. Table 10 gives an indication that the participants in the research thought that the ease of identifying opportunities to create revenue was significant (a score of 4 out of 5).The discussion on objective empowerment focuses on:

a) Demand and supply conditions affecting the value chain
b) Dominant coordination arrangements in the value chain

These elements are discussed below.

a) The main issue within the allocation discourse in the water sector is that there is a finite supply of water to be allocated amongst growing and diverse demand. The demand for water is illustrated in Figure 9, showing that demand for water is derived from demand for the products produced from water. Figure 9 indicates that the most realistic entry point for rural communities in the agricultural value chain is in the sugar cane sub-sector. There is an indication that the demand for sugar cane from processors is strong (Groome, 2006) and this would create the opportunity for rural communities to enter into relatively strong contractual agreements, thus improving access to other factors of production such as finance and inputs. The same demand and supply condition affect water as an input, implying that if the conditions of supply were flexible enough, and the coordination of the chain was conducive to trading in terms of knowledge and access, there would be good opportunities for trading of water through contracts.
b) The dominant coordination arrangements reflected in the sector map (Figure 8) are the nodal

points in the allocation and access to water as an input, and the directed (or captive) nature of the current dominant value chain for product from the use of water(Groome, 2006). The potential of the different value chains taken in isolation within the water sector to create empowerment opportunities were identified in Table 9 in the research prioritising the value chains.

The bottlenecks limiting potential opportunities for rural communities and small growers to participate in the water sector are the allocation, storage and access functions within the value chain. The allocation function is institutional and controlled under the NWRS framework at national and the CMS framework at the catchment level. Both these frameworks have made provisions to promote equitable allocation of water based on previously disadvantaged individuals, therefore aimed at the rural communities (Mackay, 2003). The institutional commitment however does not take into account the capacity of these individuals and communities to create benefits, nor the access to additional complimentary resources required to create a revenue flow. The rural communities indicated in the interactive interviews (Shozi, pers. comm, 2006; Mtshali pers. comm, 2006; Hlongwane pers. comm, 2006) that the re-allocation process has not really assisted them except in terms of schedule 1 use, and this only where there is infrastructure to support the access to the allocation. Water license applications are still considered in conjunction with irrigable land (at 12 600 m^3 per ha) (Brook, 2009) and so lack of access to additional resources impedes the identification for opportunities for water use (Scoones, 1998). Participation in the institutional allocation process for rural communities is limited, and this in turn limits their ability to identify opportunities available for creating benefits. In addition, the rural communities have the perception that they are not responsible for water resource management due to their limited participation in decision making.

The current infrastructure facilitating storage and access to water is concentrated in the historical irrigation board areas and urban/industrial areas, creating a geographical node in the sector map (Figure 8). The rural communities are spatially challenged (Figure12) in terms of access to water or storage, and this limits their ability to identify and use opportunities to use water to create benefits. These nodes are currently governed by national institutions (DWAF) and by existing commercial farmers with whom the rural communities will compete for water.

The captive, or directed nature of the value chain coordination of products created by water use creates opportunities through higher degrees of explicit coordination present in these types of value chain (Kaplinsky and Morris, 2006), and this creates a double edged sword for identifying opportunities to create benefits. On one hand, the single integrated nature of the supply and marketing chain makes it easy to identify opportunities, but if the rural communities are not kept informed of prices, agronomic practices etc. required to be sustainable in the agricultural sector, then these is no other recourse or opportunity available to them to create a revenue flow. This is also evident in the low level of linkages between rural communities and the market (processors) (Figure 11). In addition, the singular nature of the value chain makes it difficult for actors to identify opportunities which are external to that chain due to lack of horizontal integration and linkages present in the water sector.

The distribution of income amongst the actors in the agricultural chain, represented in Table 13, indicates that the rural communities and small growers only contribute about 0.05 % of the share of value chain added in the Mhlatuze catchment, whilst commercial farmers contribute about 9.5 %. The major portion of income earned is concentrated in the processing and marketing zone within the revenue boundary indicated on the sector map (Figure 8). Statistics SA (2009) figure indicated on the sector map show that commercial farmers in sugar cane return about 12.5 % on the cost of water (about R0.90 per m^3), whilst the industrial and municipal value chains create much higher returns per m^3 used (R8.80/m^3).

4.4.3.2 Potential Solutions Offered by Water Trading as an Allocation Mechanism

The potential solutions offered to challenges presented in the section above discussing objective empowerment are presented here.

a) The identification of opportunities to create revenue is mainly a function of participation in the decision-making process and flow of knowledge from interaction with other vertically placed actors. The use of a market based allocation mechanism would encourage more interaction from the demand side of agriculture, represented by the actors in the revenue boundary in the sector map (Figure 8), thus generating a flow of information regarding supply opportunities that exist in the value chain. The flexibility previously described of the water trading mechanism would also allow trade horizontally within the water sector, in other words into other value chains. This would create more chance to identify

opportunities, at the same create a sense of responsibility to manage resources which have an opportunity cost.

b) The coordination of the agricultural value chain is captive, and thus the use of a water trading mechanism to allocate water licenses would probably be more of a negative in terms of the market providing information as to alternative opportunities to create benefits from water use. However, increased horizontal integration of the value chain sets within the water sector through flexibility of allocation would enable the rural communities to identify more opportunities for water use, and increase the flow of information regarding desired quality and quantity of water for other value chains, which would have a positive effect on the level of responsibility for management.

4.4.4 Subjective Empowerment

The willingness to participate in resource sharing is dependent on the benefits created through participation. A suitable indicator therefore would be based on an appraisal of how important the benefits created are to livelihood strategy, and the willingness of rural communities to participate in the value chain. The area of subjective empowerment in the context of water resource sharing addresses the third objective of the research, which is:

Objective 3: Investigate the stakeholder perception of the suitability of water trading in promoting resource sharing through empowerment.

The third objective takes the analysis results and interrogates the acceptability by stakeholders of the ability of water trading to achieve their expectations. The two questions posed to participants in this stage of the research were:

What is the stakeholder perception of how access to water allocation can result in empowerment, and what proportion of total livelihood would these benefits constitute?

Do the stakeholders consider water trading to be the most suitable allocation mechanism to create empowerment in the water sector?

4.4.4.1 Status of Subjective Empowerment

The constraints and potential solutions identified in the previous sections analysis of the water sector were discussed with stakeholders in the Mhlatuze Catchment. The potential for access to water to create empowerment was widely accepted within the agricultural and rural value chain actors interviewed. “Water is an essential resource for farming, and water allocations need to be

secure. Only through commercial farming can empowerment be created. ” (Mpongose, pers.comm, 2006). The interaction between actors in the value chains would lead to exchanges of knowledge and skills, in addition to physical resources and economic benefits. The low levels of interaction between rural communities and established actors and supporting actors (shown in Figure 11) create a situation where it is difficult for the rural communities to participate in a value chain they have identified as being most suited to creating benefits and encouraging resource sharing.

The political willingness is evident from the institutional frameworks which have been put in place (Mackay, 2003). There are sufficient indications that the re-allocation of water aimed at re-dressing the inequities of the past is part of the institutional framework, but this in its' current form leads only to addressing one aspect of the dimension of resource empowerment, and if there is not a willingness and confidence from the stakeholders and existing actors in the water sector, then re-allocation based on the compulsory licensing mechanism could lead to confrontation between groups of actors and supporting actors and the institutions (depicted as institutional nodes in the sector map, Figure 8).

The lack of linkages is also an indication of low levels of trust between organizations, and this is evident in the rural community's responses regarding other organizations. The lack of linkages with water allocation actors and agents also indicate that they have not sufficiently engaged with the relevant institutions and agencies regarding their requirements to create benefits from increasing equity in resource sharing.

4.4.4.2 Potential Solutions Offered by Water Trading as an Allocation Mechanism

The potential of water trading to create greater confidence and willingness in resource sharing lies in the knowledge for rural communities that there are alternative uses for water to create benefits, and the application of these uses results in greater interaction with stakeholders in varied value chains. Greater participation in creating benefits will result in the rural communities taking a greater interest in the decision making functions, particularly at the nodal point of allocation (Figure 8), and thus is likely to encourage these groups to become more interactive with the other stakeholders, resulting in upgrading through vertical integrating and horizontal interaction (Figure 10). The opportunity cost of trading water as opposed to using it to create benefits will be dependent on the livelihood strategies of the rural communities.

With greater opportunity and interaction with trading resources with other actors, the rural

communities are more likely to develop a sense of responsibility in terms of participating in resource management and protection. If water has a value, then there is more scope for rural communities, who are generally placed in the upper and mid-catchment areas (Figure12) with potential to have most impact on quality and quantity of water flowing downstream to the higher value users, to learn and apply better conservation practices in terms of environmental services. This would benefit all stakeholders in the water resources, and encourage resource sharing through participation.

4.4.5 Summary

In terms of empowerment, therefore, the current allocation mechanism of compulsory licensing merely re-allocates water supply, and in a stressed catchment such as the Mhlatuze, this implies taking water away from an existing actor and re-allocating the license. This has the effect of improving resource empowerment, but not necessarily improving the capacity or competence of actors to participate, ability to identify opportunities (objective empowerment), or increase the feeling of responsibility and confidence to participate in resource sharing. The dimensions of empowerment are clearly interdependent (Figure 2) and the manner in which water is allocated needs to address all the elements of these dimensions to improve holistic empowerment. The current allocation mechanism as described here does not re-allocate water according to the most efficient, equitable or sustainable use.

Improving access to resources forms the base for empowerment. This allows potential actors to participate in decision making regarding resource management and allocation and increases interaction with other actors. This in turn creates a flow of information and knowledge between vertical actors regarding the nature of products which flow up the value chain. The scope of opportunities is increased through more flexible rules and regulations regarding how water is used, creating higher opportunity costs for water and a greater sense of responsibility regarding management and usage. Increase opportunity will lead to increased willingness and confidence to participate in water resource sharing. Increased participation and knowledge combined with the ability to trade resources vertically and horizontally within a flexible allocation mechanism is more likely to result in water being used at its highest socio-economic value, depending on the livelihood strategies of the various groups of actors, and this then by definition would result in increased holistic empowerment. In addition, the flexible movement of allocations between value chains would enable the institutions to better manage water resources through greater responsibility accruing to its participants resulting from greater knowledge of resource management. Rural

communities can make an informed decision to trade water to higher value uses in lieu of physical use, whilst still being involved in resource management to protect their interests.

Chapter 5: Conclusion and Recommendations

5.1 Introduction

The overall objective of this study was to use a case study methodology to determine the level of water resource sharing amongst participants in water matters, in the Mhlatuze catchment, using a value chain approach. The key findings and discussion presented in the previous chapter are highlighted and related to assumptions regarding the role of empowerment in promoting resource sharing. Conclusions are drawn with regards to identified constraints and potential solutions offered by water trading as an allocation mechanism to promote holistic empowerment and resource sharing amongst previously disadvantaged rural poor communities. Recommendations are made in terms of the benefits of implementing the water trading mechanism and trading of water licenses within the empowerment discourse. Changes that would improve the method of research are recommended and areas for future research are suggested.

5.2 Summary of Key Findings

The specific objectives of this dissertation were:

I. Using value chain methods to understand the status of resource sharing in the Mhlatuze Catchment.
II. Using a value chain method of analysis to identify constraints to empowerment of previously disadvantaged rural communities within the water sector, and identify how water trading as an allocation mechanism could provide potential solutions.
III. Investigate the stakeholder perception of the suitability of water trading in promoting resource sharing through empowerment.

In Chapter 4, the results of the research were presented, analysed and discussed. The main findings are summarised and their significance explored in the following sections.

5.2.1 Objective 1: Using Value Chain Methods to Understand the Status of Resource Sharing in the Mhlatuze Catchment.

Historically, the majority of water resources in the Mhlatuze Catchment have been allocated on the basis of ownership of land and perceived economic importance in the catchment. The evidence suggests that this resulted in socially skewed allocation and access to water. In addition it resulted in the inefficient use of allocations due to the closed nature of allocation and lack of alternative opportunities for previously disadvantaged rural communities to participate and to use

water resources to create benefits. The primary reasons for the lack of alternatives for previously disadvantaged rural communities to create benefits are:-

- a rigid allocation mechanism relying heavily on institutional governance with little diversity in the nature of participatory stakeholders;
- directed vertically integrated and coordinated value chain sets utilising water
- no horizontal integration of value chains;
- storage functions and delivery infrastructure concentrated in the hands of historically powerful commercial groups of actors;
- geographic concentration of water delivery infrastructure in commercial, low density areas;
- legal status impeding access to complimentary resources and factors of production;
- stressed supply driven water allocations;
- lack of responsibility to innovate in a dynamic resource sector.

The lack of opportunity to access water allocations and an environment conducive to creating benefits from water use has marginalised previously disadvantaged rural communities in terms of their ability to participate in resource sharing. In addition, the water resources are not being allocated or utilised in a manner which encourages economic efficiency, equity or sustainability in resource management.

The value chain identified in the research as the most likely to encourage resource sharing through potential to empower previously disadvantaged rural communities was the agricultural value chain. The silo mentality nature of participation in utilising water resources in the Mhlatuze Catchment is prevalent. This results in no interaction between value chains, except in the function of disposal, where issues of run-off, pollution, streamflow reduction and waste water have combined effects on all the value chains.

5.2.2 Objective 2: Using a Value Chain Method of Analysis to Identify Constraints to Empowerment of Previously Disadvantaged Rural Communities within the Water Sector, and Identify how Water Trading as an Allocation Mechanism could Provide Potential Solutions

The status of resource sharing and participation of previously disadvantaged rural communities was analysed in terms of governance, beneficial linkages and distribution of power and income to provide a basis for discussion of constraints and potential solutions within the empowerment

discourse.

5.2.2.1 Analysis of Governance

As a system of production, the agricultural value chain has a system of coordination which includes formal and informal arrangements between participants. The rules and regulations governing the value chain are set by the dominant actors. The dominant coordination structures in the Mhlatuze Catchment across all value chains consist of large commercial vertically integrated processing and buying companies who source product from captive suppliers who use water as an input. These lead firms, such as the sugar processing companies, and industrial giants exert direct control over production of mainly large commercial suppliers. The coordination between these actors is influenced by historical relationships governing quality and quantity of produce supplied, and tends to preclude new participation. The coordination structure also allows the flow of production and price knowledge down to the producer to build capacity to produce. The agricultural sector also has many small rural growers in the supply base, but these are more marginalised due to small volumes of production. The rules applied by these lead firms have an enormous direct impact on the participation of previously disadvantaged rural communities in terms of ability to conform. The previously disadvantaged rural groups therefore occupy the low value usage function on the agricultural value chain, and are dependent on formal regulations for access to water allocation.

The formal regulations are set by institutional actors, DWAF, the shadow CMA and WUAs whose decision making is in turn influenced by stakeholder participation. Since the previously disadvantaged rural communities are not well integrated in to the coordination structure, they have little say in the decision making process, and hence the outcomes of the allocation of water. This is a defined constraint in the water sector map, represented by the institutional node in Figure 8. The lack of representation in the allocation function, and influence over value added usage or horizontal integration with other higher value chains allows the previously disadvantaged rural communities little opportunity to upgrade themselves in the chain.

5.2.2.2 Linkages within the Value Chain

Rural communities have few beneficial linkages with other actors and supporting actors in the value chain (Figure 11) due to the low levels of functionality and legal status. The results of few vertical or horizontal linkages are decreased access to water, low levels of information and knowledge transfer, fewer opportunities to create business linkages and low levels of participation in decision making. This tends to depress the confidence and willingness to participate.

5.2.2.3 Power Distribution in the Value Chain

The level of participation the functions of the value chain determines the distribution of power, and hence access to resources through leverage and influence. The low levels of participation by previously disadvantaged rural communities in the value added functions limit their ability to influence governance and allocation of water resources, and combined with low levels of skills and knowledge, this limits their ability to upgrade in the value chain. The skewed distribution of power is towards commercial farmers and processors, as well as higher value chains such as mining and manufacturing.

The literature review offered an interrogation of how resource sharing could be promoted through increasing holistic empowerment. The areas of analysis above are discussed in the next sections within the empowerment discourse to determine how constraints impeded empowerment, and recommend how water trading as an allocation mechanism can promote empowerment.

5.2.2.4 Resource Empowerment

Access to resources through allocation mechanisms, geographical spacing and infrastructure and control over technologies determine the level of resource empowerment. The previously disadvantaged rural communities do not participate regularly in the functions of the shadow CMA or WUA in the Mhlatuze Catchment fora and this impedes their ability to influence water allocation decision making. In addition, their low coordination and added value functions in the value chain decrease their ability to leverage resources and exert influence over value chain governance. This affects their ability to use resources to create benefits as they become recipients of rule and regulation, not participants in governance. The lack of physical access to water created by historically inequitable settlement patterns inhibits the opportunities available for previously disadvantaged rural communities to create benefits. The geographical situation of previously disadvantaged rural communities also means they have no legal status, no legitimate title to complimentary resources to agricultural production, such as land. This inhibits their ability to leverage resources from supporting actor interactions in the form of finance and factors of production. The current status of resource empowerment for previously disadvantaged rural communities is confined mainly to legislated frameworks (the NWA of 1998, NEMA) and therefore acts as an impediment to resource sharing.

The flexibility to trade water licenses amongst actors and between value chains would in effect decrease the immediate dependence of previously disadvantaged rural communities on physical

delivery and access to water to create benefits. At the same time trading would allow traditional, higher value users of water in industries in Richards Bay to continue accessing water through rental or purchase of licenses. The benefits accruing to previously disadvantaged rural communities engaged in water trading would include:-

- creation of revenue flows,
- increasing influence within the value chain,
- increased leverage through having access to allocation of scarce resources,

without having to access the necessary factors of production needed for creating benefits through agriculture. This would allow the previously disadvantaged rural communities to upgrade themselves in terms of adding value (vertical upgrading) and increased value chain coordination (horizontal linkages). Allocation trading would lead to increased interaction with other actors, which would lead to the increased transfer of information and knowledge. The flow of funds could be facilitated by South Africa's world class financial services sector with the required security, accuracy and low transaction costs. The financial services sector could also partially fulfil their Financial Services Charter obligations to spread the benefits of banking to the previously unbanked.

5.2.2.5 Empowerment through Competence-Based Capacity

Building capacity to become participatory agents in the value chain requires access to knowledge, skills and the power to create benefits from access to water resources through allocation. The current low levels of previously disadvantaged rural community participation in the value chain are an indication of low levels of skill, knowledge and attitude to create benefits. Beneficial linkages with other actors in the value chain are scarce, thus limiting the flow of information and knowledge to previously disadvantaged rural communities required to upgrade themselves in terms of value added status. Non-participation, and the skewed nature of the power distribution in the value chain sours the attitude of the previously disadvantaged rural communities towards participating as they see little opportunity for empowerment.

Participation is a direct indicator of the existence (or lack) of linkages with other more skilled and experienced actor in the chain who have greater power over the governance of the chain. It is these interactions which result in the transfer of skills and knowledge regarding production, marketing and quality between actors. These transfers are beneficial to both parties in terms of diversity of knowledge and skills. Interaction with other actors through water trading increases the flows of knowledge and skills and will increase the capacity of the previously disadvantaged rural

communities to be more competent in creating benefits. The act of trading water allocations between actors in the same value chain would lead to flows of information specific to the value chain, and allow the previously disadvantaged rural communities to partake in more decision making regarding value adding activities. Having access to a scarce resource would also increase the level of power controlled by the previously disadvantaged rural communities in the value chain, and would therefore improve their attitude towards resource sharing.

5.2.2.6 Objective Empowerment

The water allocation mechanism in its current form (compulsory licensing) is a formal regulatory function coordinated by the institutional frameworks and current participants in the sector. Participation in water matters is mandated as per the NWA of 1998, regardless of the informal rules and regulations governing creating benefits from water use. A market based allocation mechanism such as water trading, would be more regulated by the participants according to the system of governance in the water realm. The identification of opportunities to create benefits from water allocations, and the sense of responsibility to take the opportunity as part of social upliftment and livelihoods strategies, are currently limited by the levels of access to resources and skills and knowledge.

The opportunities available for creating benefits are limited by the demand and supply conditions of the agricultural value chain, and the availability and demand for water allocations is derived from that. Supply of water is finite, and the Mhlatuze catchment is already stressed in terms of supply, and over-allocated in terms of demand. The re-allocation of water summarily to new participants will cause inefficiencies in terms of lower value use re-allocation from existing users, and most probably unused allocations by previously disadvantaged rural communities who do not have sufficient complimentary resources to create benefits. In the agricultural chain, there appear to be good, stable contractual opportunities available for producers to enter in the value chain, but not many opportunities to upgrade due to the resource intensive nature of higher functions such as sugar processing and citrus packing.

Thus the coordination of the value chain also limits opportunities for previously disadvantaged rural communities to create benefits. In addition the value chain sets do not integrate horizontally, as water is allocated according to rigid licensing procedures and this further limits opportunities for water users in the value chain to whom the license is allocated. The income distribution indicated that agriculture was not the highest or most efficient use of water in the Mhlatuze Catchment.

The flexible nature of water trading as an allocation mechanism would allow the previously disadvantaged rural communities to identify opportunities outside of the production boundary and participate in different value chains, offering higher returns. This would open up the number of opportunities available to resource poor previously disadvantaged rural communities in terms of creating benefits. In addition, the overall objective of the NWA of 1998 would be better served as water would be gravitating towards its highest economic and social use and at the same time addressing equity and economic empowerment. Trading of allocations could also occur from previously disadvantaged rural communities into the environmental chain as a contractual agreement for payment as part of resource management strategies. These would include alien invasive control, donga rehabilitation and erosion control in the upper and middle catchment. This would not only help to conserve the water resource, but would ensure a better quality and more consistent water supply to the downstream users.

5.2.2.7 Subjective Empowerment

The three previous levels of empowerment result in a willingness to participate in resource sharing, and the perception of water trading as a suitable mechanism to promote empowerment is discussed on two levels. The status of subjective empowerment, in terms of willingness to participate, is dominated by the institutional node, indicating that the legislative frameworks are in place to implement re-allocation of water resources. Unfortunately, the rigidity of the allocation mechanism compromises the framework as a whole. In addition the willingness of commercial actors to participate is not high as they stand to lose the most from re-allocation of water. This would affect their ability to employ factors of production already owned, increase production and affect the price of property, as the price decreases dramatically when there is no water allocation for irrigated land. However, the previously disadvantaged rural communities indicated that they were willing to participate, but of course the current institutionally based allocation mechanism of compulsory licensing absolves the previously disadvantaged rural communities of any responsibility in gaining the license. Thus, currently the confidence in the water allocation mechanism to effect sustainable resource sharing is not prevalent in the value chain. The framework includes the democratic body of the shadow CMA and WUA to allow for greater participation, but previously disadvantaged rural communities have great distances to travel and they do not see the benefits, as most of their water allocations are at present schedule 1, for household use.

The introduction of water trading can increase the opportunity for the previously disadvantaged

rural communities to participate without having to necessarily access additional resources, nor affect the day to day functions of other participants in the value chain. This should lead to an increase in willingness to participate, and increase the confidence for previously disadvantaged rural communities that participation will result in increased holistic empowerment and benefits from resource sharing.

5.3 Conclusion

The research undertaken as part of the literature review identified that governance was one of the main issues impeding equitable water resource sharing in the Mhlatuze Catchment. Previous studies referenced indicated that, although the frameworks for water resource management (NWA of 1998), and the strategies implemented (the NWRS) are conducive to promoting equitable access to water, economic efficiency and promoting ecological integrity, the command-and-control mechanism used for allocation of water resources (compulsory licensing) is not having the desired effect of promoting equitable resource sharing. The main impediment to equity in water resource sharing is the absence of the target groups' participation in governance of the resource, hindering the capacity for building potential amongst the previously disadvantaged rural communities to participate in decision making functions and creating opportunities to create sustainable benefits from sharing in resource allocation and usage. The opportunities can be tangible and revenue related, or non-tangible livelihood related benefits, but participation in management of the resource is vital to promoting resource sharing. Increased participation leads to holistic empowerment of the previously disadvantaged rural communities through increased capacity to access and use water allocations to create these benefits.

Demand management, identified as the main function of water resource management, is a function of:-

- resource access,
- capacity building in terms of improving skills and knowledge,
- identifying opportunities for creating benefits and having the responsibility to take them, and
- the confidence and willingness to participate in water matters,

in other words, holistic empowerment.

The main bottleneck to increasing empowerment is in the function of resource allocation, dominated by the institutional mechanism of water allocation. This showed itself to be a critical

function in the flow of water resources and capacity building of previously disadvantaged rural communities, and the rigid nature of the existing allocation mechanism further impedes creative and interactive participation necessary to manage a dynamic resource sector.

The analysis of the identified value chains using water as an essential input concluded that a tradable water allocation would result in more access to resources, capacity building, opportunities to create benefits and willingness to participate in resource sharing. This can only take place if participation in the function of water allocation is representative of all the stakeholders' interests and therefore managed through integrated governance. Water trading as an allocation mechanism would result in greater participation from the previously disadvantaged rural communities without creating resource constrictions on existing water users adding value, and result in greater responsibility to conservation and resource management as this results in opportunities to create benefits. The realisation that participation and inclusion in the allocation function can create value adding and cooperative benefits resulted in increased willingness to participate, and thus the conclusion is that water trading would promote more equitable resource sharing.

5.3.1 Summary

Increasing the interaction of participants through encouraging participatory sector governance is more likely to result in increased socio-economic benefits for all, than legislative methods of re-allocating water licences according to equity goals. Allocation of water entitlements to previously disadvantaged individuals has the potential to empower previously disadvantaged rural communities, provided there is sufficient support to promote economic and social development. There is a need to allow the entitlement holders to benefit from the effort required to protect the ecological integrity of the Mhlatuze catchment, allowing the downstream entitlement holders to use better quality and quantities of water for higher economic gain.

The inequity in resource sharing cannot be addressed in isolation due to the contributing factors of production necessary to create benefits from water resource sharing, thus allocation of water resources needs to take into account holistic empowerment goals. The mechanism by which water resources are allocated would thus need to encourage participation in the allocation process and the governance of the water sector, thus increasing empowerment in all four areas previously discussed. Improving holistic empowerment would result in true benefits accruing to the previously disadvantaged rural poor from sharing in the access and use of water resource.

5.3.2 Improvement to the Methods Used

The methods used in this research were constricted by the knowledge of the interviewee base, and this combined with the rural nature, and hence variable availability of the interviewees, makes verification, or triangulation of the results and conclusions difficult. The generalisation of conclusions is also based on a very small representation of a large population base in so far as the previously disadvantaged rural communities go. It would be better to be able to prime the interviewees some time before inductive research to give them time to digest what is a complex concept and beneficiation opportunity. Other studies have been conducted in other catchment along similar lines, but not enough to conclude that the methods were exhaustive. The method could be improved through the development of more quantitative indicators, or developing quantitative presentations of qualitative data, making the results and conclusions more verifiable.

5.3.3 Further Research

The potential scope of value chain analysis is limited only by the dimensions and criteria that are attributed to the research and outputs. There is certainly scope for further research in the resource allocation discourse, and the results presented in this dissertation indicated that value chain analysis is suitable for researching water management issues. The data collected is collated in such a manner that it is easily presented in a logical sequence and is easy to visualise, and the analysis tools are based on both qualitative and quantitative data and outputs.

Further research could involve expanding the scope of analysis of the existing dissertation to include more economic and environmental elements to build a more multi criteria sector map. This would entail further data collection and further research on suitable indicators for all elements and criteria selected of the dimensions of empowerment. The final piece of research would be to develop a multi tool framework for water resource analysis which contained the data collection tools and analysis tools to study all socio-economic and policy related issues in water resource management. This would enable replication of the study in any area with similar attributes for research or for comparison.

5.4 Summary

This chapter revisited the objectives of the dissertation, and how the collation of data and resulting analysis combined with the literature review to address those objectives. The key findings were summarised according to the analysis techniques and conclusions were drawn in the empowerment discourse from the discussions in the previous chapter. The conclusions should be able to contribute

to the debate in water management discourse on the suitability of market based versus command-and –control policies and frameworks in order to create an environment of integrated management and benefits for all, whilst still protecting the integrity of the resource.

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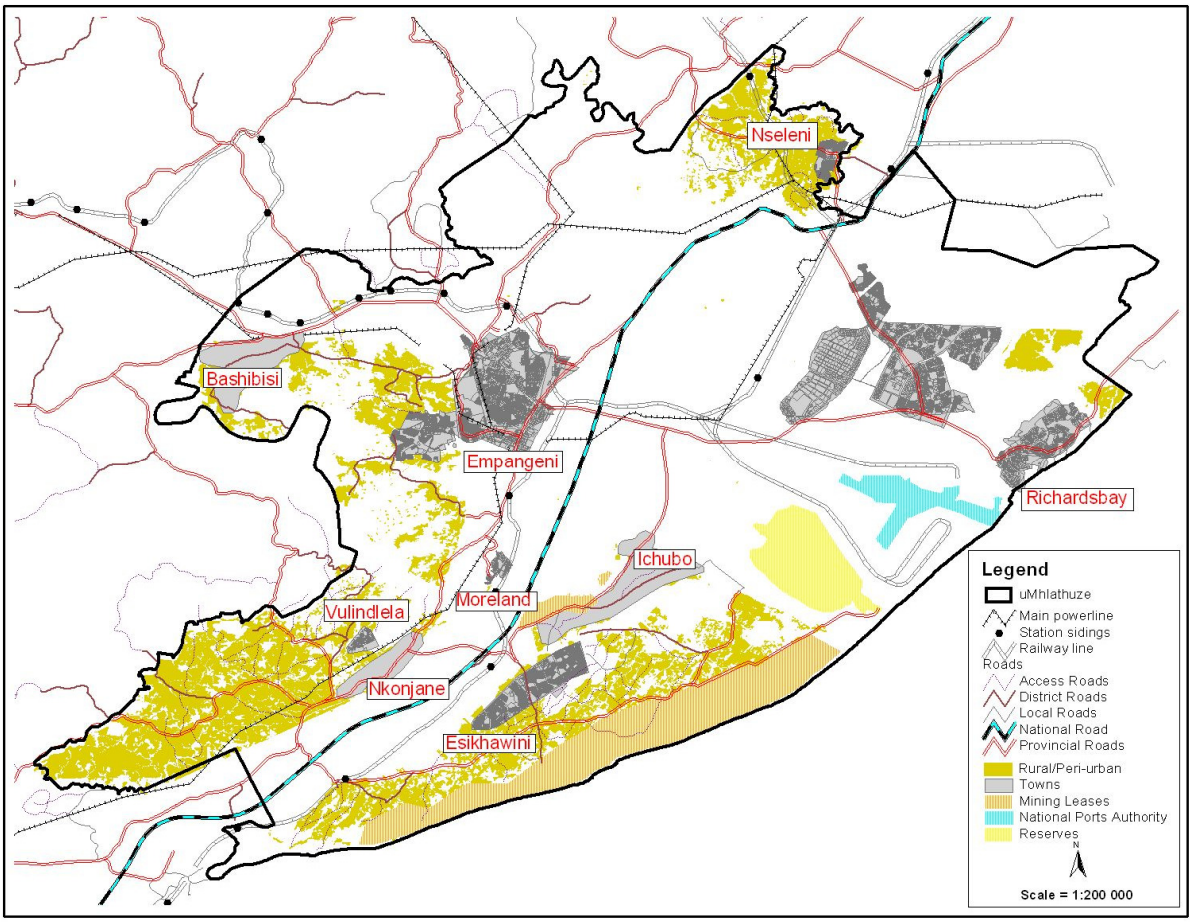
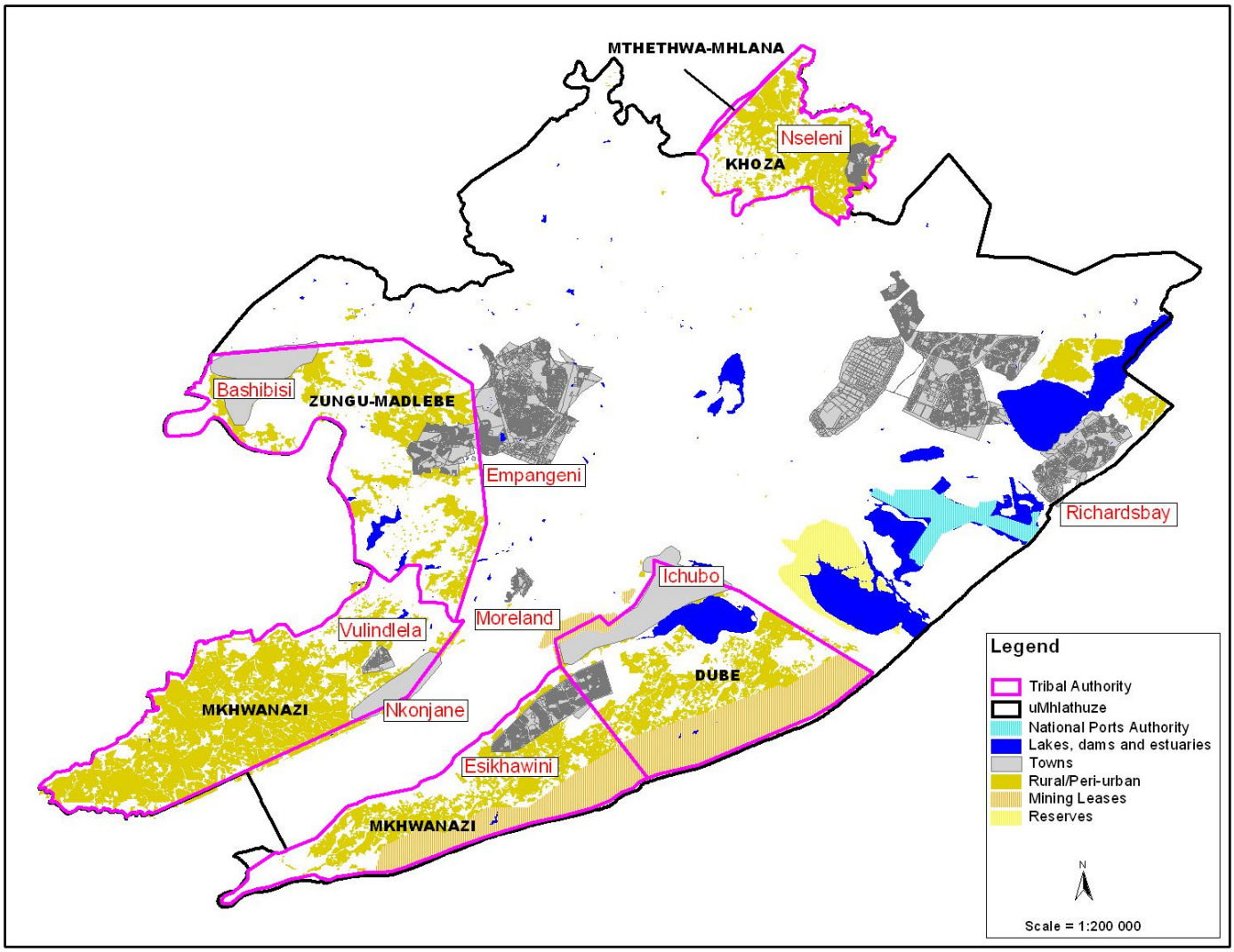
6 Appendices

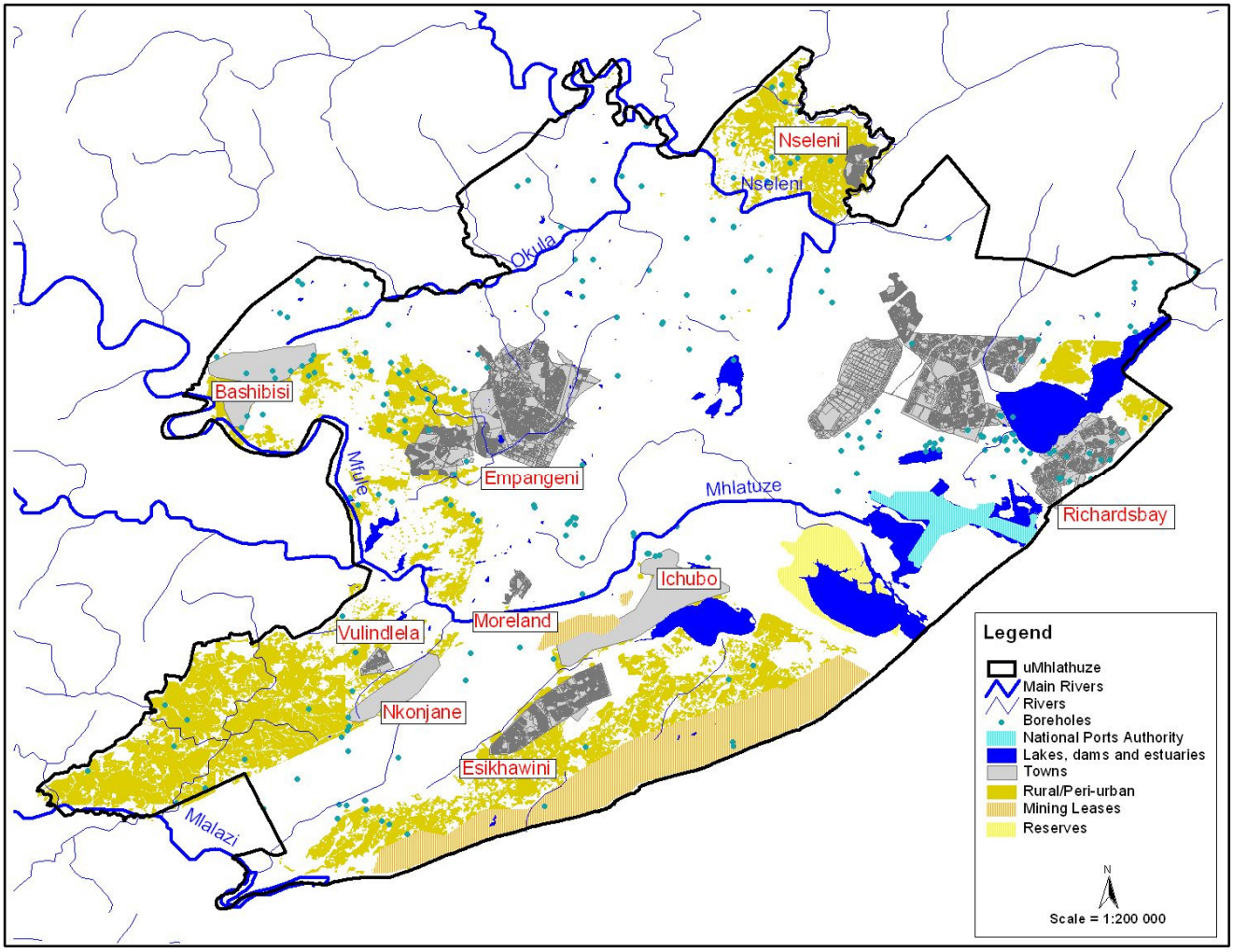
Appendix 1*: Map of Umhlathuze showing main forms of settlement patterns and existing infrastructure (Letty 2005 from Connor & Associates, 2005).*



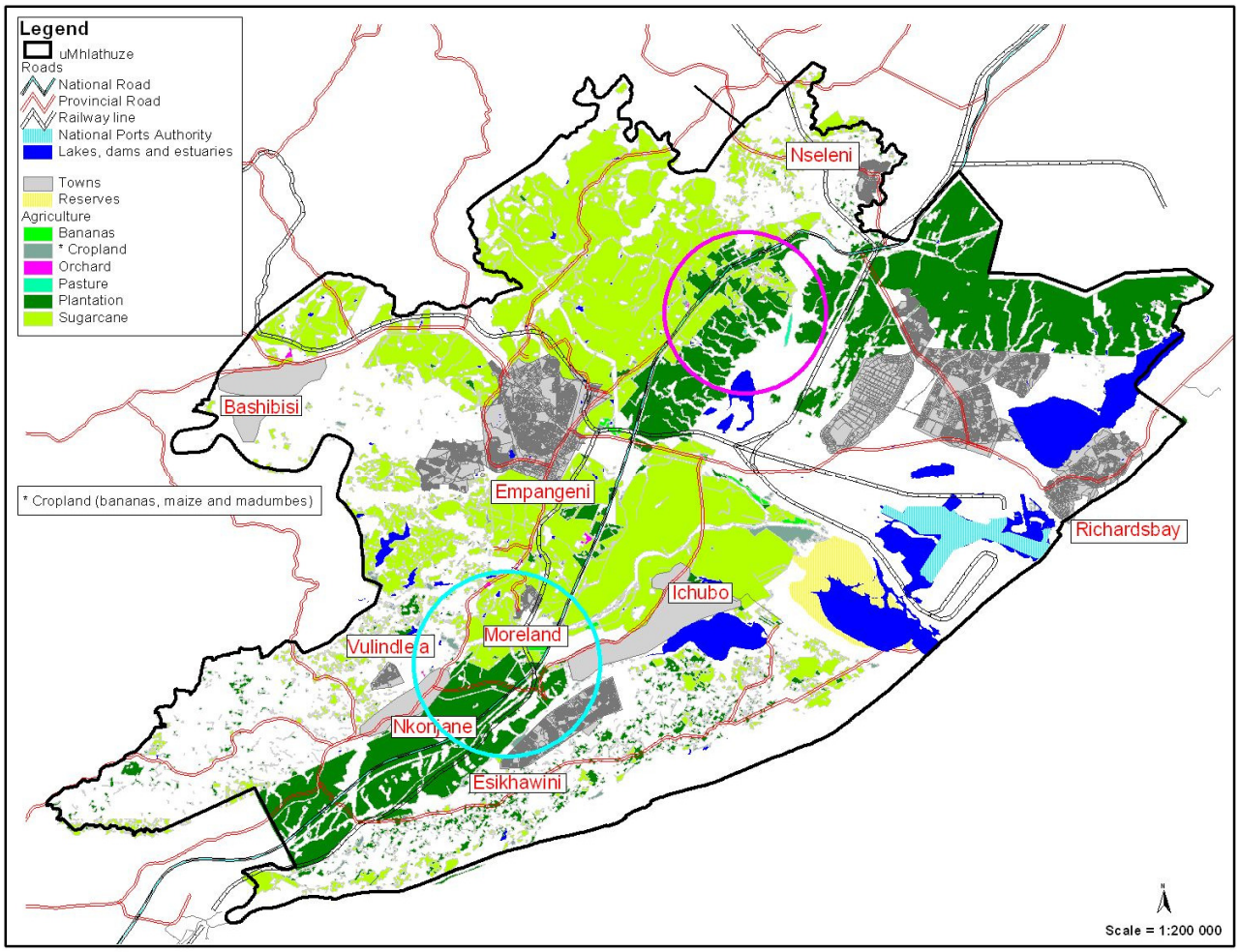
Appendix 2*: Map of Umhlathuze Municipality showing traditional authorities. (Letty, 2005)*



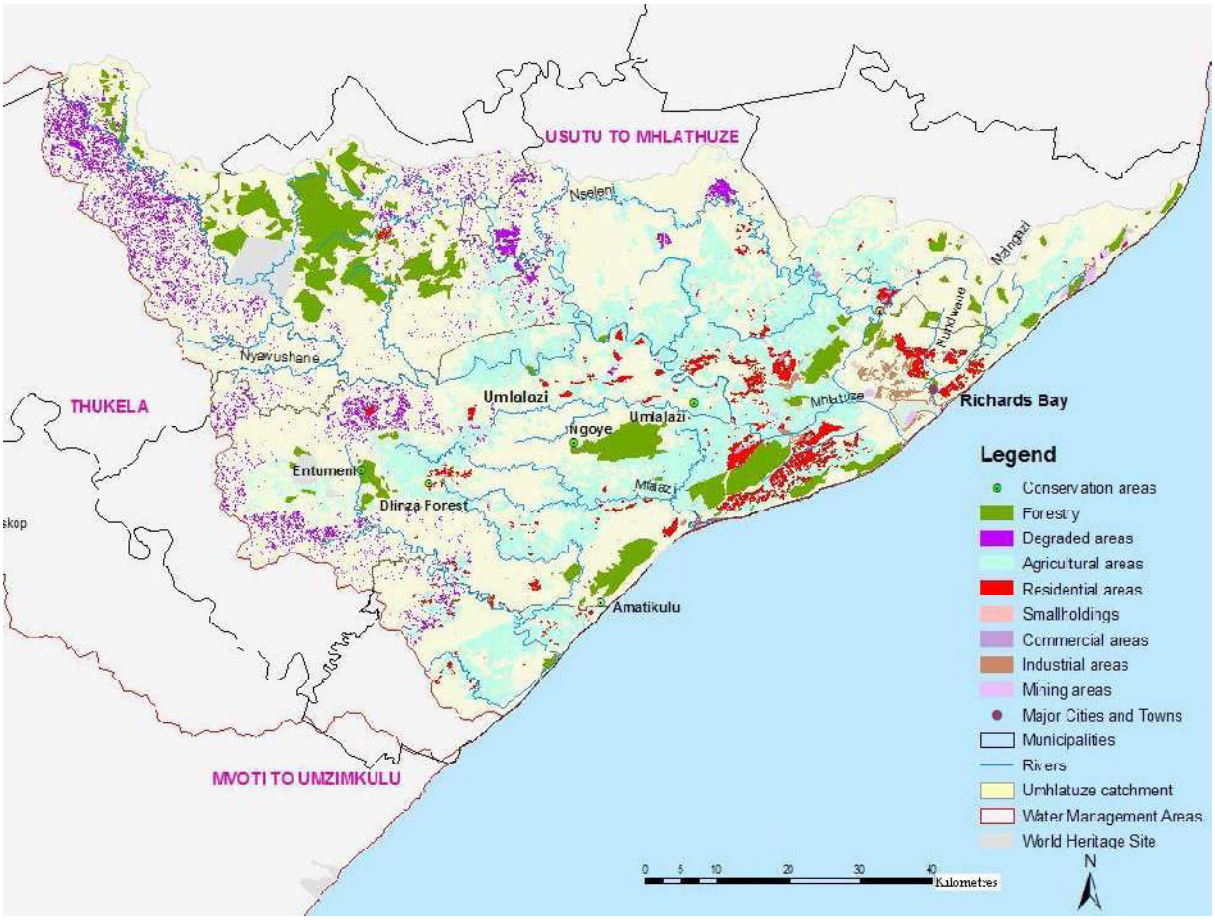
Appendix 3*: Map of Umhlathuze Municipality showing main rivers, tributaries, lakes and boreholes (Letty, 2005 from Connor & Associates, 2005).*



Appendix 4: Map of Mhlatuze Municipality showing land use (Letty, 2005)



Appendix 5*: Map showing current land cover within Umhlathuze* Catchment (Claasen et al, 2005)



Appendix 6:Basic Inductive Questionnaire used in Interviews and Discussion

Interviewee Details: **Respondent:** **Location:** **Status:** **Date:** **Enumerator:**	**Constraint/ opportunity**	**Possible intervention**
Access to Resources 1) Do you have access to land? a) Ownership b) Right to Occupy tribal land c) None 2) What extent of land can you utilise? a) Market garden b) Small scale agricultural (less than 25 ha) c) Commercial (greater than 25 ha) 3) Is the land arable? a) Grazing b) Forestry c) Irrigable 4) Do you have physical access to water? a) For household use b) For market gardening c) For agricultural production 5) Do you have access to 100 % of water allocation requirements? 6) Is water important to creating benefits in your business? 7) What price do you pay for water? 8) What additional resources could you access to create benefits for your family?		
Market Access and Demand 1) What products do you produce using water as an input? 2) To whom do you sell your product? 3) Is there a strong demand for your product? 4) What prevents the value of your product increasing? 5) How do you determine the price for your product? 6) How is demand generated for your product? 7) What other benefits are created from use of water?		
Human and Technical Capacity 1) Do you have farming experience? 2) Do you attend any training courses? 3) Do you know how resources are allocated? 4) Do you know how to access resources? 5) What additional skills would you require to be more successful? 6) Who owns the water storage? 7) How far is the nearest source?		

8) Do you have irrigation? 9) Do you have electricity?		
Opportunities to create benefits from access to water allocation 1) What benefits can you create from access to water? 2) How can you create added value? 3) Are all benefits related to revenue creation? 4) What agricultural opportunities are there to create revenue? 5) What non-consumptive opportunities are there to create benefits? 6) Are there any benefits to conservation practices? 7) Do you know what happens to the water after your usage and disposal? 8) What additional incentive do you need to create benefits?		
Financial and production support 1) Where do you access input supply? 2) Where do you access credit or finance? 3) If not, what are the constraints? 4) What could assist with access to credit and input?		
Policy relating to the water sector 1) What policy or regulations are beneficial to your business? 2) What policy constraints are there? 3) What regulations are there constraining you business? 4) What policies or regulations could assist you to create benefits from access to water allocation? 5) What are the water allocation policies in place? 6) What are the constraints? 7) Is there benefit in being able to trade these allocations?		
Operating environment and Trade associations 1) What are the biggest constraints to generating benefits from water? 2) What linkages do you have with other actors in your line of business? 3) Do you belong to a co-op or trade network? 4) What are the benefits? 5) What could be done to address these problems?		
Overall, what are the main constraints to creating benefits from water allocations? 1) Resources – access and allocation 2) Capacity – Knowledge, power and agency 3) Opportunities and responsibilities **4)** Willingness		

This questionnaire is utilised as a participative interview guide with sub-sector / value chain

participants in the water sector and is designed to:

- Identify the primary actors in the value chains, their roles and interrelationships
- Identify flow of water as an economic good and trends within the functions of the sector
- Identify empowerment issues for rural communities and small scale farmers within the sector
- Identify constraints and opportunities that hold back increasing resource sharing amongst participants
- Identify whether water trading as an allocation mechanism can contribute to improving empowerment

The responses to the questions will assist with the prioritising of the value chains most relevant to the empowerment of the target groups of the research, rural communities and small scale farmers.

The information related to constraints and opportunities is derived from questions in the following categories:

- Allocation and Access to resources
- market access and demand
- Human and technical capacity
- Opportunities to create benefits from access to water
- Financial and production support
- Policy relating to the water sector
- Operating environment

Trade associations

This questionnaire is used as a guide for the interview process, rather than a form to be filled in by the interviewees.