

Evaluating the impact of institutional factors and stakeholder capabilities on performance of decentralized water resources management regimes in Mozambique: the case of Limpopo river basin

by

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DECLARATION

I, Manuel Pedro Matsinhe, hereby declare that the work presented in this dissertation is my own work and has never been submitted for any award in any other institution. Proper citation and referencing has been done where information from other sources has been used.

Signature _____

(Manuel Pedro Matsinhe)

Date: _____

DEDICATION

This thesis is dedicated to my sons Bruno Matsinhe and Cynthia Matsinhe, to my wife Natália Helena Magaua, and to my mother Halena Machava.

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LIST OF ACRONYMS

ARA	Administração Regional de Águas (Regional Water Administration)
CENOE	Centro Operativo de Emergência
CNA	Conselho Nacional de Águas (National Council of Water)
CRA	Conselho Regulador de Águas (Regulatory Council of Water)
FIPAG	Fundo de Investimento e Património de Águas (Investment Fund for Water and Infrastructure)
DNA	Direcção Nacional de Águas (National Directorate of Water)
HICEP	Hidraulica de Chokwé (Chokwé Hydraulic)
INGC	Instituto Nacional de Gestão de Calamidades (National Institute for Disaster Management)
IWRM	Integrated Water Resource Management
MCA	Ministerio de Construção e Água (Minister for Construction and Water)
MICOA	Ministério para Coordenação Ambiental (Minister for Environmental Coordination)
MOPH	Ministério de Obras Públicas e Habitação (Minister for Public Works and Housing)
RBL	Regadio do Baixo Limpopo (Low Limpopo Irrigation Scheme)
RBO	River Basin Organisation
RLC	Regulamento de Tarifas e Concessões (Tariffs and Concession Regulation)
SAPs	Structural Adjustment Programs
UGBL	Unidade de Gestão da Bacia do Limpopo (Limpopo Basin Management Unit)
WUAs	Water User Associations

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ABSTRACT

After the International Conference on Water and Environment in Dublin in 1992, the four so-called Dublin Principles created new managerial approaches for the water sector. This case study, which was conducted in the Limpopo Basin in Mozambique, examined the performance in the implementation of the principle related to “water development and management based on a participatory approach involving users, planners and policy makers at all levels”. The study was motivated by the fact that experience with the implementation of this principle in the Limpopo Basin of Mozambique has not delivered the anticipated outcomes. To this effect, this study analysed the history and performance of the decentralization process in the Limpopo Basin, and the factors that might have contributed to the outcomes we observe

The methodology employed by the study was based on the framework for institutional analysis of decentralization reforms in natural resource management proposed by Dinar *et al.* (2005), Kemper *et al.* (2006), and Blomquist *et al.* (2008). This framework recommends that

for the decentralization process to be successful, the following pre-requisites must be in place: (1) financial assistance from the state to enable basin level stakeholders to establish some of the organisations; (2) actors' participation and equitable representation of different segments of society, and acceptance of it from the communities; (3) the presence of basin-level institutions, availability of forums for information sharing, communication and for conflict resolution; and (4) legitimacy, relevant human capacities and adequate financial resources among the River Basin Organizations (RBOs).

The results from this study indicate that in as much as the Water Law, the Regulations of Water Services Provision and the Water Policy in Mozambique created the basis for the decentralization of water resources management, the operationalisation of the process has not been successful, considering that the prerequisites for an effective and sustainable decentralization process as postulated by Blomquist, Dinar and Kemper are still lacking. The study established that incentives for the decentralization process were not linked to the scarcity of water. The study further established that most prerequisites postulated by Blomquist, Dinar and Kemper were not satisfied, in particular: (1) the financial assistance from the state to enable basin level stakeholders to establish some of the organisations is inadequate; (2) the actors' participation and equitable representation of different segments of society with interest in water resources management is not satisfactory; and (3) the legitimacy, relevant human capacities and adequate financial resources for effective functioning of the Water Users Associations (WUAs) are still lacking.

As a consequence of this, the study recommends that new institutions should be created to deal specifically with the maintenance of water-related infrastructures, and that the state should revise the way that revenues generated within the basin are allocated. In addition to this, a capacity-building programme should be put in place to empower water users associations.

Key Words: Decentralization, institutional arrangements, participation, river basin, water resource management

1 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Decentralization of river basin management as a means to achieve sustainable and integrated management of water resources is being pursued and implemented by many governments across the globe. The concept has gained acceptance by many governments especially after the International Conference on Water and Environment in Dublin in 1992, and it emphasises that “water should be managed at the basin scale, based on a participatory approach, involving users, planners and policy makers at all levels”. Under the principle of public participation in river basin management, empowered organisations or water user groups operate more or less in an equivalent position to local government agencies in the decision making.

Under decentralized systems, stakeholders are given the opportunity to participate in decision-making processes (Ferguson & Mulwafu, 2004:1). So, the term implies that when and as appropriate, some decisions are assigned to the stakeholders, while others are kept at central, provincial or local levels of governance (Kemper, Dinar & Blomquist, 2005:4–5). Decentralization of decision-making and the participation of stakeholders are based on the assumption that stakeholders are better informed, reduce resistance (Kemper *et al.*, 2007:4), improve the management of water systems (Van Ast, Rosa & Santbergen, 2008:349), and that the final solution is sustainable, workable and acceptable to all intervenient (Giupponi, Mysial & Fassio, 2008:73).

Effective decentralization of decision-making and the participation of stakeholders can lead to improvements in certain indicators of performance (such as: improved management of water systems Van Ast, Rosa & Santbergen (2008:349), reduced government expenses for operation and maintenance of water related infrastructures, improved quality of water services, lowered costs of irrigation to farmers, improved water quality, less conflicts among water users, improved participation of stakeholders, women and the most disadvantaged

groups in decision making process, etc), which can be considered to be affected by the decentralized management in the water sector (samad & Vermillion, 1999:4).

The concept of decentralization has come to replace the centralised management approach to water resources that, according to Kemper, Blomquist and Dinar (2007:4) and many other authors, has not produced the desired results, especially in developing countries. Findings from Easter and Hearne (1993:5) indicate that centralised approaches resulted in poor services, infrastructures that were located in wrong places and managerial systems that were not sustainable over the long term, because management of water services and activities were centralised at the public sector of water, which was engaged in the delivery of a full range of water supply activities and services, with little or no participation from the water users or the private sector.

The present case study, is based on a comprehensive qualitative assessment of the factors affecting the effectiveness of the decentralization process in the Limpopo river basin in Mozambique, since the regional water authority of this basin is currently fully operational, compared to other basins of the country, where the regional water authorities have not yet been established or are needing continuing support. The methodological analysis adopted in this case study was based on the analytical framework in Dinar *et al.* (2005), Kemper *et al.* (2006), and Blomquist *et al.* (2008), since they developed and implemented a comparative framework that explains river basin management decentralization reform processes and their performance. The framework identifies and focuses primarily upon four sets of potentially observable variables, and suggests hypotheses about the paths by which those variables are associated with the likelihood of successful or unsuccessful decentralization of river basin management.

1.2 PROBLEM STATEMENT

According to recent research, "...reforms directed toward decentralising the management of [water] resources are intended to increase stakeholder involvement and improve the effectiveness and sustainability of resource management arrangements" (Blomquist, Dinar & Kemper, 2010:1). However, other studies suggest that results of the implementation of the decentralization initiatives in many countries have often proven to be disappointing (IWMI and CGIAR, n.d.:3; Akpabio, 2008:268), and the general argument is that, to ensure public participation and the success of the decentralization process, a number of factors have to be considered and combined.

In regard to the poor results of this new approach, Mozambique is not an exception, since under decentralised management of river basins, supply of water is still a problem in rural areas, and there are still challenges to be faced with respect to the operation and maintenance of rural water supply infrastructures and irrigation infrastructures (DNA, 2001:1). In addition to this, there are problems regarding the improvement of stakeholder participation, with the implementation of the integrated water resource management, with the enforcement of the role of Regional Water Agencies (ARAs) (DNA, 2007b:2, 40–41); and many water users are still extracting water without any formal permission (ARA-Sul, 2011:11).

1.3 OBJECTIVES OF THE STUDY

The broad objective of this case study is to describe the process by which decentralization reforms have occurred in the Limpopo River Basin, and also the economic, and political context within which institutional arrangements have come about and are impacting the performance of the management arrangements, using the Framework for Institutional Analysis of Decentralization Reforms proposed by Kemper *et al.*, (2006), Dinar *et al.*, (2007), and Blomquist *et al.*, (2008) as an analytical tool.

The study was guided by the following specific objectives:

- To describe the process through which the decentralization process has been implemented in the Limpopo River Basin;
- To analyse how the prevailing conditions and the contextual factors in particular, the stakeholder capacities and institutional arrangements, affected the performance of the decentralization process in the Limpopo River Basin;

1.4 IMPORTANCE AND BENEFITS OF THE STUDY

Water resources are important for socio-economic development of a specific region or country. Security in the availability of water in terms of quantity and quality is necessary to ensure social well fare, increase crop and animal production and to promote the development (DNA, 2007b:18). To date, literature on decentralization in water sector management suggests that this topic is relatively recent, and there are not many studies regarding the decentralization process in river basins around the world (Mody, 2004, and GWP, 2004, in Dinar, Kemper, Blomquist, Diez, Sine & Fru, 2005:4). In relation to this, Kemper *et al.* (2007:5) suggest that "...investigations into the factors that enable decentralization process in water resource management to function, is of fundamental importance to inform public debate and policy decision making regarding the management of water resources".

This case study, the first of its kind conducted in the Limpopo Basin in Mozambique, provides detailed information on the factors that are potentially related to the development and effectiveness of the decentralization process, and a deep understanding about the factors that negatively the effectiveness of the decentralized management arrangements in the Limpopo Basin. The results obtained in this research will be of fundamental importance from a practitioner perspective since they will contribute information that will help policy makers in Mozambique to make informed decisions regarding the required changes in the management of river basins around the country.

1.5 ASSUMPTIONS ADOPTED IN THE STUDY

Decentralization can be seen as a reform process aiming to transfer decision-making power and authority as well as to enable participation (Dinar *et al.*, 2005:7). In line with the analytical framework proposed by Kemper *et al.*, (2006), Dinar *et al.*, (2007), and Blomquist *et al.*, (2008), it is assumed that the poor results observed in the management of water resources in the Limpopo river basin, are related with the fact that the prerequisites established in the framework were not satisfied, leading to a failure in the decentralization process. It is also assumed that, apart from the factors affecting the decentralization process listed in the Blomquist *et al.*, analytical framework, there are no “extraneous factors” affecting the performance of the decentralization process in the Limpopo river basin.

1.6 DEFINITION OF KEY TERMS

In order to make it easy for the reader to fully understand the contents of this case study, the following terms are defined:

Decentralization: The distribution of **administrative** functions and power to decide; from a central authority to several regional or local authorities (also see sections 2.1 and 2.2). In a decentralised approach, some decisions are delegated to regional or local sub-units of the government, and others are kept at central, provincial or district level as appropriate.

Integrated Water Resource Management: Integrated Water Resource Management is a holistic approach in this study. IWRM is defined as: public participation in decision making, and incorporation of community needs and perceptions in decision making (Pavlikakis & Tsihrintzis, 2003:193) (see section 2.3).

Stakeholder participation: A definition for public participation within a water management context is employed for this study (see also section 3.5). According to Wahid and Irshad (2009:3), participation implies that local people are directly involved in the design, management and implementation of development projects that affect them personally, and that intervention from government, non-governmental organisations, or other external organisations is reduced.

1.7 ORGANISATION OF THE STUDY

The study is organised as follows. The next chapter will address a review of the literature most relevant to this study, followed by a description of the general methodology applied in this case study. The methodology chapter is then followed by the results attained in the study and the respective conclusions. Finally, a list is given of all the references used in this case study.

2 LITERATURE REVIEW ON DECENTRALIZATION AND ITS IMPACTS ON WATER RESOURCES MANAGEMENT

2.1 ECONOMIC CHARACTERISTICS OF WATER RESOURCES

The traditional thinking about water resources is that water should be free to use, and that it is a common pool resource. Common pool resources are “...natural and man-made resources sufficiently large that it is costly to exclude users from obtaining sub-tractable resource units” (Ostrom, 1992 in Bandaragoda, 1999:5). In addition, common pool resources exhibit two important characteristics. The first is that, they are **sub-tractable**, which means that the consumption of one unit of the resource, implies that there are fewer units available to other beneficiaries and the second is they are **non-excludable**; meaning that it is difficult and costly to exclude potential users to access the resource (Rydin & Falleth, 2006:2).

In the case of water resources, another characteristic can be added, which is their **fugitivity**, meaning that: water is a fugitive resource of which the quantity, quality, location and timing of availability is uncertain (McCormick, 1994:954–956, in Backeberg,1997:358–359). Water resources are usually public property and not a perfectly divisible good, which by necessity implies group involvement. Individuals or groups can gain access through assignment of private or common property or other specified forms of entitlement (Backeberg,1997:359).

Efficient management of common pool resources is difficult because it is often accompanied by high levels of transaction costs. In the context of common-based resource management, transaction costs are incurred in the form of costs for negotiation, monitoring of activities related to institutional design, maintenance of the organisation, and enforcement of property rights (Adhikari & Lovetti, 2005:5–6). For the same reason, if resource users interact without the existence of effective rules limiting access and defining rights and duties of each user, non-excludability creates opportunistic behaviours, where people follow their own short-term

interests, not taking into consideration the long-term interests of the group (Ostrom *et al*, 1999 in Shen, 2003:146).

2.2 DECENTRALIZATION OF RIVER BASIN MANAGEMENT

After the International Conference on Water and Environment in Dublin in 1992, the four so-called Dublin Principles have created the basis for much of the new water sector management approach around the globe (GDRC.org, n.d.). One of these principles is “water development and management based on a participatory approach, involving users, planners and policy makers at all levels”. This principle implies that decisions are taken at the lowest appropriate level, with participation of all stakeholders in all phases of water projects. Decisions are made after public consultation is complete, and It is also assumed that with participation, all stakeholders will be aware of the importance of the water resource among users, policy makers and the general public (GDRC.org, n.d.).

The aim of stakeholder participation is to ensure responsibility in the management of the water resources, to reinforce ownership of these resources by the users, and to guarantee sustainability of the services and infrastructure functionality. According to Wahid and Irshad (2009:3), participation implies that local people are directly involved in the design, managing and implementation of development projects which affect them personally, and intervention from government, non-governmental organisations, or other external organisations is reduced. In addition to this, increased awareness regarding the scarcity of water and its provision have motivated implementation of various reforms in the water sector, including at the river basin level, in recent years (Dinar, Kemper & Blomquist, 2007:33).

Abu-Zeid (2003) acknowledges that in the different types of reforms in the water sector management, central government agencies transfer responsibility, authority and rights to more localised government agencies, institutions or local communities. In fact, responsibility varies with capacity; some local governments focus more on interacting with communities relying on staff from central or intermediate governments for technical support to the communities. Reforms in the natural resource management are often referred by Meinzen-

Dick (2009:337) under a broad heading as (1) decentralization, (2) deconcentration or (3) devolution.

Decentralization can be described as a political process whereby administrative authority, public resources, and responsibilities are transferred from central government agencies to lower-levels of governance (Crook and Manor, 1998:6–7; Rondinelli *et al.*, 1989; Meenakshi Sundaram, 1999; World Bank, 2000a:3, in Wahid & Irshad, 2009:2). Meinzen-Dick (2009:323) defines decentralization as process in which the decision-making authority and payment responsibility is transferred to lower levels of government. With decentralization, authority still resides in the government; however, decentralization provides a stronger role for local bodies, which are presumed to have greater accountability to the local communities and the resource users.

Meinzen-Dick (2009:322) gives an accurate definition of **deconcentration**, taken from Agrawal and Ribot (1999), and stating the following: “deconcentration is a transfer of decision-making authority to lower level units of a bureaucracy or government line agency. It represents the least fundamental change because authority remains with the same type of institution, and accountability is ultimately still upward to the central government, which is sometimes taken to represent society at large”. For Nel and Binns (n.d.), in Answers (n.d.: 1), deconcentration is the transfer of decision-making powers to the lowest levels of authority.

Devolution, on other hand, enables local communities to be directly involved in decisions and implementation of projects affecting their lives, and is defined by Ribot (1999, in Meinzen-Dick, 2009:322) as a process whereby rights and responsibilities are transferred to user groups at the local level. These organisations are usually accountable to those members who depend on the resource but do not represent others in the local community, or the community at all.

To summarize, and for the proposes of this research, the terms “decentralization”, “deconcentration” and “devolution” can be interpreted as synonymous since they are all

concerned with the share of responsibility and power among stakeholders, on decision making and management of water related issues.

2.3 DECENTRALIZATION AND LOCAL GOVERNANCE

As shown above, decentralization is defined as a transfer of authority and responsibility from the national level to lower levels of governance (Rondinelli, cited in Mills, 1990; Wahid & Irshad, 2009:2). In a decentralised approach, some decisions are delegated to regional or local sub-units of the government, and others are kept at central, provincial or district level, when and as appropriate. In a decentralised management approach, it is assumed that the lower the level where decisions are made, the greater is the decentralization (Wahid & Irshad, 2009:2).

The actual literature on decentralization demonstrates that decentralization has a political character that goes beyond its technical aspects DRC (2008:3), and in countries that have experimented decentralization in water resources management, or the formal transfer of responsibility and decision-making power and authority to lower levels of governance, this has not necessarily increased lower-level power and authority or resulted in more participatory decision-making processes. Decentralized institutions frequently have difficulty in carrying out the decision-making power and responsibility entrusted to them when lower-level institutions remain dependent upon higher-level funding, decisions or approval, or when institutional capacity to appropriate the new responsibilities is weak (Abers & Keck, 2004:3).

Experience has also shown that in most of the countries that have experienced decentralization, the initiatives were often poorly linked with the characteristics of local institutions and procedures. They were often institutional models copied from other countries that usually failed to respond to the needs and rights of local people, including women and the most disadvantaged groups (IDRC, 2008:5). For Dinar *et al.* (2005:6), decentralization of decision making should not be touted as a goal; it is recommended when water resource management is inadequate, and accountability of decision making is weak, due to centralisation of decision making.

By comparison, a process of decentralization that takes into consideration local conditions is more appropriate and can lead to positive outcomes arising from stakeholder involvement in decision making. However, Agrawal and Ribot (1999, in Ferguson and Mulwafu, 2004:1) are of the opinion that the presumed benefits of decentralization become available to local communities only when empowered local actors are accountable to the community.

Any decentralization process aimed at improving local governance, accountability and stakeholder participation should also take into consideration how to support local communities and participation and how to ensure sustainability of the decentralization process. Local government agencies may have to collaborate more with River Basin Organisations to jointly deliver quality services. Once a decision to decentralise has been made, ensuring that the required capacity at local government level and local level organisations is in place MDF (2011:1), and the formulation of the legal and political instruments at central or local level aims to sustain decentralization, should take into consideration whether the local institutions and communities have a strong enough motivation to do so (Abers & Keck, 2004:5).

To summarize, the aspects of decentralization of river basin management rely principally on the style of governance, the role of the participants and the institutional arrangements in place. It also requires a clear mandate, adequate staffing, sustainable funding and the necessary political and administrative power to carry out the job. In particular, decentralization needs to be clear in terms of at what level decision-making authority applies. These highlights are similar to those proposed in the Blomquist, Dinar and Kemper's framework, which states that decentralization initiatives have to be coupled with the active involvement of government institutions and practices, as well as basin stakeholders recognised enforced and incorporated in the decentralization process (Dinar *et al.*, 2005:11).

2.3.1 Effects of prevailing conditions and contextual factors on the performance of the decentralization process

The initial stages of decentralization might require some financial assistance from the state to enable basin-level stakeholders to establish some of the organisations. Here, the level of economic development in the nation gives an indication of the financial capacity of the government to finance the establishment of these basin level organisations (Kemper, Blomquist & Dinar, 2007:7–8). For example, Dinar *et al.* (2005:9) are of the opinion that the decentralization process is more sustainable where the economic well-being of the nation allows the central government to support the cost of the transition and the costs of the initial stages of the decentralization process.

In addition to the financial support from the government during the initial stages of the decentralization process, the stakeholders at the basin level have to contribute some financial resources to the decentralization effort. For the same reason, Meinzen-Dick (2009:324) indicates that when local level capacity is weak, the state should provide temporary help and transfer more complete rights when local capacities are developed. Thus, decentralization does not mean a total withdrawal of state involvement, but often implies the need for the state to engage with other institutions in different ways.

As a result of the relationship between the level of economic development at the basin level and the decentralization process, decentralization initiatives are hypothesised by Dinar *et al.* (2007:35–36), to be more likely to achieve sustainable success where the basin region is able to contribute some financial resources and other means to continue and consolidate the process.

The distribution of resources among stakeholders within the boundaries of the basin, also plays a role on the sustainability of the decentralization process, since some stakeholders may be so privileged (financially or in terms of rights over the resource in such way that any change in the management of the resource or resource allocation, may leave them worse off,

and they may opt not to cooperate in the joint management of the resource (Blomquist, 2010:6)

To summarise, the level of economic development of the river basin stakeholders gives an indication of the capacity of the stakeholders at the basin level to complement the government effort with financial and other necessary resources to the decentralization process in the initial stages and in the maintenance of the process (Kemper *et al.*, 2005:7).

2.3.2 Characteristics of the decentralization process on the performance of the decentralized process

The characteristics of the decentralization process itself have effects on the success of the implementation of the decentralised water management at the basin level (Blomquist *et al.*, 2005c:38). The decentralization process can be initiated by central government officials to solve their own problems (the top-down approach). In other cases, it can be initiated from the bottom to the top (the bottom-up approach), and thirdly, the decision to decentralise may be the result of debate and agreement between central officials and local stakeholders. In this case, central authorities expect to improve performance outcomes, and local stakeholders desire greater autonomy and flexibility to manage the resources.

In relation to the direction of the decentralization initiative, Blomquist, Ballestero, Bhat and Kemper (2005a:29) are of the opinion that bottom-up initiatives often lack a well-defined legal role and mandate. They may be dependent upon higher levels of government funds as well as technical support, making the bottom-up initiative vulnerable to political changes and influence, and that, the initiation of the decentralization process by governments is also counter productive and ends up in lower levels of reform performance.

To summarise, successful implementation of a decentralization initiative is hypothesised by Kemper *et al.* (2007:9), to depend significantly on the decentralization of authority and responsibility from the centre, and the acceptability of these authority and responsibility by local stakeholders in the basin. In addition to this, responsibility should be given to a level

where stakeholders are empowered to participate in decision making about the management of the resource (Van Wilgen, Breen, Jaganyi, Rogers, Roux, Sherwill, Wyk & Venter, 2003:8).

2.3.3 Recognition of basin communities of interest and incorporation of community level governance arrangements in the decentralization process

In addition to the direction of the decentralization initiation, decentralization initiatives are more likely to succeed in gaining stakeholder acceptance if they are based upon, and constructed from, traditional community governance institutions and arrangements (Dinar *et al*, 2005:11). According to Van Koppen, Giordano, Butterworth and Mapedza (2007:2), community governance institutions are "...the set of informal institutions, socio-economic and cultural arrangements that shape communities. These arrangements are embedded in local governance structures and normative frameworks of kinship groups and communities". Therefore, North (1990, in Adhikari & Lovetti, 2005:5) is of the opinion that communities that succeed in creating institutions that effectively reduce transaction costs will have successful governance in the water sector.

The literature on decentralization suggests that a successful decentralization process and the active involvement of stakeholders are likely to occur if diversity of communities, social groups (especially traditionally marginalized groups such as women, cultural minorities) Kapoor (2001:272), and community governance and practices, are recognised and incorporated in the decentralization process (Taylor 1998 in Dinar *et al.*, 2005:11).

Recognition of communities of interest increase the representation and participation of stakeholders; helps clarify and stabilize communication and power relationships between communities and the governmental entity, by enhancing team-building and joint problem-solving possibilities. It can expand the information needed for management, since managerial decisions are then based in a wide variety of information and knowledge held by the diversity of communities (Zazuea, 1995 in Kapoor, 2001:272).

To conclude, decentralization initiatives are more likely to succeed and gain stakeholder acceptance if they are well matched to local contexts and are based upon, and constructed with, existing community institutions and practices (Blomquist *et al.*, 2010:7).

2.4 INSTITUTIONAL ARRANGEMENTS IN A DECENTRALISED RIVER BASIN MANAGEMENT

Water resources have been managed in an holistic approaches over centuries in a number of countries, such as Japan, Spain, USA, Germany, Finland and others (Makin *et al.*, 2002; Embid, 2003; Tortajada, 204; Berg, 1960, in Rahaman and Varis, 2005; & Rahaman and Varis, 2005, in Bandaragoda & Babel, 2010:215). Decentralization of river basin management requires social dialogue and democratic style of governance to reconcile competing perceptions, needs and values. This emphasises the role and importance of institutions and institutional arrangements in the management of river basins (Akpabio, 2008:267). Participation of water institutions should fit into the existing formal and informal institutional structures. Svendsen *et al.* (2002) in Akpabio (2008:268) provide the following list of institutional arrangements for water resource management:

- Processes, mechanisms and procedures for decision-making, co-ordination, negotiation and planning;
- Established policy and legal environment (policies, laws, rules, rights, regulations, conventions, and customs, both formal and informal); and
- Water management organisations with responsibilities in water management.

Institutions in river basins can be organisations, and can be defined as: “the set of formal and informal rules and regulations governing human interactions” (Rosenberg & Korsmo, 2001:286). For Mitchell (1989:245, in Akpabio, 2008:268), institutional arrangements are explained as a combination of (1) legislation and regulations, (2) policies and guidelines, (3) administrative structure, (4) economic and financial arrangements, (5) political structures and processes, (6) historical and traditional customs and values, and (7) key participants or

actors. Institutional arrangements for a particular river basin depend on multiple factors, such as (IWMI & CGIAR, n.d.:1):

- Basin scale (trans-boundary, national or local);
- The main water management issue to be addressed (flood control, water scarcity, water quality, land degradation.);
- The social, economic, political and institutional environment prevailing in the basin;
- The stage of the basin development.

Decentralization of River Basin Management (RBM) have the need for integration of legal, technical, financial, social and institutional factors (Bandaragoda & Babel, 2010:217). In the literature concerning river basin management, organisations located at the basin scale are normally referred to as River Basin Organisations (RBO) and Water User Associations (WUAs). The term River Basin Organization covers a wide range of institutions, and it doesn't mean that the organization only deal with rivers. The organization might also be involved in the management of the lakes, wetlands, aquifers, and the land at the basin scale (IWMI & CGIAR, n.d.:2). Al-Harithi (2009:5) suggests that to improve water resource management at the basin scale, and to strength institutional arrangements, the following set of conditions should be observed:

- Actors' participation and equitable representation of different society's segments;
- Co-operation among cross sectors;
- Existing organizations must have legitimacy, relevant human capacities and adequate financial resources;

To conclude, enabling institutions and organisational arrangements should be done at central and local levels of governance to ensure participation and equitable roles, power and responsibilities in the decision-making process, for all stakeholders (Al-Harithi, 2009:5), and institutional co-ordination both horizontally (between different policy fields) and vertically (between different levels of social organisations) should be considered (Moss, 2007:124). In addition, when creating institutions for river basin management, it is crucial to recognize that

stakeholders have different levels of access to information, resources, knowledge and political representation (IWMI & CGIAR. n.d.:3).

2.4.1 Basin-level institutional arrangements under decentralized basin management

Successful implementation of the decentralization process will also depend on the characteristics of the basin-level institutional arrangements created by stakeholders and/or central government officials (Blomquist *et al.*, 2005a:29). In fact, local organisations that are empowered with more responsibility will have more incentives to manage the resource in a sustainable way (Meinzen-Dick, 2009:325).

2.4.1.1 Presence of basin-level governance institutions

Water governance is the process and structure within which decisions of issues related to water are made and the actors' that influence the decisions operate (Stefano, 2009:2). In a decentralised approach, decision making involves a share of power and responsibilities between a state agency and a community of resource users (Carlsson & Berkes, 204:65). Under such conditions, governmental water agencies are set up specifically to manage water resources, and the presence of formal and informal institutions in river basins is important since they determine and channel the effectiveness of legal procedures, and they rely heavily on both regulation and economic instruments to implement the rules (Newson, 1997:281–283).

Failure in the decentralization process is highly expected in river basins where basin governance institutions are up-sent; however, their presence is not a guarantee that the decentralization process will be successful (Dinar *et al.*, 2005:8). For Ostrom (1990, in Kemper *et al.*, 2007:13), basin-level governance is important to allow water users to operate at multiple levels of action, which is important to sustain the use of the resource.

Whereas in natural resources management, decision making is often organised through interest groups or organisations, in co-ordination with a more formal administrative entity such

as a regional or local authority (Faludi, 1973, in Ligtenberg, Wachowicz, Bregt, Beulens & Kettenis, 2004:44), information sharing is important to reduce information asymmetries and promote co-operation. So, Dinar *et al.* (2007:39) are of the opinion that effective participation of stakeholders presupposes the existence of institutions whereby stakeholders articulate their interests, share information, communicate, bargain, and take collective decisions.

2.4.1.2 Mechanisms for conflict resolution and prevention and the collective action which facilitate basin management efforts

Conflicts might arise during the dry season, when the water resource is scarce, and different users compete for the same scarce resource. Backeberg (1997:351) notes that water shortages can cause conflict between individuals, communities, countries, regions and/or communities. As a matter of fact, when multiple actors from different organisations or user groups compete for the same resource, this often leads to conflicts of interest (Ligtenberg *et al.*, 2004:43). Shen (2003:147) is of the opinion that solving water resources problems involves two distinct governance elements. One is the restriction of access to the resource and the second is the creation of incentive mechanisms, usually by assigning individual rights to the resource. Assignment of individual rights to the resource gives the incentive for users to invest in the resource instead of overexploiting it. Restricting access can increase competition among resource users, and the resources can become depleted unless incentives or regulations prevent overexploitation.

Therefore, Dinar *et al.* (2005:38) are of the opinion that the existence of dispute resolution mechanisms is positively associated with water users' involvement and with perceived decentralization performance. Kemper *et al.* (2007:8) in other hand, hypothesises that the success and sustainability of decentralised management efforts also depend on the presence of forums for airing and resolving conflicts related to water allocation and quality.

Apart from the scarcity of the resource itself, diversity of religions, or other social and cultural distinctions can affect successful implementation of the decentralization process because they affect stakeholder communications and trust. In fact, resource users can and will

disagree about how well their interests are being represented and protected, and about how well the resource management system is working and whether it is time to make changes (Dinar *et al.*, 2005:16). According to Ligtenberg *et al.* (2004:44), actors in the decision-making process can be organisations or interested user groups that have a common interest in participating in the management process.

Community-based institutions often use informal strategies to achieve compliance that rely on participants' commitment to rules and sanctions for those not obeying the rules. These rules are enforced by formal or informal mechanisms, and those who impose them must be legitimated by resource users or resistance will undermine the common governance strategy (Dietz, Ostrom & Stern, 2003:1909).

Collective action arises when people collaborate on joint initiatives and decisions to accomplish a goal that involves their interests or lives (Sandler, 1992 in Kirsten, Karaan & Dorward, 2009:50). Acting collectively implies that all actors using the same resource must come together and agree upon the same rules to use the resource (Rydin & Falleth, 2006:8). Collective action problems may occur because of a fragmented institutional setting, lack of co-ordination mechanisms, poor enforcement of institutions and a considerable number of actors with highly varying cultures, interests and power to act (Rydin & Falleth, 2006:9).

Collective action problems are characterised by divergence among the stakeholders' interests (Kirsten, Karaan & Dorward, 2009:50). To stimulate greater participation in collective action in water management and decentralization performance, stronger and more effective user fee payment, collection procedures, and efficient use of resources must occur in parallel with evidence of improved delivery of services and benefits (Sserunkuuma, Ochom & Ainembabazi, 2009:385).

2.4.1.3 **Characteristics of the water rights systems in place which facilitate or hinder basin management decentralization efforts**

The presence of recognised rights on resource use is hypothesised by Blomquist, Dinar & Kemper (2010:10), to contribute to a more sustainable use of the resource and can make it easy for resource users to agree on rules that regulate the access and duties of each user. In fact, the state needs to develop property rights regimes that entrench community rights over local resources to determine and measure the type and impact of participation on resource management issues (Furze *et al.*, 1996, in Kapoor, 2001:276). Certain characteristics of resource use rights (if they exist) can make it easier or harder for users to participate in the management of the resource (Blomquist *et al.*, 2010:10).

For McCormick (1994:954–956, in Backeberg, 1997:358–359), water rights can be classified as **usufructuary rights** where the decision-making powers to lease or sell some or all rights, are in most cases attenuated or at least severely limited, and the quantity and variability of water entitled to the holder of the rights are often vaguely specified. The types of property right regimes that can be assigned to resource users are summarised in table 1 below:

Table 1: Types of property rights systems used to regulate water resources

Property rights	Characteristics
Open access	Absence of enforcement property rights
Group property	Resource rights held by a group of users that can exclude others
Individual property	Resource rights held by individual (or firms) that can exclude others
Government property	Resource rights held by a government that can regulate or subsidise use

Source: Shen, 2003:148

A quantified rights system has an advantage for users because it includes relative clarity about the assignment of tariffs and other fees, and certainty about who may use what and how (Kemper, Blomquist & Dinar, 2007:12). Among these four types of property rights illustrated in table 1, Bandaragoda (1999:6) is of the opinion that a **group property** regime appears to be the most applicable form to a common pool water resources, while Shen

(2003:147) is of the opinion that because water is a public good, a **government property** regime is considered the best method of allocating water resources to meet social needs.

2.4.2 Central and local relationships and capacities

Under the highly centralized water service provision in many developing countries, the state was entirely responsible for setting up infrastructures, controlling the price level of water services, and bear the costs of operation and maintenance of the infrastructures Shao (2001) in (Zhong & Mol., 2008:[2]). It was believed that only the state was capable of handling the large investments and operations necessary in water supply systems (Hearne & Easter, 1993:2). This approach has left various user groups and the public in general completely absent in the share of investment, operations, and maintenance costs. The link between community participation in project development, user responsibility for operating and maintenance of water related infrastructures, and quality of service has been demonstrated by the success of many rural water supply programs in Africa (Easter & Hearne, 1993:16). In another case, Zwarteveen and Neupane (1996:15) concluded from the literature on participatory management in irrigation systems that all users should be involved in the management of the system for it to operate efficiently.

With the centralised approaches not functioning, for example due to too much infrastructure investment in the wrong place or of the wrong size, and inadequate long-term finance for maintenance (Kemper *et al.*, 2005:5), an unprecedented reform of the water sector has taken place across the globe. Events such as the declaration of the Dublin Principles in 1992, and the reforms in the late 1980s have radically redefined the role of the public sector (Van Koppen, *et al.*, 2007:1). In this regard, existing infrastructures were transferred from government control to users' control, while privatisation was encouraged, thus leaving the role of the state to that of regulator, promoting decentralization and users' participation.

The commonly agreed view is that co-operative approaches can achieve better results compared to a more centralized approach. Dinar, Kemper, Blomquist, Diez, Sine and Fru (2005:6) are of the opinion that decentralization of decision-making is not a goal; it is

recommended when water resource management is inadequate, and accountability of decision making is weak, due to centralization of decision making and the local conditions and opinions are not appropriately taken into consideration during planning processes.

Successful implementation of decentralised water resource management is hypothesised by Kemper, Blomquist and Dinar, 2007:12; to depend on features of the basin-level arrangements created by stakeholders and central government officials. Blomquist, Tonderski, and Dinar (2005e:29) provide evidence that when a central government makes and sustains a commitment to decentralization and to create institutions in river basins, successful reforms can be accomplished in a relatively short period. On the other hand, the authority of local-level stakeholders to create and modify local institutional arrangements as needed, is positively associated with successfully and sustainable implementation of decentralization initiatives (Blomquist *et al.*, 2010:9).

The degree of stakeholder participation in decision making arrangements explains the strength, and extent of the decentralization process. According to Blomquist *et al.* (2010:8), the extent of stakeholder participation also plays a role in the performance of decentralization initiatives, since it can be merely symbolic (amounting to only words on paper), where the central government in practice retains control over all significant resource management decisions, or where the central government abandon the responsibility for resource management without a concomitant establishment of local-level authority. Neither symbolic decentralization nor abandonment of decentralization is likely to improve resource management. Other findings from Blomquist, Calbick and Dinar (2005b:30) indicate that an NGO strategy to basin management may reduce some of the bureaucratic processes expected to be associated with placing basin management responsibility in an existing agency, or creating an agency that would have authority and responsibility that were transferred from or overlapped with existing agencies.

The literature on decentralization of water resource management also indicates that successful decentralization must include some degree of financial autonomy (Musgrave, 1997, in Dinar *et al.*, 2005:9). Sustaining this financial autonomy often depends upon the

establishment of some form of water use fees (Dinar *et al.*, 2005:9). A water use fee is meant to collect money from the users in such a way that all or a portion of the construction of infrastructures is recovered, and payments for the operation and maintenance costs of the system are ensured. Hence, users pay a price to use a certain service, either irrigation or domestic service (Bandaragoda, 1999:26).

In this regard, studies from Dinar *et al.* (2005:41) have concluded that in basins where stakeholders accepted greater financial responsibility, the decentralization process and performance measures were increased. As a result of the acceptance of financial responsibility by users, government contributions to operations and maintenance of water supply infrastructures may be eliminated (Blomquist, Haisman, Dinar & Bhat ,2005d:26).

As shown above, effective implementation of the decentralization initiatives is highly dependent on the willingness of the water users to successful organises collective action. So, the need to examine stakeholders' incentives to accept financial responsibilities is critical (Sserunkuuma *et al.*, 2009:375).

2.5 INCENTIVES AND ABILITIES OF STAKEHOLDERS TO PARTICIPATE IN A DECENTRALIZED RIVER BASIN MANAGEMENT

Public participation is a process aiming to improve decision making (Giupponi *et al.*, 2008:72). According to Wahid and Irshad (2009), participation as a developmental intervention exists due to a failure in state-led water service provision. Hearne and Easter (1993:6) acknowledge that when the knowledge of stakeholders is included in the planning and management of water systems, it provides them with some assurance that the system will supply them with an effective level of service, and they are willing to participate in the maintenance of the system. In this regard, Zwarteveen and Neupane (1996:15) concluded from the literature on participatory management in irrigation systems that all users should be involved in the management of the system for it to operate efficiently.

Active participation implies that the transparency and accountability of institutions is assured by the free flow of information and multiple inputs into the decision-making process (Payne, 1998:370, in Rosenberg & Korsmo, 2001:284). Giupponi *et al.* (2008:73) asserts that some benefits of public participation processes are:

- less conflict and misunderstanding, fewer delays and more effective implementation;
- making use of local knowledge, experience and initiatives of the different stakeholders and thus improving the quality of the decisions;
- more transparent and more creative decision making;
- public acceptance, commitment and support with regard to outcome of the decision-making process;
- Social learning and experience.

Following this, Blomquist *et al.*, (2010:9), hypothesises that the ability of central and local level participants to perform successfully depends on the skills and practices that they have developed along the time, in issues like raising funds, maintaining, and distribution revenues, resolving disagreements and taking collective decisions, and maintaining common facilities.

To conclude, all other things being constant, it is hypothesised by Dinar *et al.* (2005:15), that successful implementation of basin decentralization is positively related with the level of participation of stakeholders and the abilities gain along the time.

2.5.1 Determinants of stakeholder participation in a decentralized river basin management

Recent literatures on decentralization of River Basin Management have shown that stakeholder participation in basin management is not straightforward, and that; including the poor and achieving substantive stakeholder representation has proven elusive in practice (Akpabio, 2008:268). Experiences of decentralization have also shown that WUAs have little or no say in allocation decisions at the basin scale because state agencies have continued to maintain central control of water resources development and allocation (IWMI & CGIAR,

n.d.:1). For example, in South Africa, government agencies retain control of water sources and the main storage and distribution network (Johnson, 1995:62, in Backeberg, 1997:360).

The aforementioned example suggests that participation by itself may not be enough; other important factors have to be involved (Slocum, 1995 in Kapoor, 2001:274). For participation to be effective it requires involvement by relevant stakeholders in all decision-making phases throughout the project circle (Kapoor, 2001:274); and the communities need to be empowered otherwise the participation in programmes and decision making processes can be meaningless or even counter-productive (Agarwal, 1997, in Kapoor, 2001:274).

Recognition of communities of interest can include mere representation in a decision making forums, but it need not to be limited to that. Institutional arrangements must be constructed in such way that they ensure that communities of interest reach agreements on resource management decisions (Blomquist et al., 2008:13).

Voluntary participation in user's organisations and activities is determined by multiple factors such as demographic factors, personality of the individual social status, age, gender, marital status, homeownership, and contextual variables (Smith, 1994, in Larson & Lach, 2007:[5]). Curtis and Van Nouhuys (1999, in Larson and Lach, 2007:[5]) assert that community or social orientation affects participation through social capital such as social networks, goals and needs, and social circumstances such as availability and being asked to participate.

Geographical and situational factors also influence the willingness to participate. For example, small rural communities typically exhibit more community involvement compared to large ones. Findings from Martinez and McMullin (2004, in Larson and Lach, 2007:[5]) indicate that higher incomes increase stakeholders participation, while other research indicates that involvement peaks at middle incomes and ages. In conclusion, the transition towards participation requires a change in organisational culture. This behavioural change, in turn, depends on deeper structural and political changes such as political leadership and the establishment of appropriate institutional framework. Furthermore, the transition to a

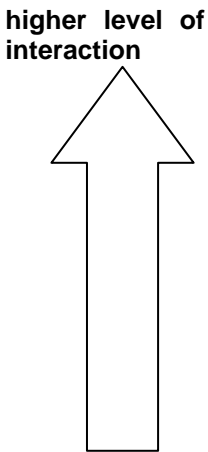
participatory approach need not necessarily be government initiated (Blackburn, 1998, in Kapoor, 2001:273).

2.5.2 Relationship between the style of leadership and the level of participation

Different forms of public participation are often categorised as public opinion surveys, consumer councils, public hearings, consensus conferences, and citizen advisory committee (Halvorsen, 2001, in Zhong & Mol, 2008:[3]). Debates in the literature concerning participatory decision-making focus on the various institutional arrangements for participation, discussing what forms of stakeholder participation is best (Konisky & Beierle, 2001 in Zhong & Mol, 2008:[3]). In fact, the concepts and strategies of public participation differ with various decision-making and management styles (see figure of the ladder of participation below), going from totalitarian to democratic (Van Ast, Rosa & Santbergen, 2008:343)..

Figure 1: Ladder of participation

Step	Style of Governance	Role of participant	level of participation
6	Facilitative	Initiator	Active participation
5	Co-operative	Co-operating partner	
4	Delegating	Co-decision maker	
3	Advising	Advisor	
2	Consultative	Consultant	Passive participation
1	Open authoritative	'Target group' of information	
0	Closed authoritative	Obedient citizen	



Source: adapted from Van Ast, Rosa and Santbergen (2008:349)

The ladder of participation in figure 1 above shows a relationship between the style of leadership and the level of participation. In a closed authoritative style of governance, local communities do not participate in the decision-making process. They just do what they are

told to do by the government agency. In the open authoritative style of governance the degree of participation is small. In this managerial style, the decision-making entity gathers information from the community. Participation increases at the consultative governance style. The third step of the ladder corresponds to advice governance. Here local communities act as advisors of the government agency (Van Ast *et al.*, 2008:348–349).

At the fourth level, the government delegates tasks, and actors become co-decision makers. At the fifth level of the ladder is the co-operative government style. At this level there is a partnership between societal actors and government agency in policy making, involving a sharing of responsibility, functions, rights and duties between a state agency (usually the central government agency or local government agency) and other relevant stakeholders (local communities, resource users, the commercial private sector). At the sixth level, societal actors take the initiative, and the government agency acts as facilitator (Van Ast *et al.*, 2008:348–349).

Among all these managerial styles, Giupponi *et al.* (2008:72) acknowledge that the commonly agreed view is that co-operative approaches make participation a rewarding experience and achieve better results compared to a more coercive approach.

3 RESEARCH AND INSTRUMENT DESIGN, SURVEY IMPLEMENTATION, AND DESCRIPTION OF THE STUDY AREA

3.1 INTRODUCTION

In this research, a **case study approach** was implemented as the overall inquiry strategy. O'Neil (2010:4) defines case study as a detailed analysis of one setting, organisation, group, event or person, or collection of the mentioned units. In a case study, the researcher aims to uncover the manifest interaction of significant factors or characteristics of a particular phenomenon, individual community or institution (Beng, 2007:284, in O'Neil, 2010:4).

A case study approach was designed to bring out the details from the viewpoint of the government water agencies and the water user associations by using multiple sources of data (also see Tellis, 1997:[1]). The sources of data in this case study were participant observation, analysis of organisations' documents and semi-structured interviews. In fact, "...when conducting a case study, the researcher have [has] to consider not just the voice and perspective of the actor, but also the voice of the relevant groups of actors and the interaction between them" (Feagin, Orum & Sjoberg, 1991, in Tellis, 1997:[2]).

3.2 SURVEY INSTRUMENT IMPLEMENTATION AND BROAD RESEARCH DESIGN

3.2.1 Survey design

The questionnaire was designed to enable the researcher to collect **primary and secondary data**: Primary data were facts and information gathered specifically for the purpose of this case study, while secondary data were facts and information that were collected by others for their own purposes (see also GOLIATH, 2003:[2]). The questionnaire was structured with both open-ended and close-ended questions. Open-ended questions enabled the respondents to freely describe perceptions with respect to the issues related to the

performance of decentralization, and stakeholders' understandings of specific decision-making processes and problems.

Information gathering and analysis have focused on addressing the following research objectives: (1) prevailing conditions and contextual factors; (2) characteristics of the decentralization process; (3) institutional arrangements; and (4) abilities and degree of stakeholder participation in decision-making processes. The set of variables considered within each category of the framework are listed in the questionnaire in Appendix I, page 97, adapted from Blomquist *et al.*; since in the questionnaire used to this case study the sequence of the questions, have been rearranged to directly respond the aforementioned research objectives and to facilitate analyses. In addition to this, it was introduced to the questionnaire one more set of variables extracted from the ladder of participation (figure 1 on page 26 of this document) to capture information on the degree of stakeholder participation.

3.2.2 Sampling

The study used a non-probabilistic sample, named “purposive sampling technique”. This technique is appropriate in case studies, where a small sample is selected using a subjective judgement of the researcher to select cases that are particularly informative, and to meet the objectives of the research (Saunders *et al.*, 2007:230). The subjective judgement of the researcher was based on the arguments of O’Neil (2010:11) who states that the sample can be selected based on their typical representation of the phenomenon.

Following this, the target group interviewed in this research were past and current river basin commission staff members and academic researchers, current and former leaders of the National Directorate of Water (DNA), current and former Deans of the Limpopo Basin Unit, ARA-Sul officials and law makers, respondents from the local water services providers, and many water users’ associations. For each of the organizations selected, interviews were conducted for a group of respondents representing each organization. In this case study, interviews with water user associations, and with government and local agencies, were conducted to obtain information about their perceptions about the performance of the

decentralization process, their perception in relation to stakeholder participation and the factors impacting the performance of the decentralized management of water resources in the basin.

Interviews were stopped only when responses from the different WUAs have started to become repetitive, one after another interview. As consequence, the study used a sample of 21 cases of which 7 were from different central and local-level government institutions, and the other 14 cases representing the view of 14 different WUAs of the basin, among the 41 WUAs formally recognized in the basin.

3.3 DATA COLLECTION

In this case study, data was collected in two distinct steps: a) collection of secondary data, and b) site visits. The collection of secondary data was done prior to site visits through a literature review. The site visits served to get the researcher familiar with the place and conduct interviews with the respondents. The people interviewed in the field visit were divided into three groups: (1) Local river basin organisations (including farmers associations and water users' associations), (2) key informants (such as experts in water-related areas, community leaders, current and former deans of the Limpopo Basin Unit), and (3) Central and local government agencies.

No pilot test was required for the questionnaire because the questions were adapted from previous questionnaires designed for similar studies, and the questions in the survey instrument were translated into the local language for effective communication between non-English speaking respondents and the researcher. The interviews were conducted face-to-face between the researcher and the respondents, and the data was recorded by the researcher on the questionnaire sheet. In order to enable the researcher to capture the complete answers provided by the respondents, interviews were also recorded using an electronic voice recorder.

To avoid fatigue of the respondents the questionnaire was distributed to selected organizations excluding WUA's prior to the site visit, and interviewees were given enough time to understand the questions on the questionnaire and to start responding wherever possible. During interviews both to the governmental organizations and WUA's, questions corresponding to section 2 and related to finances were not asked to respondents. In addition to this, some questions that seemed confusing both to the interviewer as well as to the respondents were deliberately not asked by the researcher.

3.3.1 Collection of primary data

Primary data was collected during the field visits, and covered the following set of variables:

Initial conditions and contextual factors: as elements of the social context prevailing at the time that a decentralization initiative is attempted and implemented. This category included variables such as the economic development of the nation, economic development of the basin area, initial distribution of resources among basin stakeholders, and class, religious or other social or cultural distinctions among basin stakeholders (Blomquist *et al.*, 2005c:38).

In this study, variables for the contextual factors and initial conditions that were gathered and analysed were the quality of water-related infrastructures in the river basin, and the capacity and financial autonomy of the stakeholders and local government agencies to contribute to improvements in basin conditions.

Characteristics of the decentralization process include factors aiming to respond to the question of "how the decentralization process was implemented". Under this category, the variables included in the questionnaire aimed at capturing information on the following:

- whether the decentralised management approach was a local initiative (bottom-up approach), imposed by the central government officials (top-down approach) or whether the decentralization resulted from an agreement between the both parts;
- the extent to which central government recognises local-level basin organisations;

- Commitment from the central government to maintain a policy to decentralise, and acceptance of the responsibilities by local-level basin governance.

Based on the analytical framework, the successful **relationship between central and local organisations** depends on the existence of clear goals for decentralization, and commitment of physical labour and capital. Questions under the category of central/basin level institutions' relationships and capacities enabled the researcher to capture information on the following:

- Basin management participants' ability to create and modify institutional arrangements that are tailored to their needs and circumstances;
- Characteristics of the water rights system in the country which facilitate or hinder basin management efforts;
- The financial resources available to basin-level institutions, and the extent of their financial autonomy; and
- Level of stakeholder participation in decision making process.

According to the framework, successful implementation of the decentralization process also depends on the **basin-level institutional arrangements** created by stakeholders and/or central government officials (Blomquist *et al.*, 2005c:39). Under this category, the variables that were included in the survey instrument were:

- The level of stakeholders participation;
- The presence of basin-level governance institutions;
- The availability of forums for information sharing and communication among basin stakeholders; and
- The availability of forums for conflict resolution.

3.3.2 Collection of secondary data

Secondary data was used to complement the information obtained during the interviews, as well as to address the first objective of the study. Data on **river basin characteristics** was

collected through nominal measures under the questions in section 2. Variables collected through the questionnaire include: river basin population, river basin geographical location including geographical boundaries, river basin land area, basin main rivers, climate data, annual surface water resources and the infrastructures and storage capacity of reservoirs.

The main source of secondary information was records maintained by various government agencies, minutes of meetings, progress and evaluation reports, and land use records. Institutions contacted to collect secondary data were the following: ARA-Sul; the National Directorate of Water; the Provincial Directorate of Agriculture; the National Institute of Statistics, the National Institute for Natural Disaster Management, the Ministry of Agriculture, the Ministry of Environmental Issues, the Regional Water Administration (ARA-Sul) and the National Institute of Statistics.

3.3.3 Challenges faced during data collection

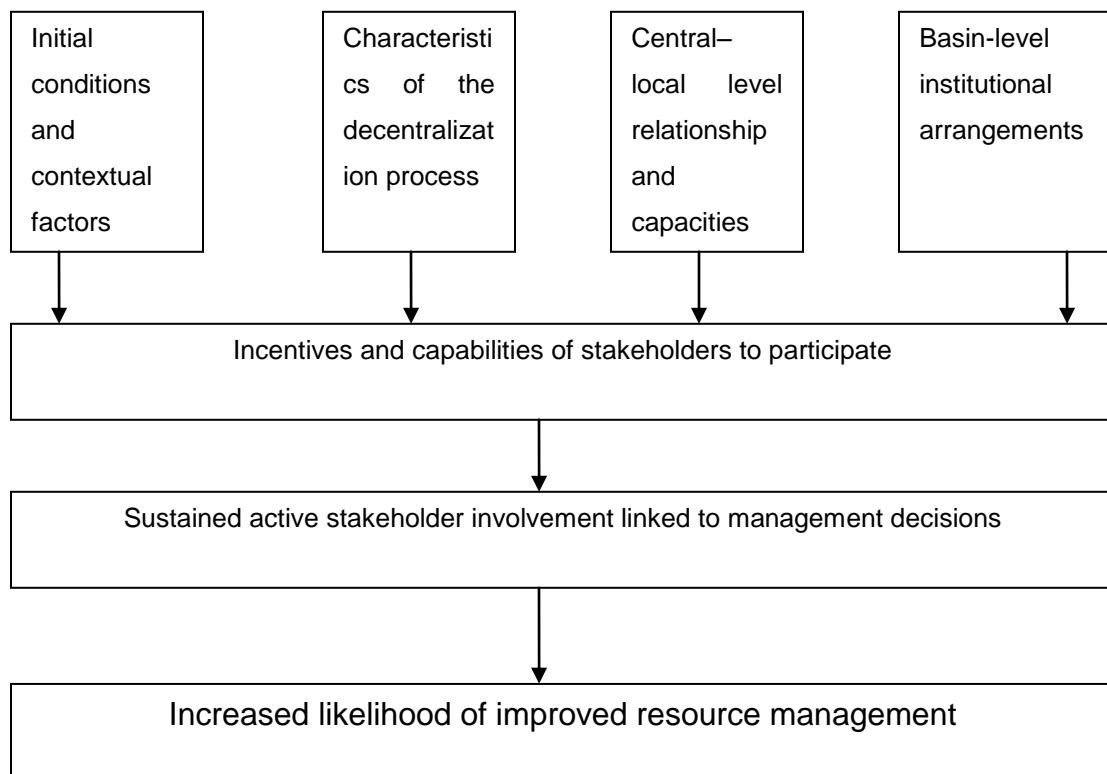
Whereas the information about finances are sensitive, the researcher faced physical access problems due to refuse of the individuals from the Financial Departments of the Regional Water Administration to participate in the study, leading to the lack of information about revenues and cost share in the basin. In addition, the unavailability of the respondents which were involved in the preparation and design of the water law No. 16/91, as well as the Water Policy, Decree No. 7/95 in Mozambique, created data source access problems to the researcher.

3.4 VARIABLE DESCRIPTION

The framework proposed by Blomquist, Dinar and Kemper applied in this study, was implemented to identify the factors likely to be affecting the performance of the decentralization reforms in the Limpopo river basins. According to Blomquist *et al.*, (2010:2-3), this framework is an integrated tool, and was drawn from existing literature on participatory natural resource management, common property resource regimes and decentralization, community forest management, and common-pool resource management.

According to Blomquist *et al.*,(2010:4) this framework (figure 2 below) is composed by a primary set of four variables that are hypothesised by Blomquist, Dinar and Kemper, to be associated with the likelihood of successful or unsuccessful decentralization of natural resource management that are the: (1) initial conditions and contextual factors; (2) characteristics of the decentralization process; (3) central and local level relationships and capacities; and (4) basin level institutional arrangements. The second and third dimension of the framework focuses on the engagement of resource users and other stakeholder, in the decision making about management of the resource, as consequence of the prospects for sustained active participation by stakeholders in resource governance and decision making illustrated in the first dimension of the framework.

Figure 2: Simplified scheme of the framework for institutional analysis of decentralization reforms in natural resource management



Source: Blomquist *et al.*, (2008:3)

The section 3 of the questionnaire was applied to collect data regarding the **characteristics of the decentralization process**. This section aimed to investigate the ways through which

the decentralization process started. Variables in this section were measured with: (1) nominal scales of water-related issues, objectives of the water law in the country, direction of the decentralization process as noted by participation (top-down, bottom-up, both) of local people in development of water-related issues. A four-point ordinal frequency scale (from never broken to not follow at all) was applied for question 3.4 of the questionnaire.

Basin-level institutional arrangements variables were collected under section 4 of the questionnaire. This section aimed to provide information about existing arrangements whereby stakeholders articulate their interests, share information, communicate, and take collective decisions through meetings or conflict resolution forums.

Variables in this section were measured with (1) nominal scales of availability of basin-level institutions, availability of forums for conflict resolution, types and issues discussed in meetings, information sharing among stakeholders, responsibilities and objectives of each organisation within the basin, and (2) a four-point ordinal frequency scale (from never to very often, and from weekly to yearly) were applied to measure occurrence of conflicts as well as calls for meetings.

Data regarding the **initial conditions and contextual factors** and the ***relationship and capacities of the institutions involved in the management of the river basin*** were collected under section 5 of the questionnaire. This section aimed to provide information about the relationship and the complementarities of actions between the central government and basin-level organisations, as well as capacities of the central government and the basin-level stakeholders.

Variables in this section were measured with: (1) nominal scales of systems of water rights prevailing in the basin, financial and human capacities of the organisations, strategies for financial sustainability of the organisations, capacity-building programmes for RBO members and systems of tariffs, and (2) a three-point Likert-scale (from none to severe) was applied to measure the impact of decisions made by the RBO delayed by the government.

The **degree of stakeholder participation** in decision-making arrangements explains the strength, and extent of the decentralization process. Data regarding this variable were collected under section 6 of the questionnaire, and were measured with: (1) nominal scales of the role of RBO in decision making process, (2) a five point Likert-scale (from no participation to very good participation) was applied to measure stakeholder participation in decision making, and (3) a numerical scale were applied to measure the level of participation in maintenance of infrastructures.

3.5 DATA ANALYSIS

The last step of the field visit was the data cleanup and posterior analysis. Responses to the questionnaires were recorded in an answer sheet, and at the same time in a digital voice recorder. In order to ensure accuracy and completeness of the data that was collected, at the end of each day of interviews, all questionnaires were checked for incongruence's as well as unanswered questions. Whenever possible, respondents were re-consulted to clarify unclear answers or to complete the questionnaires whenever possible.

To obtain quantitative data and to facilitate the process of data entered, close-ended questions in the questionnaires were pre-coded using Arabic numerals. Questions and responses from the open-ended questions were deductively coded based on concepts of water decentralization processes. In relation to the textual responses in the questionnaires, the information was typed in Ms Word, and each line of the text was numbered to facilitate the process of identification and aggregation of answers that fell within the same category.

To analyse the data gathered in this case study, an Institutional analytical framework was implemented. Quantitative data was analysed using the computer software SPSS (Statistical Package for Social Sciences), to describe the characteristics and relationship between variables of interest. On the other hand, the software that was used to analyse qualitative data was the Welft QDA (tool for qualitative data analysis of text documents). Qualitative analysis of the interviews involved inductive summary of the responses, and was applied for variables with textual characteristics.

In order to describe the characteristics of the Limpopo Basin, responses from questions on the questionnaire, and the collection of secondary data were organised and presented in textual form. Under the section of river basin's major problems, variables such as pollution, flooding, water scarcity and others were presented in terms of “not having problems” to “severe problems” based on the results of the analysis of the interviews.

Variables providing numerical frequency as well as Likert-scale measures within the decentralization process, basin-level institutional arrangements, central and local relationship and capacities, and stakeholder participation were presented in tabular and graphical forms. Under these conditions, graphical and descriptive statistics methods were applied for data analyses.

3.6 CHARACTERISTICS OF THE SAMPLE INSTITUTIONS

Various institutional and organisational characteristics influence the performance of the decentralization process. In this research, the sample was composed of 5 institutions representing the local government entities, and 16 local water user associations distributed along the Limpopo Basin to represent the local organisation perspective about the decentralization process.

Actually, water user associations in the Limpopo Basin are very weak at the institutional level. They have scarce financial resources and do not pursue skilled personnel to manage water resources and water-related infrastructures. In addition, they are not able to influence the development of laws and policies related to water. The total number of WUAs in the basin is estimated to be more than 80, but only 41 are legalized by law in Chokwé District, and are composed by 12 442 members of which 3 044 are female and 9 398 are male. Most of the associations are devoted to crop production and are composed of farm members sharing the same social group and living in the same area, holding lands less than 1ha. Most of the WUAs are located in the Chokwé District, and they seem to be relatively better organized compared with the WUAs of the other regions within the basin.

The main provider of water supply services in the country is the National Directorate of Water (DNA). The DNA is a government entity with the authority over water resource management and policy making in the country. At the Limpopo Basin level, the DNA is represented by the ARA-Sul and by the Basin Management Unit (UGBL) for technical support. The DNA appoints the ARA-Sul Director and the UGBL president, and provides more than 85 % of the ARA-Sul and UGBL annual budget to support the operational costs of these institutions. HICEP and RBL are other government institutions subordinated to the Minister of Agriculture. They request water for irrigation from the UGBL, ARA-Sul and the DNA to provide to WUAs, since smallholder farmers have to be organised into associations to have access to irrigating water.

3.7 ASSESSING AND DEMONSTRATING THE QUALITY AND RIGOUR OF THE STUDY

In this section, the focus is on assessing the quality and rigour of the proposed research design. To attain this goal, the author has made use of two concepts namely validation and reliability.

Validation is the process of checking to make sure proper procedures were followed in collecting, organising and analysing the data, while **reliability** refers to reproducibility or replication of estimates. If the analyst measures the same variable several times, the data is reliable if the estimates are approximately the same. If validity and reliability in the data can be verified, more is known about the origin and characteristics of the data, and consequently more confidence can be placed in the research effort (GOLIATH, 2003:[9]).

In this research, reliability cannot be verified due to the fact that a non-probabilistic sampling technique was implemented. In addition to this, Marshall and Rossman (1999) in Saunders *et al.* (2007:319), are of the opinion that the findings resulting from using “non-standardised research methods are not necessarily intended to be repeatable”, whereas they reflect reality at the time data is collected. **Credibility**, on the other side, depends on the richness of the

information collected, and on the analytical ability of the researcher. In this case study, credibility was enhanced by means of triangulation of the data (see also O'Neil, 2010:8).

Due to the fact that a non-probabilistic sampling method to collect primary data was applied, the most significant errors that could have influenced the results are associated with non-sampling errors. In such a situation, the sources of errors or bias that could have happen are the following (see also GOLIATH, 2003:[6–9]):

- Interviewer bias: due to the presence of the interviewer, causing the respondent to craft an answer to please the interviewer;
- Response error: This type of error arises when individuals who respond to the questions do not provide the correct information.

To reduce biases and ensure validity, the researcher has made use of the following safeguards:

- Ensured that selected people were accessible (see also O'Neil, 2010;10);
- Ensured that the selected respondents were interested in participating in the study (see also O'Neil, 2010:11);
- Selected cases were part of the process under study, and respondents had experience of the subject under investigation (see also O'Neil, 2010:10);
- Triangulation of data by using multiple sources of data;
- Whenever possible, the researcher employed visual techniques to minimise errors.

3.8 ETHICAL CONSIDERATIONS

The following is a list of ethical issues that were observed in this research:

- A cover letter was included in each questionnaire to ensure that the respondents would be made aware of their role in the research, and the time that the interview would take;
- Plagiarism was avoided by using the University's code on research ethics;

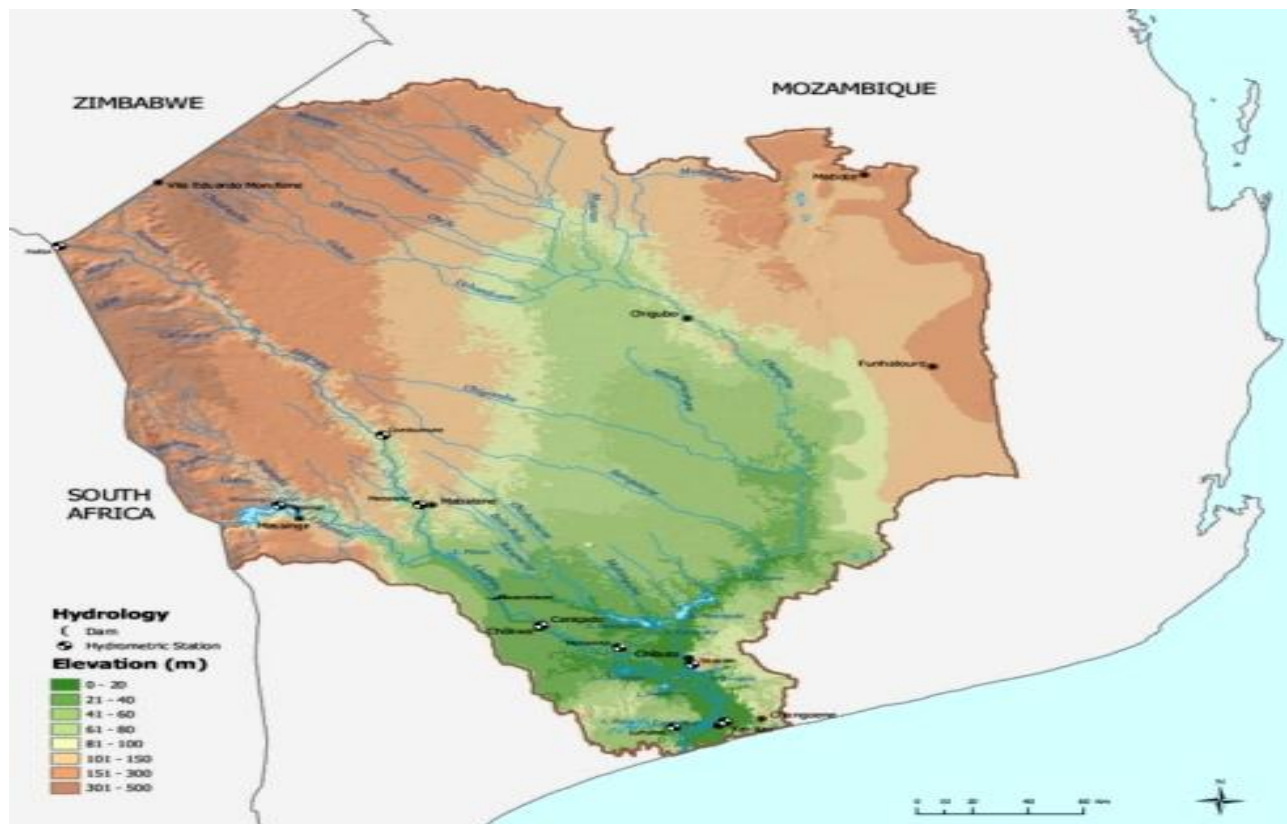
- Interviews were only conducted after the researcher obtain written consent from the organisation or person to be interviewed, stating that: the respondent was supported with enough information about the research in hand, and understand it;
- Interviewees were not forced to participate, and were not given monetary incentives to participate;
- Individual participants' anonymity was protected in relation to anything that the researcher referred to in the dissertation (see also Saunders *et al.*, 2007:195);
- The interviewer respected others' rights to privacy during data collection (see also Saunders *et al.*, 2007:195).

3.9 STUDY AREA

3.9.1 Location and situation

The study was conducted in the Limpopo River Basin in Mozambique. Figure 3 below gives a graphical representation of the Limpopo River Basin in Mozambique.

Figure 3: Graphical representation of the Limpopo River Basin in Mozambique



Source: INGC, UEM and FEWS NET (2003:21)

The Limpopo Basin in Mozambique is situated between the parallels 21° and 25° south, and the meridians 31° and 35° east. The main rivers of the Limpopo Basin are the Elephants River with a permanent flow, and the Limpopo, Changane and Nuanetzi rivers with intermittent flows (MOPH, 1996:5–8). The altitude of the basin in the Mozambican territory is

977 metres in the Mapai District, dropping to 133, 23 and 7 metres in the Chokwé and Xai-Xai Districts respectively (MOPH, 1996:6).

3.9.2 Local conditions

3.9.2.1 Climatic conditions

The basin's climate is characterised by a fresh and dry season from April to August, and a hot and wet season from October to March. Rainfall occurs during the hot and wet season, and temperatures are high with a maximum average of 31°C to 35°C and minimum average of 20°C to 21°C (INGC, UEM. & FEWS NET, 2003:31–34). During this period, the Limpopo River can reach 7 metres and inundates huge areas of land (MOPH, 1996:9).

During the fresh and dry season, precipitation is scarce, and temperatures are lower, with a maximum average of 26°C to 30°C and a minimum average of 13°C to 16°C (INGC, UEM. & FEWS NET, 2003:31–34). During this period, the flow of the Limpopo River can be extremely reduced, at some times reaching zero level (MOPH, 1996:9). In all districts covered by the basin, evapo-transpiration is higher than precipitation levels, both in the wet and hot season, as well as during the fresh and dry season (INGC, UEM. & FEWS NET, 2003:31–34).

3.9.2.2 Soils

The predominant soils in the Limpopo Basin in Mozambique are derived from sediments, and are constituted by a vast sandy coverage in almost the entire eastern region. In the interior regions, soils vary from sandy to argyle-sandy texture with a conglomerate base, while soils from the costal dunes to the interior are regosols with a white colour. In the interior, dunes are of the type feral and cambric-sandy, with an orange colour or lighter in general. The alluvium region is dominated by eutric and thionic fluvisols in the littoral zone. In some zones, soils are of the halomorphics type, like Soloncharks in the Changane River valley. Near the Limpopo, Changane and Elephants rivers, soils correspond to fluvial terraces (MOPH, 1996:19–21).

3.9.2.3 *Vegetation*

Vegetal coverage is mostly constituted by 57,67 % of shrub savannah of the type *Colophospermum mopane*. Along the coastal zone of the basin, forests are mixed with coastal dunes, having a share of 13,76 % of the vegetation coverage in the basin. Acacia savannah accounts for 10,74 % and occurs in saline lands. In the Pafuri region, where the Limpopo River enters Mozambican territory, the Chigubo, Mabalane and Chicualacuala Districts are mostly constituted of arboreal savannah, accounting for about 7,09 % of the basin vegetation. Near the Changane River, vegetation is of the shrub savannah type, from the Chiguto to the Chibuto District, with a share of 6,06 % of the vegetation coverage of the basin (MOPH, 1996:19).

Forests of the type *miombo* are located at the Limpopo mouth in Xai-Xai, and at the coastal region between Xai-Xai and Chibuto Districts and account for 1.11 % of the vegetation. Shrub savannah and woods account for 0,98 % and thicket forests account for 0,09 % of the vegetation coverage (MOPH, 1996:19).

3.9.3 Social and economic characteristics

Mozambique is a downstream country, sharing the Limpopo Basin with South Africa, Zimbabwe and Botswana. The Limpopo Basin in Mozambique (see Appendix III, page. 114) has an estimated area of 79 600 km², covering most of the Gaza Province, and the western part of the Inhambane Province, and is separated from South Africa and Zimbabwe by the Lebombo Ridge, which also forms the political border between Mozambique, and the two aforementioned countries (INGC, UEM. & FEWS NET, 2003:39). The basin can be divided into three agro-climatologically regions:

- the lower Limpopo in the Xai-Xai region. The monthly mean temperature varies between 18°C (July) to 26°C (January to February), and annual precipitation vary between 900 and 1000 mm;

- the medium Limpopo between Xai-Xai and Chokwé Districts. This region can be characterised as having monthly mean temperatures of 18,5°C (July) to 27°C (December to February), with an annual precipitation varying from 600 to 800 mm, and;
- the upper Limpopo between Chokwé District and the border between Mozambique, South Africa and Zimbabwe. In this region, monthly mean temperatures vary between 19°C (June to July) to 28°C in January. Annual precipitation is below 600 mm.

The population in the basin is more than 856 466 inhabitants. Majority of the population is still concentrated in the proximities of the administrative centres of Xai-Xai, Chokwé and Chibuto, along the rivers and agro-ecological regions, and where accessibility to major markets, infrastructures and roads is higher. In remote areas, the population lives near the rivers (INGC, UEM. and FEWS NET, 2003:39).

Agriculture is the main activity in the basin (INGC, UEM and FEWS NET, 2003:39), where 15 % of the total population depends on irrigated agriculture, among which 26 % are in the lower Limpopo, 69 % are in the medium Limpopo and 5 % are in the upper Limpopo (NIDMP, 1993a:3). Vegetable production covers much of the land in the central portion of the basin, and represents the major share of the region's agricultural production. In the medium and lower Limpopo, maize and rice production represent a bigger share of the total cultivated land. Fishing is mainly done at the Massingir reservoir, and the fresh and dried fish is sold in Maputo Province and in Gaza's main towns.

The Limpopo Basin with 15 rivers, 9 lakes as well as an important groundwater system has two main catchments areas: the Limpopo and Elephants Rivers. The Limpopo River enters Mozambican territory through Pafuri District at 200 m above the sea level, while the Elephants River enters Mozambican territory through the Massingir District at about 100 m above the sea level (see Appendix IV, page: 115). The Changane River and its tributaries all originate within the Mozambican territory and constitute another major branch of the Limpopo River. The basin's annual surface water availability per season is 1119,4 million cubic meters in the dry season, and 2110,2 million cubic meters in the rainy season.

Water use within the basin are explained by the concept of “water as a unitary resource”, which says that the surface water in rivers, lakes, lagoons, aquifers and groundwater all constitute part of the same resource base but occur in different parts of the hydrological basin (Rogers, 1992:2). In order to allocate water to different users in the Limpopo Basin, a water accounting procedure is applied by DNA and ARA-Sul (see also Molden, 1997 in Bandaragoda, 1999:6). The water accounting procedure gives the water balances along the Limpopo River and its tributaries, and gives a better understanding of the relative quantities of water needed and used by the different user groups and the availability of water in the basin. It also gives an indication of the performance of the basin water management system and use (see also Bandaragoda, 1999:6).

The above allocation strategy suggests that in order to have a full picture of the government agencies and user groups representing different types of water users, a stakeholder analysis needs to be taken in account. Because most of the actors have their own views about solutions for the problems they face. For example, different user groups, associations and individual citizens may all have different ideas about indicators that change the physical, chemical or biological characteristics of a river basin (Van Ast *et al.*, 2008:351). Obviously, the number of existing user groups is positively associated with the initiation of decentralization reforms, and also with the costs and difficulty of achieving decentralization (Dinar *et al.*, 2005: 37–41).

The total storage capacity of the dams and water reservoirs in the basin is estimated to be above 2 846.6 mm³/yr, and water uses within the basin are divided between water for urban and rural domestic consumption, hydropower production, flood control, saline intrusion control and irrigation. Based on the description given in table 2 below, it is clear that irrigation is the dominant consumer of water resources within the basin, with 3.21 % of the share, and the remaining 1 % of the share accounting for human and animal consumption as well as for environmental uses. In the Limpopo Basin, water is not especially allocated for livestock use. Water use for livestock is informal and not clearly defined.

Table 2: Water use by sector in the Limpopo Basin

Sector	Water consumed/demand (m ³ /year)	Percentage of total water consumed/demanded (%)
Domestic consumption	0,51 * 10 ⁶	<1
Animal consumption	600	<1
Irrigation	103,9*10 ⁶	3,21
Industrial use	No information	No information
Environmental use (e.g.: saline intrusion control)	155,52*10 ⁶	4,81
Total availability of surface water	3229,6 * 10⁶	100

Source: ARA-Sul, 2010

The two main reservoirs in the basin are the Massingir Dam, which was built for hydropower generation (40 Mw), flood control, saline intrusion control, irrigation, and rural and urban water supply within the basin, while the Macarretane Dam is intended only to provide water for irrigation. The combined capacity of the two reservoirs in the basin is $2\,704 * 10^6 \text{ m}^3$, and the potential for irrigation of each of the dams is 70 000 ha. The irrigation potential of the Limpopo valley is about 150 000 ha. Actually, the irrigated area under cultivation in the basin is estimated to cover about 40 000 ha, with the main irrigation infrastructures located in the Chokwé and Xai-Xai Districts, with 26 140 ha) and 3 962 ha) respectively, and 700 ha of irrigated land in the upper Limpopo (NIDMP, 1993a:3).

According to NIDMP (1993a:34), several reservoirs need significant maintenance to reduce the loss of capacity, since the Massingir, Macarretane, and Manguenhane dams still need maintenance. The Punguine dam is facing huge problems of erosion, while the Chiziore and Brithis dams are not operating. The only dam operating in relatively good condition is the Maleice dam. Irrigation infrastructures are also not operating at their full capacity since there are severe problems of siltation and weeds in the water canals. Many irrigation canals and distribution systems still need clearance, maintenance or replacement. For example, 14 000 ha still need to be rehabilitated, 10 000 ha are having saline problems, and many areas are inundated.

The major source of water for urban water supply systems in the main towns of the Limpopo Basin is underground water, with a daily production capacity of 12 200 m³/day, and a storage capacity of 3 005 m³ (MICOA & INE, 2010:63–65). Deep clean water reservoirs located in the confluent regions of the rivers 80m in the Mabalane District and 200m in the Xai-Xai District constitute the main source of water for the urban population living in the Xai-Xai and Chokwé districts. The urban population as well as demand for water in these two districts are expected to grow, and are represented in the table 3 below:

Table 3: Projected urban water demand for Xai-Xai and Chokwé Districts

District	Population (1992)	Demand for water (m ³ /day)	Population (2002)	Demand for water (m ³ /day)	Population (2017)	Demand for water (m ³ /day)
Xai-Xai	77 500	3 602	119 100	5 978	192 000	14 690
Chokwé	39 000	1 844	66 500	2 775	99 000	9 186
Total	116 500	5 446	185 600	8 753	291 000	23 876

Source: DNA, 1994 in MICOA., INE.2010:69

3.9.4 Floods and drought problems

Mozambique has a deficit in hydraulic infrastructures to regulate natural water flow, to control floods, as well as to retain water (DNA, 2007a:14). In addition, the Limpopo Basin in Mozambique is downstream located, and the population, urban areas and the agricultural activity are concentrated along the rivers and in floodplain areas, making the population and agricultural activities vulnerable to floods. Major flooding occurrences were reported in 1981, when 500 000 citizens were affected, followed by the floods of 1984, 1985, 1996, and the worst flooding was reported in 2000. Despite the strategy adopted by the DNA, ARA-Sul and INGC, which focuses on a real-time information system, flood zone identification, protective dykes for the urban, rural centres and irrigation systems, and the creation of water storage zones, floods remain a major problem, in particular on the medium and lower Limpopo. In this regard, climate change also plays a role on the frequency of occurrence of floods.

Precipitation is concentrated in the hot and wet season, and the peak rainfall occurs January to February. During the rainy season, protection against floods through a reduction in the flow

of the medium and lower Limpopo is limited by the availability of dams. A huge water storage dam is needed upstream at Mapai district (the Mapai dam) to retain the water (NIDMP (1993b:46). The unique flood control infrastructure in the basin at this time is the Massingir dam, but this infrastructure is not performing at its full capacity, and can only control floods of the Elephants River. The occurrence of floods in the Limpopo River and in its effluents in the Mozambican territory is more frequent during December to March and the flooding of the Limpopo and Elephants Rivers normally coincide (MOPH, 1996:81).

In relation to saline intrusion control, studies have revealed that the minimum flow to control saline intrusion at the mouth of the Limpopo River is about $155,52 \cdot 10^6 \text{ m}^3/\text{year}$ (Matola, 1995, in MOPH, 1996:148). During the rainy season, it is possible to achieve this flow; however, during extremely dry seasons, or when the Limpopo River reaches flows equal to zero, it is not possible to guarantee these flows with the amount of water stored in the Massingir dam. In addition, there is a clear indication that the natural flow in the dry season is highly reduced as a result of the catchments in upstream countries (NIDMP, 1993b:40). Drought problems are exacerbated due to reductions in the levels of the rivers' flow coming from upstream countries like South Africa and Zimbabwe, and a deficit in precipitation inside the country. Some districts within the basin, namely, Mabalane, Chicualacuala, Massagena, Massingir, Funhalouro and Mabote, are highly affected, socially and economically, by droughts (MICOA & INE, 2010:28).

3.9.5 Water quality issues

According to data from 1970 to 1980, the quality of water of the Limpopo and Elephants Rivers was polluted, and some regions under the influence of the Limpopo and Elephants Rivers were polluted, while in the medium and upper Limpopo there were only signs of pollution. With respect to the risks of pollution, it was suspected that it was due to upstream mining activities close to the frontier between South Africa and Mozambique, where residual water resulting from the mining activity at the Phalaborwa Mining Complex was discharged into the Elephants River flows without any previous treatment. In the same period, emerging water quality problems caused by the use of pesticides in agricultural activity in the basin

were reported to have any visible impact (MOPH, 1996:110). In relation to nitrates and ammonia concentrations along the river, it is possible to see from figure 4 below that from 1991 onwards, concentrations of nitrates and ammonia do not exceed the limits stipulated by Decree 18/2004, but before 1991 we find concentrations of ammonia higher than the limits in 1986 and 1987.

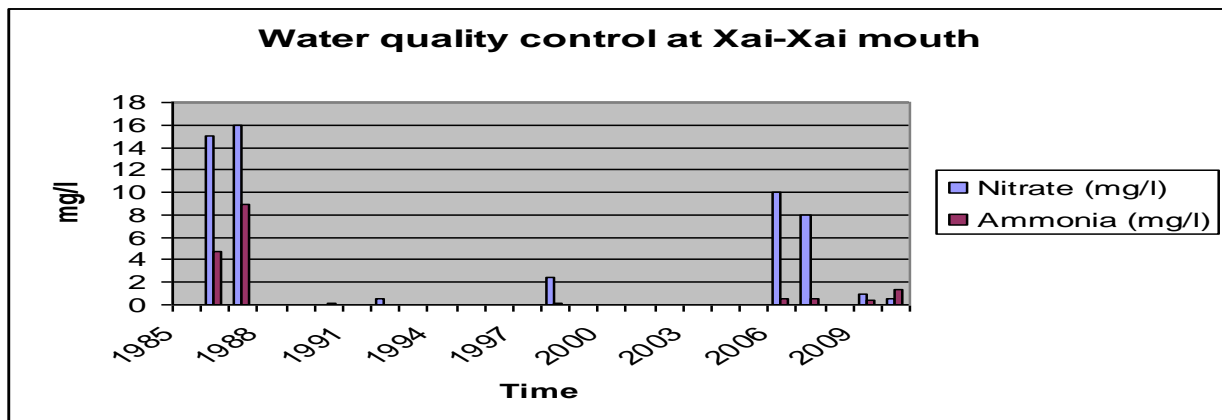


Figure 4: Concentration of Nitrate and Ammonia over time at the Xai-Xai mouth

In relation to the aquifers of the Limpopo Basin, the water is characterised by a relative poor quality and limited productive capacity, presenting significant constraints to the way they can be used for domestic consumption and for irrigation (INGC *et al.*, 2003:29). Underground water quality is influenced by the presence of salted lakes and lagoons, high levels of mineral content, marine sedimentation and occasional invasion of water from the sea (INGC *et al.*, 2003:29), particularly downstream in the Xai-Xai district, and especially in the dry season (NIDMP, 1993b:9).

Figure 5 below shows the values of electrical conductivity along the Limpopo River up to the mouth. The code E31 represents the Pafuri District, where the Limpopo River enters Mozambican territory, while the code E38 represents the mouth of the Limpopo River in the Xai-Xai District.

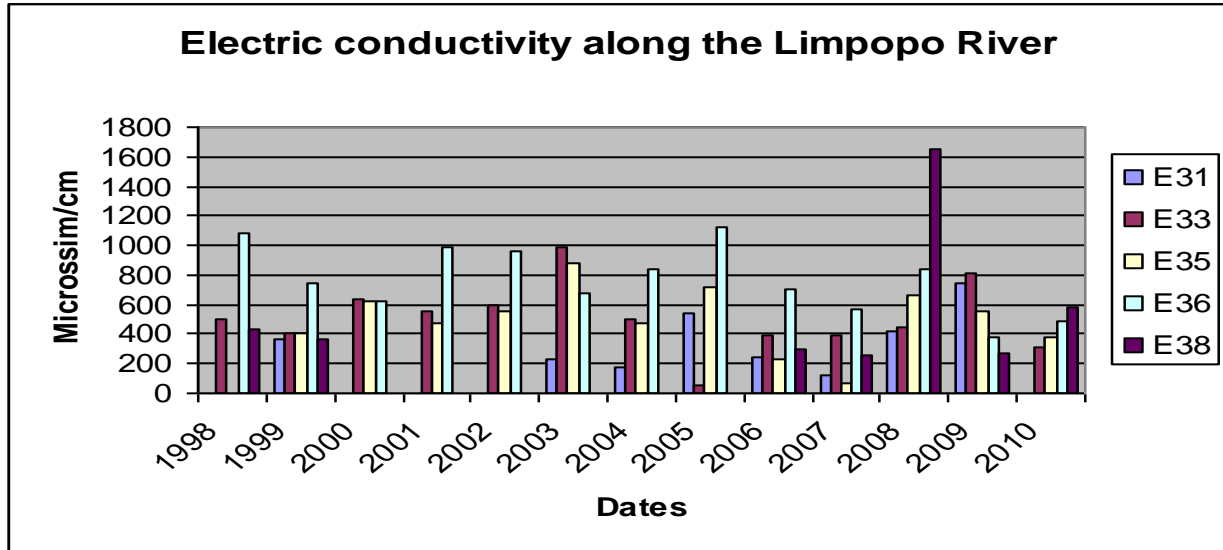


Figure 5: Graphical representation of electrical conductivity values from 1998 to 2010

Depending on the flow, the electrical conductivity shows a rising trend from upstream to downstream in 2001, 2002, 2004, 2005, 2008 and 2010, which can be attributed to intensive agricultural fertiliser application, and the saline intrusion that is registered at the mouth in Xai-Xai District; nevertheless the water in Limpopo river basin has an acceptable potential for irrigation because electric conductivity is less than 2000 $\mu\text{s}/\text{cm}$.

4 RESULTS AND DISCUSSION

This chapter presents the findings related to the first dimension of the variables listed on the framework proposed by Blomquist, Dinar and Kemper. The results obtained in this case study, have been discussed against the hypothesis derived by Blomquist *et al.*, of which the researcher summarized in the appendix 1 on page 95.

4.1 INITIAL CONDITIONS AND CONTEXTUAL FACTORS ASSOCIATED WITH THE DECENTRALIZATION PROCESS

Following the methodological procedure as earlier reported in chapter three, the questionnaire was applied to capture information related to the “initial conditions and contextual factors” which may be associated with the sustainability, and the performance of decentralised management in the Limpopo Basin in Mozambique. So, the questionnaire sought to collect responses that would give information regarding the initial conditions that prevailed at the time a decentralization initiative was attempted in the Limpopo Basin, and the local context in which such reforms are being implemented (see also Mody, 2004, in Blomquist *et al.*, 2010:4–6). In this regard, the following set of information was collected from the respondents:

- The quality of water-related infrastructure (question 2.25);
- Water scarcity problems before and after decentralization (question 3.21)
- Infrastructure financing (question 3.23)
- The percentage of users paying tariffs (question 5.19);
- Percentage of the tariffs staying in the basin (question 5.20);
- Destination of water tariffs (question 5.21); and
- Origin of funds for the maintenance of water-related infrastructures (question 5.22).

According to government interviewees, most of the farmers operating in the Limpopo Basin are smallholder farmers, whose revenues from crop production are insufficient to cover the

costs of water. At the end of the planting season, about 60 % of the farmers cannot pay the costs of water to the suppliers (HICEP and RBL). The result is a low rate of returns to HICEP and RBL, and the poor quality of the infrastructure and services. In such conditions, decentralization initiatives in the Limpopo river basin might fail to succeed as shown by Dinar *et al.* (2005:9), who hypothesises that decentralization is more suitable to succeed in basins where the economic well-being of the basin stakeholder allow them to support the costs to sustain the decentralization after the governmental withdrawal.

Before the decentralization process in 1991, the level of services and the level of coverage of water supply were far below the required levels. Most of the population did not have access to regular clean water, and the water supply services for the urban population with access to taps were irregular and of poor quality. In rural areas, and in cases where manual pumping systems were installed, it was difficult to maintain the functionality of the systems. The interview findings in figure 6 illustrate the respondents' opinions about the level of water scarcity problems before and after decentralization.

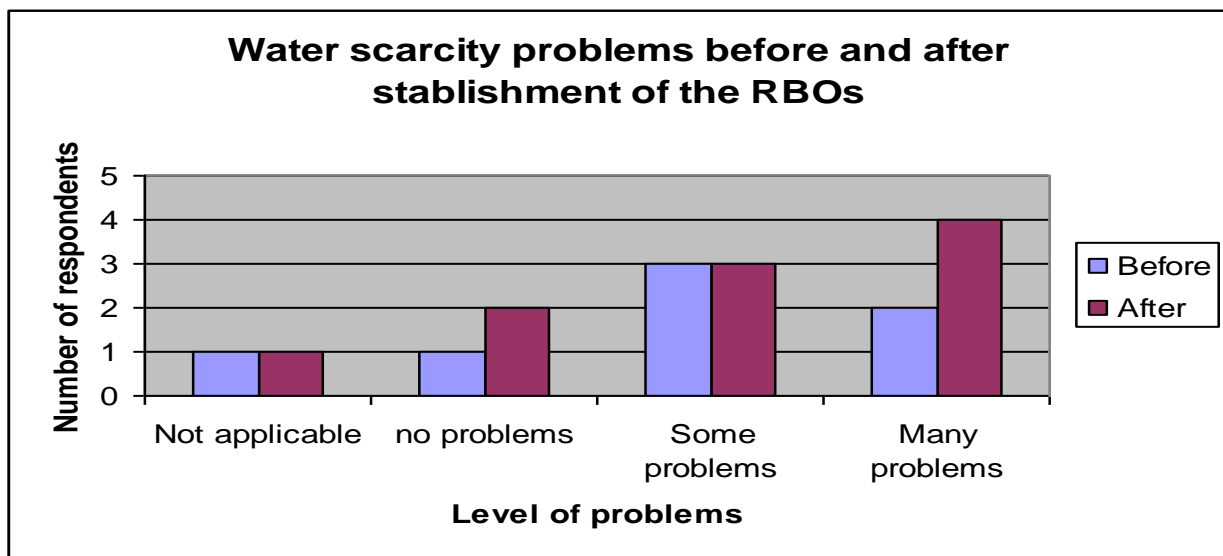


Figure 6: Water scarcity problems before and after decentralization

It is clear from this figure that water scarcity problems still exist especially within the Chokwé irrigation scheme and in rural areas due to poor condition of the infrastructures. WUAs of rural

areas are of the opinion that, with decentralization, they have 100% responsibility in financing the maintenance of rural water pumping infrastructures while WUAs at the irrigating schemes have some responsibility for the maintenance and distribution of water among the farmers within the tertiary irrigation canals. This in turn, might affect the effectiveness of the decentralization process, because they do not have the financial capacity to maintain rural water-related infrastructures, and the irrigation canals. The same result was found in a research conducted by Dinar *et al.* (2007:35-36), where they concluded that decentralization initiatives are more likely to achieve sustainable success, where the basin region is able to contribute some financial resources to continue and consolidate the process.

Interview findings indicate that 33.3% of the respondents have reported that water-related infrastructures are financed and maintained by government funds, and 66.7% reported that the funds come from local NGOs. In relation to the quality of water related infrastructures (table 4 below), the majority of WUAs interviewed are of the opinion that water related infrastructures within the basin is still bad (80.00%), whereas a smaller percentage (33.33) of government officials have the same opinion.

Table 4: Quality of water-related infrastructures

		Quality of water-related infrastructures		Total
		Moderate	Bad	
Respondent category	Government representatives	4 (66.67%)	2 (33.33%)	6
	Water user associations	3 (20.00%)	12 (80.00%)	15

Respondents, particularly from the water user associations using the Chokwé irrigating scheme, expressed their disappointment with the poor quality of the irrigation canals and the failure of the local government to perform activities related to the clearance of canals. In their opinion, the local government’s responsibility for clearance of canals should be shifted to another institution or should involve private operators with machinery and more financial capacity to take care of this.

In relation to water prices (table 5 below), water use within the basin is charged according to Ministerial Diploma No. 21/2007 of February 28th. The objective of the Water Policy Tariffs is to ensure the recovery of the investments costs in infrastructures and the maintenance of respective infrastructure. It is also aimed at promote the rational use of water resources, and to impose conservation of water resources and the environment. However, due to the financial limitations of UGBL, HICEP and RBL to install instruments to measure the amount of water used, smallholder farmers are not charged according to the amount of water they use. They are charged according to the planting season at a fixed rate of 800,00mt per year.

Central-level government respondents revealed that the price charged to irrigators is not economically viable to cover the investment costs, to maintain the infrastructures and ultimately to sustain decentralization. UGBL, HICEP and RBL operations are funded through the annual budget from the State, and revenues generated from the tariffs on water uses. The income generated in the Limpopo Basin accounts for less than 15% of the annual budget of the UGBL. The central government retains 100% of the locally generated revenue, since according to the regulation of tariffs and concessions (Decree 43/2007), 60% should go to the MOPH, and 40% goes to the Minister of Finance. Nothing is committed back to enforce associations or to sustain decentralization.

Table 5: Water tariffs to different sectors in the Limpopo Basin

<i>User Type</i>	Mt/m³ (1 mt = 0.0312 US\$)
Agriculture	
Household sector < 1 ha (common use)	0
Subsistence agriculture > 1 ha	0.04
Commercial sector < 50 ha	0.48
Commercial sector 50 – 1 000 ha	0.08
Commercial sector > 1 000 ha	0.096
Industry	0.159
Water supply	
Large systems	0.159
Small systems	0.08

Source: Ministerial Diploma no 21/2007 of February 28th

In relation to the monitoring of the water quality along the rivers in the basin, norms and water quality standards for domestic consumption, irrigation, recreation, industrial use, etc. are enforced through Decree No. 18/2004. However, implementation of a regular monitoring system along the Limpopo Basin is limited by financial constraints from the central authorities (lack of laboratories, skilled personnel and financial resources), which creates lack of information regarding the quality of water for some of the indicators in many of the years of implementation of the decentralization process (see figure 7 below).

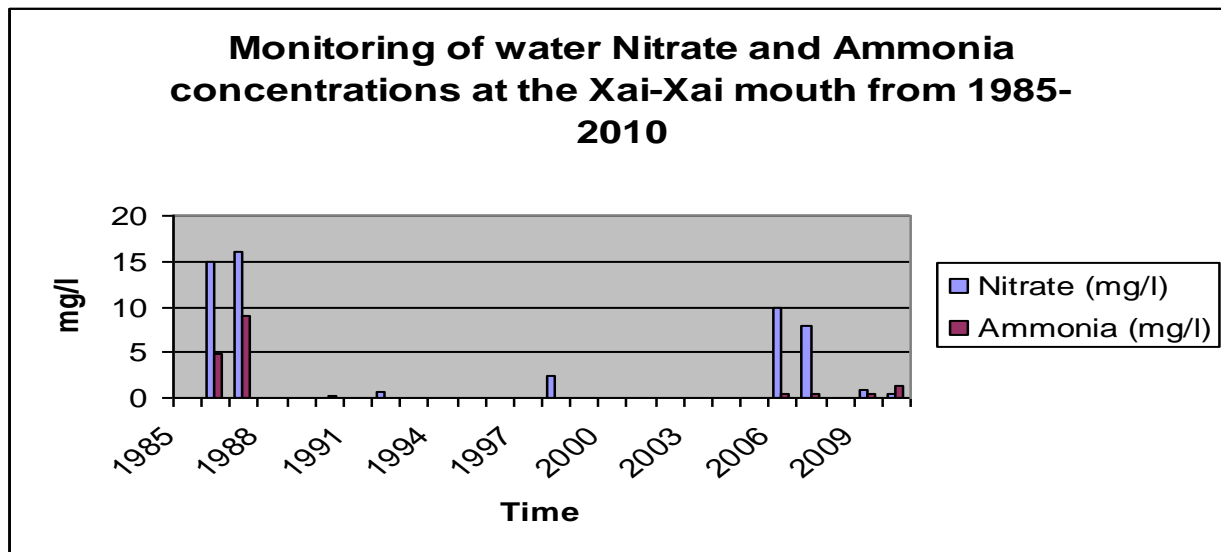


Figure 7: Information about Nitrates and Ammonia concentrations at the Limpopo River mouth, 1985–2010

Summary of findings

According to Dinar *et al.* (2005:40), when water in the basin is less abundant, incentives for decentralization process are more likely. Scarcity of water is positively associated with several aspects of the decentralization process and with the decentralization performance. In the Limpopo Basin case, demand of water is less than supply meaning that, incentives for initiation and the performance of the decentralization process are not linked with the scarcity of water.

From the available data, it is clear that water quality is not a problem in the basin; however Information about the quality of water is not available from 1989 to 2007 along the different locations within the basin. With the decentralization, the quality of water in the basin is monitored through a specific legislation, but due to financial limitations, laboratories are poorly equipped to perform all water quality control activities, and are affecting negatively the quality of water related infrastructures at the river basin scale. The findings from this variable of the analytical framework provide evidence that when the level of economic development within the basin is positively associated with the effectiveness and performance of the decentralization process.

4.2 CHARACTERISTICS OF THE DECENTRALIZATION PROCESS

Certain characteristics of the decentralization process itself may affect the performance of the implementation of decentralization efforts. With regard to questions relating to the characteristics of the decentralization process, the same questionnaire proposed in the methodology section in chapter three sought to collect information from the respondents for the following categories:

- Description of the development of water-related legislation (laws, decrees, acts, etc.) in the country, following chronological order (question 3.1);
- Involvement of the stakeholders in crafting and in the implementation of the laws and rules related to water management (questions 3.2 to 3.4);
- Contribution of the Water Law of 1991 to the decentralization process (questions 3.5 and 3.21);
- The direction of the decentralization effort (questions 3.10 to 3.15);
- Responsibility for decision making under the decentralised approach (question 3.23);
- Institutions created and dismantled during the decentralization process in the Limpopo Basin (questions 3.17 to 3.20).

4.2.1 Changes in Mozambican water law and policy since 1975, and their implications for the Limpopo Basin decentralization process

4.2.1.1 *Water Law*

During the colonial period in Mozambique, water resources were both public and private good and with the independence of the country, all water resources became state property. After Mozambican independence in 1975, the government approved the first constitution of the country. This legal framework served as the base for the change in the juridical water regime. Water resources became solely managed by the government through the Ministry of

Construction and Water (MCA). During this period, water laws and regulations were the same as that of the colonial period.

The first document developed after independence related to water management was Ministerial Diploma No. 25/87, which created the National Directorate for Waters (DNA). Following Ministerial Diploma No. 25/87, the Mozambican government in 1988 fixed the Water Tariff for regularised gross extraction of water from the two main dams in the Southern part of Mozambique; namely the Massingir and Libombos dams, and approved the first Water Law in 1991. The Water Law No. 16/91 established the limits of hydrological resources that belong to the public domain, the water management principles, the needs to cadastre the existing hydrological resources in the country, the usage regime, and usage rights and priorities. In relation to the surface and underground water, the objectives of the water law are as follows:

- a) Definition of the hydrological public domain of the state and the overall management policy;
- b) Definition of the overall juridical regime of the activities related to water use, protection, preservation and inventorying of available water resources;
- c) To define the responsibilities attributed to the government in relation to the hydrological public domain.

Law No. 16/91 established the property right regime of the water resources in Mozambique, stating that “superficial and underground water is the property of the state, constituting a public domain”. According to respondents of the questionnaire, it was a key legal instrument towards the process of decentralization of water management in Mozambique. In addition to this, the law created conditions for the operations of the National Water Council (CNA) through Decree No. 25/91. In order to implement the water law of 1991, to facilitate water management and service delivery in the water sector, as well as the implementation of the IWRM, the national government through Decree No. 26/91 created the Regional Water Administration of the South (ARA-Sul), and four other Regional Water Administrations responsible to the river basins located in the central and the northern parts of Mozambique.

Following the creation of these ARAs, the government approved the internal regulation of the National Directorate of Water through Ministerial Diploma No. 172/92, and the statutes of ARA-Sul in 1993 through Ministerial Diploma No. 134/93. According to the respondents of the questionnaire (figure 8 below), apparently local communities were not involved in the development of water-related policies since 67% of the respondents are not sure about the involvement of local communities because it was initiated at ministerial level, appreciated and approved at governmental level, and 33% of the respondents are of the opinion that local communities were not involved at all in the process.

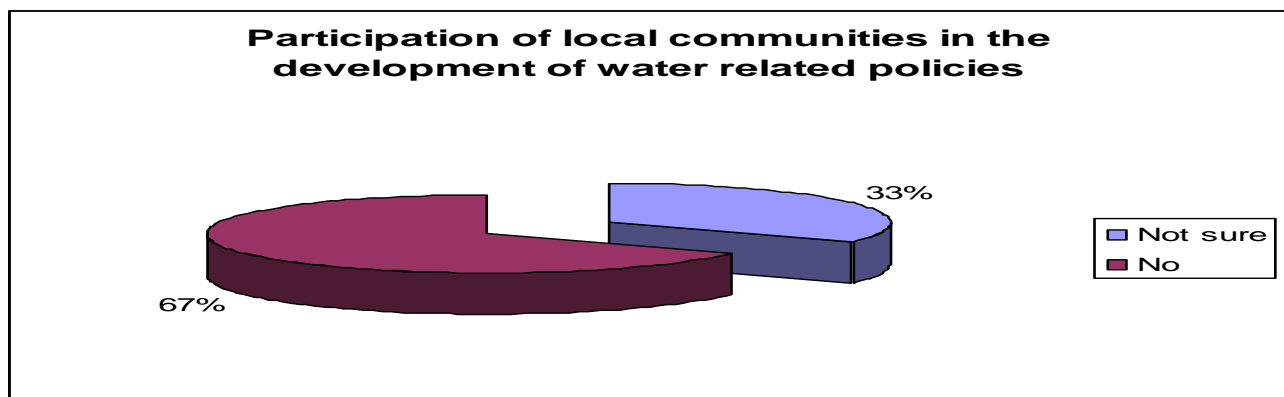


Figure 8: Local communities' participation in development of water-related policies

Results demonstrated on figure 8, suggests that formulation of legal and political instruments to regulate the water sector, did not involve stakeholders. In relation to this finding, Dinar et al. (2005:3,11) are of the opinion that decentralization initiatives fail to succeed when local level stakeholders are not involved in the process, and when it is not based upon, and constructed from, traditional community governance institutions and arrangements.

Respondents are of the opinion that local people in the Limpopo Basin regularly violate the rules and regulations (52.4%), and some never follow the rules (23.8%) because they don't know the rules and others because of opportunistic behaviour and unwillingness to follow the rules (see figure 9 below). Communities living far from the urban centres never follow the rules because they do not have access to information about the water laws, rules and regulations. People using the Law Limpopo Irrigation Scheme (RBL) regularly break the rules

because of the failure of institutions to monitor and control access to water for irrigation, while people using the Chokwé irrigation scheme seldom break the rules (14.3% of the respondents).

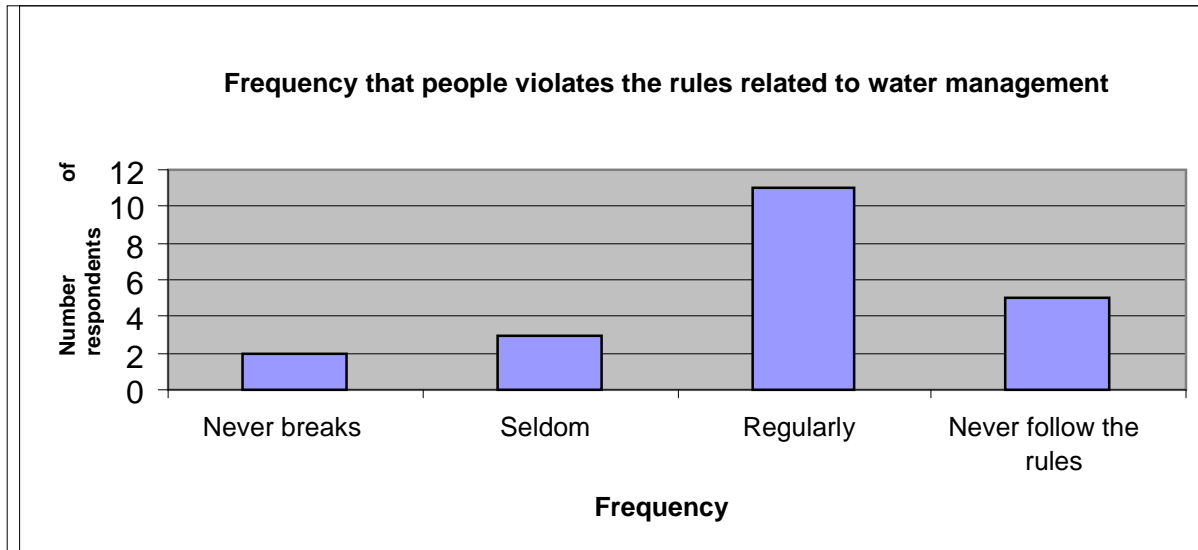


Figure 9: Frequency that people violate the rules and regulations related to water management

The findings from figure 9 provide evidences that formulation of the legal and political instruments of central or local level, should take into consideration whether the local institutions and community have a strong enough motivation to do so (Abers & Keck, 2004:5). Kemper *et al.* (2007:9) also reinforces the argument of Abers and Keck (2004:5) by arguing that successful decentralization depends on the acceptability of the authority and responsibility by local level stakeholders.

4.2.1.2 Water Policy

In 1995, many changes characterised the water sector in Mozambique. The approval of the first national water policy Decree No 7/95, the closure of the Ministry of Construction and Water (MCA), and the creation of the Ministry of Public Works and Housing (MOPH) through Presidential Decree No. 8/95 created space for the new organic structure of the National Directorate of Water. From 1995 onwards, the priority of the Mozambican government was to

recover basic water services, in particular the supply of water to urban, per-urban and rural areas. The government also envisaged the need to introduce new partners in the water sector, in particular private operators, and to develop new approaches to the provision of water services (DNA, 2007b:2).

The National Water Policy No. 7/95 came as an instrument to implement the Water Law of 1991. The main objectives of the water policy are as follows:

- To improve the sanitation of the environment as an essential tool for prevention of water-related diseases;
- To promote the use of water as a resource, and a tool to achieve economic development, and provide for efficient use of the hydrological resources available;
- To promote the conservation of water in the management of hydrological resources, considering in particular the ecological flows of the water courses, and the quality of water;
- To promote inter-regional peace and the development of the country through the joint management of the water in basins that are shared by multiple countries;
- To reduce vulnerability to floods and drought through the co-ordination, planning, use of structured and unstructured measures; and
- To satisfy the basic needs of clean water supply for human consumption in a safe and feasible way.

The National Water Policy created the basis for the restructuring and development of the systems for public water supply, aimed at improving services to the public, and the augmenting of the coverage through Decree No. 72/98, which defines the implementation of the Delegated Management of Water Supply. Decree No. 72/98 establishes the principles and rules that govern the water delegated management to FIPAG and private operators, and the exploitation and management of water supply systems. The institutionalisation of the Delegated Management of Water Supply has the objective to ensure efficiency in the management of the public service and respond to the needs of planning, development and execution of the National Water Policy.

Under the Delegated Management of Water Supply, three new institutions were created, namely: FIPAG through Decree No. 73/98, CRA through Decree No. 74/98, while resolution No. 60/98 approved the Policy for Water Tariffs. Water tariffs for private use were regularised by Ministerial Diploma No. 70/97. According to the water law of 1991, private use results from the need for licenses and concessions.

Mozambique is a downstream country sharing many of the river basins with upstream countries. As a result of this, resolution No. 31/2000 was ratified among SADC countries to govern river courses shared by the SADC countries, and to regulate the use of international rivers. In order to implement the resolution in the Limpopo River Basin, resolution No. 67/2004 established the agreements of water sharing in the Limpopo Basin among South Africa, Botswana, Mozambique and Zimbabwe. The objective of the agreement is to advise the water government entities and provide recommendations about the uses of the river basins, and in issues of measures of protection, preservation and management of the basins. The agreement is guided by the following principles:

- a) Intergenerational equity principles;
- b) Prevention and preservation principles;
- c) Sustainable development;
- d) Trans-boundary impact assessment principles.

In relation to licenses and concessions, Decree No. 43/2007 approves the Regulation for Licenses and Concessions. This regulation defines the type of use in terms of common use and private use. Common use is that aiming essentially to satisfy domestic needs, where the extraction of water does not make use of mechanised means, while private use relies on mechanised means to extract water. Private use is subject to the regulation of licenses and concessions. Due to the deficiencies of the 1995 water policy, the new instrument to implement the 1991 Water Law is Decree No. 46/2007, which approves the Water Policy and repeals Decree No. 7/95.

4.2.1.3 Water management principles

With the decentralization approach in Mozambique, allocation of water to different users (crop and animal producers, domestic consumers, industry, environment, etc), follows the **Integrated Water Resource Management (IWRM)** principle. This principle means that water “allocation to different users has to be considered together with water resource development, management and participatory decision making. Issues like the effect of each water user on the availability of water for others users, land degradation, water conservation and sustainability” (DNA 2007b:6).

In relation to rural communities, domestic water supply follows the **Demand Oriented Principle**. This principle foresees that, in the planning of the rural water supply projects, the community request the services and share the costs of construction. The objectives of this principle are to ensure sustainability of the investment, to satisfy the needs of the tenants, and ensure ownership and rights to the community (DNA, 2001:22), as well as to incorporate community needs and perceptions in decision making and management (Pavlikakis & Tsihrintzis, 2003:193).

4.2.2 Institutions created with the decentralization process and the type of decentralization process

In the post-independence period (after 1975), the national government through the Ministry of Public Works and Infrastructure (MOPH) was the sole water resource policy maker, water-related infrastructural provider and urban and rural water supplier in the country. In 1987, the DNA was created by the ministerial diploma no 25/87, of 13th January, and is under the direction of the Minister of Public Works and Habitation (MOPH). DNA is responsible for the strategic and integrated management of water resources, as well as for the supply of clean water to the population.

This government agency prepares regulations related to all aspects concerning water resources, and is responsible for ensuring the implementation of the National Water Policy. Figure 10 below gives an overview of the boards directly involved in the management of water resources.

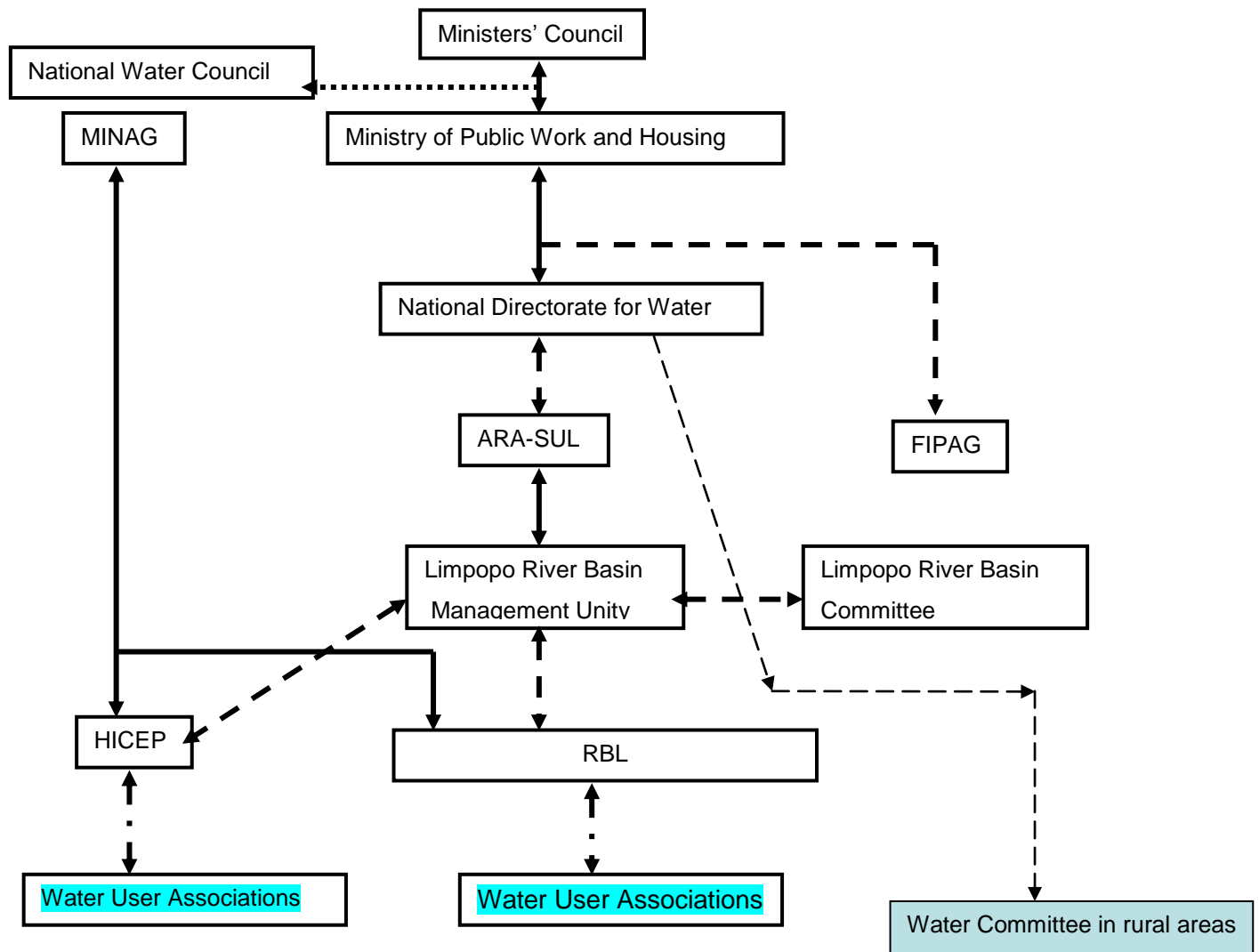


Figure 10: Government agencies and stakeholders involved in the management of water resources

The DNA plays a very active role in the management of water resources in the country, and has representations in all districts within the Limpopo Basin. The 16/91 water law of 3rd August, and Resolution No. 7/95 on water policy, stimulated the decentralization of authority and responsibilities to lower levels of administration. With the decentralization process, the

role of the state has shifted more towards that of regulator, setting policies, promoting decentralization and users' participation and water-related issues have shifted more to multi-sector and stakeholder involvement (see figure 11 below).

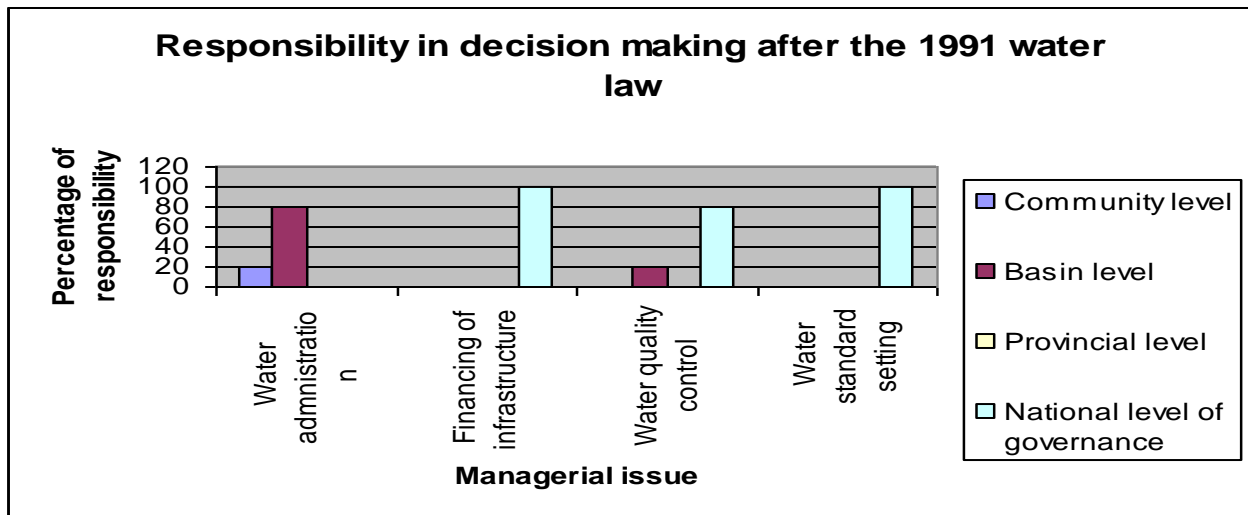


Figure 11: Responsibility for decision making after the decentralization process

From this figure it is clear that WUAs still have little responsibility on decision making, since only about 20% of water administration responsibility is devoted to the community, and the central government in practice retains control over all significant resource management decisions. In regard to this result, the literature on decentralization often points out that successful implementation of the decentralization process will depend on the empowerment of local communities with more responsibility, and with institutional arrangements created by stakeholders and or central government (Blomquist *et al.*, 2005a:29).

Co-ordination among the different ministries is held by the National Water Council (CAN). This is a consultative body of the Ministries' Council created to give pronouncements regarding relevant general issues of the water management policy, and to monitor its implementation. Operational management of hydrological resources in the basins is undertaken by the ARAs (Regional Water Administrations), created by the Central Government through Act No. 26/91 of November 14th. ARA-Sul is subordinated to the DNA, and was established through

Ministerial Diploma No. 134/93 of 17th November, while its organic structure was approved by Ministerial Diploma No. 163/96 of 25th December.

ARA-Sul is a collective juridical entity enjoying financial and administrative autonomy, and is devoted to the operational management of water-related issues of river basins located in the southern part of the country. Co-ordination of activities in the Limpopo Basin is done by multiple sectors, and is also subject to stakeholder participation. At the Limpopo Basin level, ARA-Sul is represented by the Limpopo Hydrographical Basin Management Unit (UGBL). The UGBL works like a Department of ARA-Sul, and has the responsibility to implement the general scheme of water use within the basin, ensuring that existing resources will meet existing demands. Involvement of stakeholders at the basin level is done through the Basin Committee.

Existing infrastructure like the Chokwé and Xai-Xai Irrigating Schemes were transferred from central government control to local government control, to Hidraulica de Chokwé, E.P. (HICEP) and Regadio do Baixo Limpopo (RBI) when privatisation of the domestic water supply services was encouraged. HICEP and RBL are juridical entities created under the umbrella of the decentralization process through Decree No. 3/97 of March 4th, and RBL was created by Decree No. 5/2010 of March 23rd. Both HICEP and RBL are subordinate to the Ministry of Agriculture. The operation and maintenance of the main canal of the irrigation schemes is the direct responsibility of HICEP and RBL. Secondary and tertiary level canals are the responsibility of Water User Associations (WUAs), but under supervision of the group of “cantoneiros”. These groups of “cantoneiros” are HICEP and RBL representatives.

HICEP has replaced SIREMO in the management of the Chokwé irrigation system, and its responsibilities are to supply water to farmers within the Chokwé irrigating system and to manage the contractual relationship with ARA-Sul, the supplier of gross amounts of water at the upstream of the irrigating system. HICEP and RBL have also the responsibility to operate and maintain the hydraulic infrastructures as well as to organise the water users. The central government has authorised the HICEP to transfer some managerial responsibilities of the secondary and tertiary level to the Chokwé WUA at the time associations are established, as

well as the management of the correspondent hydraulic infrastructures. The central government has also assigned to HICEP the duty to monitor the infrastructures that have been given to WUAs responsibility.

According to the review of literature of the Mozambican water law sector, formal basin management institutions are set by national laws and decrees. Respondents of the questionnaire (see table 6 below) are of the opinion that this process follows a top-down approach 42.8%, and the majority of the respondents 57.2% do not know if local communities have contributed to the development of such institutions, raising the question of an effective participation of the stakeholders in the process. According to Blomquist et al. (2005a:29) in such conditions institutions created by the Central Government are likely not to gain stakeholder acceptance because they were not based upon, and constructed from, traditional community governance institutions and arrangements, and decentralization initiative might fail to succeed.

Table 6 Establishment of basin management institutions

		Direction of establishment		Total
		Top-down	Don't know	
Respondent category	Government representatives	3	3	6
	Water User Associations	6	9	15
Total		9	12	21

In addition, respondents are of the opinion that UGBL and the Basin Committee were created as institutions to directly implement central government authority and responsibility at the basin level, and the communities have a less share of responsibility in the basin management issues. The Basin Committee is a coordinative organ between the users of the basin, the entity responsible for managing the irrigation system, and other institutions related to the use of water and land.

The Basin Committee is chaired by the Director of the Basin Unit, a representative of ARA-Sul, and incorporates members of the private sector, representatives of the WUAs, the Chokwé and Xai-Xai irrigation systems' managers, religious institutions, farm representatives and guests from other economic and political sectors. The objective of the Basin Committee is to combine initiatives in order to optimise the use of water and minimise losses, to monitor the supply and use of water, and to optimise the management of water in the irrigation systems.

Water quality standards are set by the Ministry of the Environment (created by Decree No. 2/95), and the water quality along rivers is monitored by ARA-Sul and MICOA through a specific legislation, Decree No. 18/2004 of 2nd June, while monitoring of the basin's river flow to anticipate and identify flooding or insufficiency of water is the responsibility of DNA, ARA-Sul, and the National Institute for Disaster Management (INGC) through the Emergency Operative Centre (CENOE).

INGC was created by Decree no 49/2005 of 14th December, and was repealed by the Decree No. 52/2007 of 27th November. Involvement of state agencies in water quality, floods and droughts monitoring is in line with findings from Kemper *et al.* (2007:7–13) in studies carried out in other river basins, who says that aspects of water resource management with characteristics of public goods such as flood control, water quality control are still being efficiently provided by the central governments.

To regulate and to supervise the behaviour of the domestic water service providers and their services quality, an independent government organ named the Council for Water Supply Regulation (CRA) was created, by Decree No. 74/98 of 23rd December. This organ has the responsibility to reconcile the interests of domestic water users, and private operators, and to ensure a balance between the quality of the service provided and its adequacy to the interests of the users and the economic sustainability of the water supply systems.

Investment in water-related infrastructures is held by FIPAG (Investment Fund for Water Supply and Assets). This national unit of the water sector was created by the Decree No.

73/98, and has the responsibility to manage the assets and financing of water-related public infrastructures, and to promote their development and economic sustainability. In relation to the construction of rural infrastructures, the community has to participate in all stages of water-related projects in its respective region. Communities are organised and led by Community Leaders elected by constituencies and legitimated according to Act No. 15/2000.

The elected authorities representing the community participate in all stages of water supply projects, in order to express the community's needs, desires and preferences in the selection of the location of the source, type and level of services required as well as the type of investment. Managerial responsibility for the water sources at community level is assigned to a Water Committee that has the responsibility to monitor and maintain the functionality of water sources. Water Committees also have the responsibility to collect fees from users, and ensure that all members pay their fees. They also have to guarantee that spare parts are available, and disseminate information about community development projects and community activities regarding water supply.

Water Committees, just like the Basin Committees, are not legal institutions. They do not have juridical personality. The Limpopo Basin Management Unit (UGBL) a department of ARA-Sul, benefits from the juridical personality of ARA-Sul. UGBL enjoy recognition from the central government as the local government water resource management entity. Local associations and communities have less influence in the management of water resources at the basin level, and no role in policy setting.

Summary of findings

The 1991 water law and the 1995 water policy represent a major reform of the water sector in Mozambique; but it was designed by expert personnel at the National level of governance with little involvement of communities of interest. Decentralization was not initiated due to scarcity of water in the basin; it was initiated by the central governmental following donor's recommendations instead.

The institutional arrangement presented do not coincide with the decentralization to the lowest level concept, and It is clear from the institutional arrangements that the lowest appropriate level of the decentralized management in the Limpopo Basin, are still governmental entities, and that, communities still have less share in the responsibilities of basin management issues.

4.3 BASIN-LEVEL INSTITUTIONAL ARRANGEMENTS UNDER THE DECENTRALIZED MANAGEMENT

The relationship between the basin-level institutional arrangements and the performance of decentralization was captured by gathering information related to the following set of data from the respondents:

- Establishment and recognising of basin level institutions (questions 4.1 and 4.7);
- Difficulties encountered in establishing basin-level institutions (questions 3.16, 4.2 and 4.3);
- The objectives of basin-level institutions (question 4.4);
- Internal arrangements of local-level basin institutions (questions 4.6 and 4.12);
- Presence of forums for conflict resolution (questions 4.13 to 4.18 and 4.29);
- Frequency of meetings within the basin and among stakeholders (questions 4.19 to 4.27 and 4.31); and
- Information sharing among stakeholders (question 4.30).
- Role of the River Basin Organizations in the decision making process (question 6.1)

Basin-level governance institutions do exist in the Limpopo Basin, represented by the delegations of ARA-Sul, UGBL, Basin Committee. HICEP, RBL. According to Dinar *et al.* (2005:8), failure in the decentralization process is highly expected in river basins where basin governance institutions are up-set. However, their presence is not a guarantee that the decentralization process will be successful. The former observation can be confirmed by the results observed in the Mozambican decentralization process, where under decentralized river basin management, the desired performance is still not attained.

The 1991 water law encouraged communities to organise themselves into associations. The existing WUAs and the Water Committees in rural areas are other forms of non governmental institutions at basin level since they have some responsibility in the management of water resources, in particular the distribution of water at the farm level in the irrigation systems of the Chokwé and Xai-Xai districts, and in drinking water sources in rural areas.

Limpopo Basin associations have been created by the farmers' own efforts since the decentralization process. Some of the associations that have been created in the basin are of the opinion that it is costly to create an association because money is needed to send people to urban centres to organise and formalise the necessary documentation, and that there are high transaction costs to mobilise and to convince people to join in a collective auction scheme.

Most of the associations that are formally recognised by national law reported that they have found many difficulties to create the association. In the Limpopo Basin, 41 WUAs are formally recognised by the national law, but they are not incorporate in the ARA-Sul, HICEP or RBL organisational structures. Most of the associations in the Chokwé District are irrigation associations, and they have substantial flexibility to govern internal water distribution at the secondary and tertiary canals within the irrigation scheme and within their associated perimeters. They also have the authority to monitor water uses and to resolve their own disputes. In the Xai-Xai District, associations, do exist, but are not formally created.

Presidents of the associations are elected through a voting system The legal recognition of associations allows them to organise themselves and resolve their own internal conflicts, and they strengthen their influence by speaking and acting collectively through the forum composed by the farmers of the community sharing the same water sources, and their representatives in the Basin Committee.

According to Abu-Zeid (2003), responsibility varies with capacity. In the Limpopo Basin case, all of the respondents reported that associations have not yet been formally incorporated into

the managerial structure of the basin, and are not given any responsibility to make rules or regulations because WUAs are not internally well organised, and do not pursue skilled personnel to manage water resources and water-related infrastructures. Officials of DNA are of the opinion that to manage basin resources one has to hold adequate academic qualifications and certified technical qualifications to perform the job.

Most of the associations are devoted to crop production and are composed of farm members sharing the same social group and living in the same area. Associations also have central government representatives in their overall structure, named the “contador”. This individual is responsible for water distribution in the secondary and tertiary canals. Each association resolves almost all problems regarding water resources management within their farms, and there is no organisation responsible for flood control, water scarcity, water allocation, conflict resolution or water quality control. All these duties are under the control of central government institutions.

According to Kemper *et al.* (2007:8), the success and sustainability of decentralised management efforts depends also on the presence of forums for airing and resolving conflicts. In the Limpopo Basin case there are no forums for conflict resolution at the basin level. The Basin Committee works slightly like a forum to resolve disputes when called for, but this is not its duty. The Basin Committee is the forum whereby government agencies meet with basin-level institutions. Interview findings and the statutes of ARA-Sul clearly indicated that the Basin Committee, including the representatives of the water users, meet frequently. The Rural Water Department and the Water Committees in rural areas, as well as the urban water suppliers, ARA-Sul and FIPAG did not appear to have any type of co-ordination mechanism.

FIPAG have the responsibility for financing the construction of reservoirs for flow regulation, water storage and infrastructures for domestic water supply. Under the delegated management mechanism, they are also involved in the licensing and supply of drinking water for urban consumers, and installation of metered measures for domestic water consumption control. ARA-Sul is responsible for development basin plans, collecting and analyse of data

about physical conditions of the basin and water uses, forecast demands and evaluation of balances between availability of water and demand, as well as to mitigate droughts and floods effects. ARA-Sul has also the responsibility for licensing water uses, and monitoring water quality and use through the river basin.

Monitoring of water deliveries from Massingir and Macarretane dams for irrigation and saline intrusion control is performed by ARA-Sul. HICEP and RBL request water for irrigation to ARA-Sul based on the number of registered irrigating users in the system, and based in the surface of land to be irrigated for each farmer. With respect to irrigation water use, HICEP and RBL collect fees from the registered users to pay the right to extract water to ARA-Sul, and monitor what goes into each irrigation plot within the Chokwé and Xai-Xai irrigation system. Monitoring of use by individual irrigators occurs within the irrigation communities through the “cantoneiro” and the “contador”.

Farmers and associations that are located far from the Chokwé and Xai-Xai irrigation systems, and that extract water from the Limpopo River using pumping water systems, are licensed directly by ARA-Sul. They pay fees directly to ARA-Sul, and do not interact with HICEP and RBL. For this group, water use by licensed holders is monitored inconsistently for the same reasons mentioned above. Irrigation associations of this group collect fees from members, regulate water use, and implement and enforce their rules.

With respect to domestic water use, the large supplier is FIPAG, but informal urban water suppliers are starting to operate. Urban consumers pay fees for water consumed under metered bases to FIPAG and informal suppliers, but the suppliers do not pay fees to ARA-Sul for their services in delivering underground water from the Limpopo Basin. In addition, urban suppliers are not subject to ARA-Sul/DNA decisions concerning water allocations, and are not represented in the Basin Committee. In rural areas, drinking water supply infrastructures are maintained by the community sharing the same deep water pumping system, and each community administers its own drinking water source through the collection of tariffs that revert in favour of the maintenance of the same pumping system.

At present, interaction and co-ordination between the UGBL, HICEP, RBL and big farmers is related to water releases and the operation of Massingir and Macarretane dams. The interaction is on a monthly basis while co-ordination of activities occurs twice a year during the basin committee sections where HICEP, RBL and the big farmers request the amount of water required according to the needs of the crops and the size of the land to be irrigated. Interaction and co-ordination between HICEP, RBL and irrigation associations is at the farm level on a daily basis. It is related to the operation and clearance of the canals through the “contador” and “cantoneiro”. With respect to higher-level policy setting, interaction and co-ordination is almost inexistent between the basin stakeholders.

In the Limpopo Basin case, management of hydrological resources is done through UGBL co-ordination, taking into account priorities in use defined by local government entity, and there are different government agencies dealing with the irrigation users, domestic users, crop producers, fisheries as well as for the mines. For each type of water use, effective co-ordination among different ministries is inefficient, and, members from the different user groups are not represented in the Basin Committee. Table 7 gives an overview of the range of organisations and user groups associations existing in the Limpopo Basin.

Table 7: Government agencies and WUAs represented in the Basin Committee

Type of water user	Government agency	Water user group
Crop production (irrigators)	Agrarian Services Department, HICEP, RBL	Farmers Associations; Irrigation associations
Fisheries	Ministry of Fisheries	Not represented
Livestock	Agrarian Services Department; Department of Animal Production and Health	Not represented
Domestic use	FIPAG; Rural Water Department	Water Committees in rural areas, but not represented in Basin Committee
Industrial use	Ministry of Industry and Trade	Not represented
Mineral resources use (Sand extraction along the river banks, thermal and mineral water)	Ministry of Mineral Resources	Not represented

Water supply in urban areas (Chibuto, Chokwé, and Xai-Xai Districts) is under the responsibility of FIPAG. Urban domestic consumers of water are required to pay fees to FIPAG, and this water supply entity does not pay fees to ARA-Sul for their services in delivering water, and use underground water that is under the responsibility of the ARA-Sul. Urban suppliers are not subject to ARA-Sul/DNA decisions concerning water allocations and policies.

With the Water Law of 1991 and the National Water Policy of 1995, the processes of water allocation in the basin have changed. The need for water is first identified at the community level, and any solution devised to meet these needs includes the explicit identification of users and beneficiaries (see also Newson, 1997:285). Water allocations are differentiated as industrial services, irrigation services, domestic services and environmental services. The domestic service provides clean water to the inhabitants in the area, the irrigation service is mainly intended to meet crop needs, and the industrial service provides water for industrial activities (see also Bandaragoda, 1999:7).

The negotiations over water allocation take place only between irrigation user groups and the UGBL, but not between the different government agencies representing different users. In the Limpopo case, there is no specific forum in which communities resolve their conflicts.

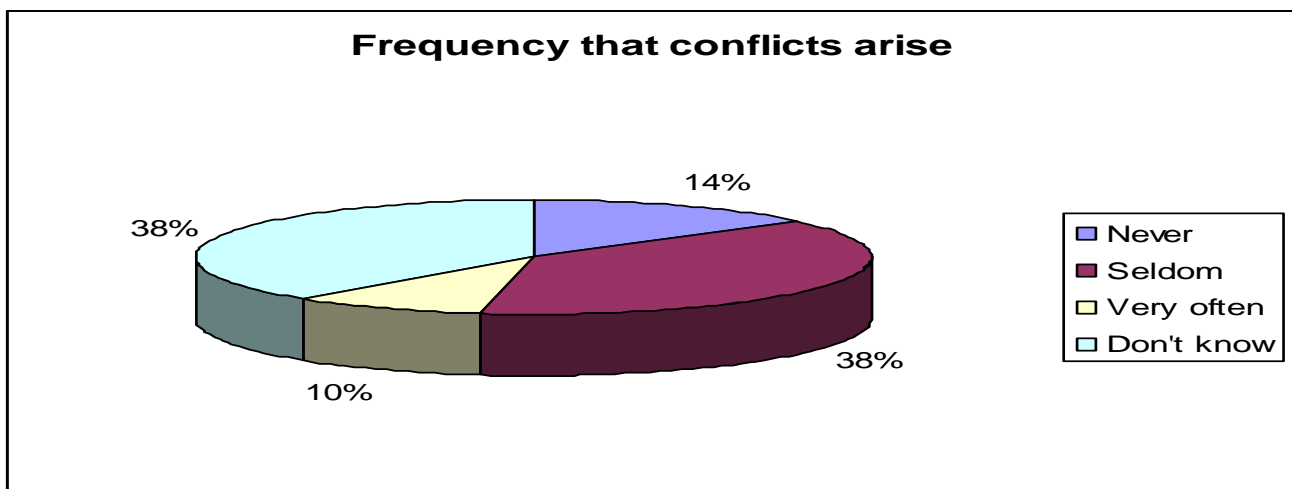


Figure 12: Frequency of occurrence of conflicts in the Limpopo Basin

Interview findings (figure 12 above) indicate that conflicts rarely occur in the basin (38 % respondents), and when they occur, they are related to water allocation between farmers within the associations and not because of water scarcity (see figure 13 below). WUAs have elements within their structure (the Vogel) to resolve disagreements among members of the same association, but no comparable forum exists at the river basin scale.

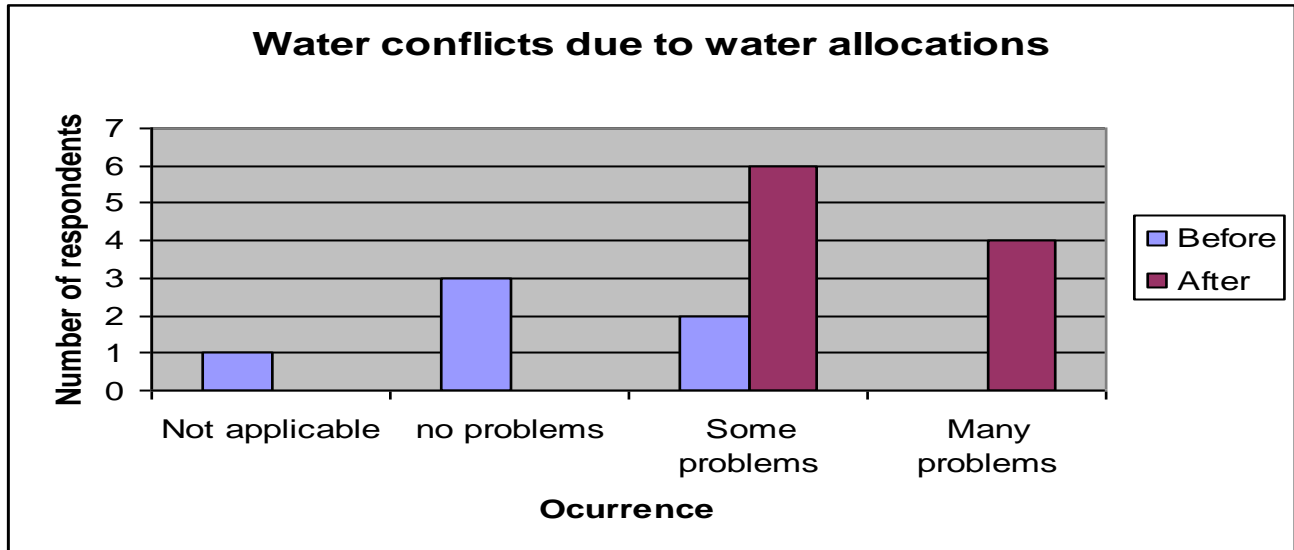


Figure 13: Conflicts due to water allocation

The results from figure 12 and 13, and the argument from respondents, provide evidence that the presence of forums and mechanisms to avoid and resolve conflicts lowers the level of conflicts among stakeholders. This is similar to the arguments made by Kemper et al. (2007:8), who posits that “success and sustainability of decentralization depend on the presence of forums for airing and resolving conflicts related to water allocation and quality.

Irrigating associations were created at the basin level, without any support from the central government and the interview findings suggest that most of the associations do not know about the water law, and do not have a big role on setting the rules and policies. Water allocation is spread across different government-level entities and mediated by a range of formal and informal institutions. In addition, central government respondents are of the opinion that associations do not have adequate know-how or skills to perform activities such

as the ones that are actually under the responsibility of the ARA-Sul, UGBL, HICEP, RBL and FIPAG.

This argument from the central governmental respondents raises a concern about the sustainability of the decentralization process, since according to Dinar *et al.* (2005:15), the ability of stakeholders to perform successfully depends on the skills and practices that they have developed along the time. If they are not trained and given the chance to perform the activities currently under the responsibility of the central government, they will never gain the required abilities and skills compromising the success and sustainability of the decentralization process.

As postulated by Blomquist *et al.* (2008:16), effective implementation of decentralized management requires communication with and among stakeholders. In the Limpopo basin case, the basin committee should meet twice a year, and it works like a forum for information sharing and communication. In addition, basin-level institutional arrangements are structured to provide mechanisms for information sharing and communication among basin associations. Following the arguments from Dinar *et al.* (2007:39), this institutional arrangement contributes to sustain the decentralization process because the existence of institutions whereby stakeholders articulate their interests, share information, bargain and take collective decisions is positively associated with a successful decentralization and effective stakeholder participation

Communication among members of the same association is mostly through meetings. Interview findings revealed that within the associations, meetings are scheduled on a weekly basis, and meetings between associations are scheduled on an irregular basis, depending on the occurrence of problems in the basin. At the basin level, the Basin Committee meets twice a year while HICEP, RBL and the WUAs meet monthly. HICEP and the RBL are invited to participate in the meetings among associations. Interview findings also indicated that UGBL and water users outside the Chokwé and Xai-Xai irrigation systems meet infrequently, while the Rural Water Department and the Water Committees in rural areas never meet.

For Wahid and Irshad (2009:3), participation implies that local people are directly involved in the design, management and implementation of development projects which affect them personally, and the intervention from government, or other external organisation is reduced. Although stakeholders are represented in the Basin Committee, the management structure and internal configurations of the ARA-Sul and DNA as well as UGBL, HICEP and RBL do not reflect stakeholder involvement in managerial decisions.

The UGBL was established as a government institution to manage river basin in all aspects, while stakeholders are invited to the meetings to provide information to help central authority to take decisions (13.3%), and to be consulted by the central authority when the last is taking decisions (20.0%). Small farmers and WUAs located far from the decision centres in the Limpopo Basin are virtually excluded, and have little meaningful participation in the decision-making process (46.7%). In addition, farmers' associations that are located far from the urban centres where meetings take place have claimed that they are not invited to participate in the Basin Committee, and for others it is difficult to participate in the meetings due to the associated costs of accommodation and transport.

Table 8: Role of the WUAs located in the basin in the decision-making process

Respondents		Role of the organizations located in the basin in the decision-making process				Total
		Provide information to help central authorities to take decisions	Be consulted by the central authority when it is taking decisions	To advise the central authorities when they are taking decisions	Other	
Respondent category	Government representative	0	1	3	2	6
	Water User Association	2 (13.3%)	3 (20.0%)	3 (20.0%)	7 (46.7%)	15 (100.0%)
Total						

The Basin Committee is a consultative body, since it does not take decisions. WUAs provide information about the amounts of water that they intend to use during the planting season

through the Basin Committee, but formal and final decision-making authority remains concentrated in the hands of the UGBL and ARA-Sul boards.

According to respondents and the statutes of ARA-Sul, UGBL, HICEP, RBL and FIPAG, the central government has the exclusive right to alter the governance structure and to appoint the leaders of the aforementioned institutions with no stakeholder consultation. Furthermore, HICEP and RBL have the flexibility to nominate the individual (“the contador”) responsible for allocating water within the farms of the associations. Basin associations do not enjoy a similar privilege to adjust the structures of the above-mentioned institutions according to their own perceptions and needs. In the Limpopo case, this lack of flexibility is best reflected in the difficulty that WUAs face to negotiate or recommend to the UGBL or HICEP the creation of another institution with the responsibility to clean the irrigation canals.

Summary of findings

The Limpopo Basin institutional arrangement do recognize WUAs, however many governmental agencies are still involved in aspects of water policy design, planning and management. According to Costeja *et al.* (2002:18-21) in Blomquist *et al.* (2005:36), this arrangement can be classified as an horizontal fragmentation that has to do with the dispersion of power and responsibility across more governmental agencies, with little or no interaction with the local level stakeholders.

Basin-level institutional arrangements are structured to provide forums for information sharing among basin stakeholders, forums for conflict resolution, and communication between WUAs. With the decentralization and the creation of ARA-Sul, availability and distribution of water within the basin is discussed during the “basin committee” meetings, with the participation of the stakeholders, but WUAs located far from the urban centres, have a virtual participation in these meetings,

Water scarcity during the dry season appears not to create problems and conflicts between different users. However, due to the economic characteristics of the resource water, and the type of property rights in place, conflicts arise, and the performance of the management of water resources in the basin is affected by the opportunistic behaviour of the tenants. In addition, poor quality of infrastructures also affects the performance of the management of water resources.

4.4 CENTRAL–LOCAL RELATIONSHIPS AND CAPACITIES UNDER THE DECENTRALIZED MANAGEMENT

In order to understand how central–local relationships and capacities affect the performance of the decentralization initiative in the Limpopo Basin, the questionnaire proposed in the methodology section in chapter three also sought to collect information from the respondents on the following categories:

- How water basin organisations are recognized (question 5.1);
- The type of support from the central government to the basin-level organisations (question 5.2);
- Laws and decrees that govern WUAs and water rights regimes (questions 5.4 and 5.8);
- Mechanisms of selection of governing bodies of local-level organisations (question 5.7);
- Financial and human capacities of the basin organisations (questions 5.9 to 5.11); and
- Existence of capacity-building programmes (question 5.10).

It was found through the interviews that the river basin associations are not formally incorporated into the structures of the central government, and that only a few groups of associations participate in the Basin Committee. Based on the arguments from Agarwal (1997), in Kapoor (2001:274), for participation to be effective, stakeholders need to be empowered otherwise their participation in the decision making process is meaningless or even counter-productive.

The government doesn't provide any support to local WUAs (62% of the respondents), and when it does, it goes in the form of seed distribution to enhance production, and training in crop production techniques and water management within the association perimeter (24% of the respondents) (see table 9 below). Although most of the farmers are organised into associations, most of these, in particular those far from the urban centres, are not formally created as juridical entity. Basin-level associations engage in collective decisions because of their own needs, and they are governed by Law No. 8/91 of July 18th.

Table 9: Support that the central government provides to enforce WUAs

		What type of support that the central government provides to enforce WUAs			Total
		Nothing	Monetary help	Other	
Respondent category	Government representative	4	0	2	6
	Water User Association	9	3	3	15
Total		13	3	5	21

The 1991 water law in Mozambique, in accordance with what is stipulated in the constitution of the country, stipulated that the internal water (lakes and lagoons), the surface water, river banks and underground water are state property and constitute a public domain (DNA, 2007a: 5). In this regard, studies from the NIDMP (1993a:3) have found that the absence of a clear property rights regime creates management problems in the irrigated land. In the Limpopo Basin case, how consumers use water resources is not only affected by the type of property rights that are in place, it is also affected by the opportunistic behaviour of some community members, and by the fact that water is a common pool resource. This observation is confirmed by Blomquist *et al.* (2010:10), who suggests that the presence of recognised rights on resource use, contributes to a more sustainable use of the resource and for sustainability of the decentralization process.

Within the basin, water use is categorised into common and private use. Common use aims to satisfy domestic needs, or the personal or family needs of the tenant. Common use implies that the user does not make use of a pump or other mechanised means to extract water. Private use implies the extraction of water in large quantities. Private use depends on a

licence or concession, meaning that no one can use large quantities of surface or underground water above basic or family needs without formal permission (Manjate, 2010 in ARA–Sul, 2010:3). Common uses can be made without government permission. while private use is regulated by the Regulations for Licences and Concessions (RLC) – Act No. 43/2007, and is controlled by the ARA-Sul (ARA–Sul, 2010:4).

Individuals interviewed for this study and officials of ARA-Sul acknowledged a substantial problem with illegal water use continuing in the basin. The number of users has increased, some without authorised water use. Many projects are extracting water from the rivers without licences, and some users with licences are using the water for different destinations to that of the concession, and are extracting water above the authorised amounts (Deisy, 2010 in ARA-Sul, 2011:11). Many of the users that extract water without permission avoid licensing to access water at no cost, because they say that water belongs to God, and some do not apply for permission due to lack of information or unwillingness to apply (Deisy, 2010 in ARA-Sul, 2010:11). With Decree No. 43/2007 of 30th November, all users without any formal permission to extract gross amounts of water are subject to penalties, because they reduce the amount of water allocated to those who do have such permission.

Summary of findings

The central government has established basin comities and water comities in rural areas and use them for water development, water planning. Basing on the findings of the study it is clear that Stakeholders have less influence on final decision about basin-scale water allocations, planning and funding. In addition, there is no any WUA responsible for water administration, infrastructure financing, water quality control and water standards setting.

5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE GENERAL PREMISE OF THE STUDY

The study was carried out in the Limpopo Basin in Mozambique, located between the parallels 21° and 25° south, and the meridians 31° and 35° east. This study was motivated by the fact that decentralization initiatives in the Limpopo Basin in Mozambique are not providing effective results. Based on the literature on decentralization, effective and sustained decentralization initiatives will depend on 1) initial conditions and contextual factors; 2) characteristics of the decentralization process; 3) central–local relationships and capacities; and 4) resource-level institutional arrangements. So, the aim of this study was to identify the factors that are potentially related to the performance of the decentralization process in the Limpopo Basin.

Following the methodological procedures reported in chapter three, a questionnaire (see appendix A) was applied to collect data. A total of 21 respondents were selected using a purposive sampling technique, which is based on their typical representation of the phenomenon. In this regard, interviews were conducted with DNA, ARA-Sul, UGBL, HICEP and RBL officials, and local-level associations. Questions in the survey instrument were translated into the local language to facilitate communication between the respondents and the researcher. Descriptive statistics and codification of the answers were used to analyse quantitative and qualitative data respectively. Findings presented in chapters four indicate that only the following hypothesis postulated by Blomquist *et al* are verified in the Limpopo Basin case (see also appendix I for referencing):

- Presence of basin governance institutions;
- Existence of institutions whereby stakeholders articulate their interests, share information, communicate, bargain, and take collective decisions;

- Presence of forums for airing and resolving conflicts related to water allocation and quality.

A detailed explanation of the factors positively and negatively affecting the performance of the decentralization process in the Limpopo Basin, and suggestions to overcome the negative impacting factors are given in the closing part of the case study.

5.2 CONCLUSIONS OF THE STUDY

Our results offer useful information both on the literature on decentralization of water resources, as well as for understanding the decentralization process in the Limpopo River Basin in Mozambique. Based on the results of the study, it is clear that some aspects of the water sector in Mozambique have been decentralised while, nonetheless, water management issues are still controlled by central government entities.

In a decentralised management approach, it is assumed that the lower the level that decisions are made, the greater the decentralization. In respect of the Limpopo Basin, decentralization of authority to the river basin level has not included local river basin organisations. Authority and power continues to be vested with the central government agencies. Government agencies focus more on interacting with associations, relying on staff from central or local government agencies for technical support to manage and solve water-related issues within the basin.

The 1991 water law and the 1995 water policy represent a major reform of the water sector in Mozambique, but they were designed by international consultants at the national level of governance with no involvement of the communities affected. Decentralization was initiated by the central government, following donor's recommendations, and does not coincide with the concept of decentralization to the lowest level.

The central government has established basin and water committees in rural areas and uses them for water development and water planning. Based on the findings of the study it is clear

that this was a top-down creation of basin organisations by the central government rather than a bottom-up process initiated by local water users. In addition, there are no WUAs that are responsible for water administration, infrastructure financing, water quality control and setting of water standards. Negotiations over water allocation between different users take place between user groups and the government. Government agencies make the final decision on the amount of water to allocate to each sector.

At the basin level, the human and financial capacities of decentralized institutions are weak. The UGBL depends on contributions from the central government for more than 85% of the investment and operational costs of the UGBL as well as of the basin. The Basin Committees do not have their own financial resources, and the members' contributions within the WUAs are not enough to cover investments and maintenance of water-related infrastructures or operational costs. This makes these institutions vulnerable to any change that may occur or be proposed by the central level of authority.

The findings also enable the study to conclude that the factors that might have negatively impacted the effectiveness of decentralization in the Limpopo Basin can be described as follows:

- Most of the farmers in the Limpopo Basin are small-scale farmers, and they are not able to commit financial resources to maintain resource-level infrastructures and institutions to sustain decentralization. As a result, 20 years after decentralization was initiated, the central government still contributes more than 85% of the basin's annual budget. In addition, failure of government agencies to maintain water-related infrastructures due to financial limitations affects the performance and sustainability of the decentralization process.
- Decentralization was top-down, initiated without involvement and recognition of traditional community governance institutions and practices. This means that resource-level users and other stakeholders are virtually not involved in the decision-making and policy-setting regime. Furthermore, in practice, central government retains control over

all significant resource management decisions. So, communities are not willing to commit resources to collective endeavours, and regularly break rules and decisions about resource management and regulations related to water.

- In the Limpopo Basin case, resource-level stakeholders and the local-level government authority (UGBL) do not have autonomy to determine how funds generated within the basin can be spent since these are transferred to the Ministry of Finance and the MOPH and nothing stays in the basin. In addition, resources committed by stakeholders are not enough to maintain water-related infrastructures, nor to sustain decentralization and management functions.
- Institutional arrangements at the basin level are set by the central government. Basin-level stakeholders are not formally incorporated into the structure of central government organisations, and do not enjoy the flexibility to craft management arrangements at the resource and sub-resource level, or modify them as perceived and needed. Under such conditions, it is not expected to find successful and sustainable implementation of decentralization initiatives because participation of local communities is passive.
- The ability of central and local participants to perform successfully depends on the skills that they have developed. In the case of the Limpopo Basin, local communities' skills and capabilities are weak, so that many aspects of water management and basin organisations are tied to the central government. In addition, government agencies do not trust the communities' capabilities to perform managerial functions. This means that the central government does not transfer decision-making and managerial functions to the lowest level possible.
- The type and of property rights regime, and the economic characteristics of water resources, also impacts the performance of the decentralization process since they open space for opportunistic behaviour of water users.

5.3 RECOMMENDATIONS OF THE STUDY

As recommended by local communities, government agencies should create institutions responsible for clearance of the canals or, alternatively, the state should reinforce its conventional role of investing in machinery and in maintenance of the secondary and tertiary level canals of the irrigation schemes, but now in a co-managed mode that reduces transaction costs and provides incentives for stakeholder participation. For the fulfilment of this recommendation, new laws regarding the destination of the revenues generated within the basin should be created to enhance the commitment of stakeholders to sustaining the decentralization effort.

With regard to the participation of water users in the Basin Committee, it is important that the UGBL makes an exhaustive inventory of possible parties to be included in Basin Committee meetings. Therefore an actor analysis needs to be done to give a better picture of the stakeholders/communities/social and ethic groups to include in the basin committee at the basin level, as well as the actors to include at government level. By giving all stakeholders a representation in the Basin Committee and in decision-making processes, the UGBL would avoid problems that arise in the implementation of the decentralization process within the Limpopo Basin.

Government agencies should implement capacity-building programmes directed at improving the skills and capacities of local communities and strengthening their managerial capabilities to sustain the decentralization process. These capacity building programs can be through empowerment of local communities with more responsibility on water allocation decision making and financial control.

Governmental agencies should also incorporate local level institutions in the organizational structure of governmental agencies. This of course does not imply that the government should have financial responsibilities over local level institutions.

6 REFERENCES

- Abers, R.N. & Keck, M.E. 2004. Muddy Waters: Decentralization, Coordination and Power Struggle in the Brazilian Water Management Reform. Paper presented at the Conference of the Latin American Studies Association. Las Vegas, Nevada. [Online]. Available from: <http://lasa.international.pitt.edu/members/congress-papers/lasa2004/files/AbersRebecca.pdf>. [Accessed: 2011-06-20].
- Abu-Zeid, M. 2003. *Water pricing: A controversial issue*. Kyoto, Japan: Third World Water Forum.
- Adhikari, B. & Lovetti, J.C. 2005. Transaction costs and community-based natural resource in Nepal. *Journal of Environmental Management*, 78(2006):5–15. [Online] Available from: www.elsevier.com/locate/jenvman. [Accessed: 2009-11-16].
- Administração Regional de Águas do Sul (ARA – Sul). 2010. *Entregue o regadio de Xai-Xai, sua reabilitação contribui para aliviar a pobreza das populações beneficiárias*. (O Rio – n° 02). Moçambique: ARA-Sul.
- Administração Regional de Águas do Sul (ARA – Sul). 2011. *Chuvas intensas no sul do país materializam previsão hidrológica 2010/2011*. (O Rio – n° 05). Moçambique: ARA-Sul
- Akpabio, E.M. 2008. Integrated Water Resource Management in the Cross River Basin, Nigeria: How can we reconcile institutional boundaries and interests. *International Journal of River Basin Management*, 6(3): 267–276
- Al-Harithi, N. 2009. Decentralization of formal water sector institutions in Yemen from IWRM perspectives. 34th WEDC International Conference, Addis Ababa, Ethiopia. [Online]. Available from: [http://wedc.lboro.ac.uk/resources/conference/34/Al-Harithi %20N_-_277.pdf](http://wedc.lboro.ac.uk/resources/conference/34/Al-Harithi%20N_-_277.pdf). [Assessed: 20/06/2011]

- Answers.com. Not dated. *Decentralization*. [Online] Available from: <http://www. Answers.com/topic/decentralization>. [Accessed: 2010-06-18].
- Backeberg, G.R. 1997. Water Institutions, Markets and Decentralized Resource Management: Prospects For Innovative Policy Reforms in Irrigated Agriculture. *Agrekon*, 36(4):350–384. [Online] Available from: <http://www. sciencedirect. com. innopac.up.za/science> [Accessed: 2009-11-16].
- Bandaragoda, D.J. 1999. Institutional change and shared management of water resources in large canal systems: Results of an action research programme in Pakistan. International Water Management Institute (Research report no. 36). Colombo, Sri Lanka.
- Bandaragoda, D.J. & Babel, M. S. 2010. Institutional development for IWRM: An international perspective. *International Journal of River Basin Management*. 8(3–4): 215–224.
- Blomquist, W., Ballesteros, M., Bhat, A. & Kemper, K. 2005a. *Institutional and policy analysis of river basin management: The Tárcoles River Basin, Costa Rica*. The World Bank. (Policy Research Working Paper 3612). Washington, DC: The World Bank.
- Blomquist, W., Calbick, K. S. & Dinar, A. 2005b. *Institutional and policy analysis of river basin management: the Fraser River Basin, Canada*. The World Bank. (Policy Research Working Paper 3525). Washington, DC: The World Bank.
- Blomquist, W., Giansante, C., Bhat, A. & Kemper, K. 2005c. *Institutional and policy analysis of river basin management: the Guadalquivir River Basin, Spain*. The World Bank. (Policy Research Working Paper 3526). Washington, DC: The World Bank.
- Blomquist, W., Haisman, B., Dinar, A. & Bhat, A. 2005d. *Institutional and policy analysis of river basin management: The Murray Darling River Basin, Australia*. The World Bank. (Policy Research Working Paper 3527). Washington, DC: The World Bank.

- Blomquist, W., Tonderski, A. & Dinar, A. 2005e. *Institutional and policy analysis of river basin management: The Warta River Basin, Poland*. The World Bank. (Policy Research Working Paper 3528). Washington, DC: The World Bank.
- Blomquist, W., Dinar, A. & Kemper, K. 2008. A framework for institutional analysis of decentralization reforms in natural resource management. *Society & Natural Resources*, 23:1–16.
- Carlsson, L. & Berkes, F. 2004. Co-management: concepts and methodological implications. *Journal of Environmental Management*. 75(2005):65–76. [Online] Available from: www.elsevier.com/locate/jenvman. [Accessed: 2010-03-20].
- Dietz, T., Ostrom, E. & Stern, P.C. 2003. The struggle to govern the commons. *Science*, 302:1908–1909. [Online] Available from: www.sciencemag.org.
- Dinar, A., Kemper, K., Blomquist, W., Diez, M., Sine, G. & Fru, W. 2005. *Decentralization of river basin management: A global analysis*. The World Bank. (Policy Research Working Paper 3637). Washington, DC: The World Bank.
- Dinar, A., Kemper, K.E. & Blomquist, W. 2007. Determinants of River Basin management decentralization: Motivation, process, and performance. In: Kemper, K.E., Blomquist, W. & Dinar, A. (eds.) *Integrated river basin management through decentralization*. Berlin, New York: Springer.
- DNA. 2001. *Manual de água rural*. Ministério de Obras Públicas e Habitação. DNA, Mozambique.
- DNA. 2007a. *Estratégia Nacional de Gestão de Recursos Hídricos*. Ministério de Obras Públicas e Habitação. DNA, Mozambique.

- DNA. 2007b. *Política de águas*. Ministério de Obras Públicas e Habitação. DNA, Mozambique.
- Easter W.K. & Hearne, R.R. 1993. *Decentralizing water resource management: Economic incentives, accountability, and assurance*. The World Bank. (Policy Research Working Paper 1219). Washington, DC: The World Bank. [Online] Available from: <http://go.worldbank.org> [Accessed: 2010-03-20].
- Ferguson, A.F. & Mulwafu, W.O. 2004. Decentralization, participation and access to water resources in Malawi. University of Wisconsin, Madison: BASIS CRSP. [Online] Available from: <http://www.basis.wisc.edu.pdf>. [Accessed: 2010-04-18].
- GDRC.org. not dated. *Principles of integrated water resource management in urban areas*. Industry sector report for W.S.S.D. prepared by I.W.A. [Online] Available from: <http://www.GDRC.org/uem/water> (IWRM). [Accessed: 2010-06-18].
- Giupponi, C., Sgobbi, A., Mysiak, J., Camera, R. & Fassio, A. 2008. Netsymod: An integrated approach for water resources management. In: Meire, P., Coenen, M., Lombardo, C., Robba, M. & Sacile, R. (eds.) *Integrated water management*. NATO Science Series. (IV. Earth and Environmental Sciences, Vol. 80). Dordrecht, The Netherlands: Springer.
- GOLIATH. 2003. Primary and secondary data: concepts, concerns, errors, and issues. (features). *Appraisal Journal*. Publication: 2003-Jan-01. [Online] Accessed from: http://GOLIATH.ecnext.com/coms2/gi_0199-934872/primary-and-secondary-data-concepts.html. [Accessed: 2010-09-22].
- Imprensa Nacional de Moçambique. 2007. Boletim da República – 5^o Suplemento. Publicação Oficial da República de Moçambique. Maputo, Moçambique.

- INGC., UEM. & FEWS NET. 2003. *Atlas for disaster preparedness and response in the Limpopo Basin*. Cape Town: Creda Communications.
- International Development Research Centre (IDRC). 2008. Decentralization, local power and women's rights. Policy Recommendations from the International Conference on Mexico City. Ottawa, Canada [Online]. Available from:http://web.idrc.ca/uploads/user-S/12348114451WRC_PR_ENG_web.pdf. [Accessed: 2011-06-20].
- IWMI & CGIAR. Developing and managing river basins: The need for adaptive, multilevel, collaborative institutional arrangements. [Online]. Available from: [http://www.iwmi.cgiar.org/assessment/files_new/publications/Discussion %20Paper/CA_Issue_Brief_12.pdf](http://www.iwmi.cgiar.org/assessment/files_new/publications/Discussion%20Paper/CA_Issue_Brief_12.pdf). [Accessed: 2011-06-20].
- Kapoor, I. 2001. Towards participatory environmental management? *Journal of Environmental Management*, 63:269–279. [Online] Available from: <http://www.ideallibrary.com>. [Accessed: 2009-11-16].
- Kemper, K.E., Blomquist, W. & Dinar, A. 2005. *Institutional and policy analysis of river basin management decentralization. The principle of managing water resources at the lowest appropriate level – when and why does it (not) work in practice?* Washington, DC: The World Bank.
- Kemper, K.E., Blomquist, W. & Dinar, A. 2007. River Basin Management at the Lowest Appropriate Level: When and why does it (not) work in practice? In: Kemper, K.E., Blomquist, W. & Dinar, A. (eds.) *Integrated river basin management through decentralization*. Berlin, New York: Springer.
- Kirsten, J.F., Karaan, A.S.M. & Dorward, A.R. 2009. Introduction to the economics of institutions. In: Kirsten, J.F., Dorward, A.R., Poulton, C. & Vink, N. (eds.) *Institutional economics perspectives on African agricultural development*. Washington, DC: International Food Policy Research Institute.

- Ligtenberg, A., Wachowicz, M., Bregt, A. K., Beulens, A. & Kettenis, D.L. 2004. A design and application of a multi-agent system for simulation of multi-actor special planning. *Journal of Environmental Management*, 72:43–55. [Online] Available from: www.elsevier.com/locate/jenvman. [Accessed: 2009-11-16].
- Larson, K.L. & Lach, D. 2007. Participatory and non-participants of place-based groups: An assessment of attitudes and implications for public participation in water resource management. *Journal of Environmental Management*, 88(4):817–830. [Online] Available from: <http://www.sciencedirect.com.innopac.up.ac.za/science?> [Accessed: 2009-11-16].
- MDF. 2011. Decentralization Local Governance. [Online] Available from: <http://www.mdf.nl/page/MDF-SERVICES/Institutional-Development-Support>. Accessed: 2011-06-20]
- Meinzen-Dick, R.S. 2009. Coordination in natural resource management. In: Kirsten, J.F., Dorward, A.R., Poulton, C. & Vink, N. (eds.) *Institutional economics perspectives on African agricultural development*. Washington, DC: International Food Policy Research Institute.
- MICOA & INE. 2010. Compêndio de estatística do ambiente. Republica de Moçambique
- MOPH - Ministério de Obras Públicas e Habitação. Direcção Nacional de Águas. 1996. Monografia Hidrográfica da Bacia do Rio Limpopo. República de Moçambique
- Moss, T. 2007. Institutional drivers and constraints of floodplain restoration in Europe. *International Journal of River Basin Management*. 5(2): 121–130
- Newson, M. 1997. *Land, water and development: Sustainable management of basin systems*. 2nd ed. New York: Routledge.

NIDMP - Secretaria de Estado de Hidraulica Agricola, 1993a. Plano director nacional de desenvolvimento da irrigação. Relatório final. Resumo da bacia hidrográfica. República de Moçambique.

NIDMP - Secretaria de Estado de Hidraulica Agricola, 1993b. Plano director nacional de desenvolvimento da irrigação. Relatório final. Resumo fisicos e ambiente natural. República de Moçambique.

O'Neil, S. 2010. *A (very) brief journey through qualitative research*. Lessons on Research Methodology (EBW 801). Pretoria: Department of Marketing and Communication Management, University of Pretoria. [Online] Available from: <https://elearn.up.ac.za/webct/urw/lc4-120011.tpo/cobatmainframe.dowbct?JSESSIONDVISTA> [Downloaded: 2010-09-12].

Pavlikakis, G.E. & Tsihrintzis, V.A. 2003. A quantitative method for accounting human opinion, preferences and perceptions in ecosystem management. *Journal of Environmental Management*. [Online] Available from: www.elsevier.com/locate/jenvman. [Accessed: 2009-11-16].

Rogers, P. 1992. *Comprehensive water resource management. A concept paper*. (Policy Research Working papers 879). Washington, DC: The World Bank. [Online] Available from: <http://go.worldbank.org>. [Accessed: 2010-03-24].

Rosenberg, J. & Korsmo, F.L. 2001. Local participation, international politics and the environment: The World Bank and the Grenada Dove. *Journal of Environmental Management*, 62:283–300. Academic Press. [Online] Available from: <http://www.idealibrary.com>. [Accessed: 2009-11-16].

Rydin, Y. and Falleth, E. 2006. *Networks and institutions in natural resource management*. Edward Elgar Publishing. UK.

- Samad, M. & Vermillion, D. 1999. *Assessment of participatory management of irrigation schemes in Sri-Lanka: partial reforms, partial benefits*. (Research report no. 34). International Water Management Institute. Colombo, Sri-Lanka.
- Saunders, M., Lewis, P. & Thornhill, A. 2007. *Research Methods for Business Students*. 4th ed. London: Prentice Hall.
- Shen, D. 2003. Water rights and their management: a comparative country study and its implication for China. In: Figueres, C.M., Tortajada, C. & Rockstrom, J. (eds.) *Rethinking water management: innovative approaches to contemporary issue*. London: Earthscan Publications.
- Stefano, L. D. 2009. *Water governance: why does it matter and how can we measure it?* Notes on world water week session T6. [Online] Available from: [http://www.rewab.net/files/www_T6 %20 session_summary.pdf](http://www.rewab.net/files/www_T6%20session_summary.pdf). [Accessed: 2010-06-18].
- Sserunkuuma, D., Ochom, N. & Ainembabazi, J.H. 2009. Collective action in the management of canal irrigation systems: The Doho rice scheme in Uganda. In: Kirsten, J.F., Dorward, A.R., Poulton, C. & Vink, N. (eds.) *Institutional economics perspectives on African agricultural development*. International Food Policy Research Institute. Washington, DC.
- Strasheim, A. 2010. *What is a theory?* Lessons on Research Methodology (EBW 801). Pretoria: Department of Marketing and Communication Management, University of Pretoria. [Online] Available from: <https://elearn.up.ac.za/webct/urw/lc4-120011.tpo/cobatmainframe.dowbct?JSESSIONDVISTA> [Downloaded: 2010-09-12].
- Tellis, W. 1997. Application of a case study methodology. *The Qualitative Report*, 3(3) (September). [Online] Available from: <http://www.nova.edu/ssss/QR/QR3-3/tellis2.html>. [Accessed: 2010-09-22].

- Van Ast, J.A., Rosa, M.P. & Santbergen, L.L.P.A. 2008. Developments in participation within integrated water management. In: Meire, P., Coenen, M., Lombardo, C., Robba, M. & Sacile, R. (eds.) *Integrated water management*. NATO Science Series. (IV. Earth and Environmental Sciences, Vol. 80). Dordrecht, The Netherlands: Springer.
- Van Koppen, B., Giordano, M., Butterworth, J. & Mapedza, E. 2007. Community based water law and water resource management reform in development countries: Rationale, contents and key messages. In: Van Koppen, B., Giordano, M., Butterworth, J. (eds.) *Community based water law and water resource management reform in developing countries*. UK, USA: CAB International.
- Van Wilgen, B.W., Breen, C.M., Jaganyi, J.J., Rogers, K.H., Roux, D.J., Sherwill, T., Van Wyk, E., & Venter, F. 2003. Principles and processes for supporting stakeholder participation in integrated river management. Water Research Commission (WRC) Report No.1062/01/03. South Africa.
- Wahid, A.N.M. & Irshad, S.M. 2009. A critique of decentralization and participatory approach in delivering clean water: The case of rural India. *Indian Journal of Economics and Business*. Business Service Industry. [Online] Available from: <http://findarticles.com/articles/> [Accessed: 2010-04-18].
- Zwarteveen, M. & Neupane, N. 1996. Free riders or victims: Women's non-participation in irrigation management in Nepal's Chattis Mauja irrigation scheme. (Research report no. 7). International Irrigation Management Institute. Colombo, Sri-Lanka.
- Zhong, L.J. & Mol, A.P.J. 2008. Participatory environmental governance in China: Public hearings on urban water tariff setting. *Journal of Environmental Management*, 88(4):899–913. [Online] Available from: <http://www.sciencedirect.com>. [innopac.up.za/science](http://www.innopac.up.za/science) [Accessed: 2009-11-16].

7 APPENDICES

Appendix I: Matrix of variables of the institutional framework proposed by Blomquist, Dinar and Kemper, and the respective hypotheses

Variable set	Variable sub-set	Hypothesis
1. Contextual factors and initial conditions	1.1 Level of economic development within the basin	Decentralization initiatives are more likely to achieve sustainable success where the basin region is able to contribute some financial resources and other means to continue and consolidate the process.
	1.2 Initial distribution of resources among resource level stakeholders	Decentralization initiatives are more likely to succeed where the endowments among stakeholders do not interfere in the decision making process.
2. Characteristics of the decentralization process	2.1 Unilateral/mutually desired centralization process	Successful decentralization initiative is depend significantly on the decentralization of authority and responsibility from the centre, and the acceptability of these authority and responsibility by local stakeholders in the basin
	2.2 Central governmental recognition and incorporation of local-level communities of interest	decentralization initiatives are more likely to succeed in gaining stakeholder acceptance if they are based upon, and constructed from, traditional community governance institutions and arrangements
3. The internal configuration of resource-level institutional arrangements	3.1 Presence of resource-level governance organizations	Failure in the decentralization process is highly expected in river basins where basin governance institutions are up- sent; however, their presence is not a guarantee that the decentralization process will be successful
	3.2 Availability of forums for information sharing and communication	Successful decentralization and effective participation of stakeholders presupposes the existence of institutions whereby stakeholders articulate their interests, share information, communicate, bargain, and take collective decisions
	3.3 Availability of forums for conflict resolution	success and sustainability of decentralized management efforts also depend on the presence of forums for airing and resolving conflicts related to water allocation and quality
4. Characteristics of central government/resource-level relationships and capacities	4.1 The extent of decentralization	Successful implementation of the decentralization process depend on the characteristics of the basin-level institutional arrangements created by stakeholders and/or central government officials and with the level of empowered with more responsibility
	4.2 Financial control and financial resources at the resource level	basins where stakeholders accepted greater financial responsibility, the decentralization process and performance measures were increased



Variable set	Variable sub-set	Hypothesis
	4.3 Local-level experience with self-governance and service provision	The ability of stakeholders to perform successfully depends on the skills and practices they have developed along the time. So, successfully decentralization initiatives is positively related with the level of participation of the stakeholders, and the abilities they developed
	4.4 Presence/absence and characteristics of property rights regime	The presence of recognized rights on resource use contributes to a more sustainable use of the resource and to sustain the decentralization process

Appendix II: Survey instrument

Name of the interviewer: _____

Date of interview: |_|_| |_|_| |_|_|_|_|_|

I. Person interviewed

Name: _____

Tel: _____ Fax: _____

Function: _____

E-mail: _____

Province: _____

District: _____

Locality: _____

City: _____

III. Contact person

Name: _____

Tel: _____ Fax: _____

Function: _____

E-mail: _____

SECTION 1: IDENTIFICATION OF THE ORGANIZATION

a) Designation

Official: _____

Location: _____

Section 2: Description of the characteristics of the Limpopo River Basin;

2.1. River basin population: Total _____ Rural (%) _____

2.2. River basin geographical location including geographical boundaries:

2.3. Countries that sharing the basin:

2.4. River basin area (square km): _____

2.5. River basin main rivers: _____

2.6. River basin annual climate data (precipitation, temperature, evaporation)

2.7. River basin annual surface water resources (Million cubic meters per year):

2.8. River basin annual surface water availability per season:

Dry season (Million cubic meters) _____

Raining season (Million cubic meters) _____

2.9. Basin's surface water use types (e.g. domestic, industrial, irrigation, hydro, environmental use) and share of use:

User Types	Share of Basin Water (%)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

2.10. What is the share of types of water: Percentage (%) of users that use? Perceptual distribution of the use (surface water, ground water, both)?

Types of water	Percentage (0-100 %)
1. Ground water only	_____
2. Surface water only	_____
3. Both ground and surface water	_____
4. Other	_____
5. Other	_____
6. Other	_____

2.11. List and describe other river basin resources (vegetation and soil type, fisheries, and other natural resources)? _____

2.12. What is the distribution of basin land area per sector?

Sectors	Basin Area (km ²)
Agriculture	
Forestry	
Urban zones	
Other (name _____)	
Other (name _____)	

2.13. Irrigated area, and irrigated by crop.

Type of crop	Area (ha)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

2.14. What are the types and quantities of infrastructure (canals, reservoirs, dams, water treatment, etc.) including their capacity in the basin?

Type of infrastructure	Quantity	Capacity (m ³)
_____	_____	_____
_____	_____	_____

2.15 Basin land area utilised by various sectors?

Agricultural production: _____ Area (Km²): _____
 Animal production: _____ Area (Km²): _____
 Housing: _____ Area (Km²): _____
 Industrial: _____ Area (Km²): _____
 Other uses: _____ Area (Km²): _____

2.16 What is the total amount of water that enters the system (unit/year at Pafuri, Massingir and Changane catchments)?

Pafuri catchment (Million cubic meters): _____
 Massingir catchment (Million cubic meters) _____
 Changane catchment (Million cubic meters) _____
 Rain (cubic meters) _____

2.17 What is the amount of water consumed per year in (unit/year) for each user group and the share of use of the basin's water?

Domestic consumption: _____ Share (%): _____
 Animal consumption: _____ Share (%): _____
 Irrigation: _____ Share (%): _____
 Industrial: _____ Share (%): _____
 Other uses: _____ Share (%): _____

2.18 What is the amount of water that is lost to the sea per year (unit/year)?

2.19 Total amount of water available for irrigation in Chokwé irrigating scheme:

2.20 Water deficit problems for irrigation or industrial use, major occurrences and strategies applied to deal with the issue? _____

2.21 How many reservoirs exist in the basin and where are they located?

2.22 Storage capacity of each reservoir in: Dry season and in rainy season?

2.23 Have you ever registered deficits of water for users in the basin, and how often?

2.24 Is deficit of water a big deal in the basin? 1. Yes and 2. No. Why do you say that?

2.25. How good are the water-related infrastructures?

2.26 Where are industries located, and what problems do they bring to water streams and quality? _____

Section 3: Description of the decentralization process in the Limpopo River Basin;

3.1 Describe the development of water-related issues (laws, decrees, acts, etc.) in the country following chronological order

3.2 Have the local people contributed to the development of water-related issues (laws, decrees, acts, etc.)? 1. Yes; 2. No

3.3. If yes to question 2.2., who was more active in crafting the rules?

1. Politicians; 2. Government officials; 3. Traditional structure and local people

4. Other _____; 5. Other _____

3.4. How often are these rules broken by the local people?

1. *Never broken*; 2. *Seldom broken*; 3. *Regularly broken*; 4. *Not followed at all*.

3.5. In your opinion, did the present water laws contribute to decentralization of water resource management? 1. *Yes*; 2. *No*. Why? _____

3.6. Period (years) that the decentralization took place in the country: _____

3.7. What are the main objectives of the water laws in the country? _____

3.8 To date, are those objectives attained?

1. *Not at all*; 2. *25 % attained*; 3. *50 % attained*; 4. *75 % attained*; 5. *100 % attained*

3.9 What was the Year that the River Basin Organisation was created?

3.10 What was the type of decentralization of the River Basin Organisation creation?

1. *Top-down*; 2. *Bottom-up*; 3. *Both*

3.11 Who first came up with the idea of forming the River Basin Organisation?

3.12 Who created the River Basin Organisation?

1. *Government*; 2. *Private sector*; 3. *Civil society*; 4. *Local community*; 5. *NGOs*

6. *Other* _____

3.13 Role of the Organisation/Association/catchments agency:

1. *Co-ordination of activities in river basin*.....

2. *to setup rules and regulations*

3. *Resolve conflicts*.....

4. *Supply spare materials for maintenance of river basin infrastructure*.....

5. *Other* Specify _____

3.14 Have the local people contributed to the development of the River Basin Organisation?

1. *Yes*; 2. *No*

3.15 If yes to question 3.14, who was more active in creating the River Basin Organisation?



1. Politicians; 2. Government officials; 3. Traditional structure and local people
4. Other _____; 5. Other _____

3.16 What were the costs of creating institutions due to decentralization process?

1 none 2 Low cost 3 Medium cost 4 High cost

3.17 Describe the existing institutions that had to be dismantled in the decentralization process at national level. _____

3.18 Describe the new institutions that had to be created in the decentralization process including their role and administrative power in the country.

3.19 What are the existing institutions at river basin level that had to be dismantled in the decentralization process? _____

3.20 What are the new institutions at river basin level that had to be created in the decentralization process? _____

3.20a Can you name the new institutions created by the local people/local river basin stakeholders? _____



3.21 Indicators of problems **before** and **after** establishment of the RBO. Please check all that apply in the table below for each water resource problem in the river basin **before** and **after** the establishment of RBO, using the following choices: 1. *No response*; 2. *No problem*; 3. *Some problem*; 4. *Severe problem*

Water resource problem at the River basin	Before	After
Water scarcity		
Floods		
Environmental quality		
Land degradation (erosion, salinity, etc.)		
Water conflicts (water allocation, etc.)		
Water storage		
River ecology		
Other (specify)		
Other (specify)		

3.22 Describe the major water resource problems at the river basin **before** and **after** the decentralization process in terms of occurrence and consequences _____

3.23 Responsibilities for decision making **before** and **after** the creation of the RBO. Please indicate the share of decision making of different levels of governance (municipal, basin, provincial and national) for the areas (water administration, etc.) indicated in table below **before** and **after** the establishment of the RBO, using the following choices of share (in %) in decision making: 1. Not applicable; 2. 0 %; 3. 25 %; 4. 50 %; 5. 75 %; 6. 100 %

Responsibility for	Before				After			
	% at local level (e.g. municipality)	% at Basin level	% at state/provincial gov. level	% national gov. level	% at local level (e.g. municipality)	% at Basin level	% at state/provincial gov. level	% at national gov. level
Water Administration								
Infrastructure Financing								
Water quality enforcement								
Setting water quality standards								
Other (please explain)								

3.24 Describe the reduction in loss of production and productivity due to water scarcity or flooding **before** and **after** the decentralization process. _____

3.25 Quantify and describe disputes regarding water allocation or water quality **before** and **after** the creation of the River Basin Organisation. _____

3.26. Water Resource Management Instruments: Compare the situation **before** and **after** the existence of the RBO.

Section 4: Description of the internal configuration of basin-level institutional arrangements;

4.1 Have water user associations been established? **1. Yes** and **2. No**

4.1a If yes in question 4.1, how many and what are their degree of involvement (in percentage from (0-100 %) in water resource management?

4.2 If water user associations have not yet been established, what are the difficulties that have been encountered in this process? _____

4.3 In developing the river basin organisation, what are the difficulties that have been encountered in the process, if any? _____

4.4 What are the main objectives of the River Basin Organisation?

- 1. Flood control; 2. Water scarcity; 3. Water conflicts resolution; 4. Assuring water quality; 5. Other**

4.5 To date, are those objectives attained?

Objective	Level of attainment					
	N/A	0 – 24 % success	25 – 49 % success	50 – 74 % success	75 – 90 % success	91 – 100 % success
Flood control						
Water scarcity						
Water conflict resolution						
Assuring water quality						
Other						

4.6 Explain the process by which the Governing Body of the River Basin Organisation was selected. _____

4.7 Have the River basin organisations been formally incorporated into the institutional structure of river basin management? 1. Yes ... 2. No

4.7a If yes, what is their position? Add in the organogram if possible!

4.7b If no why? _____

4.8 Can you please provide a River Basin Organisation organogram?

4.9 Explain the roles of each element of the organogram: _____

4.10 Can you please provide the composition of governing body of the river basin organisation including the type of stakeholders (water users) that they represent as well as the level of education?

Name	Type of water user	Education
_____	_____	_____
_____	_____	_____

4.11 Extent/activities of private sector involvement in basin investments (e.g. water supply, water treatment, reservoir construction, basin infrastructure maintenance): Percent Private Involvement: _____ (1. Not applicable; 2. 1 - 24 %; 3. 25 - 49 %; 4. 50 - 74 %; 5. 75 - 90 %; 6. 91 - 100 %).

4.12 Does the River Basin Organisation have the necessary authority/independence in managing water resources? 1. Yes; 2. No. Why _____

4.13 Are there forums to hear disputes, how many and which ones?
1. Yes 2. No

4.14 If yes, who co-ordinates this?

1. Only government agencies.....
 2. River basin organizations and government agencies.....
 3. Only river basin organizations.....
 4. Non-governmental and government stakeholders.....
 5. Other type of co-ordination.....
- Specify: _____

4.15 Who participates?

1. Only government agencies.....
 2. River basin organizations and government agencies.....
 3. Only river basin organizations.....
 4. Non-governmental and government stakeholders
 5. Other type of participants
- Specify: _____

4.16 What are the main types of disputes/issues that usually need to be resolved?

4.17 How often these conflicts arise? 1. Never; 2. Rarely; 3. Often; 4. Very often

4.18 What are the challenges faced by the River Basin Organisation in resolving the conflicts?

4.19 Frequency of meetings with the River basin organisations?

1. None
2. Weekly.....
3. Monthly.....
4. Yearly.....
5. Other Specify: _____

4.20 What types of issues are frequently discussed on these meetings?

1. Politics and non water issues; 2. Some water issues; 3. Purely important water issues
4. Other _____; 5. Other _____

4.21 What is the percentage of time allocated to each of the following issues at these meetings?

Meeting issue	Percentage (%)
1. Politics and non water issues	_____
2. Some water issues	_____
3. Purely important water issues	_____
4. Other_____	_____
5. Other_____	_____

4.22 Information sharing among all stakeholders (meetings, annual reports)? ____

4.23 Co-ordination of activities with river basin organizations and other water-related institutions (how does co-ordination occur?) _____

4.24 What are the responsibilities of the local government agency that overlap with the responsibility of ARA –Sul? _____

4.25 What are the responsibilities of the ARA that overlap with the responsibility of RBO?

4.27 Does the organisation participate in forums of River basins organisations?

1. Yes..... 2. No.....

If yes, which)? _____

If no, why not? _____

4.28 How does the RBO monitor the basin conditions, and the behavior of the other organisations, as well as the central authority? _____

4.29 How conflicts are resolved among members and with other organisations?

4.30 Information sharing among all stakeholders (meetings, annual reports, websites):

4.31 How often does the River Basin Organisation call for a meeting?

1. Never; 2. When need rise; 3. Twice a year; 4. Quarterly; 5. Monthly 6. Other

4.32 What are the other forms of information sharing among stakeholders (annual reports, websites, radio, etc.) and explain their effectiveness in communicating to all stakeholders?

4.33. Water Resource Management Instruments: Compare the situation **before** and **after** the existence of the RBO? _____

Section 5: Relationship and capacities of the institutions involved in management of the river basin

5.1 How are water basin organisations enforced?

- 1. *Law*
- 2. *Tradition*.....
- 3. *Norms of trust*.....
- 4. *Culturally*.....
- 5. *Other type of enforcement*.....

Specify: _____

5.2 What type of support does the central or local Government provide to enforce or strengthen river basin organisations/water users associations?

- 1. *None*
- 2. *Funding*.....
- 3. *Training*.....
- 4. *Workshop*.....
- 5. *Other type of support*.....

Specify: _____

5.3 Enforcement of the river basin organizations (cost of decentralization process)?

- 1. None 4. Moderate.....
- 2. Very low..... 5. High.....
- 3. Low..... 6. Very high.....

5.4 Explain the laws and decrees that govern the River Basin Organisation. (how are structures and responsibilities set?): _____

5.5 Are there some decisions made by the River Basin Organisation delayed by the government? 1. Yes; 2. No

5.6 If yes to question 5.5, how do you rate the impact of these delays on service delivery? 1. None; 2. Moderate; 3. Severe

5.7 Explain the process by which the Governing Body of the River Basin Organisation was selected? _____

5.8 Explain the system of water rights prevailing in the basin? _____

5.9 Does the River Basin Organisation have human capacity to manage water resource at basin level? 1. Yes; 2. No

5.10 Are there capacity building programmes for the River Basin Organisation's stakeholders? 1. Yes; 2. No. If yes, explain the types of capacity building (training courses, seminars, study tours, etc.)?

5.11 Strategies for financial sustainability of the organization

1. *Members contributions*
2. *Income generating activities of the organisation*.....
3. *Governmental support*
4. *Donations*.....
5. *Other forms*..... *Specify* _____

5.12 What is the annual budget of the river basin organisation? _____

5.13 What are the major sources and their contribution for the annual budget?

Sources	Percentage (0-100 %)
Government	
Private sector (name_____)	
NGOs (name_____)	
Stakeholders at River Basin	
Other (name_____)	
Other (name_____)	

5.14 What is the distribution of the annual budget in percentage among different activities at River Basin?

Activities	Percentage (0-100 %)
Investment	
Development	
Water quality	
Capacity building and meetings	
Other (name_____)	
Other (name_____)	

5.15 Do you measure your basin's revenues? 1. Yes; 2. No

5.16 If yes in question 5.15, please indicate the basin's yearly revenues and the basin population in the past five years

Year	Revenues	River Basin Population
2010		
2009		
2008		
2007		
2006		

5.17 What is the value of the river basin's revenues by sector?

Sectors	Revenues
Agriculture	
Forestry	
Industry	
Other (name_____)	
Other (name_____)	

5.18 What is the value of water Tariffs for different water users/collection of revenue from services (if possible provide rates for various major users)

Water Users	Water tariffs
Irrigation	
Industry	
Domestic	
Other_____	
Other_____	
Other_____	
Other_____	

519 Can you indicate the percentage of users paying tariffs for the different water users? Indicate in table below using the following choices of percentage of water users paying tariffs: 1. Not applicable; 2. 1 - 24 %; 3. 25 - 49 %; 4. 50 - 74 %; 5. 75 - 90 %; 6. 91 - 100 %

User group	Percentage who pay
Irrigation	
Industry	
Domestic	
Other_____	
Other_____	
Other_____	
Other_____	

5.20 What percentage of the tariff payments stays in the basin and what percentage goes to other destinations? What destinations? _____

5.20a. Percentage of tariffs staying in the Basin: 1. Not applicable; 2. 1 - 24 %; 3. 25 - 49 %; 4. 50 - 74 %; 5. 75 - 90 %; 6. 91 - 100 %.

5.20b. Percentage of tariffs going to other Destinations: 1. Not applicable; 2. 1 - 24 %; 3. 25 - 49 %; 4. 50 - 74 %; 5. 75 - 90 %; 6. 91 - 100 %.

5.21 What are the destinations of water tariff _____

5.22 Where funds for maintenance of water-related infrastructures come from?

1. *Members contributions*
2. *Income generating activities of the organisation*
3. *Governmental support*
4. *Donations*.....
5. *Members contributions and governmental support*.....
6. *Other forms*..... Specify _____

Section 6: Degree of stakeholder participation in decision making, conflict resolution and in maintenance and rehabilitation of water infrastructures

6.1 Role of the River Basin Organisation in the decision making process

1. *To do what it is told to do by the central authority*
2. *to provide information to help central authority to take decisions*.....
3. *to be consulted by the central authority when they are taking decisions*
4. *to advise the central authority during the decision making process*
5. *Participate in decision making process as a co-decision maker*
6. *Take the initiative to start projects to improve River basin management efficiency*

6.2 Your perception about stakeholder participation in decision making process

1. *No participation*.....
2. *Poor participation*.....
3. *Moderate*
4. *Good participation*.....
5. *Very good participation*

6.3 Can you rate the level of participation of RBO in maintenance of water-related infrastructures (0-100 %) _____

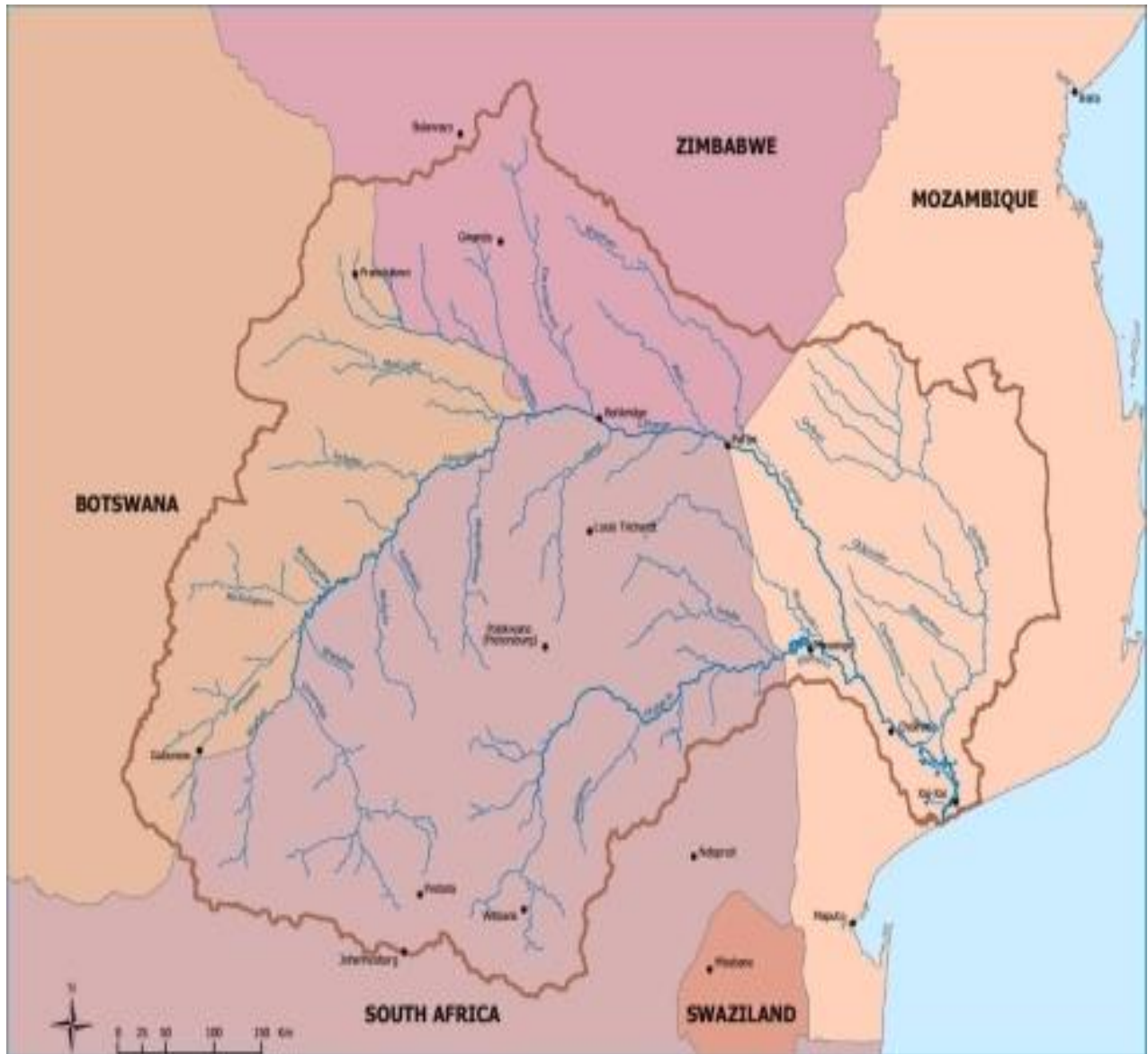
7. BASIN COMPARISONS

7.1. In your opinion, are there some characteristics about this river basin that make it different from other basins in the country? 1. Yes; 2. No

7.2. If yes in question 7.1, what are these characteristics and can you please mention the strengths and weaknesses of these characteristics?

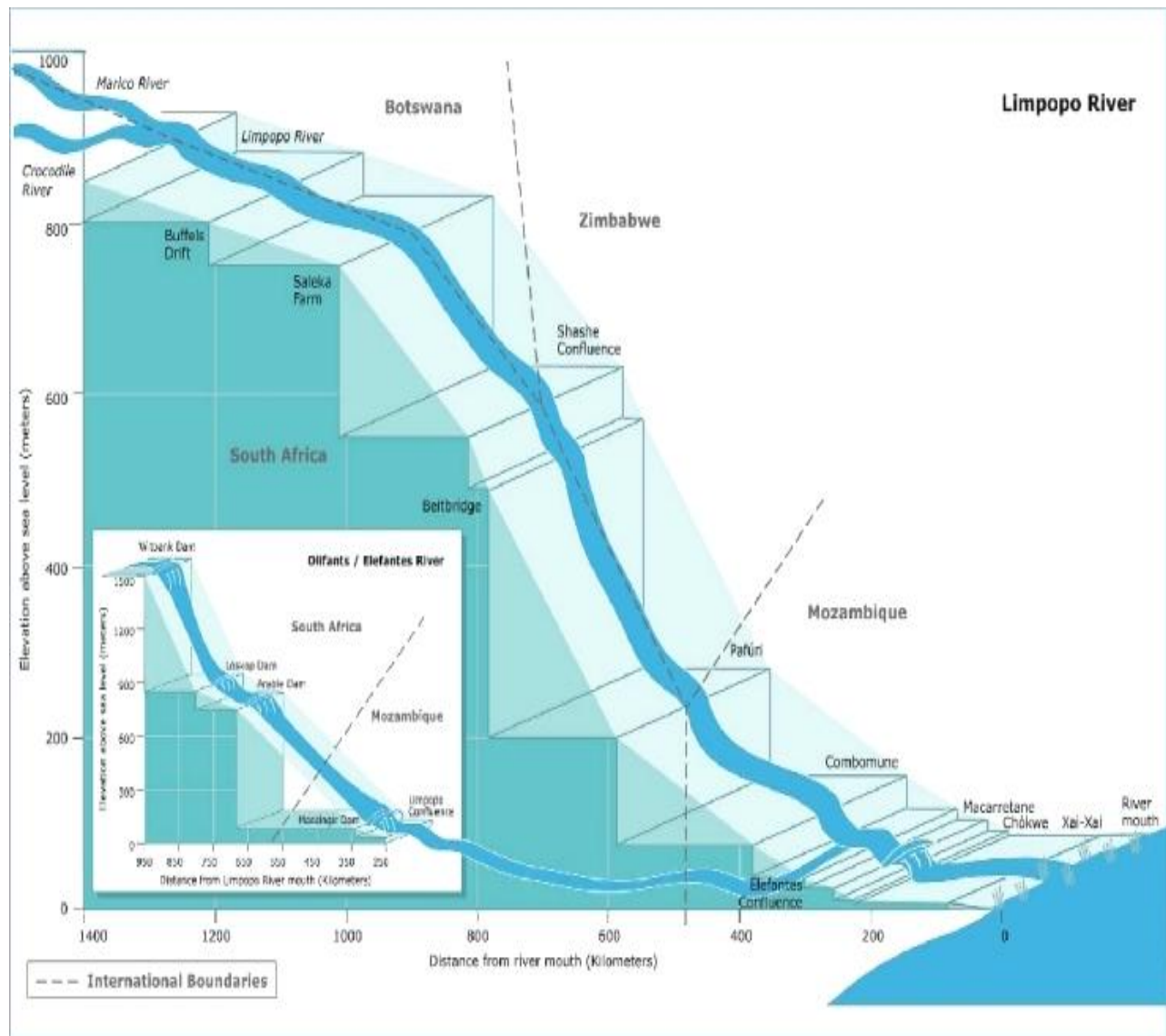
7.3. Any comments or clarifications including annexed material you think may be of value?

Appendix III: The Limpopo River Basin



Source: INGC, UEM and FEWS NET (2003:27).

Appendix IV: Main catchments areas of the Limpopo Basin in Mozambique



Source: INGC, UEM and FEWS NET (2003:28).