



# **LAND AND WATER GOVERNANCE AND PROPOOR MECHANISMS IN THE MOZAMBICAN PART OF THE LIMPOPO BASIN: BASELINE STUDY**

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This literature review aims

- to delineate the main ecological, social, political characteristics of water management in the Limpopo basin in Mozambique at the different scales (from plot to basin level);
- To assess the information gaps and need for further information concerning the social and political dimension of water management and governance.

It studies the Mozambican part of the Limpopo Basin, which represent 19 % of its 412 000 km<sup>2</sup> surface, which lies mostly in two provinces: The Gaza and Maputo province. A large part of the area studied faces **semi arid conditions**.

Population density is low in most rural and remote districts and tends to concentrate along rivers and main roads. Thus, only 4 % of the territory is actually cultivated. But population growth rate is high with for example a growth rate of 2,4% per annum in the Gaza province, which is actually highly variable depending of the district (see table 1).

**Table 1 : Some population data in some of the districts of the Limpopo Basin (From Bakker and Teyssier 2010)**

District	Surface (Km <sup>2</sup> )	Population 2007	Population density	Population 1997	Growth rate 1997-2007
Guija	4 207	75 306	17,9	57 217	31%
Massingir	5 893	28 701	4,9	22 284	29%
<b>Mabalane</b>	<b>9 107</b>	<b>32 067</b>	<b>3,5</b>	<b>25 464</b>	<b>26%</b>
Chicualacuala	18 155	38 917	2,1	33 284	17%
Massangena	7 481	15 780	2,1	13 300	19%

Fonte: População 2007: Censo Geral da População 2007, INE Área e população 1997: perfis distritais, MAE, 2005

Though Mozambique has enjoyed a high economic grow rate in the last 15 years, it remains one of the poorest countries in the world and 75 % of the population considered as poor. Ten million people of the Gaza province are estimated to live still in extreme poverty. Access to water and sanitation is still a major issue and only 4 % of the populations have access to sanitation (DFID, 2011).

Agriculture is the main activity in the basin and 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 (Matsinhe, 2011)

Water access and control depends on different factors: water availability, infrastructure and governance dimension both of water, land and infrastructure management. The information available concerning this different dimensions are being reviewed and synthesized.

# 1 THE FORMAL INSTITUTIONAL GOVERNANCE FRAMEWORK

This part presents the different regulations that impact water management either water resources or water services. It includes: the territorial and administrative management framework, the international institutions and regulations concerning water and the national ones, the land governance framework and the risk governance framework.

The annex (**Erreur ! Source du renvoi introuvable.** and **Erreur ! Source du renvoi introuvable.**) identifies the legal framework for environmental issues in Mozambique and the following table summarizes the overarching institutional framework for water in the country.

**Table 2 : The multi-level institutional framework for environmental issues of Mozambique**

	regulations	supranational institution	national institutions	decentralized institutions	Key local Institution
Overarching policy	PARPIII 5 years government Plan	SADC			
Water Management	- Lei das Aguas 1991 - Politica Nacional de Aguas 94 revised 2007 - Groundwater (DM 83/2002 Chapter I art 1)	LIMCOM	DNA – MICOH	ARA Sul HICEP FIPAG XAI XAI	- WUA (Chokwe) - Water committee - Partnerships farmers-companies - Farmers association
Territorial and land Management				Provincial government District - PEDD	- Village Chief -Party representative -Farmers association
Risks and natural disaster	National Water Policy for Disaster		MICOA INGC CONDES		
Others			INAM		

## 1.1 TERRITORIAL AND ADMINISTRATIVE GOVERNANCE

### 1.1.1 Provincial level

Most of the Mozambican part of the Limpopo basin lies in the Gaza province and the water bodies runs through 8 districts (Chicualacuala, Massingir, Mabalane, Guija, Chokwe in the Upper and medium Limpopo; Bilene, Xai-xai, Chibuto in the Lower Limpopo) and 5 municipalities (Chokwe, Xaixai).

Even if provincial authorities have great autonomy it remains subjects to an administrative central tutelage (Uandela, 2010). The governor (which is named by the President of the Republic) names the provincial directors which are being proposed by their respective Ministry. Five provincial secretaries has activities related to water: Directoria Provincial das Obras Publicas e Habitação; Directoria Provincial do Plano e Finanças; Directoria Prov. Para Coord. da Acção Ambiental; Directoria Provincial de Agricultura; Director Provincial das Pescas.

### 1.1.2 District level

Districts are divided in **administrative posts**, locality, villages and settlements (*posto administrativo, localidades, aldeias e povoações*). At these level (community), different types of authorities can be recognized as **communities authorities** (*autoridade comunitaria*) such as traditional authorities such as land chief or representatives of the administration (village chief, neighborhood secretary - of the party, block chief ) (*regulos, chefe de terras e secretaria de bairros*) – see Traditional authorities page 11 for more information. Until 2003, village secretaries were appointed by the ruling parties until local election were undertaken to design community authority as part of the decentralization process.

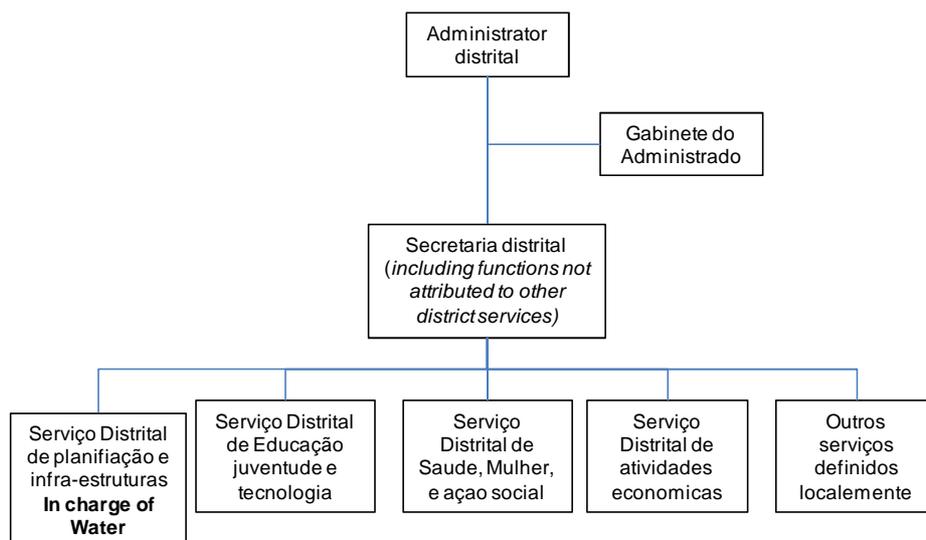
Mabalane is divided in 3 sub administrative areas and have 3 traditional chiefs and 2 district secretaries (*secretarios de bairros*) which are:

- Sede: Mabalane Sede, Nhatimamba, Tsocate
- Combomune: estação, Rio
- Ntlavenhe: Ntlavenje, Chipswane

Each district elaborates **District Strategic Development Plans** (*Plano Estrategico de desenvolvimento Distrital ou PEDD*) but only a few district in the Gaza province including the Mabalane district have elaborated its PEDD

The **district administration** counts 16 employees, 2 only being middle technicians. It is divided into an administrator, and 5 district directions (agriculture and rural development, education, health, culture and youth, women and coordination of social action). Thus local leaderships encompasses traditional leaders, church and school committee, district administrator and local party representative (Perfil do Distrito de Mabalane, 2005)

Figure 1 : District organigram

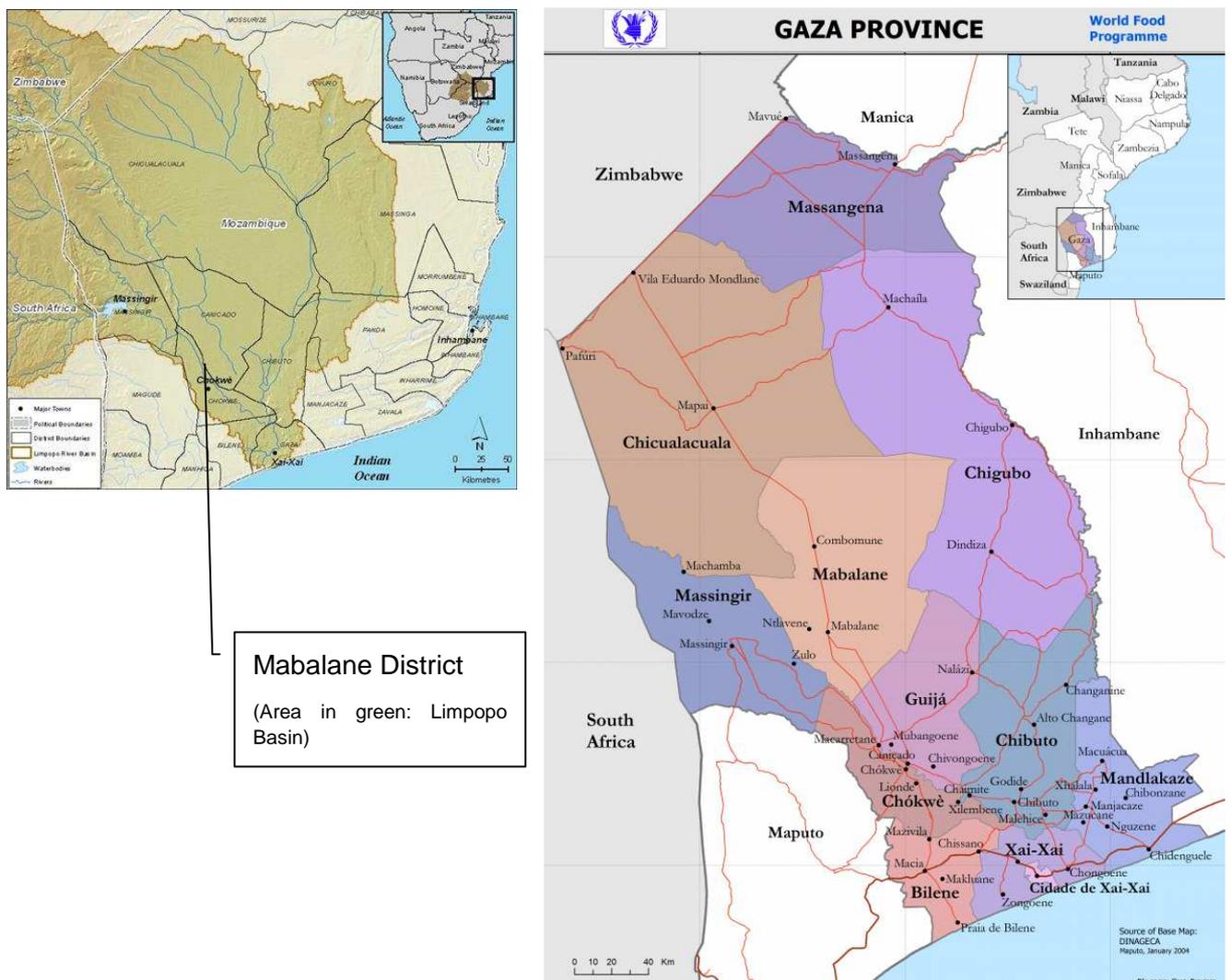


Extension services in the district counts 15 people of which 6 are civil servants and 8 from NGO's. The PEDD identifies 2 main NGOs active in the district: LWF<sup>1</sup> (with activities related to support to agriculture, health and education and caritas<sup>2</sup> (agriculture)

Community and leaders are officially organized in **Natural Resources Management Committee** (*Comités de Gestão de Recursos Naturais*) which are 14 in the Mabalane district. The PEDD also report 11 institutions of participation and community consultation (Comunitárias (Conselhos Consultivos): 1 at district level, 3 at Posto Administrativo levels e 7 in localities. Forums in each village are also mentioned.

The district profile states that only 40 % of the population was reported to have organized water access in 2006 (19 % through wells and small sources, 8 % through collective tap water and 1 % thanks to individual tap water - mostly in the city of Mabalane). Sixty percent of the population of the district depends on superficial water bodies for water access.

**Figure 2 : Localization of the Mabalane District in the Limpopo Basin and Gaza Province**



**Mabalane District**  
(Area in green: Limpopo Basin)

<sup>1</sup> In the following village : Pfkwe, Tsocate, Chinhequete, Covela, Mahunhane, Munging

<sup>2</sup> Chinhequete, Kokwe, Zona 8, Combomune –Rio

### 1.1.3 The Limpopo National Park

Part of the district of Mabalane is included in the Limpopo National Park. This park has been developed has a concrete example of international cooperation between Mozambique, RSA and Zimbabwe in the context of the post-apartheid regime and end of the civil war in Mozambique. It was initiated 1998 with the support of an NGO (Peace Park Foundation - PPF). But political and ideological pressure to speed up the process and lobby of this NGO led to the transformation of initial project of a transfrontier conservation area of a transfrontier park<sup>3</sup>, although Mozambique officials pushed for the former option. Donors also insisted that no forced removal would be undertake for the 27 000 people that lived in the area (mostly along rivers in particular the Limpopo and Shingwedzi rivers) and that broad consultation would be undertaken with committees in case of resettlement to discuss notably the compensation.

The park was officially created in 2001 on an area used by the Portuguese colonial regime as an hunting zone (or Coutada 16) (Nhancale, 2007). A project Management Unit (PIU) is in charge of the management with a South African project coordinator from the PPF NGO and park warder appointed by the Mozambican government. This governance framework gives the NGO an important power in the management of the park (Spierenburg et al., 2008). Management committees were created but none of the finally institutionalized ones had the mandate to deal with community issues. The PIU is directly under the authority of the Ministry of Tourism.

Analysis of the governance of the park has underlined that local government (that is district representatives and/or traditional authorities) have in fact lost jurisdiction in the area and communities voice have been actually little heard in the park development<sup>4</sup> and management (Spierenburg, 2008)(Nhancale, 2007). *“They are under-represented, under-respected, under-skilled and under-ressourced actors in this power games”* (Spierenburg, 2008). Local authorities have only been involved in later stage of the process to mobilize and inform communities. Although communities did not want to leave originally the intensified human-wildlife conflicts they are facing due to the removal of fences are leading them to be more willing for “voluntary” resettlement in other areas. (Leeuwis and Milgroom, 2010).

Management committees have been established in all villages. Some members of these villages committees are participating in the district committee and two members of each district committee have been elected to to constitute the park committee (made of 6 members) (Nhancale, 2007). The institutional functioning of the park is presented in Annex

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<sup>3</sup> No population is supposed live in a park, while population may remain in a conservation area.

<sup>4</sup> Nhancale (2007) mentioned than that the park was proclaimed by the Mozambican council of Ministers the same day that a consultation workshop with stakeholder was conducted in Xai Xai and local gouvernement both at district and provincial level were not involved in the park development leading to conflict between government authorities and PIU...

Figure 3 : Park management institutions (From Nhancale, 2007)

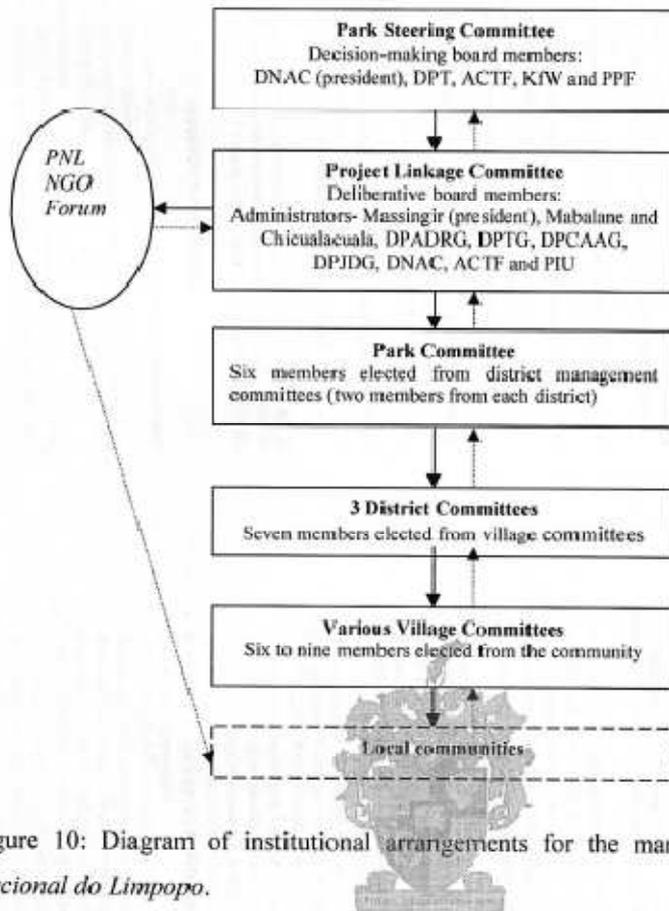


Figure 10: Diagram of institutional arrangements for the management of *Parque Nacional do Limpopo*.

Legend:

DNAC – *Direcção Nacional de Áreas de Conservação* (National Directorate for Conservation Areas).

DPT – *Direcção de Promoção Turística* (Tourism Promotion Directorate).

ACTF – *Áreas de Conservação Transfronteiriça* (Transfrontier Conservation Areas)

KfW – German Bank for Development.

PPF – Peace Parks Foundation.

DPADRG – *Direcção Provincial de Desenvolvimento Rural de Gaza* (Gaza Provincial Directorate for Rural Development).

Spierenburg (2008) also report than a **NGO forum**<sup>5</sup> was created in order to try and secure funding to facilitate coordination and provide better services to the communities. Seven NGOs are reported as active in the areas with activities ranging to the development of infrastructure (such as school and hospitals), interpretation and dissemination of new land law, information and “education” of communities (Nhancale, 2007)

<sup>5</sup> Comprising seven national NGOs (Organização Rural de Ajuda Mutua ou ORAM, Forum para Natureza em Perigo ou FNP – secretaria do Forum, União Nacional de Camponeses ou UNAC; Caridade Christã ou Caritas – Chokwe; Justiça e Paz de Xai Xai, Serviço civil pela Paz,; Reconstruindo a Esperança (RE). Three international NGOs : African Wildlife Foundation AWF, International Union For Nature Conservation ou IUCN –Mozambique an Veterinarian Aid ou VETAID Mozambique.

Population that are living on the margin of the Shingwedzi river in the heart of the park should be removed toward the Elefant rivers but the population living on the margin of the Limpopo will be maintained: accompanying measures of the development of the park includes support to small irrigation for this communities<sup>6</sup>. A grade will be built in the southeastern corner of the park between the Limpopo rivers and the Elephant river. Nhancale (2007) mentioned a lack of transparency and clarity on compensation. Although poor community did not want to leave originally the intensification human-wildlife conflict due is leading more and more people to accept the idea of moving (Leeuwis and Milgroom, 2010)

The legal framework (Diploma Ministerial 93/2005 relative to the right of local communities on Mozambican State Tax) grants **20 % of revenues from wildlife and forest resources**<sup>7</sup> to local communities, the funds aiming to promote local development. But this fund is not yet being used by community for different reasons among which formalization of their organization

## 1.2 LAND MANAGEMENT

As other countries of the Limpopo Basin, Mozambique is characterized by the existence of a dual system of customary and statutory land tenure.

The Land Policy (1995) and the Land Law (19/97) confirms that all land in Mozambique is State property. The land law protects the citizens' rights (against notably more commercial enterprise) by allowing obtaining a right to use and exploit the land (DUAT – Direito de Uso e aproveitamento da Terra). Land use rights may be acquired through 3 main mechanisms 1) occupation according to customary norms and practices 2) good faith occupation of land previously used by other for a minimum time occupation (10 years) with no contestation or claim by other 3) through the formal request to the state by investors. The constitution confers locally a real sense of security (Nhancale, 2007).

DUAT can be attributed to an individual or to a community – provided the land is being efficiently used according to normal practices and not against the constitution (Manjate, 2010). The Mabalane district for example has already emitted 29 DUAT's (PEDD Mabalane, 2008)

Local community and administration plays a central role in the Land law: Community can be given long term land use rights and use right to resources connected to the land including water. But this land use right has to be formalized through a process of community delimitation or land demarcation, a complex and expensive process that can face various bureaucratic delay.

Private investors system usually use the statutory system to get access to land: Provincial government can grants titles to areas from 0-1000 ha, the Ministry of Agriculture to areas of 1000 to 10000 ha and the council of Ministries to areas above 10000 ha. Communities are supposed to be consulted prior to approving a concession and title as well as participate to resolution of land and resources conflicts with private interest (Tique, 2002). Private sector must register the holding, acquire a title and pay a land tax. The title guarantees security of tenure.

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<sup>6</sup> These activities are supported by the French Aid agency (Agence Française de Developpement – AFD)

<sup>7</sup> Known as the “o mecanismo de canalização dos 20%”

Most of the time smallholders and communities relies on customary tenure regimes (Tique, 2002)) At household level and in a context of general shortage of labour power in the peasant sector, the capacity to use the land is one of the key determinants of landholding. Locally land are inherited or distributed by the chief, notably low-land: those who have better relationships with the traditional authority in charge of land distribution are thus favored notably by getting access to better land that is land with water access (Osbahe et al., 2008, Tique, 2002). In the family sector and community security of tenure is guaranteed by occupation, community membership and may be strengthened by planting trees. With the local leaders' knowledge foreigners from the community can acquire the right to use community land.

Land access can also be related to particular arrangement between families. Manjate and Magaia (2010) mentioned for example that surface cultivated by large farmer tend to increase during the rice season which suppose some form of arrangement between farmers (Manjate et al., 2010). Tique (2002) reports possibility of borrowing and the existence of land market within community or between community and foreigner. Within community the sellers are often young people wanting money to move to urban area or South Africa and buyer older people. Arrangement between communities and private investors are also possible. The private investor is often asked to provide some kind of compensation for exchange of the piece of land which is often based **in kind for example in equipment**. Conflict emerged when the private investor for example do not comply with its promise. Tique underlines that one of the question is who represent the communities on the land negotiation and transaction and raises the issue of the legitimacy of the leaders involved in the discussion (see part) .

### 1.3 TRADITIONAL AUTHORITIES

Nhancale (2007) reports that Portuguese colonial administration destroyed the traditional authorities and replaced them in rural areas by *regulados*, a mix of customary authorities and imposed colonial local administration, whose tasks were strictly colonial (such as tax collection). When possible the administration used pre-existing local traditional leaders. The FRELIMO abolished the *regulos* system and replaced it by “*grupos dinamizadores*” (dinamizing groups) with their *Secretarios* and local assemblies. But the banned institutions based on kinships and hereditary succession continued to exist and to play a central role. Defiance to “the modern administration system” imposed by the FRELIMO government was actually used by RENAMO as the core strategy in rural area (Earle et al., 2006). This organization supported the revival of traditional structure and religions in order to get support of rural communities.

**Table 3 : Different types of local leaderships (Nhancale, 2007)**

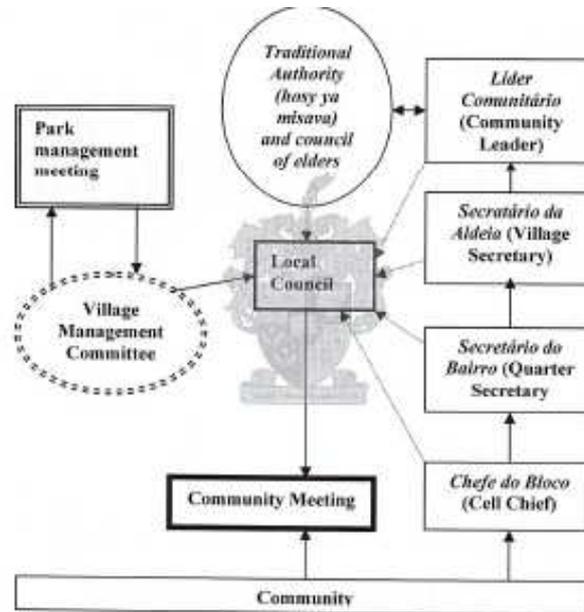
Type of Leader	Comments and tasks
Community Leader	Elected by the local community, a newly established authority at the grassroots complying with the new traditional authority legislation, the Decree no. 15/2000. Locally is known as "hosi ya mudjeke " (the flag leader) because he/she displays the Republic' s National Flag daily at his/her homestead , wears a uniform and emblems of the Republic.
Secretario da aldeia (Village secretary)	FRELIMO ' s ( Frente de Liberaçãp de Mocambique) elected leader (village secretary) after independence, is responsi b l e of the <i>aldeia</i> (village).
Secretaries dos Bairros (quarter secretaries)	They are under the supervision of secretario da aldeia and they are bairros (quarter responsible for the bairro (quarter) within the aldeia (village) s
Chefes do bloco (cell chiefs)	They are under the secretario do bairro and they are responsible for chiefs) a bloco (cell) within the bairro (quarter)
Secretari o do Partido	FRELIMO' s political party representative, interacts with all (party secretary) 'government' members in the village. The tasks are to get members for the party and to mobilise the community to vote for his/her political party
Other party representative	When declared opposition party is represented in the villages (for example RENAMO)
<i>Hosi ya misava</i> Traditional land chief or "land owner"	supported by a (traditional land chief council of elders (a group of mostly elderly men who assist and or "land owner") advise the traditional land chief). The councillors know of the traditions and the history of traditional power. The hosi ya misava deals with the issue of land and traditional/cultural ceremonies. He controls access to land and forest resources

Decentralization approaches and introduction of multi party system led to a new position toward traditional authorities who are again being recognized<sup>8</sup> (Nhancale, 2007). Concretely different types of local authorities and leader currently co-exist in rural areas as presented in Table 1 which can locally lead to conflicts. Some authors points out to the effort of the government to better involve traditional and local governance structure un decision making at national level (Earle et al., 2006).

This different authorities cooperates through within the existing participatory management structure that exists in the village as for example in the village of the Limpopo park (Figure 2)

<sup>8</sup> Decree n°15/2000 about local state authority which recognizes the role of community authorities in controlling natural resources

Figure 4 : Natural resources management governance in the village of the Limpopo park.  
(Nhancale, 2007)



Earle and al also mentions the existence of **various customary water management arrangements** in Mozambique varying from province to province depending on the tradition and cultural values. Customary law distinguished between private and community ownership with water considered as a community resources that everybody can use freely (Ibraimo, 1999) cite by Earle 2006 but information on these aspects is scarce.

## 1.4 WATER GOVERNANCE FRAMEWORK

### 1.4.1 International Water Governance

Water management of the Limpopo basin comes under **SADC protocol on shared water resources**. The SADC Water Sector Coordinating unit was established in 1996 that is 16 years after the foundation of the Southern African Development Co-ordination Conference (FAO, 2004). The protocol itself, which is aligned with other international legal instruments such as is the United Nations Convention on the Law of the Non-navigational Uses of International Watercourse (UN, 1997), was signed in 2000. It is designed to help SADC member countries<sup>9</sup> to manage transboundary water resources **in drought prone areas** in order to meet human development needs while protecting the ecosystem (Amaral and Sommerhalder, 2004). It came into force officially only official 2003.

Despite the conflictive and troubled relationships that prevailed between the different bordering countries of the Limpopo basin until the 90's decade, cooperation between countries concerning the management of shared watercourses have long relied **on bilateral agreements** (table 5). The change of regime South Africa in the 90's opened the door to improved cooperation and implementation of multilateral agreements. It resulted in the establishment in 1986 of **the Limpopo Basin Permanent Technical Committee (LBPTC)** which was turned into a commission (LIMCOM) in 2003. In 2011 Zimbabwe finally ratified the agreement and thus the LBPTC has just been turned into the Commission (LIMCOM).

Although some agreements for international cooperation over transboundary water were signed during the years of conflicts, the functioning of some of the institutions often remained unsatisfactory due to the political situation between the countries involved. This was notably the case of Tripartite Technical Committee (TPTC) to manage the Inkomati, Limpopo and Maputo River Basins as well as initially the LBPTC multilateral accord. The latter was reactivated in 1995; In the recent years it has been assessed to have worked reasonably well in terms of producing reports, sharing some data and establishing better communication (Merrey, 2008). However there is **no agreement specifying transboundary flow requirements and Limpopo hydrological data are contested**.

Only a small number of the agreement specifies water allocation agreement : as far as the Limpopo is concerned this only concerned the allocation between South Africa and Bostwana (1988 agreement and the 1989 MOU which divided the shared water equally) (Kistin et al., 2009). The Inkomati and Maputo basin agreement of 2000 also includes water allocation specification and outlines a detailed flow regime. The principle of "equitable and reasonable utilization" enshrined in global and regional water agreements and international water law has been adopted in many bilateral and basin wide agreements.

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<sup>9</sup> Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe

**Table 4 : the Different international agreement relative to shared waterscourse involving Mozambique - adapted from (Amaral and Sommerhalder, 2004, Turton, 2005)**

	Countries involved	Name	Comments
1926	South Africa Portugal	South Africa-Portugal Treaty	
1964	South Africa Portugal	Second Water Use Agreement	Colonial agreement speaking of "rivers of mutual interest" between Portugal and South Africa.
1967	South Africa Botswana	sharing of the basin between Botswana and South Africa	
1971	Mozambique South Africa	Massingir agreement Treaty	Construction of the Massengir Dam
1983	South Africa Botswana	Creation of the Joint Permanent Technical Committee (JPTC)	Within the scope of river of mutual interest
1983	Mozambique, South Africa Swaziland,	Establishment of the Tripartite Permanent Technical Committee (TPTC) to manage the Incomati, Limpopo and Maputo River Basins,	Excluding Zimbabwe (in war with South Africa at the time) recommendations on the management of the water shortages being experienced in the Limpopo, Incomati and Maputo Rivers
1988	Botswana South Africa	Bilateral agreement for the transfer of the water for domestic use from the Molatedi dam to the Marico tributary	
1986	South Africa Botswana Mozambique Zimbabwe	Establishment of the Limpopo Basin Permanent Technical Committee (LBPTC)	To advise the parties on issues regarding the common use of the river both to improve water quality and quantity, largely focused on the management of water shortages
1995	South Africa Botswana Mozambique Zimbabwe	Reactivation of the LBPTC	
1996	Mozambique South Africa	Agreement the South Africa/Mozambique Joint Water Commission Agreement.	
1997	South Africa Botswana	Establishment of the Joint Permanent Commission for Cooperation (JPCC).	broader than water
2003	Botswana, South Africa Mozambique	Establishment of Limpopo Watercourse Commission LIMCOM	Technical Committee for the Limpopo was turned into a commission (
2004	Botswana, South Africa Mozambique Zimbabwe		Zimbabwe joins in Limpopo Watercourse Commission
2011			The 4 countries have ratified the LIMCOM agreement. LIMCOM officially operates.

At international level, a number of other organizations and institutions are also influential for water anagement such as the African Unification Front, the African Ministerial Council on Water, which are supported by the African Development Bank, the European Union, and the

World Bank (Amaral and Sommerhalder, 2004)). Swatuk established a list of stakeholders involved in water management at national level (Swatuk, 2010). The most influential ones (Central Government, Department Ministeries of Water Affairs, SADC president, SADC water division, Mining and Commercial Farming Sector, Multilateral Banks) were involved in powerful ‘tecnocentric coalitions’ supporting the development of large scale infrastructure development, in particular dam building and water transfer scheme, to which the ecocentric (environmental oriented) actors such donors agencies and international environmental agencies had difficulties to compete. These latter actors were nonetheless able to introduce aspects of the ecocentric arguments into government decision-making process.

It is also important to understand that South Africa occupies an hegemonic position across SADC countries and sectors in term of economic power and human, financial and technical resource capacity, and this country drives the regional integration agenda. (Swatuk, 2010). But it also is the main bulk water users and pollution contributor. Consequently the position of Mozambique, the less developed countries of the 4 riparian countries of the Limpopo basin, directly downstream to South Africa is a difficult one

#### **1.4.2 Governance of Water Resources**

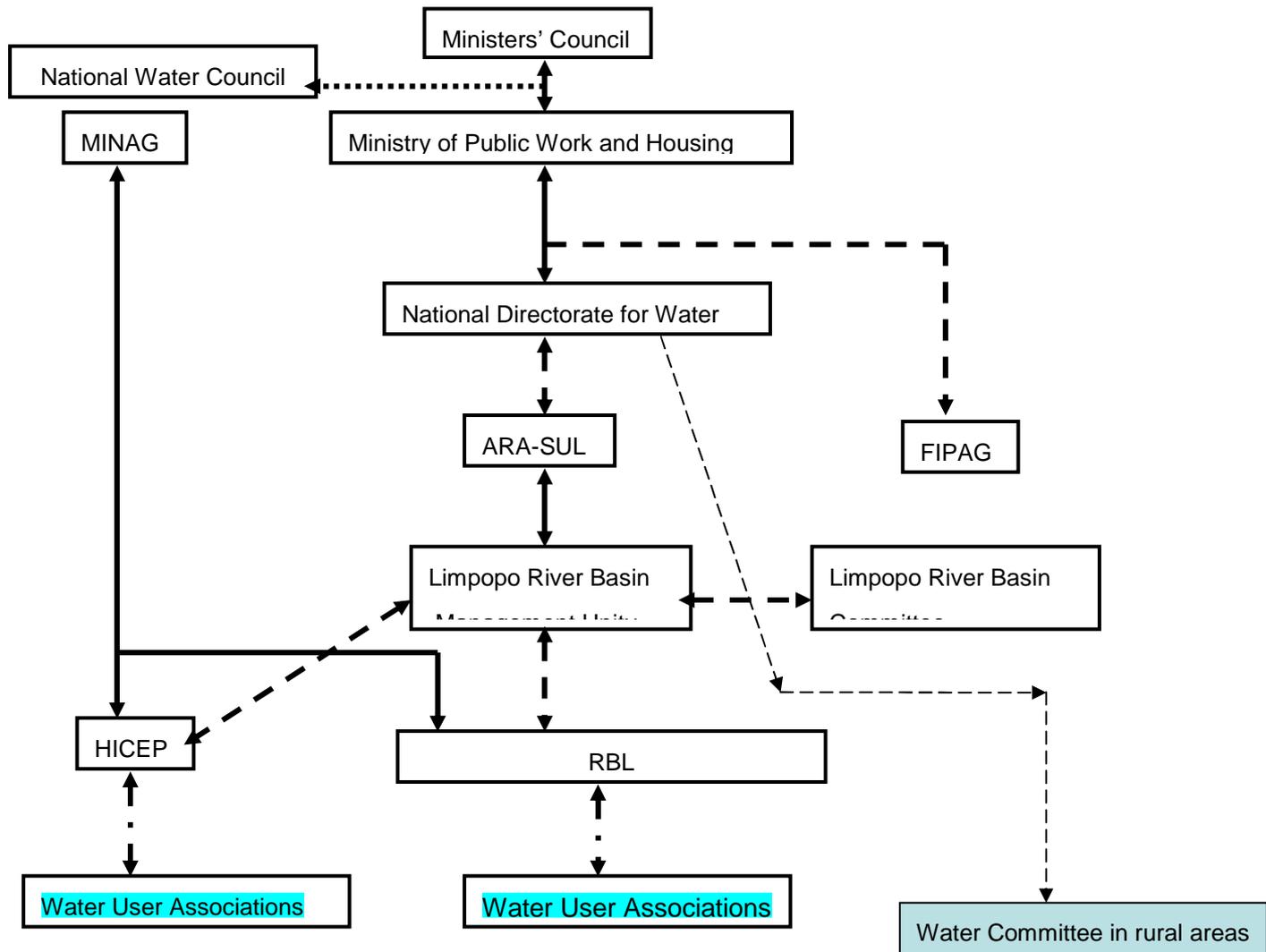
Mozambique has embarked in decentralization policy that concerns both the management of water and the development of autonomous regional water administration and administrative-territorial management with higher power given to the provincial authorities. Two other types of territories of the basin have also their own management institution: the irrigation schemes (notably the Chokwe irrigated scheme or CIS and the Xai-Xai irrigated scheme) and the protected areas of the basin, among which the Limpopo National Park (see The Limpopo National Park page 9). The articulation between local management and national management level is synthetised in the following figure and reviewed.

##### ***a) Water management at national level***

Two main institutions are involved in the management of water resources at national level:

- The **National Commission for Water or CAN (Comissão Nacional da Agua)** is a consultative body to the Council of Ministers established through the Decree 25/91 of 14<sup>th</sup> November.
- The **National Water Directorate (Diretoria Nacional da Agua)** is one of the four directorates of the Ministry of Construction and Water (**MOPH**). It has a mandate over surface and groundwater resources. The MOPH is also responsible for the licensing of drilling companies (DM 83/2002 Chapter I art 1) by means of a permit (*alvara*);

**Figure 5: Governmental agencies and stakeholders involved in the management of water resources (Matsinhe, 2011)**



Two main regulations govern water management: the **1991 Water Law** and the **1994 water policy** which propose the implementation of IWRM at basin level. This latter policy is currently being reviewed in order to define environmental flow requirement – *to be verified*. The 1991 Water Law states that the natural resources of soil and subsoil and the continental waters are **property of the state and of the public domain**. There is no specific aspect related to the use of ground water. The version of the National Water Policy incorporates mentions to climate change.

Basic hydrological data collection is in charge of the **National Meteorological Institute (INAM)** and **National Water Directorate (DNA)**. The latter develops and maintains a hydro-meteorological station network and have the responsibility for collecting and disseminating hydrometric information. There are currently 800 pluviometric and 100 hydrometric stations (that ideally should be expanded to 1000 and 300, respectively).

The law distinguished private and common uses;

- **Private uses** are subject to having a **license or a concession** to be requested to the decentralized institution (ARA) and to the payment of **the gross water tariff** whose value is decided at national level. This tariff is currently being reviewed
- **Common uses** correspond to the uses for domestic, personal and family need, including the watering of cattle and small scale irrigation (less than 1 ha) without the use of siphons or mechanic devices. Common uses must follow the traditional regime for water exploitation and must not significantly alter water discharge and river banks. They do not require a license and is not subject to tariff. They have an absolute priority over other type of use.

### **b) Local and decentralized water institutions**

#### **ARA**

The Regional Administrations of Water called **Administração Regional das Aguas – or ARA** have been established in the Law 16/91. They are the basin authorities responsible for water resources development and management, in charge of the daily operations and hydrological data collection. ARAs has based on water basins boundaries, and are public institutions with a judicial personality, administrative, patrimonial and financial autonomy but they report to the DNA. Financial autonomy is supposed to be acquired by the payment of **gross water tariff** which has been fixed by Ministerial Diploma 21/2007 of 28th February: all users except common uses are submitted to this tariff<sup>10</sup> (Table 5).

**Table 5: Water tariffs to different sectors in the Limpopo Basin (Source Mastinhe, 2011)**

<i>User Type</i>	<b>Mt/m<sup>3</sup> (1mt = 0.0312usd)</b>
<b>Agriculture</b>	
Household sector < 1ha (common use)	0
Subsistence agriculture > 1ha	0.04
Commercial sector < 50ha	0.48
Commercial sector 50 – 1 000ha	0.08
Commercial sector > 1 000ha	0.096
<b>Industry</b>	<b>0.159</b>
<b>Water supply</b>	
Huge systems	0.159
Small systems	0.08

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

The central government still subsidized ARA-Sul annual budget for more than 80% of his budget as the income generated in the Limpopo Basin water fees accounts for less than 15% of the annual budget. 100% of the locally generated revenue is retained although it should

<sup>10</sup> But because lack of meters farmers are not charged in fact according to the volume of water used but in a fixed rate of 800 MT a year according to Mastinhe (2011). It is unclear however whether this amount refers to the bulk water tariff only and/or the irrigation water tariffs

legally (Decree 43/2007) transfert 60% should to the MOPH, and 40% to the Minister of Finance (Matsinhe, 2011).

ARA-Sul is operating the Limpopo area and manages three major dams: Massingir, Corumana and Pequenos Libombos and the large weir at Macarretane on the Limpopo river basin, as well as smaller dams, dykes and other hydraulic structures. ARA-SUL executes all the activities in the Limpopo River Basin through UGBL (**Unity of Limpopo Bain Management**). Concretely it monitors water deliveries from Massingir and Macarretane dam for irrigation and saline intrusion control.

The UBGL is the biggest basin of ARA-Sul (79.600Km<sup>2</sup>)<sup>11</sup> and the unit manages - 37 pluviometric stations, 30 Hidrométric stations, 2 evapotranpiration station.

**Table 6 : Cadaster of users of UBGL (source UBGL)**

	<b>Users known</b>	<b>Users registered</b>	<b>Users Licensed</b>	<b>Users Invoiced</b>
<b>2004</b>	2	2	2	2
<b>2011</b>	220	131	68	70

### The Limpopo Basin Committee

The **Limpopo Basin Committee (Comite de Bacia do Limpopo - CBL)** is a coordination body between users, institutions in charge of the management of irrigation and the other institutions in charge of the use of land and water. The CBL depends on the UBGL (Unidade de Bacia Do Limpopo). By status, it is a consultative body for the director of UGBL with the responsibility to provide whenever requested advices and assessments. The CBL is composed of 12 members directly appointed by the committee which are: the director of UGBL, a representative of the provincial government, a representative of MICOA, a representative of the provincial department for rural extensions (rural services), two representative of irrigators associations, two representatives of commercial farming firms, two representative of private farmers, two representatives of the institutions in charge of irrigated schemes. Meetings gather a larger number of people than the formal members of the CBL and the invitation is extended to the most important water users (commercial firms notably), to all administrative services and even city councils. The CBL was created in 1998 but has been regularly functioning only since 2004 with two annual ordinary meetings a year, and extraordinary meeting on request (in case for example emergency situation or accident).

Only a small part of water users or governmental institution is actually represented in the committee as underlined by Mastinhe (2011) (Table 7). Even farmers are poorly represented: neither smallholders, traditional water communities nor isolated farmers association are represented. Participation is also limited by distance and cost of accommodation and transport.

UBGL in particular is in charge of delivering water to attend the irrigation water request made by the irrigation scheme (HICEP and RBL) base on a planning of irrigated land for each farmer. However, farmers and association located on the perimeters but who directly pump water in the Limpopo River do not interact with ARA SUL (for license or water fee for example) through the irrigation management but directly with UBGL (Matsinhe, 2011).

<sup>11</sup> An extension route of 5000 km

**Table 7: Governmental agencies and WUAs represented in the Basin Committee (Matsinhe, 2011)**

<b>Type of water user</b>	<b>Governmental agency</b>	<b>Water user group</b>
Crop production (irrigators)	Agrarian Services Department, HICEP, RBL	Farmers Associations; Irrigation associations
Fisheries	Minister of Fishery	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	Minister of Industry and Trade	Not represented
Mineral resources user ( Sand extraction along the river banks, thermal and mineral water)	Minister of Mineral Resources	Not represented

**Analysis of the functioning of the CBL through analysis of the meetings minutes 1998-2011. (R Ducrot, November 2011)**

Twenty minutes of the committee meetings were analyzed (from 1998 until the 21<sup>st</sup> ordinary meeting -May 2011). During this time, the CBL held 21 ordinary meetings and 5 extraordinary meetings. The minutes contains the list of participants, occasionally the list of persons invited, the main content of the presentation held during the session, some elements of the debate; A couple of document also included a summary of the decisions.

The 3 first meetings (2 in 1998 and 1 in 1999) aimed to design and develop the CBL. This phase was disrupted by the 2000 flood and the meetings only resumed in 2001. These first 4 meetings focused on the design of the CBL (composition, regulation). Underlying tensions between HICEP and UBGL regularly appears in these first meetings with mentions to debt of HICEP concerning the gross water tariff among others. HICEP participated irregularly during these first years. 8 farmers were invited to the first meeting and 5 of them attended. In latter meetings their participation did not overpass 2 persons. Farmers initially asked for a more diversified representation of farmers: Different type of farmers were actually farming in the Chokwe scheme (namely commercial farmers, big, medium and small farmers) and would be affected by the decisions concerning water differently which supposed a differentiated representation of the farmers group. But at the end the farmers' representation excludes smallholders or even medium irrigators. Beside some confusion appears in the notion of representativity: for example HICEP defended the position that they represented the farmers that irrigated in the scheme. The first meetings also focused on the presentation on the legal framework that underpins water management as well as provided information on the basin. The content of meetings rapidly evolved to the format that will kept in following ordinary meetings: presentation of the climatic and hydrological situation of the basin with prevision and simulation of hydraulic availability for the next 6 months period, assessment of cropping and irrigation in the past period and presentation of the demand for the next period, presentation of the state of advancement of the different projects notably those concerning big water infrastructures. Many of the questions in this first phase focused on the clarification of information.

After 2001, meetings were regularly implemented. During this second phase, ARA SUL and UBGL staffs represent 20 % to 50 % of the participants of the meetings, which gathered between 15 and 33 people (with an average of 23). Local authorities (with representatives of district administration and services, city council,

city) represented in average 5 persons in each meeting (between 10 to 30 % of the participants of the meeting) but there was a high diversity of representation from one meeting to the other and this tended to even more diversify over time. More than 17 different authorities (service districts) participated at one meeting or other during this 10 years time. The provincial governor attended twice (during the drought period 2004-2006).

The representation of private and institutional sector was characterized by also changes reflecting the rapid evolution: Many institutions were remodeled with another name, firm were created or transformed, and this transpired in the list of institutions that attended the meeting; This was particularly the case in the case of the Xai Xai irrigated schemes, that was destroyed during the flood and rehabilitated afterward. This evolution translated into the regular appointment of new members as some institutions failed to participate. Committee members appears to be selected depending of their effective actuation in the basin and interest as manifested by attending the meetings (as observers) for example. HICEP has been regularly attending the meeting since 2004.

According to the minutes, the CBL is principally an information body: it is the mean for the water authority to disseminate information concerning the hydrological state of the basin and the advancement of the work in infrastructure projects. The CBL is also used as coordination body between the main water institutions, for example between HICEP and UBGL (about water demand for the next period), or between water users and dams rehabilitation project teams for the coordination of the rehabilitation work. This coordination tasks were particularly important between 2004 and 2008 when the Massingir and Macarrettane dam were rehabilitated. The meeting were also a mean to monitor the development of agricultural cropping and water licensing.

Many meeting were purely informational and their discussions as reported in the documents consulted only dealt with clarification points. But along the 10 years of discussions, some crucial points have been emerging in the discussion even if they have only been discussed superficially. For example, there have questions concerning the detailed hydrological functioning of the basin (coordination between dams), the availability and accuracy of data and how to adaptat of the management to these uncertainties; the difficulties raised by projects that focus only on the infrastructure dimension neglecting the other aspects of water management (institutional, organizational and financial dimension); water tariffs; coordination between land and water licensing especially in the perimeter; partnerships between farmers association and companies; hydrological functioning of Chokwe perimeter; technological alternatives after Macaretane dam accident. However in the top down settings that prevails in the CBL, these questions were not given the importance they deserved or were even simply put aside (for example for water tariff) One can regret that the CBL is not used to assess or comment on project content before they are being adopted and the CBL is only mobilized to deal with the consequences of project implementation (and the resulting difficulties).

The conflict between HICEP and UBGL is less apparent in this second phase although the payment of water fees has not yet been regularized. The minutes underlined that the functioning difficulties of HICEP preexisted the floods, and cannot be reduced to the difficulties and delays of the rehabilitation of the dams as many problems were reported since the ending of this project.

## Irrigated schemes

**HICEP** (created in a 1997 MINAPER decree as a follow up of the SIREMO – sistema de Regadio Eduardo Mondlane that managed the irrigation infrastructure) is in charge of the administration the 22 000 ha of the Chokwe scheme that are cultivated (rainfed and irrigated) as well as supplementary 8000 ha (not cultivated). Its responsibility encompasses

management and financial task for the primary infrastructure, of the distribution of water at this level, of the maintenance of the main canals. It also has the mandate to provide support to the **Water Users Associations (WUA) who are formally in charge of the management of secondary and tertiary infrastructure** under the supervision of the groups of *cantoneiros* (representatives of HICEP) (Matsinhe, 2011).

The 2000 flood flow away the infrastructure and what remained of land leveling. The primary and secondary infrastructure deserving 7000 ha were rehabilitated with the support of French Development Agency (AFD) and Japanese cooperation, but the cultivated area under irrigation remain low (cf Table 8). 7000 ha are soon to be also rehabilitated with support of Islamic Development Bank and HICEP is also discussing the rehabilitation of the remnant superficies with OPEC.

**Table 8 : Evolution of irrigated cropping surface in Chokwe perimeter (from minutes of CBL meeting and Amilei, 2008)**

Season	Crop	84/95	04/05	05/06	06/07	07/08	08/09	09/10	10/11
	Rice	8 150	1 998	156	2 713	2 981	5 834	6 940	2 812
Hot	Others		663	65	1 143	1 420	1 659	1 579	509
	Total		2 661	221	3 856	4 411	7 859	9 146	3 321
Cold	Horti.		2 883	1 889	3 115	4 134	3 271	2 349	
<b>Total</b>			<b>5 544</b>	<b>2 110</b>	<b>6 971</b>	<b>8 545</b>			<b>3 878</b>

This low efficiency is attributed to different factors among which soil salinisation, poor drainage and lack of financing. But many discussions of CBL as reported in the minutes of the meetings tend also to point out to functioning problem of the perimeters concerning water, financial and social management. Indeed, a first visit and discussions with some farmers in November 2011 seems to indicate that the issues are more institutional and managerial than technical. Technical problem such as salinisation would be much more symptoms of other such problems than causes of low efficiency. Among other, the CIS seems to be suffering from acute labor shortage, difficulties to access farm machineries and coordination between actors which results in difficult credit access and poor cropping intensity.

The role of HICEP in managing land access has been confirmed by a presidential decree of 2009. It attributes land to farmers, mostly small holders (1-4 ha) whose land tenure is being oficialized through their inscription in the cadastre of water users (or *cadastro*). But only a small fraction of the farmers registered are actively production rice. Arrangement between farmers concerning land tenure could also been important<sup>12</sup> and the names registered are not necessarily the name of the family head in charge of production.

HICEP has recently<sup>13</sup> negotiated the removal from the perimeters of whole cattle that are not allowed anymore on the scheme except for oxen as well as the acquisition of heavy machinery for the maintenance of primary irrigation and drainage system.

Another important irrigated scheme is the Xai Xai perimeter situated downstream near the sea. Initiated in 1952, he beneficiated from various interventions in the 80's (1981/83 and 1987/1987) before its complete collapse after the 2000 flood. 5000 ha (60 %) were supposed

<sup>12</sup> A master student from Wageningen is currently exploring the land tenure aspect on the perimeter.

<sup>13</sup> November 2011

to be rehabilitated between 2003/2008 as part of the Massingir project but only part of the projected area have effectively been rehabilitated because lack of funding. A public institution under the Ministry of Agriculture has recently been created and is in charge of water management in this perimeter. The perimeter is managed by the Regadio do Baixo Limpopo (RBL) created by Decree no 5/2010 of March 23<sup>rd</sup>. Both HICEP and RBL are subordinated to the Ministry of Agriculture. Both are funded through the State annual budget and revenues generated from the tariffs on water uses.

### **Water Users Association in Chokwé perimeter (WUA)**

The same decree that establishes HICEP (MINAPER, 1997) establishes the WUA (Water users Associations). WUA<sup>14</sup> are in charge of the maintenance work on the secondary and tertiary canals of the perimeter, participates in the administration of the scheme along with HICEP (and RBL). They have flexibility to govern internal water distribution, monitor water uses and resolve their own conflict (Matsinhe, 2011). Though new institutions, some associations in charge of WUA existed during colonials' times. Implementation of WUA was formally initiated in 2004. Irrigation associations hold currently 12 442 members. Central government representative, call "contador" intervenes in the WUA. They are nominated by HICEP (or RBL). Contador is responsible for water distributions in the secondary and tertiary canals.

WUA also have a role in land management in the perimeter: It is the WUA that receive the land title (or DUAT) and every farmer receive a title deed upon approval of his WUA in the form of co-titling<sup>15</sup>: But farmers remain individually subjected to the land regulation that efficient production (understood as production for commercialization), the principle of intensification of agriculture and the obligation to pay the water tax (Pellizzoli, 2008).

Thus farmers must pay a water fee twice a year unless it can prove that he has not received the water. Non-payment leads to suspension of water access and occasionally to expropriation (Pelizzoli, 2008). In 2008, Pellizzoli mentions an increase of the fee from 550 Mt/ha/season to 850 MT/ha/season while it should reach 3500 to cover all costs including rehabilitation<sup>16</sup>. It remains unclear whether this tariff actually includes the catchment bulk water tariff that HICEP (and RBL) are supposed to collect for the UBGL. In any case, HICEP never paid the bulk water tariff to ARA-SUL.

In 2010, farmers of the Arredonze association (Associação do Distribuidore 11) were reported to pay a membership fee to the association of 1000 Mt per annum + an annual land use fee of 100 MT/ha for the maintenance of tertiary irrigation and inputs (Munguambe et al., 2010). Payment of the raw water tariff<sup>17</sup> is reported to be very conflictive.

WUA structure is closely related to the hydraulic structure of the perimeter has presented for the Arredonze association (Muguambe and al, 2011). The WUA gathers all farmers from

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<sup>14</sup> "Water users association" existed in the colonial time, as part of the Cooperativa Agrícola do Limpopo. Adhesion was mandatory and the association provided labour and commercialization support to its members, and were also in charge of rural extension service and electricity and water distribution (Pellizzoli, 2008)

<sup>15</sup> Co-titling is possible for a group of farmers that that shares common interest and cultural norms including indigenous authority system (Muguambe, 2010)

<sup>16</sup> Water tariff in fully rehabilitated area (including laser leveling) reached 3000 MT in the recently approved validated tariff reform of November 2011. However, no area of the perimeter is planned to be reach this standard of rehabilitation

<sup>17</sup> It is not clear whether this tariff includes or not the gross water tariff and a specific fee for the functioning of the association.

the same canals which can be very different. For example ARREDONZE counts 350 members, among which smallholders (less than 2 ha), medium farmers (4 – 20 ha) and big farmers (more than 20 ha). The smallholder groups count all the women of the association and 60 % of the men. 30 % of the men are medium farmers and large farmers represent 10 % of the farmers. WUA are thus characterized by the diversity of members they gathers.

### 1.4.3 Governance of domestic water supply

#### a) *Cities and peri-urban areas (Butterworth and O’Leary, 2009)*

“The **water supply regulatory council (Conselho de Regulação do Abastecimento de Agua or CRA)** is an independent regulatory agency that reports directly to the Council of Ministers. It is in charge of the regulation in 14 of the largest cities. CRA notably set the water tariffs annually.

The **Fundo de Investimento de Patrimônio de Abastecimento de Agua (The Water Sector Investment and Asset Management Fund - FIPAG)** is a public entity set up under the delegated management framework with investment and oversight responsibilities in relation to 14 major cities in Mozambique (World Bank 2007c). It is in charge of investment and asset management, rehabilitation and expansion of water supply assets, contract management, and monitoring and enforcement of the contractual obligations of the operators. FIPAG is notably in charge of the development of the **water network in Chokwe city**. Urban domestic consumers pay fees to FIPAG but this organization do not pay fees to ARA-Sul although it uses the 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 (Matsinhe, 2011).

With the support of the World Bank and the Millennium Challenge, Government of Mozambique is currently setting up a fund similar to FIPAG but operating on a more subsidized basis, to support the development of water supplies in smaller cities and towns. This agency will also take responsibility for the existing small-piped systems in towns and rural areas. Responsibilities in rural water are increasingly being decentralized to provincial governments (major new investments) and districts (rehabilitation, operation and maintenance).

**A new common fund (National Rural Water Supply and Sanitation Program)** is being established to better harmonize government and the many non-governmental efforts in rural water in line with the Paris declaration (one fund, one plan, one report).

**Grupo de Água y Saneamento (GAS)** which focuses on rural water appears to be an active multi-stakeholder platform (currently operating at national level with plans to mirror at provincial level).

**Table 9: Projected urban water demand for Xai-Xai and Chokwé Districts**

District	Population (1992)	Demand for water (m <sup>3</sup> /day)	Population (2002)	Demand for water (m <sup>3</sup> /day)	Population (2017)	Demand for water (m <sup>3</sup> /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
<b>Total</b>	116 500	5 446	185 600	8 753	291 000	23 876

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

### b) Rural areas

While the objective of the government is to reach coverage of 70 % in water supply in rural area by 2015, the rural part of the Limpopo basin is well known for water scarcity and access to water. Water points have been reported to be sometimes far as 15 km (3 hours walking) of the village<sup>18</sup>. Districts profile though the study indicates that only 10 to 20 % das people interviewed needed more than one hour to access a water point (Perfil do Distrito de Mabalane, 2005). It is true that water points varied significantly between district and within districts as underline in the following table (Bakker and Teyssier, 2010).

**Table 10 : Water points in three districts (From Bakker and Teyssier, 2010) and Mabalane**

	Population	Nb boreholes	In operation	Small water system	reservoir
Chicualacuala (district)	38 000	66	44 (67 %)	10 (6 in administrative post, 4 headquarter)	1
PA* Mapai (Chicualacuala)	18 000	34	27 (79 %)	6 (3 in operation)	
PA Chicualacuala and PA Parfuri	20 000	32	17 (53 %)	4 (In chicualacuala)	
Machaze		98	84 (85 %)	3 (in district headquarters)	32
<b>Mabalane (district)</b>	<b>32 000</b>	<b>63</b>	<b>35 (55 %)</b>	<b>6 (in district headquarter)</b>	<b>17</b>

\*Posto Administrativo

Bakker and Teyssier (2010) specify and analyze different technical options which are presented in Frame 1 and the main challenges to domestic water infrastructures (Frame 2).

The **Service for Public works** of the district are in charge of water and sanitation in rural areas. Communities are supposed to participate in all stage of water supply project through the involvement of elected authorities.

A **water committee** is in charge of management of the water source at community level with responsibility to monitor and maintenance of the infrastructure, collecting fees but this committee does not have a juridical personality (Matsinhe, 2011). In the Guija district, the water committee was headed by the chief - also representing the local authority - and the elders representing the 6 neighborhoods of the communities; The committee decided about water use and plan for future institution .

<sup>18</sup> In Mabalane, this is notably the case of 3 communities: (Mungazi, Mabuiapanse and Matchele) which are located at more than 60 km from the next river.

The water committee receives a fee for the maintenance of the system based on a monthly payment of 100 MT plus 1,5 MT for 40 l. Houses that are connected to in-house network related to Caritas paid for 150 MT for the use of 10 m<sup>3</sup> and an additional 30 MT per m<sup>3</sup> (Manjate and Magaia, 2010).

Differential fees can be applied to foreigners of the community: In Chibote Bakker and Teyssier (2010) observed that women from outside communities paid water 5 MT/20 l while the price was only 1 MT/20l for local resident.

**Frame 1 : Some technical options for water supply in the rural areas, opportunities and constraints. Adapted from Bakker and Teyssier, 2010.**

The National Water Policy gives preference to boreholes and closed well with pump for hygiene reason to provide for potable water supply.

- A hand pump (type AfriDev) provides theoretically 20 l/day for up to 500 people in a distance of 1 km but a lot more practically.
- Water system with diesel or solar pump, that are equipped with a small reservoir and a distribution system can provide to up 40 l/day for up to 2 000 people.
- Solar system present lower operational costs but their investment costs are high (USD 25 000 for the solar system itself without borehole. Beside His life span is generally shorter than expected and goes to 2 to 3 years. Theft of this kind of pump has also been reported. With a 3 year life span a solar system requires between 5 000 to 10 000 USD to be properly maintained and sustainable (considering than tank and hole maintenance is not as frequent).
- Diesel pumps require regular and frequent maintenance, and consequently complex management and high operational costs.

Small rainwater tank and small reservoir are cheaper than borehole. Although they may not permit yearlong water storage, they may alleviate the issue of water scarcity by providing interesting complement.

- Reservoir presents risk of contamination as they generally supply both to human and animal water consumption. The development of a pump and tank system to separate both consumption is expansive both in investment and maintenance terms.
- Rainwater harvesting tanks allow to minimize evaporation (compared to small reservoir) while preventing access to water to animals. But it requires a clean and impermeable catchment area, typically zinc roof which remain rare in typical village as they are too expensive for poor households. Bigger rainwater tank such as the one promoted by Caritas (55m<sup>3</sup>) can be build in school and other public building.

Buried rainwater tank equipped with filter catches water from road can also be used to water animals and crop.

**Frame 2: Challenges for water points in the Limpopo basin rural areas**

High investment costs due to the depth, the rocky nature of the subsoil and the remoteness of the area

All the area is covered by a layer of brackish water as it was once covered by sea, which means non salty water is only found at a depth of 80 to 150 m. Beside the rock nature of the subsoil makes perforation difficult and requires equipped and skilled perforation firms. A borehole is estimated to a minimum of USD 25000 varying with depth. It is often difficult to find firm with the ability to perforate to high depth and they are frequent and long delays in such work.

Distance between borehole and population concentration/village might be important because it is often difficult to find area were perforation is possible close to population concentration. Consequently population often prefer to get its water to closer water points when possible even if they present quality problem.

High maintenance cost which make proper maintenance besides the capacities of even well organized communities. District maintenance and financial capacities is also limited. Private operators can guarantee better maintenance as they are interested to sell water but they only are interested to operate in area with large concentration of people (Vilas and Headquarters). In practice, sustainability of water system depends of external intervention and rehabilitation program.

Hygiene and quality issue. Beside the quality of raw water itself, water points for multiple purpose including watering animals which can create hygiene issues. It is necessary to separate the domestic water point to the animal water point to avoid contamination of water.

The low population density means that there is a need for a very high numbers of water points to maintain the index distance water point home in the accepted norms.

Many communities have a low organizational capacity and do not succeed to organize to manage the water point –But some technical problem goes well beside the financial capacities of even well organized communities. Although the most important problem the services of Public Works are in charge of the maintenance of the most important reparations, communication difficulties between communities and the district services may result in important delay.

#### 1.4.4 Local water institutions

#### 1.4.5 Governance of risks and climate change

Mozambique have a relatively well developed disaster preparedness plan, including a National Policy for Disaster, operationalised at district level alongside a long term poverty alleviation policy (PARPIII) (Osbaahr et al., 2008). The National Policy for Disaster recognizes the cyclic occurrence of floods, cyclones, pests, drought and epidemic surge.

Though there is no overall strategic vision or specific tools on climate change, both economic and planning instruments include references to climate changes and many regulations and legislative tools include risks and hazard references (Dondeyne, 2010). This is notably the case of the National Water Policy of 2007 which include a specific reference to climate change, mentioning that despite scientific uncertainties climate change can bring an increase of the frequency of drought and rains, which requires extensive planning in order to be ready to tackle those extreme events. Climate change is also mentioned in the 5 year government Plan and PARP

Three institutions has a prevalent role in relation to risks and climate change :

- **MICOA, Ministry for coordination of Environmental Action** responsibility for coordinating work on climate change and territorial planning but not for implementation
- **INGC, National institute for Disaster Management** (which replace the Department for the Prevention and Combat of Natural Disasters in 1999 that worked closely with The DPCCN worked closely with provincial and local government, donor and NGOs (P1367) INGC was actually scaled down to emphasize its role in planning and coordinating emergency prevention and response rather than the actual operational logistic of distribution aids ( )
- It reports to **Ministry of State Administration (MAE)** and is in charge of the prevention and mitigation of natural disasters (floods, cyclones, pests, drought, and epidemic). It thus has an operational responsibility for coordinating work on disaster risk. Dondeyne underline that its work is relying on relatively well founded scientific knowledge and information. It has developed a climate risk strategy. The INGC was charged with coordinating disaster prevention strategy and from 2003 its Disaster Management Technical Sub-Committee advised the government on the first and second Action Plan for the Reduction of Absolute Poverty (2001–2005, 2006–2009). Allows for a rapid identification of disaster and response but don not proactively attend long term vulnerability through livelihood renewal (Osbaahr 2008)

- **CONDES (National Council for Sustainable Development)** it is in charge of the coordination and integration of the environmental principles and activities; It holds an advisory/consultative role for the council of minister and is also a forum to hear public opinion (Dondeyne 2010)

**Disaster management committees** acting at local level are mentioned by Dondeyne: 83 out of the 125 of the Gaza province has been established but only a few are reported to have the necessary equipment. Their social/territorial level and mandate have to be clarified. Vulnerability assessment committees coordinated by the **Food Security and Nutrition Secretariat (SETSAN)**, which is part of the Ministry of Agriculture and Rural Development (MADER) have also been mentioned in the literature.

Different project and program are being implemented that are related to climate change and vulnerability. The multi-donor 'PROAGRI' program for example, coordinated by the Ministry of Agriculture and Rural Development from 1999 with activities that cut across different livelihood areas, from micro-finance to communication, and set out to support small scale farming in rural areas by supporting technical extension training, infrastructure development and local organizations (VAC, 2003). The Integrated rural development approach also aimed to create (emergent conditions for local level resilience to climate disturbance, with a focus on resilience to drought food security and poverty reduction

## 1.5 OFFICIAL AID ASSISTANCE AND WATER

Official Aid Assistance constitutes around 40 % of the Mozambique gross national income and some 19 donor agencies are active in this country.

Following the recommendation of the 2005 Paris Declaration on aid effectiveness, donors program have recently been evolving, with the harmonization of the different donors program, better coordination, aid delivery from project interventions to more pragmatic forms including general budget support. Specifically, **general budget support for water services development** has been implemented. It held between 30-35 millions USD per year that are funding the PRONASAR program is supported by DFID, UNICEF, Embassy of Netherland , SDC (Switzerland), CIDA (Canada).

Other donor activities are developed in more traditional way that is through project funding among which we can cite:

- The lately approved 70 million USD loan by the World Bank to support implementation of the Mozambican government's National Water Resources Development Project for 2011-2017. The project includes renovation of the Coruma Dam but also institutional development and support to decentralization process of operational management of water. 12,5 Millions USD will be devoted to the implementation of structural and non structural measures for the reduction and mitigation of climate risk in vulnerable basin (which include the Limpopo basin)
- Support to the development of the Limpopo park (Agence Française de Development) which include support for small irrigation along the Limpopo river by residing communities of the park.

## 1.6 COORDINATION MECHANISMS

### *c) Planning and budgeting mechanisms in the water sector (Uandela, 2010)*

As part of the WAHScost<sup>19</sup> project (a 5 years action research project aiming to improve decision making and investigating the economic aspects of water and sanitation in rural, small towns and periurban communities in 5 countries including Mozambique), a preliminary investigation of planning and budgeting mechanisms related to water and sanitation in Mozambique has been undertaken by Uandela. It underlines that planning and budgeting processes have been undergoing major improvement with the development of new tools and establishment of sound process, especially for strategic planning rather than in budgeting. It also was accompanied with a change of logic from a a top down centralized process to bottom up decentralized one that should be initiated by the need and prioritization at district level. However different problems are still existing notably: coordination and synchronisation process; weak involvement and appropriation of the process by provincial staff as plans are developed by experts; A weak link between the strategic plans and the annual operational plans.

At the moment, unit cost used in planning concerned mainly water supply with little availability of data for sanitation. It deals mostly with investment cost, with no reference to operation and maintenance as well as cost of capital. Indirect and direct costs are estimated as percentage. Cost update is done through market mechanism.

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<sup>19</sup> <http://www.washcost.info/page/121>

**Table 11 : Multi level Planning and budgeting tools**

	<b>National Level General</b>	<b>National Level Water</b>	<b>Provincial Level</b>	<b>District Level</b>
Planning	PARP - Poverty Reduction strategic Plan CFMP - Medium-Term Fiscal Framework <sup>20</sup>	Strategic Water sector Plan PESA-ASR – rural Water Supply and Sanitation <sup>21</sup>	Provincial Water and Sanitation Master Plans Medium term planning plans	PEDD - Development Strategic Plans <sup>22</sup> PESOD - annual operational and budgeting Plans
Operationalisation	SISTAFE - Integrated State Financial and Administration System <sup>23</sup> OE - state budget	PRONASAR National Ruralm Water Supply and Sanitation Program  cost projection in its Medium Term fiscal galework		
Monitoring		SINAS - National Water and Sanitation Information System (		

**d) Between government administration**

Different bodies are supposed to foster coordination between government administrations. At national level this is the case of **the National Commission for Water or CAN (Comissão Nacional da Agua)** and **CONDES (National Council for Sustainable Development)**. Ministry of Planning and Development (MPD) has responsibility for overall lbudget coordination and expenditure prioritization. But studies mentioned there are little effective coordination. At provincial level, coordination is supposed to be done through planning

**e) Between donor and government**

At national level, the coordination between donors and government has been organized through the implementation of thematic work group.

Two internet databases diffuse and centralized the information of this workgroup: [www.pap.org.mz](http://www.pap.org.mz) (donors web site) and [www.odamoz.org.mz](http://www.odamoz.org.mz) (the Government aid database). France assistance is oriented toward environmental issues, mostly biodiversity and national park development. AFD also contributed to the rehabilitation of 7000 ha of Chokwe perimeter in the 90's but supports to agricultural program were not pursued.

**f) What coordination at decentralized level?**

<sup>20</sup> A medium term planning tools to achieve the its 5 years plan and parp

<sup>21</sup> The last one was elaborated in 2007 with 2015 final time line

<sup>22</sup> Five years time line covering all activities

<sup>23</sup> An integrated budgeting financial programming, accounting and internal control system

The basin committee is a first level of coordination between local administrations, water decentralized bodies and users. But various factors limit the coordination process: i) First, as already underlined not all stakeholders, water users or concerned administration are being represented in the committee or even invited. Only a few groups of formal associations are also represented in the basin committee. ii) at regional and local level IWRM is often predominantly perceived as a purely hydrological problem to be being controlled by key actors driving national water management agencies. Iii) Local government and public has often been marginalized in the conceptualization of IWRM approaches – and considered as only recipients of water services or provider of simple support systems (López et al., 2008) even (or because) if for local government with its political prerogative as the basic cell for electoral process, service delivery mechanisms are often pivotal for the election campaigns (Lopez et al, 2008).

Globally there is little involvement of local administration in the decentralized water institution. This is acknowledged as one of the main difficulties of the ARAs and of Mozambican decentralization water policies (Nandane, com pers).

CBL plays a role in coordination at least of dissemination of information between the water administration, key users and local administration; Minutes of the Limpopo CBL underlines that administration services are associated but in a diversified and heterogeneous manner: over the last 10 years, more than 17 services has participating to at least one CBL meeting. Most of services came from districts administrations- from the 5 main districts that beneficiate of the regularized flow of the Limpopo, but it also included representatives of municipal council of the main cities and the cities themselves. District that did not beneficiate from regularized flow did not show in the meetings either because they were not invited or not interested. The minutes shows that a very diversified types of administrative service has been attending the meetings but one service rarely attended more than twice (except provincial services that were full members of the committee).

At local level HICEP, RBL and the associations meet in monthly bases. The Contador and Cantineiro also play a role in the interaction between HICEP, association and farmers. HICEP (and RBL) are also invited to participate to internal meeting of association. UBGL also meets regularly with water users (on a montly basis) but the Rural Water Department and the Water Comittees in rural areas never meets (Mastinhe, 2011)

Two other mechanisms can theoretically help coordination at local level although their concrete implementation have to be investigated:

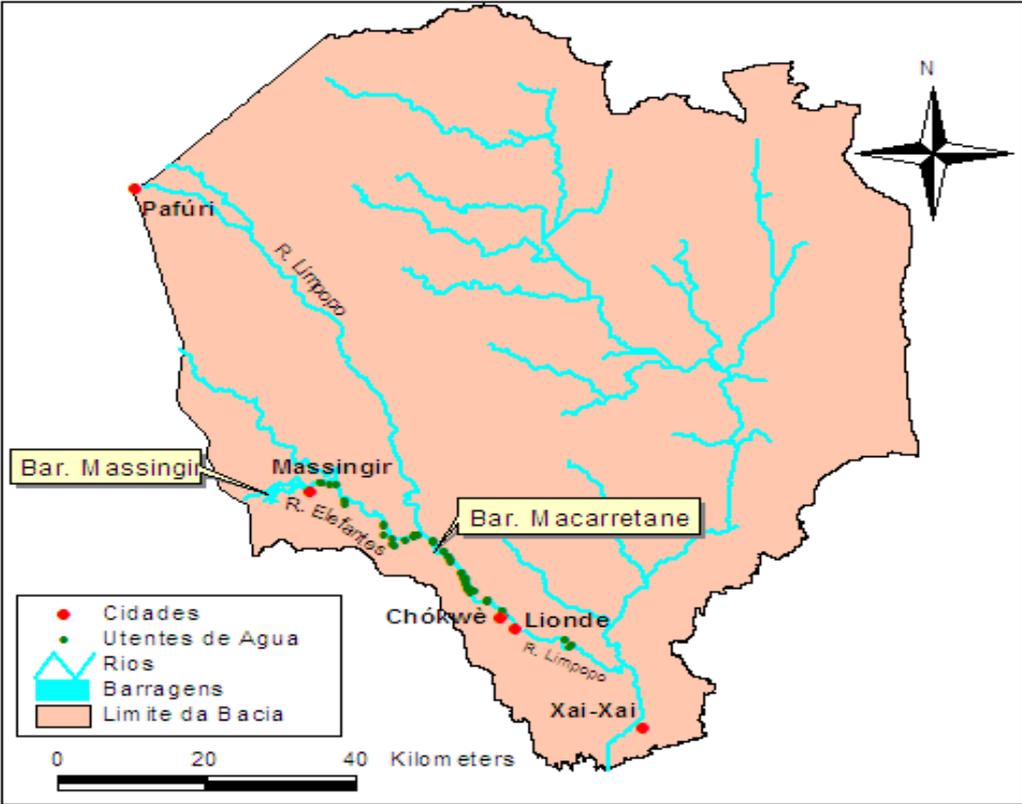
- ARA are required by the license and concession regulations to submit all application water license or concessions received to the district administration authorities so that water management plans can be adapted to the district plan
- Planning should thus be a critical mechanisms and process for the coordination around territories and water. Though the process is meant to facilitate coordination at district and provincial level, the effective implementation of the approach remains unclear.

## 2 THE HYDROLOGICAL FUNCTIONING OF THE MOZAMBICAN PART OF THE LIMPOPO BASIN

### 2.1 DESCRIPTION OF THE BASIN

Two branches of the Limpopo flows in Mozambique: the Oliphant (Elephants) and the main stem Limpopo, with its local tributaries (Changane and Sangutane rivers) for a total length of 450 km over the 1460 km full length of the river.

Figure 6 : The Mozambican part of the Limpopo Basin (source UBGL)



The basin can be divided in three agro-climatologically regions:

Table 12 : The agro-climatic region of the Limpopo catchment

	Lower Limpopo	medium Limpopo	upper Limpopo
	Xai-Xai region	between Xai-Xai and Chokwé District	between Chokwé District up to the borderd
Monthly mean temperature	18°C (July) - 26°C (January to February),	18,5°C(July) to 27°C (Dec to February),	19°C (June to July) to 28°C (January)
annual precipitation	900 - 1000mm	600 - 800 mm,	< 600 mm

River Basin annual surface water availability per season is 1 119,4 (Million cubic meters) in the dry season, and 2 110,2 (Million cubic meters) in the raining season (Mastinhe, 2011).

Local tributaries (except of the Oliphant where is localized the only significant dam of the Mozambican part of the watershed) are also non permanent and only contributes to water flows after some rainstorm (van der Zaag et al., 2010b) but the Limpopo river also dries up occasionally. Van der Zaag (2010) underlines the absence of data concerning the Changane and Sangutane rivers; Besides estimates of current water availability in the two main stems are also estimated as unreliable due to (1) lack of reliable discharge measurement on the Mozambican part of both rivers (data are incomplete and their reliability questioned) (2) the impact of upstream development especially in South Africa since the early 80s has resulted on higher water withdrawals but consequences on water availability in Mozambique flows has not been properly assessed.

The **Massingir Dam** is the only significant storage on the Limpopo basin in Mozambique. Built between 1972 and 1977, its capacity is estimated between 2840 Mm<sup>3</sup> (or 2,6 10<sup>9</sup> m<sup>3</sup> VandDerZaag, 2010) with a surface of 150 km<sup>2</sup>. Its storage capacity does not reach its full potential because of infrastructure problem. *“Its spillway discharge capacity reaches 12 000 m<sup>3</sup>/s while the bottom gate can discharge up to 1 600 m<sup>3</sup>/s. But the maximum storage capacity was never realized because of seepage problem in the dam wall so in practice storage capacity has been limited to 1,3 x 10<sup>9</sup> m<sup>3</sup>. Additional gates were build on the top of the spillway which allows to raise water level by 10 m but in May 2008 problem occurred as the reservoir was filling over and above historic level of 1,3 10<sup>9</sup> m<sup>3</sup> so this remain the storage capacity of the dam” (Van der Zaag, 2010).*

Funding has recently been secured to rehabilitate the dam and the building of another dam on the main Limpopo stem (the Mapai dam) is currently being discussed.

## 2.2 WATER AVAILABILITY

### 2.2.1 Current uses (Van der Zaag, 2010)

Van der Zaag (2010) points out the paucity of data on current water uses. This uses are nonetheless relatively small. They include

- (1) **Formal irrigation**, mostly the Chokwé perimeter, the main irrigation scheme of Mozambique. The effective irrigated area of the perimeter varies according to authors but the surface is significantly lower than the initial surface of the perimeter. Van Der Zaag (2010) estimates the surface to 5 400 ha of the 23 000 ha of the scheme (for 2009) but this surface should increase in a short medium term due to on-going rehabilitation work (see part Irrigated schemes, page 6). At the end of the 60's, irrigation in the Gaza province used to cover up to 24 447 ha (or 42 % of national area under irrigation) but the surface have considerably decreased as a result of poor maintenance of infrastructure, high salinisation and sodisation rate, and degradation of infrastructure.
- (2) **Common uses** or uses that satisfy primary requirements for which no water license are required. Because they neither require license, concession or payment these uses are most of the time not registered although the Basin Management Unit is trying to register them. Common uses concerns irrigated plots of less than 1 ha per household as well as *machongo* (irrigation through groundwater capillarity in peaty soil in the flood plains or spring water from adjacent dunes –at the end of the 60's *machongo* surface was estimated to 4000 ha.
- (3) Some cities supplies.

Some important irrigation development is planned in the Limpopo basin. In 2010, Van der Zaag estimates the planned new uses up to 77 000 ha. This included a big sugar cane irrigation project (PROCANA) that planned to irrigated 26 500 ha with drip irrigation and out growing of 11 000 ha) – which have recently been withdrawn<sup>24</sup>, CAM (10 000 ha) and Xai Xai. Some other reports an estimation potential of 148 000 ha.

Urban water supply is also expected to increase as underlined in the following table (Mastinhe, 2011).

**Table 13: Projected urban water demand for Xai-Xai and Chokwé Districts (Mastinhe, 2011)**

District	Population (1992)	Demand for water (m <sup>3</sup> /day)	Population (2002)	Demand for water (m <sup>3</sup> /day)	Population (2017)	Demand for water (m <sup>3</sup> /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
<b>Total</b>	116 500	5 446	185 600	8 753	291 000	23 876

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

## 2.2.2 Water availability

Irrigation in the Chokwé perimeter is currently secured by the Massingir Dam as the Limpopo may stop flowing up to 8 months a year. Though water availability in the Olifants rivers and the main Limpopo stems is not a problem at the moment, Van der Zaag and al estimate that water tensions could arise if the 77 000 ha of planned irrigation projected were being implemented. According to this author a maximum of 58 000 ha irrigated can be sustained in the Mozambican part of the Limpopo basin (assuming that the Massingir Dam was operating at its maximum capacity) while only 44 000 ha could be sustained if the Massingir Dam operates at its current capacity (van der Zaag et al., 2010b).

A joint hydrological assessment<sup>25</sup> should be very soon be undertaken and will probably help to precise the numbers.

Indeed, the water legislation recognizes a prioritization process to help solve potential availability conflicts between uses and users which are ranked as followed:

1. water for human consumption needs and sanitation
2. water uses that are sustainable in the long run
3. economic and productive use of water
4. use that benefits the largest numbers of Mozambican citizens
5. water use with the best economic and social impact on basis of investments
6. If uses are the same in all these respects then water should be shared equally

But this hierarchization supposes an in-depth knowledge of current uses at basin level which is currently not satisfied: common uses are in fact being considered as “losses” items in basin balance. Besides it is methodologically difficult to assess the amount of water for common use at basin level (Van der Zaag, 2010).

<sup>24</sup> The government could be currently negotiating the development of another main irrigation project in the area that had been reserved for PROCANA

<sup>25</sup> LIMCOM assessment funded by GTZ, call launched in October 2011

At the moment supply largely exceeds demand and domestic consumers are supplied by underground water and not conflicts between users groups are being reported. But **local conflicts** exist notably between upstream and downstream farmers, smallholders and bigger farmers **during very dry period** (Mastinhe, 2011). Conflicts concerns also the building of edges that block water flow especially during the rice planting season or inundation of smallholder plot because of the demands of water of bigger farmers.

## 2.3 WATER RELATED RISKS IN THE BASIN

The Limpopo basin regularly faces occurrences of floods and drought as reported in Table 14. **Drought risks** are actually acknowledged by local authorities as the major risks in the basin (Dondeyne, 2010). Drought strikes 7 every 10 years<sup>26</sup> in Southern Mozambique, in a country where 35 % of the population is chronically food insecure. The population estimates the rain to be sufficient for reasonable production 2 or 3 years out of 10, and to be insufficient the rest of the time with 2 or 3 year considered as very dry (Bakker and Teyssier, 2010).

Floods have also severe impacts, and the most important flood of the last 50 years (in 2000) severely affected the population and infrastructure of the area: 100 % of the population of Chokwe district were affected, 67 % of Massingir district, 32 % of Guija 24 % of Chibuto and **14 % in Mabalane**

**Table 14 : Main flood and drought in the Limpopo basin**

1975	Flood (Limpopo River, Incomati River)	75 000 people affected
1977	Flood (Limpopo River)	300 casualties, 40 000 displaces, 400000 affected
83/84	Drought south	
1988	Flood (Gaza province)	90 000 affected
1991/1995	Drought in the South	
1996	Central and Souther Mozambique (Incomati, Maputo and Limpop)	11 casualties, 200 000 affected
1998	Central and Souther Mozambique	15 casualties 404 400 affected
2000	Central and Southern mozambique	700 casualties ; 100 missing ; 650 000 displaced; 4,5 Millions affected
2002/2003	Drought	659 000 in need of food aid in the region

Source (Gall, 2004)

## 2.4 OTHER PROBLEMS

Pollution was a bigger problem in the 80s due to mining activities in South Africa and Zimbabwe close to the frontier. Sign of pollution are now occasionally reported. Another problem is the saline intrusion at the mouth of the river although the electric conductivity of the water of the Limpopo (above 2000µs/cm) is acceptable for irrigation (Matsinhe, 2011).

Water quality standards are set by the Ministry of Environment (created by the Decree no 2/95), and the water quality along rivers is monitored by ARA-Sul and MICOA through a specific legislation, the Decree n° 18/2004 of 2<sup>nd</sup> June, while monitoring of basin's river flows to anticipate and identify flooding or insufficiency of water is under the responsibility of DNA,

<sup>26</sup> Numbers to relate to the assessment of the population where water is sufficient only 3 year out of 10 and drought severe 3 years out of 10.

ARA-Sul, and the National Institute for Disaster Management (INGC) through the Emergency Operative Centre (CENOE).

### 3 WATER AND LIVELIHOODS IN THE LIMPOPO BASIN

#### 3.1 A SHORT HISTORICAL REVIEW

The area was first occupied by Khoisan population before the arrival of Bantu population. The latter developed small scale agriculture (bean, maize, peanuts, tomatoes, onions and yams) and raised cattle. Traditional chiefs and their families tended to occupy the richest lowland valley rivers while farther land was used for grazing and distributed to other household (Pellizoli 2008). Even if Portuguese activities centered on the coastal trading post and much of the inland remained independent until 1914 (Earle et al., 2006), trade was important since the XV's but increased in the XIX with the establishment of general stores at strategic spots (Eriksen and Silva, 2009). In 1934 an administrative reform (the Reforma Administrativa Ultramarina - RAU) divided the colony of Mozambique into "*regulados*" (kingdom) each of them with a traditional leader (the *regulado*) who exercised administrative functions such as tax collection or supervision of infrastructure development.

The first infrastructure of the Limpopo region was the train line (1938) that linked Maputo, Chicualacuala and Zimbabwe. The Chokwe perimeter project (with the Massingir Dam in the Elephants River) was initially conceived in 1924/27 by Antonio Trigo de Morais, who also recommended the construction of the Mapai Dam. But the construction of the reservoir and development of the scheme only started in the 50's with the building of Canal Esquerdo in 1952. The Macarretane reservoir was operational in 1956<sup>27</sup> and the first farmers were settled between 1954 and 1959.

The Chokwe perimeter targeted a majority of small Portuguese farmers. Two thousands local families were thus expelled to give place to these Portuguese farmers and only a small number of local Bantu farmers received back 2 ha of land on probation (Pellizoli, 2008). Farming started in 1955 and two types of farmers were installed: (1) the farmers on "*colonial*" regime (*os colonos or settlers*), who were attributed 4 ha (2 ha in the communal part to feed for their 5 heads of cattle among which 3 oxen for animal traction) and were given 1 year of food subsidies, as well as technical and health support. (2) the Mozambican farmers were installed on a different regime (or *Frução*) receiving only 0,5 to 2 ha, and submitted to the coercitive indigenous work regime in which they had to work 5 months for a salary and had to pay their taxes in money (Amilai, 2008). This work regime that aimed to gain control over exports income and transform smallholders into a cheap labor pool for commercial farms induced **a large migration movement** to the South African mines to get the money to pay the taxes (Eriksen and Silva, 2009). This migration movement built into cultural habits for the inhabitants of the area.

"Colons" farmers had to pay back their investment (69 000 esc for the house and 24 000 esc for the land) to receive the full ownership of the land while farmers under the *frução* regime could not have full ownership. This latter regime was suspended for new farmers in 1969.

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<sup>27</sup> Mugambe reports that the Macarretane reservoir is only build in the 60's.

The Chokwe area knew a rapid development between 58 and the mid 60 with the development of an important agro-industrial complex (dehydration and grinding of alfalfa, dairy factory, pork transformation, rice processing, tomatoes conservation factory). Rice production rose up to 80 000 t in 74/75 produced by more or less 1 500 Portuguese and 500 Mozambican farmers. But Pellizoli reports that in 1974 one third of the initial farmers had left the scheme and that conflicts between the irrigators and the expropriated people that occupied the dry land were reported which points out to (local) social difficulties.

In 1961 a tax was charged to all farmers for the payment of the maintenance and operation of the scheme. It aimed to cover the cleaning of canals, the replacement of water, salaries, fuel and lubricants, and materials. Initially an amount of 250 esc/ha/year this tax was increased to 3000 escudos/ha/year in 1975. Farmers had also to give up one sixth or tenth of their production which was used to develop new irrigated infrastructures (not necessarily in the region).

After independence, local small holders occupied the irrigated land left by the Portuguese settlers. Land was transferred to the exclusive property of the government in 1975, all colonial companies nationalized and all trade had to go through government channel. Chokwe scheme was nationalized and the Complexo Agro Industrial do Limpopo (CAIL) (created by the decreto lei 3/78 of 9 May 1978) submitted to the direct control of central government. **Farmers Cooperative** and redistribution of land were initiated in 1976. In the same time as the Gabinete do Limpopo that had been in charge of the development of irrigation in the basin was extinguished in 1978 but the exploitation of the Xai-Xai and Chokwe irrigated scheme and the Massingir reservoir were maintained though renamed into a public body called SIREMO - Sistema de Regadio Eduardo Mondlane.

The party in charge, FRELIMO also initiated a **the grouping of population into villages (vilagisação)** pressuring people to live in larger and more centralized villages, with a hierarchised administration controlled by the party instead of the sparse settlement pattern that prevailed previously. This impacted both the rural and irrigated areas. In the Limpopo area the government used the 1977 major flood to consolidate both the nationalization of the scheme and to resettle smallholders in communal villages (Pellizoli, 2008). The government also embarked on replacing traditional leadership with the development dynamising groups, villages secretaries (Earle et al., 2006) but the war and rooted allegiance to traditional leaders in fact limited the impact of this replacement.

The country faced a large rice crisis in 1980/1981 that have been inputted to many causes with an average yield of only 1,5 t/ha. This crisis led to the **reorganization of agriculture and of the state sector in the perimeter** with the redistribution of the land of state farms to smallholders and private companies: CAIL was divided into 10 state farms of 2000 ha and the remains of land divided into family sectors and private sector. As a consequence, the scheme was divided into 4 main areas: (1) the smallholder sector (9 000 ha) farmed by the 12 000 families that were attributed between 0.5 and 1 ha; (2) the public firm sector (11 000 ha) were managed by state firms (public firm sector). Crisis of this firm led to the further subdivision into 4 ha module farms in 1991 (3) The private sector concerned 3 000 unities between 4 to 200 ha that farmed 2 500 ha. These farmers were chosen among the former peasant/settlers and Portuguese settlers that had stayed (4) the Cooperative sector occupied 1500 ha.

In total, the largest private commercial investments and two joint ventures between companies and government farmed 36 % of the best irrigated land (Pelizolli, 2008)

The criterion to benefit from land distribution in the smallholder and private sectors was the “capacity to be productive farmers”. In practice it related more to with “wealth, status, local connections and kinship relation” than equipment or specific expertise (Pelizolli, 2008). Some lotteries were also organized. This land redistribution was actually associated with the emergence of land and land tenure conflicts and tensions (revocation, water contract without land title, temporary rights).

In 1987 a structural adjustment program was initiated in order to reverse the declines in food consumptions and agriculture production in rural area, reduce national debts and establish conditions for economic growth. In particular four donors sponsored “peasant projects” which supported associativism in the smallholders sectors as a basis for extension services. This program participated to the creation in 1990 of “Casas Agrarias” in scheme which aimed to sustain the former cooperatives.

“The Civil war raged between 76 -92 and led to thousand of death, millions of refugees and devastated economy and infrastructure. Civil war priority target was destruction of public service infrastructure (road, school) paralyzed public service and destroyed infrastructure” (Gall, 2004). **War also heavily and disrupted social life and local economy** (Silva et al., 2010) with still visible consequences: Out the 36 shops that existed in Mabalane city before the war only 6 are still functioning and in rural area informal trade predominates (Perfil do Distrito de Mabalane, 2005). Rural areas were emptied and have not yet recovered their former occupation rate. Thus 70 % of Mabalane territory remains inhabited and not used and abandoned properties are still important. Infrastructures (road, bridges, dams etc) are still lacking over the countries and notably in the rural areas and most rural people often remains physically and economically isolated with little access to market and credit facilities (Osbahr et al., 2008)

### **Frame 3 : History from associativism in Mozambique (From Pelizolli, 2008)**

*Cooperativism in Mozambique date backs from 1911, although it concerned at the time mostly Portuguese farmers and was used to renegotiate credit and reduce import tariffs. In Chokwe the colonial administration supported the creation of cooperatives where indigenous better off farmers were able to participate in 1955. The first cooperative called Cooperative Agricola do Limpopo, was in charge to support farming labour of its members, provides rural extension services, commercialize production, distribute water and energy. It was supported by the association of the Water Users of the Colonato of Limpopo. The cooperatives created by the government in 1977 were initially successful as they provided access to irrigated land, inputs and means of production, but rapidly faced various problems. The creation of a Union of cooperative did not succeed to change the situation. The quality to the leadership, notably the character of the President and its authority was determinant in the success of the cooperatives.*

*In 1990 the donor peasant project created **4 Casas Agrarias** in the Chokwe perimeter to sustain former cooperatives which were latter transformed in 1993 into **Farmers association**, still grouped in the **Union of Farmers association**. In 2005, these associations received support by the Spanish cooperation to get legal status to avoid being swallowed by WUA.*

The 1992 cease fire paved the way to democratic reforms and opened the country to market economy. It was accompanied by a large involvement of donors with notably the launching in 1996 the Programa Nacional de Agricultura do Moçambique. This program supported the 14 identified irrigated schemes of more than 300 ha or 500 farmers, most of which did not function because of equipment failure. French cooperation also initiated a pilot project that

permitted rehabilitate 7000 ha in the Chokwe scheme. Massingir Dam was also rehabilitated in 1990 and a related smallholder irrigation project developed. The peace also permitted a partial return of the refugees to their land and agro-pastoral retour in the basin. Since 1992 the number of cattle is steadily increasing in the basin although it has not yet reached its pre-war level.

Decentralization process led to the creation of ARA-SUL to manage the dams and the Limpopo River. As a consequence of the 1997 “Lei das Autorquias”, a decree approved by the Ministry of Agriculture and Rural Development confirmed HICEP as the manager of the land in the Chokwe and Xai-Xai perimeter. The decree also instituted Water Users Associations to manage secondary and tertiary canals in the perimeter.

The extraordinary 2000 flood severely impacted the area, notably the hydraulic infrastructure. Channels in the irrigated schemes were filled by sediments when not washed away, leveling severely compromised and the Massingir Dam was damaged. Since the flood, HICEP managed the rehabilitation of Massingir Dam and the entry of water in Macarettane, rehabilitation of 15 km of the main canals, the rehabilitation of the primary and secondary infrastructure in 7000 ha (French cooperation). The rehabilitation of the primary and secondary infrastructure on another 7000 ha is starting (with Banco Islamico de Desenvolvimento).

Liberalization has also transformed employment opportunities, with local (unreliable) opportunity for trade and casual employment and increased competition with commercial farmer over land and natural resources (Eriksen, 2009). Agriculture policies have supported large joint venture large joint venture subcontracting small scale farmers (providing seed and chemical inputs against allocation of all crop production) and private-public partnership which are particularly active in the irrigated area.

### **3.2 SOME RELEVANT SOCIAL AND CULTURAL ASPECTS**

**Migration -more or less temporary-** has been part of local identity for a long time. Migration wages have played an important role in the economy of the area since the colonial area and help the better off to constitute a capital to invest or to sustain livelihood of the poorest (Pellizolli, 2008). It is also an important rite of passage to adulthood.

It also resulted in a “**deep gendered division of work with women in charge of household agriculture**”. The following table (Table 15) summarizes the activities for the different members of the families in the rainfed area of the basin. It also underlines that women in rainfed areas are often overloaded.

**Table 15 : percentage of people interviewed involved in different income generating activities in villages of Chicualacuala district (adapted from Bakker and Teyssier, 2010)**

Activities	Total	Work division
Agriculture	100%	Dominated by women and children por mulheres e crianças
Bush	78%	Predominantly mother and children
Animal Breeding	73%	Sons, fathers with sons. Some contract workers or leave the cattle to neighbors or family
Fishing	23%	Father and son, women when no men is available
Fire wood	100%	Nearly an exclusive femine task
Charcoal	26%	Mother, father or jointly, sometimes with the help of children and workers
Estacas (stick ?)	68%	Dominated by men
Wood	2%	Dominated by men
Forest plant collection	83%	Mother and children, rarely the father
Medical plants	72%	Mother and children, rarely the father
Small business	8%	Women and Men
Job	11%	Men
art craft	3%	Men
hunting	1%	Fathers and sons
Migration RAS <sup>a)</sup>	56%	Men

Two (independence war and civil war) wars that plagued the countries since the 60's which have been accompanied by **large scale displacements that also resulted from** periodic flooding and drought crisis in the region and the villagisation policy.

Displacement can have important traumatic consequences, depriving households from their network, social relationships, identification history and context (Gall, 2007). Some authors sustains that a culture of mistrust and isolation is still prevalent and significantly interferes with the encouragement of dialogue and participation. Cossa et al. (2001) found in their assessments for the Mozambican Red Cross that networking or collective work is still absent in Mozambican community life (UN System Mozambique, 2000a; Cossa et al., 2001; Bowen, 2000 cited by Gall 2007).

On the other hand associativism and ideology memories are still very active. Osbhar states that cultural ideology based on cooperation action group association and solidarity facilitates development of local association though they are highly politicized with relationships between associations, the party and the states (Osbarh et al., 2008). Besides, water and natural disaster is considered a collective rather than an individual experience: it helps developed a **shared sense of the past continuities to encourage community participation** making in socially unacceptable not to participate in group activity (Osbarh, at al 2008). Other consequence of the war the way tensions between the ruling party (Frelimo) and opposition (Renamo) are been played out through local politics.

Though people have come back since the end of the war, the disruption of this displacement on household should not be underestimated. It has also facilitated the spreading of the family in different location. Along with periodic migration movement these displacements may have facilitated the creation of **multi-locational household** (S Mercandalli; personal communication).

If matriarchal gender relations dominate in Northern Mozambique, the ethnic groups of the Limpopo region (Shona, Tsonga and Changana) have patriarchal gender relations. Males have more decision making authority and legal right such as the ability to enter into trade

contracts (Isaacman and Isaacman 1983). Thus women access to land only through male relatives which means that they often lose access to agricultural land when widowed or divorced (Brouwer 2008, Pellizoli, 2010). But male migration to neighboring countries led to many de facto female headed household and greater participation of women in the public sector, although absent men still have considerable amount of influence over how income is spent (Silva et al, 2009).

Local cultural trends also includes polygamy, *lobolo* (or payment of the bride price), the importance to live near your cattle. In Mabalane the main language is Xitsonga (15 % of the population speaking portuguese) and 71 % analphabetism rate. Various religions can be found with a majority of Sião/Zione.

### 3.3 LIVELIHOODS IN LIMPOPO BASIN

Globally, a household livelihood depends **on agriculture, animal breeding, small trade notably charcoal production, migration remittance**. The very detailed LIVELIHOODS BASELINE PROFILES of the Limpopo Basin produced by FEW-NET have identified 11 livelihood zones in the Basin. The reports details in each zone the main livelihoods and food security aspects depending of the main assets of households.

Based on this study, the Limpopo can be subdivided into three main areas:

- The semi arid interior (MZ 34 Sorghum and Millet / MZ 35 Maize)
- The Upper Limpopo riverine ( MZ 36 Chicualacuala Mabalane, MZ37 Limpopo national Park, MZ 36 Massingir)
- The Lower Limpopo (ME 39 non irrigation scheme – Chokwe irrigated area mostly, and MZ 42 Non irrigated and Lower Limpopo)

The main characteristics of these zones are summarized in annexe one for the semi arid zone (with limited access to water), one for the riverine zone (access to the Limpopo river or Elephants rivers) except for the irrigated area, one for the irrigated area schemes (notably Chokwe and Xai Xai). The livelihood characteristics of the “coastal” areas have not been detailed in this report which only deals with the upper and middle Limpopo region of the Basin relevant for the CPWF research areas.

This tables and existing studies underline the following aspects of livelihoods.

- Access to irrigation can significantly increase incomes and livelihood of their beneficiaries but it is not a guarantee to get better cash income: cash poor families are can also be found in the irrigated areas. In all zones the poorest families are not food sufficient and suffer from a hungry gap period and present similar characteristics. In rainfed area agricultural productivity is low with average yield between 0,5 and 0,7 t/ha for cereals and production generally do not cover annual needs of families.
- The semi arid interior with difficult access to flowing water or irrigation tend to be poorer than the riverine area or irrigated area or to offer less opportunities to get better livelihoods, unless specific cash income source are available **such as charcoal production**. The richest households in the semi arid zone correspond to middle range families in other areas. No information was found however in the respective proportion of each group in each area. It could be interesting to assess whether the agricultural or

population census could give have indication of groups repartition provided indicators can be identified. Brouwers (2008) for example identifies size of households, which account for the available working force, the cattle head (from 0 to 110) which is related to access to remittance and the number of granaries as the main factors for the differentiation of households.

- Cattle and breeding have different functions: transport, animal traction, saving, Lobolo payment, milk production, manure and skin. All types of households in the different zones do some kind of breeding: the poorest groups in all types only breed a couple of chickens while breeding diversifies with wealth increase (combining goats, cattle, duck and pigs). The better-off have generally the biggest cattle herd but may choose not to raise other type of animals than cattle<sup>28</sup>. **Livestock ownership, notably cattle, is one of the most important determinants of wealth** and livestock sales represent the largest source of income for the middle and better off. The difference between poorest and lower middle families lies in the possibility to raise a small herd of goats. In the non-irrigated area, studies have pointed out that herd building income often comes from remittance from migrants and/or charcoal business. Cattle are normally a man business although women can take care of the animal, but it is men that decide about selling animals (Bakker and Teyssier, 2010). In the villages studies in the Limpopo park, Nhancale mentioned that 90 % of households owned livestock (Nhancale, 2007)
- Wealthier households receive most of their cash through sales of goats or cattle and crop production in irrigated area although charcoal production is also important locally.
- **Source of income are particularly diversified for the poorest household that have to find different strategies to get cash.** They heavily depends on picking and natural resources to complement their dietary in normal year (as they have only 7 to 9 month food storage produced) – which are complemented by wild food, (roots and fruit) and buying through cash from casual/agricultural labor and/or charcoal production or brewing beer (especially female headed household)<sup>29</sup>. This is even more important during drought year. However, Silva (2008) states that being able to meet all needs from own farm bring the highest social esteem and subsistence farming is associated with high social respect (along with village leaders, nurse and teachers). In the village she studied, selling vegetable was actually viewed as an undignified activity probably because it points out to household that cannot meet their food needs by farming. Besides petty trade also take time from subsistence farming without generating typically enough cash to hire replacement (Silva, 2008)
- According to these report, **migration** is particularly important in the Maize middle Limpopo area and is a key strategies of young men to accumulate money for marriage

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<sup>28</sup> A 1996 FAO report regarding livestock ownership underlined that at the time cattle was owned by a very small minority of households in the Gaza province (9 %) who also grew significantly more crops than non cattle owning households did and that only 30 % of household owns goats with 10 % of households owning 1/3 of all goats. 25 % of households did not own chicken. A large part of livestock infrastructure such as such as diptanks, watering points, development and quarantine stations have been destroyed during the war

<sup>29</sup> The following numbers gives an ideas of price in the maize zone: charcoal : 120-200 MT/sack, firewood 10-20 MT budlle or 250-550 MT by cart. Wage rate : 50 MT /p/d oxen 200-250 MT/day.

(to pay the bride price or *lobolo*) and acquire autonomy from elders. It also allows to accumulating wealth in heads of cattle. 71 % of village studied by Osbarh (2008)<sup>30</sup> were having a son away and 19 % a male looking for jobs in urban area. In other area migration would be more strategy to cope with occasional difficulties. However other source points out to important migration income to families in other areas. Remittances from South Africa have tended to reduce drastically in the last years and people that are away do not all contributes to household income.

- **Workforce** is a key limiting factor and constraint in many household along with equipment (plough oxen and cart) to the cultivated surface. This is also the case in irrigated area. Those with extra labor or access to transport can diversify their cash income portfolio while larger household invest in cattle and wealth is more related to the ability to cultivate land rather than size of land owed – which includes ability to plough. In the Maize zone, the analysis points out that poor household are often female headed. Middle and better off have larger size family inclusively up to two wives. The very poor are often the elderly, young with many children. Chronic diseases probably also impact household livelihoods. In the perimeter, Puzolli states that the problem is not access to land but use it as reported by Amilei.. This author proposes to differentiate the farmers in 5 groups : Grupo I A Depauperados, Grupo I B Auto consumos, Grupo I C Consolidados, Geupo II Patronais, Grpo III. The internal variability of the groups and the lack of story line of the household makes it difficult to give a general description of each group but it appears that the older households tends to be less well off. As underlined in the livelihood baseline “consolidado” group have a significantly higher number of animals and breeding and diversified herds (ducks, goat, pigs, cattle, chicken). The better off (non commercial agriculture) beneficiates from diversified source of income inclusively from remittance and trade. The analysis points out that most of the smallholder do not have the land title. By analysing task division between family members, Bakker and Teyssier underlined that task are gendered defined that women are particularly overloaded.
- Apart in upper semi arid interior (non riverine) farm functioning is characterized by a **dual land use system** with land if possible both in the fertile loam soil of the flood plains and in the sandy soil in higher elevation. These sandier plots generally provide consumption and insurance crops such as cassava beans, sweet potatoes maize fruit and nuts; But they can perform poorly in drought but guaranty cropping in normal and wet year when the fertile lowlands are flooded: lowland vegetables rice maize and fruit that have better commercial potential. However according to Bakker and Teyssier (2010) **only 10 % to 20 % of families have field in both type of areas**, while a majority only have fields in sandy higher soil.
- **Charcoal and/firewood selling** is particularly important is the bush area (not the riverine areas). In the 90's Brouwers states that charcoal business was controlled by professional charcoal makers though the labor was furnished by village community. Nowadays, it is a community activity and 50 % of the household were reported to be involved in charcoal in the studied village sample. In the same time the unplanned development of this activity is associated with high risks of deforestation. Project focusing on forest management that

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<sup>30</sup> Location to be verified but probably in the Maize zone

do not take into account the importance of this activity for household income have a high risk not to succeed. Forest management program (in the modele of Campere in Zimbabwe) should take this issue into account to be successful.

- Other natural resources can be important especially for the most vulnerable families. Nhancale lists the uses of different forest resources (p 100 and 101 (Nhancale, 2007)

### 3.4 GENDER ASPECTS

The constitution of 2004, the Family law of 2004 and the Land law of 1997 have enshrined principles of gender equity in the field of property right. Thus law gives Mozambican women and men equal rights and access to land (and to heritage) and women can get land title. Customary norms and practices are recognized as long as they comply with the constitutional non discrimination principle (Pelizolli, 2008).

However implementation of these principles is weak in a system that civil and traditional ,law, customs and practices disenfranchise women, notably aids widows (Hendricks and Meagher). The main household assets (land building and vehicles for example) are typically registered in the husband's name or assumed to be in his control. Typically, when land are registered in both name, the husband land produces for sales and the wife for consumption but this situation is not universal (Tique, 2002). Generally in common registered situation women controls crops, field and other products of household until a surplus beyond household need, which is then typically in control of marketing the goods and control the income. Moreover women access land rights through men as committee that exercise control over land in collective DUAT have generally few female representative.

The Law of succession (2004) looks to prevailing customs and accords lower priority to widows tan children and the parents of deceased. Typically, the widow is expropriated of the husband's property by the larger family at the latter death and expropriation can be total including land home productive assets -including livestock and personal property- unless the windows have either mean to resist or have developed goods relationship with the famiy (Hendricks and Meager, sd). Spreading of HIV have weakened the traditional form of social protection for windows (finding a new husband in the families or relying on adult male children). A new inheritance law is being prepared that should provides equal share for the children and widows.

In the Chokwe scheme many households are headed by women who are in charge of farm labor including ploughing and caring for cattle. Their ability to keep the status of productive farmers<sup>31</sup> depends of what kind of household they belong to and the relationships they maintain with their migrant husband or sons, that is whether they receive remittance which are crucial to rent plough or hire seasonal worked (Pullizoli, 2008). The most successful are those with a husband living with them or providing a regular source of income, or former migrant worker. This kind of families often owns two plots in the schemes one in the name of the husband and one in the name the wife, along with another one in the rainfed area more for household consumption. Single mother divorced or widows struggles especially if they do not have help. They tend to crop more maize (which demand little work) and beans (instead

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<sup>31</sup> Which determines the access to land

of rice). As already stated this is quite an ancient characteristic: At independence 30 % of farm were headed de jure by women.

### **3.5 VULNERABILITY TO RISKS AND RESILIENCE**

#### **3.5.1 Water hazards: one among many stressors.**

The water hazards (inundation and drought) are actually one among the many stressors farmers have to cope with in the area. The cyclic destruction of irrigation equipment in two villages illustrate the diversity of risks faced by farmers in the area (Manjate and Magaia, 2010).

In the recent past rural communities had to face two wars as well as the influence of rapid economic adjustment which contributed to the disruption of the socio-political systems (Osbarh et al., 2008, Renzio and Hanlon, 2007). Rural population especially in the non irrigated area remains physically and economically isolated with little access to market or credit facilities. Though the macro-economic and structural reforms were accompanied with high rate of economic growth, their impact over rural poverty is controversial (Renzio and Hanlon, 2007). Besides, chronic diseases jeopardizes already small available workforce: the Chokwe and Mabalane districts have one of the highest HIV prevalence of Mozambique that amount to nearly 24 % of the population (1/4). Osbarh reported that they exacerbated household labor constraints in 35 % household of the studied village (Osbarh 2008). Livestock which are crucial livelihood assets are also facing episodic epizootic such as cholera, with a severe outbreak during the 2003 drought for example. Wild animal hazards are also reported as one important problem especially in the area close to the Limpopo park: Elephants cross the Limpopo during the dry season and raid green crop under irrigation (Anderson and Pariela, 2005) (Anderson, 2005); Neighbouring communities also reports crocodiles accidents toward human and animals. All this factors are actually interdependent and tend to exacerbate the vulnerability to water hazard of the population. Consequently, farmers appears to be more concerned by the less significant but more constant threats on their livelihoods than the episodic water risk (Patt and Schröter, 2008)

#### **3.5.2 Drought coping strategies**

Different responses to annual food shortage have been reported in the FEW-net report. Food short families resort to multiple portfolio of activities (casual employment, gift aid, temporary migration, leasing of material, craft work and petty trade, brewery) to secure cash in order to buy food, selling crops (a majority) and social network. The precise combination of activities depends of the opportunities and characteristics of each area (example availability of wood for charcoal making or firewood selling) and workforce availability of the household. for example in some area wood for charcoal and firewood is the most important cash activities in case of annual food shortage and in other Osbarh 2008 reports that 90 % of people interviewed used their social network to access natural resources that are essential in this food shortage period.

Households also reduce food consumption and/or expenditure to preserve asset while in last recourse, sell easily disposable assets such as small stocks (chickens, pigs and goat) (Osbarh, 2008 – maize zone).

Consequently, when drought consolidates a higher number of persons tend to diversifies their activities which results in an increase trade activities with with local and small scale interaction strategies (eriksen 2009). Household that have access to more permanent water sources also invest in horticulture crop but watering and fencing is labour intensive and suppose workforce availability and investing in pump or drip is cash intensive. It appears actually that many coping activities not viable in long lasting drought and many diversification strategies become unviable as drought intensified (eriksne and silva 2004). The author reports that although local trade had initially increase in the village studied at the start of the drought, alternatives dwindled and the village economy more or less closed down as the drought intensified. People tended then to resort to sale of charcoal other resources in highly exploitive conditions. It also depended of traders. Casual employment got also harder as the drought increased.

Formal association as a link of the community to external institution plays a specific role for example as a link to access to information and long term scientific training, or as a form of buffer in Chokwe area.

### **3.5.3 Inundation management**

Evacuation is the measure to take in case of flooding. It supposes the existence of early warning systems, reliable sheltering system and emergency relief. In the Mabalane district only 14 % of the people interviewed by Brouwers had listened to the local radio warning in 2000. Others were informed through local authorities and neighbors. Traditional knowledge and indicators were also reported to play a significant role, notably the comportment of ants or some shrubs such as Umlhangula shrub (*Euclea divinorum*) and Ukanyi terre (*sclerocarya birrea*) that are said to produce many flowers and big abundant fruits in case of very rainy season (Brouwer, 2006). Since 2000, the early warning system is considered to have improved in the area and in Mozambique in general and the very low number of casualties reported in subsequent inundation event is attributed to this amelioration. The Limpopo Basin committee plays also a role in information dissemination: the basin agency (ARA) informs the committee through regular and extraordinary meetings of the evolution of the hydrological situation and the committee members decides whether to proceed to radio specific announcement or other large scale dissemination. Although some initiatives have been developed since 2000, there is for the moment little preplanned facilities in the area at local level. Emergency sheltering is established in district capital and surroundings and camp site are selected during an emergency for depending of accessibility for relief agency (Gall, 2004). NGOs and aid agencies advocates for the establishment of dual purpose shelter at local level that could provide for accommodation for evacuated households, pre-storage of food and water and a venue for aid distribution.

People tend first to look for support and shelter in their social network and mostly translate in the donation of food or other small items providing a basic and minimal safety net. It is far more difficult for affected families to find shelter in their surrounding social network and concerned only families that had more to spare (both as the recipient and provider of the sheltering). (Brouwers, 2006). The people are not necessarily those with whom is already being interrelated through traditional exchanges system.

According to Brouwers (2006) the 2000 flood impacted 17 000 ha, affecting 5 071 people and 1 150 households in the district. All people he interviewed lost their lower field crop and most of them lost small equipment. Three quarters of them also lost heavy equipment such

as plough and nearly half of them lost their field. On the other hand less than 1/5 of affected people reported cattle loss (Brouwer, 2006). Coping with inundation thus mean the ability to recover from equipment (and seed) loss to start new crops.

The traditional exchange system was unable to cope with the large scale loss of oxen and plough in the area (Brouwer, 2006) and this exchanges mechanisms played a minor role in the recovering from the flood and even did not recover to the importance it has before the flood. As Brouwer underlined although this mechanism are important to make families resilient to drought and other low level event they are insufficient to deal with high scale mechanism. Consequently the supply of equipment including oxen and plough remains a crucial aspect of emergency relief.

## 4 REPORTED EQUITY MECHANISMS IN LOCAL LAND AND WATER INSTITUTIONS

### 4.1 THE ROLE OF ASSOCIATION AND NETWORKING

#### 4.1.1 Formal relationships and the role of associations

Since 1994 governance have sought to encourage participation accountability and trust and increase communication between villages; In rural areas, the district implementation of the national agricultural policy was accompanied by the creation of **formal agriculture associations**. Such associations are found both in the irrigated schemes area and rainfed areas. In the latter, associations have in fact replaced the former unsuccessful cooperatives and casas agrarias. 41 associations are formally recognised by the national law In the Limpopo basin. Most of the associations in the Chokwé District are irrigation associations (WUA) (Matsinhe, 2011),

Farmers associations develop collective activities on common land and experiments with work group. It thus provides an opportunity to learn and change. Income of the association comes from selling the products cultivated in communal plots.

Both Osbarh (rainfed areas) and Peluzilli (irrigated schemes) underlines **their contribution for gender equality in the community**. They help women to get more control over farming and share of the benefits. In the villages studied by Osbarh 87 of the women were reported to participate in a farming association that provided access to information, extra labor; 68 % of these women also gained access to land through the association. The associations also contributed to the formalization of *Mastoni* exchange system which is important for women (Osbarh et al., 2008). In Chokwe perimeter women represents 84 % in average of the members of associations<sup>32</sup> while only 34 % of WUA were women .(Pellizzoli, 2008). Association membership brings livelihood security to women especially for the poorest

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<sup>32</sup> It is not clear whether this associations are actually still existing or not

women that are unable to keep on the intensive labor and raise the money to pay the water fee.

Pelizolli reports that the official establishment of WUA was the theater of a conflict between HICEP and the former cooperatives. The associations struggled to be allowed to participate as association and not members as individual farmers. This was perceived as a way to minimize the risk of expropriation for those unable to pay the water fees such as single women: the union of farmers association would pay the fee (by using the commercialization of the production cultivated in communal plots) that member will pay back whenever able to do it

#### **4.1.2 The documented existence of networking activities in rainfed areas**

Recent studies are pointing out the role of networking as well as formal and informal exchanges relationships and associations in livelihood in general and resilience in particular particularly the rainfed areas. Exchange relationships are defined by Brouwers as institutional arrangement that organize the sharing of foods, goods or animal draught and organize saving and credit. Social connections are maintained through traditional gift system in order to ensure future reciprocity (Osbarh et al., 2008)

Informal and formal relationships are mentioned in different studies and detailed more specifically by Brouwers (2008) and Mash (2002). How the relationship is being named seems to vary from one location to another. The different mentions are presented in the following table.

The exchange of labor mechanisms allow for coping with household labor shortage, repaying gift or receiving food. Osbarh also indicates that it provides also access to extra laborer (45 % respondents), land (68 %) and information (52 %). Getting access to information was particularly important for those who have the biggest herd and used this kind of exchange to link outside of the community to get access to medicine and advice (Osbarh, 2008). Globally this links helps maintain solidarity between neighbors and securing families a share in limited food during difficulties. This kind of exchanges are also common in other area such the Alaotra region in Madagascar (Ducrot and Capillon, 2004).

**Table 16 : Different informal relationships in the litterature**

(Brouwer, 2006)	
Kuvekissa	outplacement of cattle (to keep livestock in somebody else homestead) (risk diversification strategy) and reciprocity with the same service
Kukathekela	move temporarily to another area to work for food (resort to kin living in better area)
Kukashela	Pooling farming tools (reduction of investment at community level)
Kurimela	Individual formal labour exchange - work on somebody land in exchange of ploughing - (35 % of all household are involved in such a relationship notably female headed ones)
Kukusela	provide heard man of boy in exchange of cattle
(Silva et al., 2010)	
Ajuda mutuo	Community members received goods in trade for help (first identified in riverine zone)
Ganho -ganho	<i>Refers to exchange of work against food or salary</i>
(Osbaahr et al., 2008)	
Tsima	Group arrangement where food or alcohol exchanged for farm labour (male group) : help rebuild house, or replant field after drought
Matsoni	Informal exchange between women => more formal self organized network (concern 21 % household) is a guaranty that dryland plot was planted
Kuvekela	look after other livestock to keep the first born as paiement : protect social norm including inspiration of livestock ownership and strengthen trust with community within the ideal of equity Increased since 92 - could correspond to kukusela
(Amilai, 2008)	
<i>No name</i>	In the Chokwe perimetre part of the household get access to motorization by working in the owner's land.

Strong cultural norms existing regarding reciprocity of labor exchange but it require availability of workforce (Osbaahr and al, 2008). Osbaahr indicated that female headed, small household and elderly of the village studied (in the Maize zone) were particularly depend on their social network but were those who had the most difficulties in returning gifts and labors which underlines the limits of such mechanisms. Other limit concerns the work coordination (when people have to share equipment or workforce) in different farms that can lead to late ploughing or planting (mentioned by Amilai in the Chokwe perimeter) (Ducrot and Capillon, 2004).

This informal exchanges can evolves with time: Osbaahr underlines their changing pattern with a shift for gaining access to labor by paying in cash to more reciprocal or non cash exchange. He assumes that the economic decline and restriction on migrant works, heavy loss on cattle due to war and drought explains the change. On the other hand *Matsoni* exchanges also are reported to have evolved from an informal exchange base to more formal exchanges.

This type of relationship has not been cited in the Chokwe literature. Moreover a comparison between 4 communities in Southern Africa – including one community of the Gaza province) underlined that only in Mozambique network of exchange continued to play an important role in the coping strategies. In South Africa, this kind of network are less developed or based on exclusion mechanisms which reinforces existing inequalities within coping mechanisms. Weak solidarity links and distrust led communities members to rely more on other mechanisms such as church network or even remittance by migrants.(Osbaahr, 2010). Interestingly relationships with people outside the village were stronger in South Africa than in Mozambique at individual level, although the traditionnal leadership was active to been able to develop formal relationship with administration and external aid and act on opportunity with institutions outside the village (Osbaahr et al., 2010);

## 4.2 EQUITY IN WATER RIGHTS AND ACCESS

### 4.2.1 Water resources

As already underlined although customary customs concerning water are said to exist but there is no information for the Gaza province. Assuming that this customary regulation does not play a fundamental role in water access, access to irrigation water depends in practice to access to land, irrigation infrastructure and equipment.

The two latter can be obtained through external support (government or external NGO/agencies occasionally combined) provided some investment from the communities, or negotiated arrangement with private equipment owner as reported in the Ngonga community<sup>33</sup> (Manjate and Magaia, 2010).

Water access may suppose the engagement with outside players such as external aid (NGOs) and or government which permitted in the Ngonga community access to a new pump, extension of the electricity line to the pump house (government) and rehabilitation of the scheme including land reorganization. The NGOs is expected to leverage gouvernement support.

In some cases, access to land supposes the development of partnership between a farmer or association in possession of a DUAT or land title. This is notably the case of private investors that want to get access to irrigated land in the Chokwe perimeter (Manjate et al., 2010) in the line of what as been reported for land access by Tique (2002). The arrangement was assessment to provide benefit for both parties: land – and water – to the commercial farming and input support for farmers. In spite of these it was not renewed which probably means that the benefit were not that clear on one hand and that the problem<sup>34</sup> reported more important.

In term of equity the arrangement was also problematic although this aspect as not been thoroughly studied. Indeed solidarity mechanisms were formally mentioned. The commercial firm was to prepare 100 ha of land at the beginning of the season that was supposed to reserve to smallholders of the association. Some people that had to cede their plot for the commercial farming did not actually receive land and had to take turn. Those who did received land with more difficult water access because of lesser leveling.

Van der Zaag and al (2010) clearly point out to the risk of such arrangement: they can debilitated local land and water entitlements; there is a high risk of gender bias were “women would be more likely to vacate space or avail their labor to allow male entrepreneur to engage in irrigated farming”; partnership tend to be vertical undermining other form of client organization and solidarity; private firm tend to limit the number of interlocutors<sup>35</sup> to control

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<sup>33</sup> The twenty associated farmers provide petrol on the basis of 20 l for 4 hours of pumping. The pump owner irrigates first its own fields for half an hour while the other organize themselves to irrigate for the last 3,5 hours.

<sup>34</sup> Conflict concerning the commercialization of production, problem in the responsibility to pay the water fees, delay in providing input or working the land. Actually the commercially firm exclusively decided on input supply (timing, quality and amount) and on the payment for productuin (price and timing) the two main point of interest of farmers.

<sup>35</sup> MIA the firm engaged in the arrangement have decided to only engage in the future with large farmers for this type of arrangements

the negotiation process and reduce negotiation cost, providing space for client patron relationships (van der Zaag et al., 2010a).

Equity issue was not only between the private firm and the association but also internal to the association. It was not clear at the end who were the beneficiaries of the 100 ha that were prepared<sup>36</sup> by the private company. Moreover the arrangement has not been renewed but the land was not returned to their former users and it is also unclear who is now cultivating this land (with good water access).

These issues underline the need to study more carefully the land tenure arrangement that prevailed in the scheme or in irrigated land which remain little known and studied.

It must be noted ARA can impose to land users to leave a public access to spring, lakes, ponds, and marches (Administrative public rights of water) (Manjate, 2010). The provincial governor can also requisition water (including water set aside for private use) in case of Force Majeure in order to satisfy the common uses of water on a temporary basis. The receiver must first be notified and the requisition published in the *Gazetta da Republica*. (Manjate, 2010)

#### **4.2.2 Water points**

At village level Magaia and Manjate (2010) reports that all village have access to the water points of the village provided a monthly payment of 10 MT used to buy spare parts in case of break down and 1,5 MT for 40 l. The communities also acknowledge the existence of people who can not afford to pay this tax (elder people, poor people and sick people). In this case and depending on their health and physical conditions they might be requested to do some community service such as cleaning the area.

## **5 CONCLUSION: ASSUMPTIONS FOR EQUITY AND PROPOOR MECHANISMS**

Pro-poor mechanisms can deal with different aspects of protection or security for the most vulnerable such as

- To protect them against abuse by more advantaged one that would further more exclude the most vulnerable such as grabbing land or water.
- To give the more vulnerable a specific voice so that their concern and interest can effectively be taken into account.
- To provide a safety net, security net to avoid further exclusion or overcome specific localized difficulty
- To facilitate some kind of redistribution mechanisms to help the most vulnerable to overcome their situation.

Our objective is to study the pro-poor norms and practices both at legal and institutional level and at community level:

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<sup>36</sup> Which were not prepared in time

- Is there a pro-poor dimension in the norms and practices ? Who is indeed being target and to what extent does it reached the most vulnerable of the communities studied?
- What kind of mechanisms is being mobilized (protection, voice giving and empowerment, redistribution mechanisms, solidarity mechanisms or other) ? To what assumptions this mechanism relies on? What social, political or economical processes do these measures aims to compensate?
- In what social, geographical and political context are they thought and implemented?
- What are they efficiency and their bias ?
- How are the different mechanisms connected and interacting ? Is there any synergic or contradictory process?
- What are the more promising processes or approaches either innovative or well used to deals with the issue of equity?

This literature reviews underlines the three main dimensions of vulnerability in the Mozambican part of the Limpopo basin.

- A geographical dimension: those who have access to plot in large irrigated schemes versus those who do not have this opportunity.
- A structural dimension: commercial farming versus smallholders in particular in the irrigated scheme
- More vulnerable in the communities themselves versus the better off in the communities.

Social differentiation drivers within the communities determines

- Access to lowland plot with higher productivity potential, although they present occasional flood risk. As we have seen, flood risk is viewed as one among many factors contriving agricultural livelihood in the area, and not the most recurrent one. As plot is distributed by the "local leaders", relationship to the local leader determines access to this lowland.
- Access to remittances is a key driver for capitalization. This supposes to consider household as multi-localized families. More vulnerable people can be locally rooted family.
- Workforce is also an important factor not only for crop production but also to reciprocate in social exchanges that is the building of the basic safety net: These are notably the small household notably female headed household, but also the elderly or families affected by chronic disease.

Social network and exchange network can be viewed as some type of safety net or social mechanisms but can be manipulated by the better off to better exploit what it has to offer that either extra labor, food, access to lowland area, cattle accumulation or information. It is also a driver of social differentiation.

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## ANNEX 1 : THE RELEVANT MOZAMBICAN LEGISLATION FOR WATER AND ENVIRONMENT

Source: (MICOA, 2006)

Leis e Políticas Relevantes	Numero do Decreto	Algumas Considerações
Lei do Ambiente	Lei nº20 de 01-10-97	Trata das bases legais para uma utilização e gestão corretas do ambiente e seus componentes, com vista à materialização de um sistema de desenvolvimento sustentável no país
Lei das Pescas	Lei nº3 de 26-11-90	Dispõe sobre a indústria pesqueira no país e estabelece os mecanismos de gestão, licenciamento e controle desta actividade
Lei das Águas	Lei nº16 de 3-08-90	Controle das águas interiores
Decreto de criação do Serviço Nacional de Administração e Fiscalização Marítima	Decreto nº 34 de 01-11-91	Reorganiza a estrutura da autoridade marítima no país e actualiza a legislação da administração portuguesa sobre a matéria
Lei do Mar	Lei nº4 de 04-01-96	Regulamenta a actividade no país e definem os fóruns jurídicos competentes na matéria
Lei dos Tribunais Marítimos	Lei nº5 de 04-01-96	Regulamenta a actividade marítima no país e definem os fóruns jurídicos competentes na matérias
Lei das Autarquias Locais	Lei nº de 18-02-97	Sobre a organização e atribuições dos governos locais, regulamentando o funcionamento descentralizado da administração
Lei das Florestas	Lei nº10 de 1999	Legisla a utilização dos recursos florestais e indica vários regimes e procedimento para o uso dos recursos estaduais
Regulamento Florestal e de Fauna Bravia	Reg. nº12 de 2002	Regula a utilização dos recursos florestais e de fauna bravia incluindo a delegação de poderes para as comunidades locais, estabelecendo a taxa de 20% sobre a exploração florestal em benefício das comunidades onde os recursos tenham sido explorados.
Lei de Terras	Lei nº19 de 01-10-97	Estabelece o quadro fundiário do país e regula o acesso ao uso do solo, sendo portanto o documento básico orientador da ocupação do espaço e da apropriação dos lugares.
Lei das Minas	Lei nº14 de 26-06-2002	Preconiza que a actividade mineira deve ser exercida observando-se os princípios da gestão e do uso dos recursos minerais bem como a protecção do ambiente, incluindo os aspectos sociais, económicos e culturais
Lei dos Órgãos Locais (LOLE)	Lei nº7 de 2003	Esta Lei pretende enaltecer a descentralização dos órgãos de decisão para o nível provincial e distrital
Política Nac. do Ambiente	Resolução N.º 5/95, de 03-08-95	Assegurar uma qualidade de vida apropriada aos cidadãos moçambicanos garantindo que a gestão do ambiente e dos recursos naturais se faça por forma a que estes mantenham a sua capacidade funcional e produtiva, para satisfazer as presentes e futuras gerações;
Política Nacional de Águas	Resolução N.º7/95, de 08-08-95	Uma melhor utilização dos recursos hídricos disponíveis para todos os propósitos através da planificação sustentável da sua utilização, visando a satisfação das necessidades das populações e desenvolvimento da economia nacional;
Política Agrária	Resolução N.º 11/95, de 31-10-95	Recomenda usar de forma sustentável dos recursos naturais, em particular do recurso terra, reforço da conservação da biodiversidade, participação das autoridades e comunidades locais em acções relacionadas com a conservação, controlo e produção daqueles e participação do sector agrícola na gestão dos recursos hídricos.

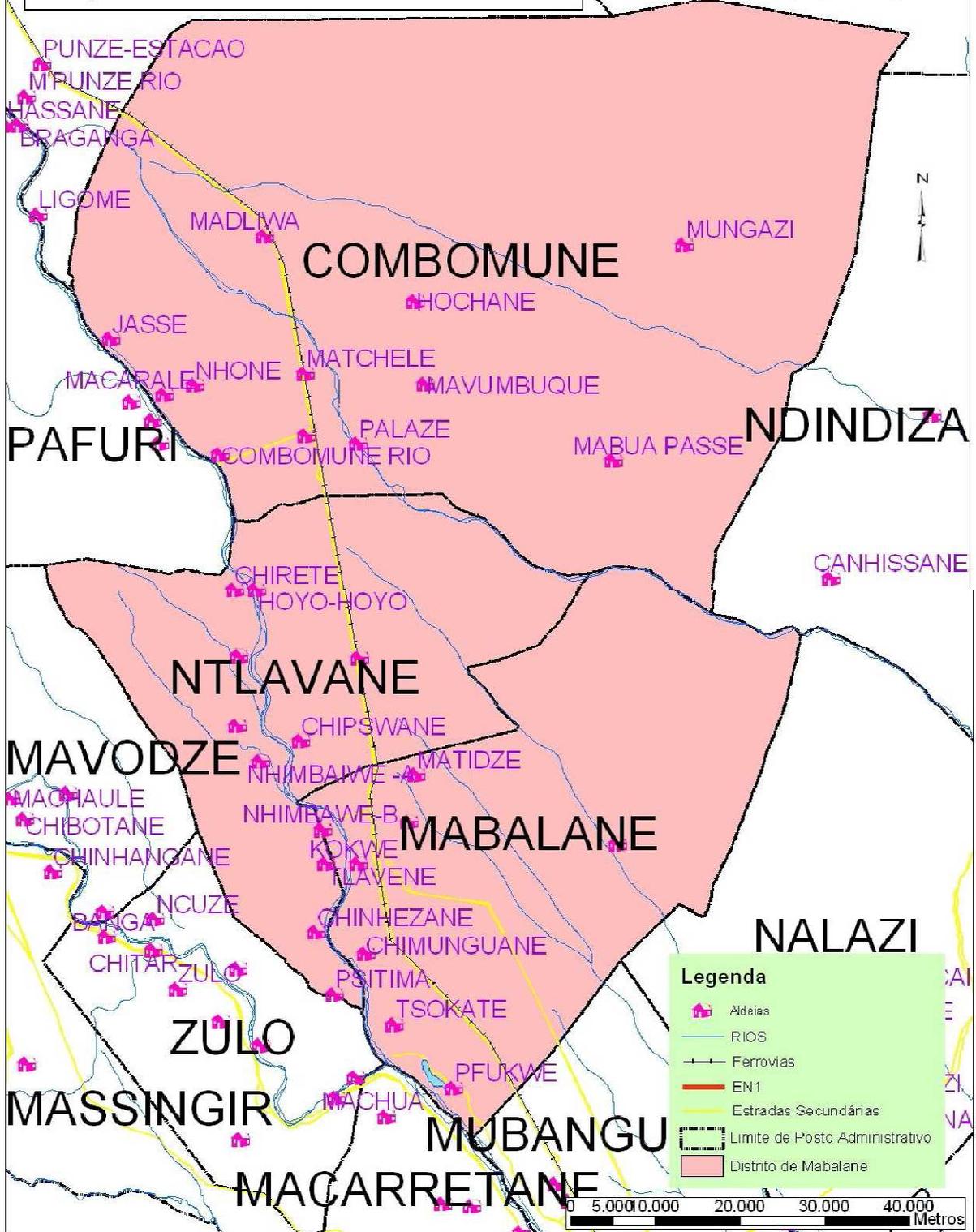
Política Nacional de Terras	Resolução N.º10/95, de 17-10-95	Relança a produção alimentar; Cria condições para que a agricultura praticada pelo sector familiar se cresça e se desenvolva; Promove do investiremto privado;
Política Pesqueira	Resolução N.º 11/96, de 28-05-96	Integra as actividades pesqueiras no quadro do desenvolvimento económico do país, uma vez que o sector pesqueiro é o que contribui com maior volume de receitas para o país.
Política e Estratégia de Florestas e Fauna Bravia	Resolução N.º 8/97, de 01-04-97	Directrizes para a coordenação dos esforços de todos os intervenientes com vista a contribuir para o desenvolvimento sócio-económico e ecológico do país através da protecção, conservação e uso sustentável dos recursos florestais e faunísticos.
Política do Turismo	Resolução nº14 de 4/4/2003	Estabelece a abordagem institucional, mecanismos de planificação e controle, promove parcerias publico-privadas, integração nas políticas de desenvolvimento, promoção do turismo, preservação cultura, treinamento entre outros aspectos
Estratégia do Turismo		Desenvolvida para implementação da política de turismo como forma de suporte e promoção do turismo e estabelecimento dos requisitos para o envolvimento dos vários actores na implementação do turismo
Estratégia do Desenvolvimento Rural	Ainda em elaboração	A estratégia de desenvolvimento rural advoga entre outros aspectos os mecanismos de coordenação entre as instituições de estado como os restantes parceiros de desenvolvimento, alargamento do financiamento as zonas rurais, acesso a mercados e melhoria dos mecanismo de participação comunitária.
Programa Nacional de Gestão Ambiental		
Agenda 21		

## ANNEX 2: THE RELEVANT LEGISLATION FOR THE ENVIRONMENT

Source (Dondeyne, 2010)

- The Political Constitution of the Republic, 2004
- Law 18/97 of National Defence and Armed Forces, 1997
- The Environmental Law 20/97, 1997
- Presidential Decree n. 2/94 establishing the Ministry for the Coordination of Environmental Action (MICOA), 1994
- The National Environment Policy, 1995
- The National Policy for Disaster Management, 1999
- Presidential Decree 5/99 creating the Coordinating Council for Disaster Management, 1999
- Decree 38/99 establishing the National Institute of Disaster Management (INGC), 1999
- Decree 52/2007 approving the Organic Statute of INGC
- The Forestry and Wildlife Law, 1999
- Law of Territorial Planning, 2007
- The National Land Policy, 1995
- The Erosion and Uncontrolled Fires Prevention and Control Action Plan, 2007
- The Land Law, 1997
- The Mine Law, 2002
- The Industrial Strategy, 1997
- The Energy Policy, 1998
- The Tourism Law, 2004
- The Oil Law, 2001
- The Urban Environment Management Action Plan (in preparation)
- The Coastal Zone Integrated Management Strategy (in preparation)
- The Pollution Prevention and Coastal and Marine Environment Protection Regulation, 2006
- The National Water Policy, 1995, revised in 2007
- The National Water Resources Management Strategy, 2007
- The Industrial Policy and Strategy, 1997
- Action Plan for Absolute Poverty Reduction (PARPA), 2006-2009

# Mapa do Distrito de Mabalane





ANNEX 5 : LIVELIHOODS IN THE LIMPOPO BASIN (FewNet, 2010)

**Semi arid areas livelihood – Upper Limpopo**

	<b>Semi arid interior</b>		<b>Semi arid border – non riverine to permanent rivers</b>	
	<b>Millet zone</b>	<b>Maize Zone</b>	<b>Maize and Ground nut (Chicualacuala)</b>	<b>Charcoal (Massingir)</b>
<b>Main production</b>	Agro pastoral area (sorghum and millet dominant)	Agro pastoral area (maize dominant)	Agro-pastoral	Agro pastoral area complemented by charcoal trade. More recent resettlement
<b>Access and market</b>	remoteness		Remoteness and low population density (compared to semi-arid border riverine )	
	Very poor access with poor network and road in bad condition	Poor access	Poor access	Poor access although better
<b>landscape</b>	Flat low lying areas with shrubs and bushes	Flat land, intermittent rivers		
	400 – 600 mm 1 cropping season		300 – 500 mm 1 cropping season	
<b>crops</b>	Pulses, maize water melons, pumpkins and Cashews	Cowpeas, groundnuts, root crops	Maize, groundnuts, cowpeas, bambara nut beans	
<b>Land</b>	1/3 ha to for the poorest – up to 5-10 ha for the richest		From 1 ha to 5-8 ha for the better off	
<b>breeding</b>	Poorest only owns chickens, then goats then invest in Pigs, ducks. cattle (up to 40) only to the richer		Chickens only and a couple of goat for the poorest + herd of goat (> 15) and cattle for the better off (up to 20)	
<b>Asset</b>	Cashew trees (more important in the Maize zone) and a couple of oxen for the better offs		A couple of pair of oxen and donkeys for the better off	
<b>Income</b>	Cash poor household : Sensibly lower for the poorer than in other zone (< 15000 Mts) Do not exceed 50000 for the richest a little less in the Millet zone (35 000 Mts)		Cash poor households (less than 40000 Mts for the better off	High level of cash income through charcoal production especially better household (up to 120 000 mts)
<b>Source of income</b>	Livestock product and sales (oxen hire), and a little crops sales (10 % of income) better off households For the poorest, different activities related to natural resources (sales of grasses, brewery, construction poles etc)		No migrant remittance Brewing ,casual labor and firewood/charcoal for the poorest – small business, crops , livestock for the better off	No migrant remittance Charcoal selling only for the poorest, contribution from livestock for the better off

### Semi-arid riverine areas of the upper Limpopo basin

	Upper Limpopo Riverine Chicualacuala/Mabalane	Upper Limpopo Riverine Massingir
	Include the population in the Limpopo park	
<b>Main production</b>	Agro –pastoral (with small watered garden) + charcoal	
<b>Access</b>	Medium (railway and main road). Crossing the Limpopo can be difficult in rainy season	Medium-good road to Choqwe but internal network poor
<b>season</b>	< 500 mm	300-500 mm
<b>landscape</b>	Plain with hilly area toward boarder – Bush scrub with dominant <i>Mopane</i> tree (firewood and charcoal) – low population density (less than 5 people/km <sup>2</sup> ) with concentration on the riverine areas	
<b>Soil</b>	fertile alluvial soil	soil mixed clay and sandy – moderate to fertile
<b>Market access</b>	Especially for cattle (including goat and chickens) with peak in august and September to Maputo Importation of cereal from Maputo and ZIM. Charcoal traders come to village	Especially for cattle (including goat and chickens) with peak in august and September to Maputo Cereals comes from Choqwe
<b>crops</b>	Maize, cowpeas, sweet potatoes, groundnuts, pumpkins, water melons + vegetables	maize, cowpeas, groundnuts, root crops, pumpkins + orange trees+ vegetables
<b>Land</b>	All farmers have land in the sandy area ( <i>Alta</i> ) and other close to the river where they can be manually watered ( <i>Baixa</i> )	
	Up to 2 ha for the poorest with 10 % <i>Baixa</i> 5 to 7 ha to the better off (max 1 ha <i>Baixa</i> )	Up to 2 ha to the poorest 4 to 6 ha for the better off (max 3 ha <i>Baixa</i> )
<b>Breeding</b>	Chickens only and occasionally a couple of goat for the poorest. Cattle breeding with increasing wealth Middle : 10-15 goats , 10-15 cattle while the better off can have up to 40 cattle. Herds seems a a little smaller in Riverine Massingir	
<b>Income</b>	Cash poor families for the poorest (up to 20000 Mt). verage families by 30-40 000 And richest up to 90 000. Riverine Massingir would be a bit better	
<b>Source of income</b>	Mostly Charcoal for the poorest complemented by livestock sales, petty trade and brewing for the better off	Charcoal, grass reeds, casual employment for the poorest. – some middle family do some fishing – livestock product and sales for the better off. Migration especially in bad years
	Not a self sufficient zone even in normal year : no crop sales	

## Medium / Lower Limpopo

	<b>Lower Limpopo Non irrigation scheme</b>	<b>Lower Limpopo Irrigation scheme</b>	<b>Maize livelihood zone</b>
	<i>Straddling the Limpopo river but excluding the villages part of irrigation schemes</i>	<i>The villages with irrigation are a minority – the schemes suffered considerable damage in 2000</i>	<i>One of the most populated zone of the area with 20-50 ha/km<sup>2</sup>, bordering the valley zone</i>
<b>Main production</b>	Agro-pastoral	Very diversified agriculture	Agro-pastoral
<b>Access</b>	Medium to good : a main non asphalted motor road + railway. Internal network in poor conditions	Very good with main asphalted motor road and railway	Variable /medium to bad : road impassable during rainy season but transport to Choqwe are good and direct bus to RSA and road to Zimbabwe
<b>landscape</b>	Low land plains and valley bottom in the middle/lower Limpopo basin – lowland ecology	Irrigated schemes in the low land plains and valley bottom of middle/lower Limpopo basin – lowland ecology	Plain with fertile alluvial zone with poor drainage (called <i>Nyaka</i> ) and less fertile sandier area (called <i>Mananga</i> ) also grazing area
<b>Soil</b>	700 – 800 mm with 2 rainy cropping season ( <b>warm <i>Mananga</i> and cool <i>Ushika</i></b> )		500 to 600 mm in the south – 2 seasons for Maize
<b>Market access</b>	Overall market access is good	Very good	Main market is Choqwe while livestock and charcoal at sold at village to traders
<b>crops</b>	Maize, beans, cowpeas, ground nuts with intercropped pumpkins + market gardening vegetables (tomatoes, onions, cauliflowers) + perennials (cashew, <i>amarula</i> , <i>mafurra</i> , banana mango citrus guava) - if alto area cassava and sweet potatoes	Rice (Nov to May) maize (Nov to April/May) – intercropped with cowpeas and beans; cassava, sweet potatoes, cowpeas, groundnuts and tomatoes.  cooler Uchika: second maize harvest + vegetables cash crop (tomatoes, cabbage, lettuce, cucumbers, cauliflowers and peppers). Sweet potatoes are a late planted, short-cycle crop (Nov to Jan) and beans dry-season irrigated crop.	maize, cowpeas, ground nits, root crops
<b>Land</b>	The poorest up to 2 ha of which 1,5 ha can be <i>Baixa</i> while middle families cultivate up to 4 ha. The better off can cultivates up to 10 ha (90 % <i>Baixa</i> )	The poorest up to 1,5 ha Middle one up to 6 ha (and 5 ha <i>Baixa</i> ) While better off can cultivates up to 20 ha (15 ha irrigated)	Poorest cultivate up to 1 ha that increase with wealth up to 5 ha
breeding	only chickens and a couple of goats for poorest families. Diversification with wealth (higher number of goats, ducks, pigs and cattle). Average own 15 goats, chickens, ducks& Pigs and up to 16 cattle than can go up to 30 for the richer one	The poorest only breed chickens and a couple of goats. Diversification with wealth with cattle and possibly pigs. Middle one own up to 10 goats and 15 cattle than can goes up to 50 goats and 60 heads of cattle.	The poorest only breed chickens, diversification with increasing wealth with goat and cattle. Bigger herd hold up to 15 goats and 20 heads of cattle Cattle is often obtained through purchase from income earned in RSA
	Lower Limpopo Non irrigation scheme	Lower Limpopo Irrigation scheme	Maize livelihood zone

	<b>Lower Limpopo Non irrigation scheme</b>	<b>Lower Limpopo Irrigation scheme</b>	<b>Maize livelihood zone</b>
Asset	The poorest only owns hoe for tilling –children up to 5 grades - Nb of plough oxen increase with wealth up to 4/6.	The poorest only owns hoe for tilling –children up to 5 grades. Nb of plough oxen increase with wealth up to 3-7 for the middle families. The richest owns tractor and their children goes up to university level	Poorest households do not have agricultural material. Only middle + and better off own plough and some oxen. Better off can have 3 complete pair of oxen and plough (sharing system)
Income	The poorest are cash poor (up to 20 000 Mts) but middle income goes up to 50 000 Mts. The better off can receive up to 150 000 mts	The poorest are cash poor up to 20 000 Mts but middle income goes up to 150 000 Mts. The better off can receive up to 800 000 Mts	Poorest household are cash poor (up to 25 000 Mts) and better off do not receive more than 60 000 Mts Main difference is in the availability of labor
Source of income	The very poor receive cash mostly from brewing, selling cut reeds and grass, and casual labor. Livestock sales and product as well as the part of crop sales increase with wealth	All groups sells crops : rice brings nearly one half of the income and is complemented by livestock sales and small amount by hiring out oxrn, tractors and carts. Crop sale (rice, groundnuts, cowpeas tomatoes) brewing ,reed grass and casual employment are also a source of income for poorest household but is limited by available workforce.	Selling charcoal and firewood provides the majority of income in all group complemented by livestock sales, oxen rental and remittance from the better off
			Migration to RSA is very important in this area. Brouwers states than 48 % of households in the village sample received remittance with in average 1,4 person abroad by family

## ANNEX 6 : PROJECTS CONCERNING CLIMATE CHANGE

Type	Donor / operator	year	
study	Denmark, GTZ, UNDP	2009	Impact of climate change on disaster risk in Mozambique
	Global Facility for Disaster Risk reduction	2009	Economic vulnerability and disaster risk assessment
	DFID Netherland and Switzerland	On goinf	The economics of adaptation to climate change
	World Bank	2007	Water resources strategy Zambezi basin
	World bank	On going	Making transport climate resilient
Presentation	in Copenhagen		CS indepth analysis the economics of adaptation to climate change studies
Program	INGC - MICOA with Japan and managed UNDP	To start	Africa adaptation program (3 millions) institutional strengthening
	Denmark		37 millions environment program with MICOA and INGC
	DFID by save the childen	to be implemented	Mainstreaming climate change into development (2,2 millions)
Multi national program	Care in Mozambique	On going	The Adaptation Learning Program for Africa (USD 13 million for 4 countries)
	a consortium comprising Oxfam GB,the Overseas Development Institute (ODI), Save the Children, Care International and Word Vision International in selected districts in Mozambique	On going	the Africa Climate Change Resilience Alliance (around USD 0.3 million for 3 countries)
Research	DFID : regional project	In preparation	Africa Climate Change Research Partnership (USD 4.7 million or £3.2 million,)

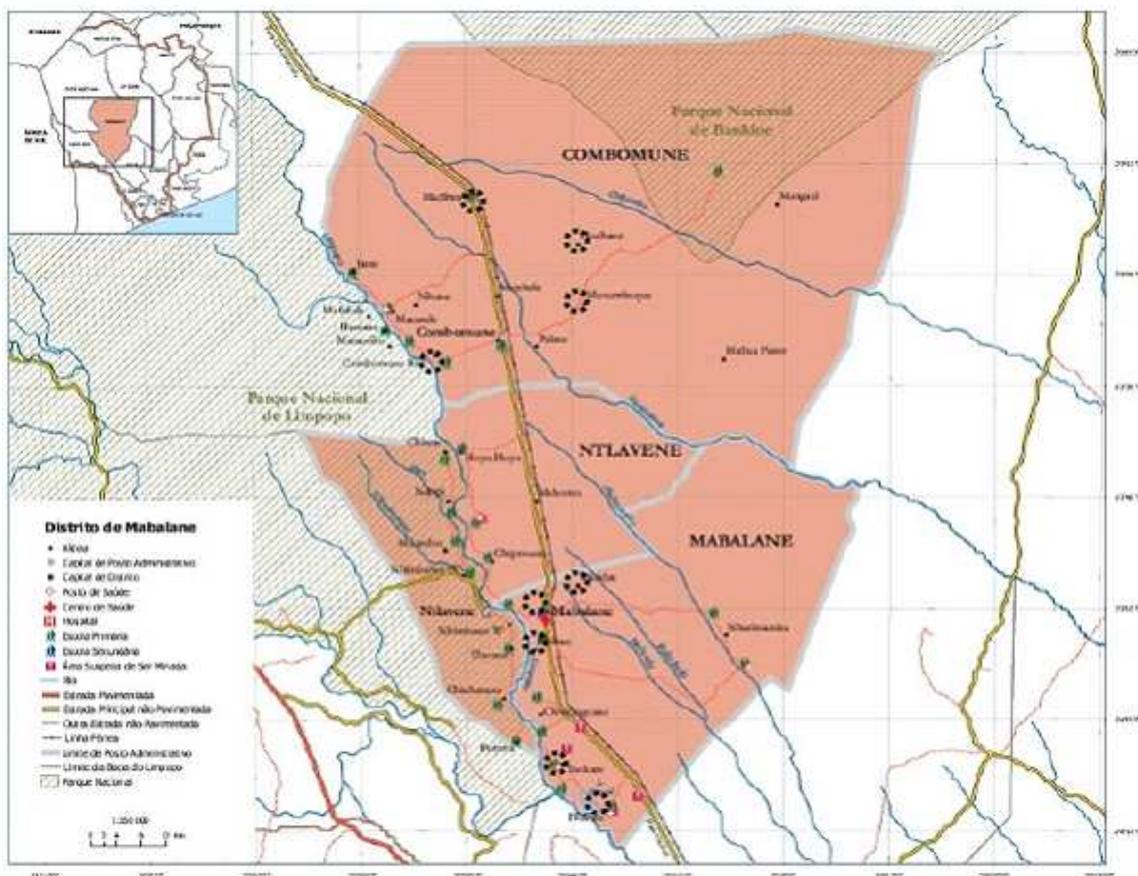
**ANNEX 7 : SOME BASIC DATA CONCERNING MABALANE (Perfil do Distrito de Mabalane, 2005)**

70 % do território desabitado e desaproveitado; 183 000 há de propriedade reconhecida. 2/3 area apropriada para agricultura cultivados sendo 10 000 ha em sequeio com uma media 1 ha maioria localizada ao longo da vale do Limpopo; 55 % das explorações agrícolas exploradas por mulheres.

600 ha de regadios não operacionais por avarias de equipamento e destuições causada pelas cheias cuja reabilitação foi iniciado em 2003.

2003 inicio reabilitação de algumas infraestrutura

Produção de gado em aumentação : 22 000 bovino em 2000 e 38 000 em 2004



**Figura 2: Locais de amostragem nas regiões de Mabalane e Combomune.**

 locais de amostragem

Fonte: INGC (2003)