

**Project No. S.7**

<b>1. PROJECT TITLE</b>	Small-scale Business Program
<b>2. LOCATION</b>	Chimwala, Dala, Mukantha, Nsanzo, Chipiri, Lumadzi, Mbinhe, Namadende Ntowe, Aphande, Banga, Makonje
<b>3. IMPLEMENTING AGENCIES</b>	Department of Commerce and Department of Agriculture, The Tete Provincial Government, Chamber of Commerce
<b>4. OBJECTIVES</b>	To diversify sources of income by encouraging starting any kind of small business through provision of small scale (informal) credit.
<b>5. EXPECTED EFFECTS</b>	Increased income opportunities; earned money retained within the community; improved access for community members to basic goods and services.
<b>6. PROJECT COSTS</b>	Up to five million Meticaïs per borrower
<b>7. IMPLEMENTING SCHEDULE</b>	2002 - 2010

**8. PROJECT DESCRIPTION**

There are three components in this program.

**(1) Provision of soft loans**

The lending scheme is administered by community members themselves through a peer-to-peer lending scheme (similar to the Grameen Bank in Bangladesh). The rural extension mobilizes communities to establish groups consisting of five to ten people. The makeup of the group varies depending on the gender and among social groups. These groups can also be vehicles of other activities (e.g., Project S.4 Small Animal Husbandry Program). It is proposed that the size of typical loan is up to five million Mozambican meticals (approximately US\$250.00) per lender. Such a small lending is not feasible for private banks, etc.

Training of trainers for organizing groups is one of perquisites for the program. The trainers should provide basic bookkeeping, and organizational management training should be provided to the members.

**(2) Skills training for start-ups**

In addition to the aforementioned training, additional training should be provided in the following areas: (a) basic business planning, (b) marketing, and (c) bookkeeping for

business. Depending on the business participants' interests, additional training related to the type of business should be provided.

**(3) Business assistance to support small business owners**

Further, additional business-related advice and support are provided to ensure repayment of the loan as well as success of the business. Trained extension officers are responsible for regular visits to businesses in rural communities while the district administration ensures the dispatch of such extension officers to communities.

**Project No. S.8**

- |                                 |   |
|---------------------------------|---|
| <b>1. PROJECT TITLE</b>         | Self-help Road Rehabilitation   |
| <b>2. LOCATION</b>              | Dala, Mukantha, Nsadzo, Chipiri, Lumadzi, Mbinhe, Aphande, Banga, Makonje   |
| <b>3. IMPLEMENTING AGENCIES</b> | Department of Road, Provincial Government of Tete   |
| <b>4. OBJECTIVES</b>            | (1) To improve road network and communication of villages within communities; and<br>(2) To improve access to market and social services. |
| <b>5. EXPECTED EFFECTS</b>      | Improved social services delivery by government and other service organizations; increased net income by improved access to the market.   |
| <b>6. PROJECT COSTS</b>         |   |
| <b>7. IMPLEMENTING SCHEDULE</b> | 2002 - 2007   |
| <b>8. PROJECT DESCRIPTION</b>   |   |

The program involves coordination and collaboration between the government and local communities. There are two different levels in project implementation: access road rehabilitation and village service road rehabilitation.

**(1) Access road rehabilitation**

This is to upgrade bridges and pavement of access roads, which link between community centers and the nearest main roads. Access roads construction usually requires large scale excavating work and therefore machine power. Building bridges passable all through the year requires advanced technical assistance. Because access roads benefit primarily communities, community members will participate in the construction by providing labor.

**(2) Village service road rehabilitation**

A community comprises up to a few tens of villages. Village service roads are a network of small paths linking among these small villages and the community center where basic social services, such as schools and health posts are located. Most village service roads are for pedestrians only. These roads are not maintained regularly and some of them have high risk of erosion that results in impasses. Under the program, the government provides communities basic tools, such as shovels, haws and bush knives. Some community members receive basic training to supervise maintenance and construction of service roads. Under the leadership of community leaders and the trainees, other community members are

mobilized to help maintain existing paths, clear bushes, and install steps using locally available gravel and materials.

It should be noted that the construction project should be undertaken during the dry season when local community's labor in their farmland is low. Special attentions should be paid to the balance between the intensity of labor and the calorie intakes. In the end of the dry season, some communities do not have foods in their storage. When the construction site is in proximity of such a community, the basic food ration should be provided in exchange for the labor.

**Project No. S.9**

- |                                 |   |
|---------------------------------|---|
| <b>1. PROJECT TITLE</b>         | Water and Sanitation Technician Training  |
| <b>2. LOCATION</b>              | Dala, Mukantha, Nsadzo, Lumadzi, Mbinhe, Aphande, Banga, Makonje, Ntowe   |
| <b>3. IMPLEMENTING AGENCY</b>   | Agua Rural  |
| <b>4. OBJECTIVES</b>            | (1) To improve and maintain existing water supply systems; and<br>(2) To improve sanitary conditions of communities.          |
| <b>5. EXPECTED EFFECTS</b>      | Improved access to safe drinking water; prevention of water-borne diseases; strengthening social organization of communities. |
| <b>6. PROJECT COSTS</b>         |   |
| <b>7. IMPLEMENTING SCHEDULE</b> | 2002 - 2010   |
| <b>8. PROJECT DESCRIPTION</b>   |   |

There are four main components in this program.

**(1) Mobilization of community (institutional building)**

A local institution to maintain and administer water facilities should be established prior to building them. The majority of existing wells do not have such institution and procedures to maintain the facilities. The establishment of a self-governing 'water committee' is a prerequisite for installing new water supply facilities. The committee is responsible for maintaining the facilities, collecting appropriate monthly usage fees to cover the cost of maintenance, keep books and report to the community, and provide various educational campaigns related to water and sanitation. Committee members should be selected by democratic process, such as voting. Special attention should be required to include women and elderly in the committee membership. The rural extension initiates and advises these issues when this program is implemented.

**(2) Maintenance of existing wells**

This component focuses on training to individuals who are selected by the committee. It comprises two separate subjects: (a) basic maintenance training for wells and pumps; and (b) organizational leadership and basic bookkeeping training.

Regular maintenance including replacing parts and supplies is a key for the operation of wells. Under this component, the trainees receive training in basic maintenance of wells. They also learn how to organize and manage water committee and how to collect use fees

to cover cost of maintenance

(3) Self-help dug-well construction training

The dug-well is a type of well that is common in Mozambique, which is usually hand-built with minimal tools and equipment. Only a pump, a slab to support it and a few concrete rings to support the well are required. Building the well only requires basic skills and knowledge. This training enables community members to self-build dug-wells in their own communities with labor and the funds contributed by them.

(4) Self-help sanitation training

Because of the relatively low population density in the region, sanitation facilities have not been seen as a priority in the Angonia region. Very few households have their own latrine. Sanitary education linked to construction of new wells is provided to the members receiving training. When a community installs new wells, community members, at the same time, receive sanitary education to build self-help pit latrine using basic tools and local materials.

**Project No. S.10**

- |                                 |   |
|---------------------------------|---|
| <b>1. PROJECT TITLE</b>         | Schools and Health Posts Construction   |
| <b>2. LOCATION</b>              | All the 12 communities surveyed   |
| <b>3. IMPLEMENTING AGENCIES</b> | Department of Health of Tete Provincial Government, and Tete Provincial Directorate of Education  |
| <b>4. OBJECTIVES</b>            | To improve quality of social services delivery through collaborative initiatives of communities and the government.   |
| <b>5. EXPECTED EFFECTS</b>      | Improved access to social services; better education leading to better jobs for youngsters; improves health supporting improved welfare of the communities. |
| <b>6. PROJECT COSTS</b>         |   |
| <b>7. IMPLEMENTING SCHEDULE</b> | 2002 - 2010   |
| <b>8. PROJECT DESCRIPTION</b>   |   |

The construction project is to be implemented by the communities in collaboration with the government. All the twelve communities are willing to share the cost of construction by contributing labor and some construction materials, including bricks, gravels and sand. The government is expected to provide other materials necessary for construction of these buildings.

Appropriate number of teachers and health professionals should be provided after the completion of the facilities. Funding is also provided by the government for expenses necessary to administer such facilities, including staff salaries, supplies and equipment.

## **Project Report**

### **Part 2: In-Depth Studies**

	<u>Related Project(s)</u>	<u>Page</u>
1. Tete-Moatize Core Urban Development	Project No. 1.1 .....	1-1
2. Tete City Water Supply Expansion	Project No. 1.2 .....	2-1
3. Power Development Program	Project Nos. 1.1, 1.4, 1.11, & 2.10 .....	3-1
4. Integrated Rural Development	Project No. 2.1 .....	4-1
5. Revobue Multipurpose Dam	Project No. 2.4 .....	5-1
6. Pilot Farmers' Associations Promotion Program	Project No. 2.7 .....	6-1
7. Promising Mineral Resources	Project No. 2.11 .....	7-1
8. Rural Roads Improvement	Project No. 3.1 .....	8-1
9. Secondary Roads Improvement	Project No. 3.2 .....	9-1
10. Sena Railway	Project No. 3.4 .....	10-1
11. GPZ Strengthening	Project No. 4.1 .....	11-1
12. Tete Provincial Hospital Upgrading	Project No. 4.5 .....	12-1
13. Extension Services Enhancement	Project No. S1 .....	13-1
14. Small-scale Business Program	Project No. S.7 .....	14-1





## **In-Depth Study on Tete-Moatize Core Urban Development (TEMOC) Project (Project No. 1.1)**

### **1. Background**

The area encompassing Tete city and Moatize town have a high growth potential. This area has a number of favorable conditions for development such as the availability of rich mineral resources, especially high quality coal reserve, a strategic location between Malawi, Zambia and Zimbabwe, and rich agriculture resources produced in the hinterland. Coal production in Moatize with a magnitude of around 3 million tons per annum could boost the regional economy. Coal sale at 3 million tons per year alone is equivalent to about 64% of the Study Area's estimated GDRP assuming coal price at US\$30 per ton. The Study Area could take advantage of this opportunity by attracting mineral resources industries as well as other types of industries and business such as food processing, wood processing and metal work industries capitalizing on its locational advantage. Abundant supply of agricultural raw materials by the hinterland enhances this possibility. Demining activities in progress along the Sena railway will remove a major obstacle toward implementing the Sena railway rehabilitation work, thus opening a new market outlet for various goods produced in Tete, Moatize and the hinterland. The Investment Potential Survey (IPS) conducted in June 2001 in Malawi, Zimbabwe, South Africa, and Maputo has revealed potential investors' strong interests among these countries in Tete province as an investment location (Appendix 1).

This above scenario, optimistic yet realistic, could be realized only with continued efforts on the part of the Mozambican government in various aspects. Human resources development is cited as the toughest challenge by potential foreign investors, followed by deficient infrastructure system and complex and time-consuming administrative regulations and procedures, as revealed by the IPS. Tete-Moatize Core Urban Development (TEMOCUD, hereafter) is a proposal to overcome these constraints as well as to avoid uncontrolled urban development. Creation of a functional and comfortable urban environment in Tete and Moatize would be a prerequisite to materialize the potential endowed not only in Tete and Moatize, but also in the Study Area, Tete province and the whole central region of Mozambique.

The objectives of the TEMOCUD are the following:

- (1) to create an urban core with high grade urban infrastructure to attract investments from abroad and other part of Mozambique as well as to support local industries and business,
- (2) to create a comfortable living environment for the local population and visitors,

- (3) to create a base of cultural and recreational opportunities for local and visiting population, and
- (4) to provide high grade urban services for the Central Mozambique and center function for the ZMM-GT.

## 2. Planning Framework

The TEMOCUD is planned based on the following framework.

### (1) Economic growth

Growth rates of industrial and service production are assumed as follows.

#### Economic Growth Rates Estimated for Industrial and Service Sectors

(Unit: %/year)

Period	Industry	Service
2000-2005	10.0	10.0
2005-2015	12.0	12.6
2015-2025	9.2	9.7
2000-2025	10.7	11.0

### (2) Population

Tete city is assumed to grow into a city of around 500,000 population by the year 2025 while in Moatize the population will reach 80,000. A certain portion of the whole population will be accommodated in new towns, provided with a set of high-grade infrastructure and social facilities. Economic growth led by coal development in Moatize and consumer type industrial development in Tete city with associated service activities will be the driving force for urban growth of this magnitude.

#### Projected Population of Tete city and Planned New Town

(Unit: 10<sup>3</sup>)

Year	Tete city			Moatize town			Total
	Total	New town	Other	Total	New town	Other	
2000	109	12	97	20	0	20	129
2005	148	25	123	30	5	25	178
2015	273	50	223	50	20	30	323
2025	503	100	403	80	30	50	583

### (3) Workforce

The following numbers of industrial, coal and service workers are assumed.

### Workforce in Tete and Moatize in 2000 and 2025

(Unit: 10<sup>3</sup>)

Year	Tete city			Moatize town		
	Total	Industry	Service	Total	Coal	Service
2000	32.4	9.0	23.4	5.2	0.2	5.0
2025	192.0	48.0	144.0	25.0	12.5	12.5

#### (4) Land requirement

The following land requirement is estimated for the core part of Tete city and Moatize town for the year 2025.

#### Land Requirement in 2005

Area and type of land use	Land requirement in 2025 (ha)
New town	
Tete	1,000
Moatize	300
Industry	
Tete	500
Moatize (coal)	1,100
Business/commercial/government area	
Tete	115
Moatize	10

### 3. Core Zoning Plan

Figure 1 (attached) presents a zoning plan for the core part of Tete city and Moatize town. This zoning plan was prepared based on the following considerations.

- (1) The plan shows general allocation of different land uses, and thus should not be taken as a strict land use plan.
- (2) The land use plan prepared by the Institute of Physical Planning with assistance from former East Germany 1980s was referred to and modified.
- (3) A sizable land development will be required in order to realize such a level of economic and population growth as assumed. From the perspective of establishing a balanced and well-organized urban structure, creation of new urban cores is proposed on the left bank of Zambezi river in Tete and an area west from the existing Moatize town. Tete and Moatize would function as twin cities supplementing each other in economic and social functions and with high-level communication facilities linking the two areas.
- (4) In principle, industrial function is allocated to the upstream river bank area of Tete, while the major residential area stretches over the downstream river bank area, area between the Zambezi river and the Revobue river. Areas next to the

industrial estate and that between the roads to Zambia and Moatize are also allocated for residential use. Business, commercial and government area sits along the trunk road close to the bridge and between industrial and residential areas. The business center to provide one-stop service and investment and market information to investors is to be located in this area.

- (5) The new town, to be named "Baobab New Town," stresses the importance of preserving many Baobab trees found in this area. In some parts, Baobab trees are cut down for clearing land for house construction. This practice needs to be immediately restricted. The proposed new town will be designed in such a manner as to preserve existing Baobab trees and houses built in coexistence with Baobab trees.
- (6) The industrial estate in Matundo is not a mere zone designated for industries. It is provided with all types of infrastructure required for industrial production. Investors either buy or lease a prepared land lot and build factory buildings at their cost. Part of the industrial estate is allocated for an export processing zone (EPZ) where industries will be able to produce goods for export free of import duties and export tax. The locational advantage of Tete could be fully realized by this EPZ concept.
- (7) The area west of the existing Moatize town area is allocated for residential, business and commercial activities. These land uses are limited to this part since most of other areas in Moatize are likely to be coal mining area.
- (8) Industrial activities in Moatize could be controlled to those related with coal mining and mineral resources. The location allocated to these activities is south of the trunk road and between the two coal mining areas.
- (9) The existing urban area in Tete city will be revitalized through rehabilitating the existing infrastructure and upgrading buildings characterized with colonial architectural heritage. Old Tete will be a comfortable place to live and work in a cozy, yet functional environment. At the initial stage of TEMOCUD, old Tete will play an important role. Support measures, such as the provision of building reform loans, would be necessary.
- (10) Recreational opportunities, extremely lacking in Tete at present, will be enhanced by allocating sufficient space for these activities. Green area will be spared in sufficient amount to create a comfortable urban area. The river bank area between the Zambezi river and the Revobue river is allocated for various sports activities such as camping, tennis, jogging, walking, horse riding, soccer, basketball, fishing, swimming etc. A sport stadium could be built in this part. The same idea applies to the riverbank area in Moatize. Monte Carroeira to the

south of the existing Tete could be developed as a core of recreation zone with a magnificent view from Tete all the way up to Moatize. A tourist wharf named "Crocodile Wharf" is proposed on the left bank of the Zambezi river. Tourist boats could be moored here. Riverside restaurants such as those found at Fishermen's Wharf in San Francisco, USA, could be built.

- (11) Culture and education zone is allocated in the center of industrial, residential and business/commercial/government areas. Various cultural activities will be provided here by museums, libraries, theaters, concert halls, movie theaters, etc. Major educational and skill-training institutes will be placed in this part as well.
- (12) The existing railway line to Moatize should be extended by 2 kilometers or so to a point in the west, where a truck terminal is proposed. This would ensure easy transfer of commodities from road transport to rail transport and vice versa. A truck weighing station is proposed in the south of the existing Tete urban area utilizing the former military complex.
- (13) The areas with altitude of 200 meters or higher are designated as preservation area.
- (14) The area between Tete and Moatize will be used mainly for agriculture activities such as irrigated farming, cattle grazing, hog raising, and chicken cooperative. An agriculture research center is proposed in this area.

#### **4. Organizational Setup**

Establishment of a development corporation is proposed. A development corporation will be established with equity participation by the public sector and the private sector as shown in Figure 2. The public sector including the Tete municipality, Tete province and the Central Government, will pay the capital either in cash or land. Most of the land where development is planned is owned by the Central Government. Land transactions take place between buyers and the municipality acting on behalf of the Central Government. This pattern of land ownership is advantageous for the Government to promote the TEMOCUD. Considering this situation, it would be realistic to assume that the capital payment by the public sector be made in the form of land. The private sector will make equity payment mainly by cash. The development corporation pays dividends to shareholders.

The major functions of the development corporation are the following:

- a) development of an industrial estate and new towns, including purchase of land use right from the Government when necessary, site preparation and development of infrastructure,
- b) promotion of sale and lease of industrial estate and new town land lots, and
- c) operation and management of the industrial estate and new towns.

An important task of the development corporation would be to secure land for development without causing social problems. The existing housings in the planned area should be incorporated into the planned new town as far as they are legally acquired. Illegal settlers need to be relocated, where necessary, in an amicable manner.

## 5. Cost for Development

The total investment cost for TEMOC Project is estimated at US\$209 million by the year 2025, excluding the cost for the mine-mouth thermal power generation plant, as summarized below. The details of estimated costs are presented in Table 1.

**Investment Cost for TEMOCUD by Year 2025**

Item	Amount (US\$10 <sup>3</sup> )
1. Transport facilities	9,728
2. Water supply	13,616
3. Power	2,691,800
4. Telecommunication	6,200
5. Sewerage system	65,000
6. Solid waste management	17,500
7. School	5,063
8. Hospital	3,400
9. Business Center	236
10. Industrial technology and Information Center	2,000
11. Site preparation	34,458
Grand total without power station	209,000
Grand total with power station	2,849,000

The costs above are those to be covered by public investment by the government and the development corporation. Costs of investment to be made privately are not included such as those for housing and factory buildings.

## 6. Expected Effects of TEMOCUD

It is expected that the following effects be generated by the implementation of the TEMOCUD:

- Attraction of investment from foreign countries and other parts of Mozambique,
- Growth of local industries and business,
- Growth of service sector to serve the Study Area, Tete province, Mozambique's central region and ZMM Triangle,
- Growth in industrial and service production and creation of employment opportunities as projected, and

- e) Enhancement of the people's quality of life through increased opportunities for recreational and cultural activities.

## **7. Immediate Actions**

The idea presented above is a general and long-term plan. A detailed engineering and market survey will be required to make a judgment on the feasibility of the TEMOCUD. It is recommended that the Government take an action to carry out a detailed survey for the immediate future, for five years or so, in the context of the long-term perspective presented above. At an initial stage, the size of industrial estate would be much smaller like 50ha to start with. An appropriate location should be selected first within the proposed industrial estate and investments concentrated there. Allocating the proposed business center for one-stop service provision next to this initial industrial estate area would make the idea of business center more appealing. Residential development could be promoted either in the area adjacent to the selected initial industrial estate area or rehabilitating part of the existing residential area in downtown Tete. The proposed detailed study should propose the most realistic and efficient solutions on these issues.



**Table 1. Cost Estimated for Tete-Moatize Core Urban Development by Year 2025**

Item	Price	Unit	Quantity	Unit	Amount (\$10 <sup>3</sup> )	Remarks
<b>1. Transport facilities</b>						
1.1 Road						
Outer ring road	120,300	\$/km	12,640	meter	1,521	
Tete-Moatize road	120,300	\$/km	16,000	meter	1,925	
Major distributors	120,300	\$/km	3,160	meter	380	
District distributors	60,150	\$/km	37,920	meter	2,281	
Collector roads	30,075	\$/km	23,967	meter	721	
Sub-total	-	-	-	-	6,828	
1.2 Bus terminal	-	-	-	-	1,150	
1.3 Truck terminal	-	-	-	-	1,750	
1.4 Sub-total	-	-	-	-	9,728	
2. Water supply	-	-	-	-	13,616	76 boreholes equipped with pump to be dug
3. Power						
1.1 Mine mouth power station	-	-	-	-	2,640,000	To serve whole Mozambique and for export
1.2 Transmission/distribution	-	-	-	-	51,800	
1.3 Sub-total	-	-	-	-	2,691,800	
4. Telecommunication	-	-	-	-	6,200	
5. Sewerage system	500	\$/m <sup>3</sup>	130,000	m <sup>3</sup>	65,000	Based on experience in Zimbabwe
6. Solid waste management						
7.1 Garbage collection truck	50,000	\$/truck	50	trucks	2,500	Assumption
7.2 Sanitary landfill	5,000,000	\$/site	3	sites	15,000	- do -
7.3 Sub-total	-	-	-	-	17,500	
7. School	22,500	\$/school	225	schools	5,063	
8. Hospital	1,700,000	\$/hospital	2	hospitals	3,400	2 new hospitals of Tete Provincial Hospital size
9. Business Center	-	-	-	-	236	
10. Industrial technology and Information Center	-	-	-	-	2,000	
11. Site preparation						
1.1 Babobab New Town	1.79	\$/m <sup>2</sup>	1,000	ha	17,900	Average of manual and mechanized method
1.2 Matundo Industrial Estate	1.79	\$/m <sup>2</sup>	500	ha	8,950	- do -
1.3 Moatize New Town	1.79	\$/m <sup>2</sup>	300	ha	5,370	- do -
1.4 Tete business/commercial area	1.79	\$/m <sup>2</sup>	115	ha	2,059	- do -
1.5 Moatize business/commercial area	1.79	\$/m <sup>2</sup>	10	ha	179	- do -
1.6 Sub-total	-	-	-	-	34,458	
Grand total without power station	-	-	-	-	209,000	
Grand total with power station	-	-	-	-	2,849,000	

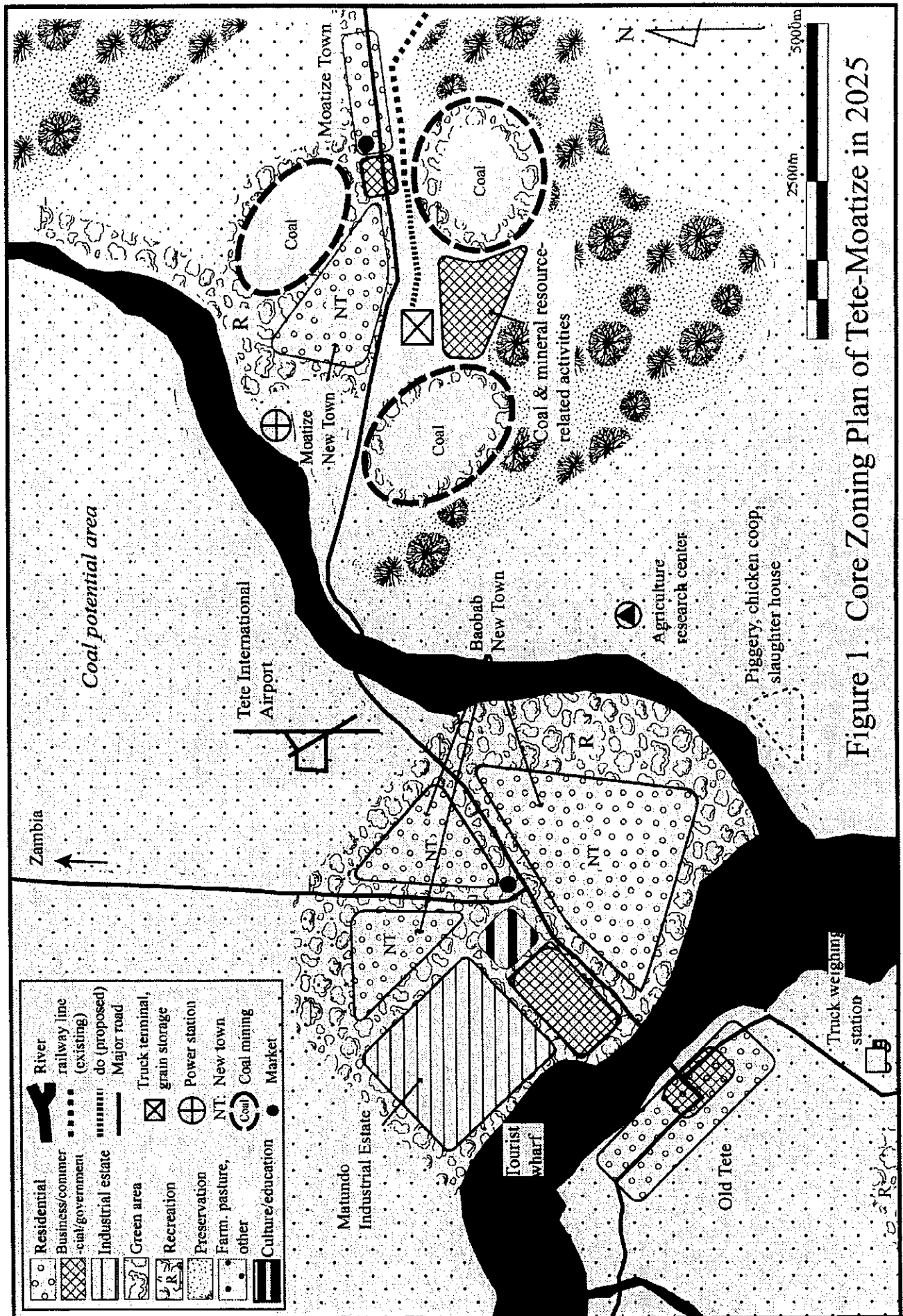
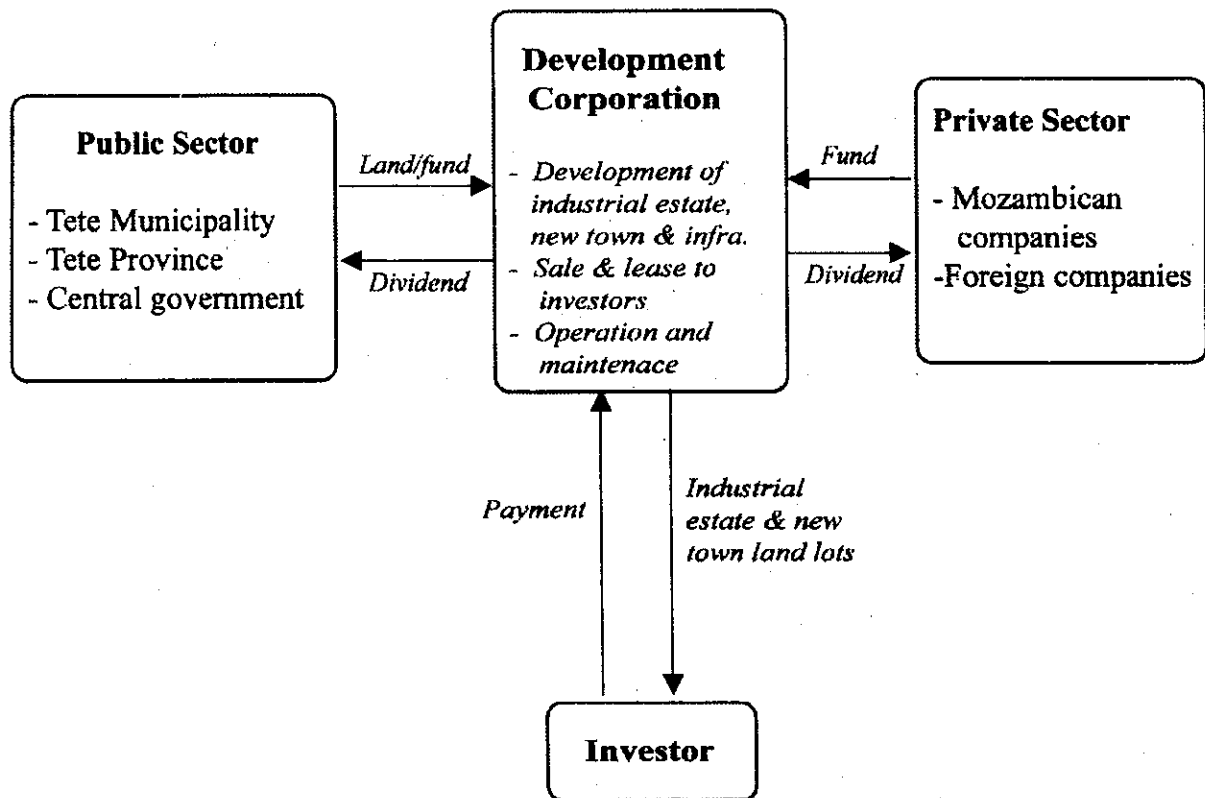


Figure 1. Core Zoning Plan of Tete-Moatize in 2025

**Figure 2**  
**Concept of Development Corporation for**  
**Tete-Moatize Core Urban Development Project**



## **Appendix 1. Investment Potential Survey**

As part of the present study, an Investment Potential Survey ("IPS" hereafter) was conducted in order to clarify the potential investors' level of acquaintance with and interest in starting business in Tete province. IPS was carried out in June to July in 2001 in the form of interview surveys in four locations: Lilongwe in Malawi, Harare in Zimbabwe, Johannesburg in South Africa, and Maputo in Mozambique. The total number of samples collected is as follows.

- Lilongwe:	11
- Harare:	4
- Johannesburg:	5
- Maputo	7
Total:	27

The major findings follow.

- a. Tete is generally well known to the interviewees at the four locations. The interviewees who have heard of Tete Province before accounted for 94%, while those who have knowledge on its location reached 79%. When it comes to business information, however, only four out of 18 interviewees or 22% have some information, indicating the limit of their knowledge at a general level (Table A-1).
- b. Mozambique looks positively rather than negatively to the eyes of potential investors. The strongest images toward Mozambique are high agriculture and mineral resources potential, accounting for 46% and 31% of all the answers respectively (Table A-2). There were two answers by Harare companies, pointing to the unique location of Tete province.
- c. In terms of business experience with Mozambique, those with experience in conducting some business in Mozambique numbered five companies out of 13, or 38% (Table A-3). Those companies with some business experience in Tete Province was higher at 63%.
- d. The biggest problem in undertaking business in Mozambique or Tete is "insufficient infrastructure" with 55% thinking of it as the big problem. This is followed by "low educational and technical level of labors", with 50% (Table A-4). What follows are "inefficient and time-consuming administrative procedures" at 48% and "corruption" and "complicated laws and regulations", both at 36%.
- e. In terms of country risk, Mozambique appears to be a low risk country to potential investors. The proportions given to "great risk" were low for all the four kinds of risks listed, "political", "economic", "international relations" and "religion/ideology", ranging from 4% to 22%. A certain level of risk is felt in terms of "political" and "economic stability", while the majority perceives almost no risk in "international

relations” and “ideology” aspects (Table A-5).

- f. Mozambique is regarded as an attractive area for investment. Five out of 17 companies, or 29%, answered that Mozambique is a very attractive location and they are ready to make investment. Altogether 82% of the companies interviewed consider Mozambique as an attractive investment location, with reservation in improvement in investment environment (Table A-6).
- g. Expectation is high for improvements in investment environment in Mozambique and Tete Province. The items with the highest rating for “very important” improvement are “improvement in infrastructure for production” and “eradication of corruption”, both with 71% of the interviewees. The following are the major improvements expected (Table A-7).
  - (1) Improvement in physical infrastructure (71%)
  - (2) Eradication of corruption (71%)
  - (3) Simplification of laws and regulations (67%)
  - (4) Development of distribution network (65%)
- h. The companies which tried to collect some information on Mozambique account for 58% of all the companies interviewed (Table A-8). The three major sources of information are: companies and people they know (27%), business organizations (20%) and Mozambican Embassy (20%) (Table A-9). Internet was used only by 10% of the interviewees, indicating still low level of IT service coverage. About 70% of those were successful, totally or partly, in collecting information and think that the information collected is useful (Table A-10).
- i. Creation of a new mechanism for providing investment information is expected by 74% of potential investors (Table A-11). Types of information perceived as “very important” are as follows (Table A-12 in more details).
  - (1) Investment opportunities in Mozambique (87%)
  - (2) Social and economic condition (86%)
  - (3) Laws and regulations (77%)
  - (4) Investment incentives (71%)
  - (5) Local administration (62%)
- j) Most companies interviewed are interested in starting business in Tete Province, including 50% very interested in doing so (Table A-13). The majority, or 60%, is interested in selling their products and services in Tete Province. Those interested in making investment in Tete Province accounts for 20% (Table A-14). The sources of information on Tete Province are also varied like for Mozambique (Table A-15). The companies answering “through companies and people they” as the source of information on Tete Province placed first at 27%.

**Table A-1. Knowledge of Tete province**

	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
Have heard of Tete	5 (100.0)	4 (100.0)	4 (100.0)	4 (80.0)	17 (94.4)
Know Tete's location	5 (83.3)	3 (75.0)	3 (75.0)	4 (80.0)	15 (78.9)
Have business information on Tete	4 (80.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (22.2)

**Table A-2. Image of Mozambique and Tete**

Mozambique	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
High agricultural potential	1 (100.0)	3 (33.3)	2 (66.7)	n.a.	6 (46.2)
High mineral resource potential	0 (0.0)	4 (44.4)	0 (0.0)	n.a.	4 (30.8)
Vast land with some potential	0 (0.0)	1 (11.1)	1 (33.3)	n.a.	2 (15.4)
Poor & low technology	0 (0.0)	1 (11.1)	0 (0.0)	n.a.	1 (7.7)
Total	1 (100.0)	9 (100.0)	3 (100.0)	n.a.	13 (100.0)

Tete	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
Unique location	n.a.	n.a.	2 (100.0)	n.a.	2 (100.0)

**Table A-3. Business Experience in Mozambique and Tete**

In Mozambique	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
Yes, currently	n.a.	2 (20.0)	n.a.	1 (33.3)	3 (23.1)
Yes, before	n.a.	1 (10.0)	n.a.	1 (33.3)	2 (15.4)
No	n.a.	7 (70.0)	n.a.	1 (33.3)	8 (61.5)
Total	n.a.	10 (100.0)	n.a.	3 (100.0)	13 (100.0)

In Tete	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
Yes, currently	1 (25.0)	n.a.	0 (0.0)	0 (0.0)	1 (12.5)
Yes, before	1 (25.0)	n.a.	1 (10.0)	2 (100.0)	4 (50.0)
No	2 (50.0)	n.a.	1 (10.0)	0 (0.0)	3 (37.5)
Total	4 (100.0)	n.a.	2 (20.0)	2 (100.0)	8 (100.0)

**Table A-4. Problems in Conducting Business in Mozambique and Tete (1/2)**

**Total**

Item	Big (%)	Some (%)	No/little (%)	Not sure (%)	Total
(1) Complicated laws & regulations	8 (36.4)	7 (31.8)	1 (4.5)	6 (27.3)	22
(2) Inefficient & time-consuming administrative procedures	11 (47.8)	6 (26.1)	3 (13.0)	3 (13.0)	23
(3) Difficult access to distribution network in Mozambique	6 (27.3)	10 (45.5)	1 (4.5)	5 (22.7)	22
(4) Insufficient infrastructure in Mozambique	11 (55.0)	5 (25.0)	1 (5.0)	3 (15.0)	20
(5) Lack of information on Tete province	5 (22.7)	9 (40.9)	3 (13.6)	5 (22.7)	22
(6) Low educational & technical level of labor	11 (50.0)	7 (31.8)	1 (4.5)	3 (13.6)	22
(7) Corruption	8 (36.4)	6 (27.3)	1 (4.5)	7 (31.8)	22
(8) Too high tax rate	7 (30.4)	3 (13.0)	3 (13.0)	10 (43.5)	23
(9) Difficulty in foreign currency exchange/remittance	2 (8.7)	4 (17.4)	7 (30.4)	10 (43.5)	23
(10) Limited availability of reasonable insurance system	3 (13.6)	6 (27.3)	2 (9.1)	11 (50.0)	22

**Maputo**

Item	Big (%)	Some (%)	No/little (%)	Not sure (%)	Total
(1) Complicated laws & regulations	2 (28.6)	3 (42.9)	1 (14.3)	1 (14.3)	7
(2) Inefficient & time-consuming administrative procedures	3 (42.9)	2 (28.6)	1 (14.3)	1 (14.3)	7
(3) Difficult access to distribution network in Mozambique	3 (42.9)	2 (28.6)	0 (0.0)	2 (28.6)	7
(4) Insufficient infrastructure in Mozambique	3 (75.0)	0 (0.0)	0 (0.0)	1 (25.0)	4
(5) Lack of information on Tete province	1 (16.7)	2 (33.3)	2 (33.3)	1 (16.7)	6
(6) Low educational & technical level of labor	3 (42.9)	3 (42.9)	0 (0.0)	1 (14.3)	7
(7) Corruption	3 (50.0)	0 (0.0)	1 (16.7)	2 (33.3)	6
(8) Too high tax rate	4 (57.1)	0 (0.0)	2 (28.6)	1 (14.3)	7
(9) Difficulty in foreign currency exchange/remittance	0 (0.0)	2 (28.6)	4 (57.1)	1 (14.3)	7
(10) Limited availability of reasonable insurance system	1 (16.7)	4 (66.7)	0 (0.0)	1 (16.7)	6

**Lilongwe, Malawi**

Item	Big (%)	Some (%)	No/little (%)	Not sure (%)	Total
(1) Complicated laws & regulations	2 (25.0)	2 (25.0)	0 (0.0)	4 (50.0)	8
(2) Inefficient & time-consuming administrative procedures	3 (37.5)	3 (37.5)	1 (12.5)	1 (12.5)	8
(3) Difficult access to distribution network in Mozambique	1 (12.5)	4 (50.0)	1 (12.5)	2 (25.0)	8
(4) Insufficient infrastructure in Mozambique	4 (50.0)	2 (25.0)	1 (12.5)	1 (12.5)	8
(5) Lack of information on Mozambique	1 (12.5)	5 (62.5)	0 (0.0)	2 (25.0)	8
(6) Low educational & technical level of labor	6 (75.0)	1 (12.5)	0 (0.0)	1 (12.5)	8
(7) Corruption	3 (37.5)	2 (25.0)	0 (0.0)	3 (37.5)	8
(8) Too high tax rate	2 (25.0)	1 (12.5)	0 (0.0)	5 (62.5)	8
(9) Difficulty in foreign currency exchange/remittance	1 (12.5)	0 (0.0)	1 (12.5)	6 (75.0)	8
(10) Limited availability of reasonable insurance system	0 (0.0)	1 (12.5)	1 (12.5)	6 (75.0)	8

**Table A-4. Problems in Conducting Business in Mozambique and Tete (2/2)**

**Harare, Zimbabwe**

Item	Big (%)	Some (%)	No/little (%)	Not sure (%)	Total
(1) Complicated laws & regulations	2 (100)	0 (0.0)	0 (0.0)	0 (0.0)	2
(2) Inefficient & time-consuming administrative procedures	3 (100)	0 (0.0)	0 (0.0)	0 (0.0)	3
(3) Difficult access to distribution network in Mozambique	0 (0.0)	2 (100)	0 (0.0)	0 (0.0)	2
(4) Insufficient infrastructure in Mozambique	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	3
(5) Lack of information on Tete province	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	3
(6) Low educational & technical level of labor	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	2
(7) Corruption	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	3
(8) Too high tax rate	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	3
(9) Difficulty in foreign currency exchange/remittance	1 (33.3)	1 (33.3)	1 (33.3)	0 (0.0)	3
(10) Limited availability of reasonable insurance system	1 (33.3)	1 (33.3)	1 (33.3)	0 (0.0)	3

**Johannesburg, South Africa**

Item	Big (%)	Some (%)	No/little (%)	Not sure (%)	Total
(1) Complicated laws & regulations	2 (40.0)	2 (40.0)	0 (0.0)	1 (20.0)	5
(2) Inefficient & time-consuming administrative procedures	2 (40.0)	1 (20.0)	1 (20.0)	1 (20.0)	5
(3) Difficult access to distribution network in Mozambique	2 (40.0)	2 (40.0)	0 (0.0)	1 (20.0)	5
(4) Insufficient infrastructure in Mozambique	3 (60.0)	1 (20.0)	0 (0.0)	1 (20.0)	5
(5) Lack of information on Tete province	2 (40.0)	0 (0.0)	1 (20.0)	2 (40.0)	5
(6) Low educational & technical level of labor	1 (20.0)	2 (40.0)	1 (20.0)	1 (20.0)	5
(7) Corruption	0 (0.0)	3 (60.0)	0 (0.0)	2 (40.0)	5
(8) Too high tax rate	0 (0.0)	0 (0.0)	1 (20.0)	4 (80.0)	5
(9) Difficulty in foreign currency exchange/remittance	0 (0.0)	1 (20.0)	1 (20.0)	3 (60.0)	5
(10) Limited availability of reasonable insurance system	1 (20.0)	0 (0.0)	0 (0.0)	4 (80.0)	5



**Table A-5. Perceived Risk Associated with Mozambique**

Item	Great risk (%)	Some risk (%)	Little/no risk (%)	Total
<b>Total</b>				
(1) Political stability	3 (13.0)	16 (69.6)	4 (17.4)	23
(2) Economic stability	5 (21.7)	11 (47.8)	7 (30.4)	23
(3) International relations	1 (4.3)	6 (26.1)	16 (69.6)	23
(4) Religion/ideology	1 (4.2)	3 (12.5)	20 (83.3)	24
<b>Maputo</b>				
(1) Political stability	0 (0.0)	4 (66.7)	2 (33.3)	6
(2) Economic stability	1 (16.7)	3 (50.0)	2 (33.3)	6
(3) International relations	0 (0.0)	2 (28.6)	5 (71.4)	7
(4) Religion/ideology	0 (0.0)	0 (0.0)	7 (100.0)	7
<b>Lilongwe, Malawi</b>				
(1) Political stability	2 (22.2)	6 (66.7)	1 (11.1)	9
(2) Economic stability	4 (44.4)	2 (22.2)	3 (33.3)	9
(3) International relations	1 (11.1)	2 (22.2)	6 (66.7)	9
(4) Religion/ideology	1 (11.1)	2 (22.2)	6 (66.7)	9
<b>Harare, Zimbabwe</b>				
(1) Political stability	1 (33.3)	2 (66.7)	0 (0.0)	3
(2) Economic stability	0 (0.0)	2 (66.7)	1 (33.3)	3
(3) International relations	0 (0.0)	1 (50.0)	1 (50.0)	2
(4) Religion/ideology	0 (0.0)	1 (33.3)	2 (66.7)	3
<b>Johannesburg, South Africa</b>				
(1) Political stability	0 (0.0)	4 (80.0)	1 (20.0)	5
(2) Economic stability	0 (0.0)	4 (80.0)	1 (20.0)	5
(3) International relations	0 (0.0)	1 (20.0)	4 (80.0)	5
(4) Religion/ideology	0 (0.0)	0 (0.0)	5 (100.0)	5

**Table A-6. Evaluation of Mozambique/Tete for Investment Opportunity**

Response	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
a. Very attractive location. We are ready to make investment anytime.	1 (33.3)	4* (44.4)	0 (0.0)	0 (0.0)	5 (29.4)
b. Very attractive location. But we have to wait until investment environment is improved.	0 (0.0)	1 (11.1)	0 (0.0)	0 (0.0)	1 (5.9)
c. Fairly attractive. We are ready to make investment.	0 (0.0)	1 (11.1)	2 (66.7)	0 (0.0)	3 (17.6)
d. Fairly attractive. But we have to wait until investment environment is improved.	1 (33.3)	2 (22.2)	1 (33.3)	1 (50.0)	5 (29.4)
e. Investment is unlikely. But other form of business is worth considering.	1 (33.3)	1 (11.1)	0 (0.0)	1 (50.0)	3 (17.6)
f. Not an attractive location. Neither investment nor any other form of business is likely.	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
g. Other	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
<b>Total</b>	<b>3 (100.0)</b>	<b>9 (100.0)</b>	<b>3 (100.0)</b>	<b>2 (100.0)</b>	<b>17 (100.0)</b>

\*Type of business expected (Lilongwe):

Agro-products

Financing small holders/agriculture

Selling furniture

Real estate

Timber supply

Farmers financing

Household products

Road improvement/water supply

**Table A-7. Improvements Expected in Mozambique/Tete (1/3)**

<b>Total</b>							
	Item	Very important (%)	Helpful (%)	Not important (%)	Not sure (%)	Total	
(1)	Simplification of laws and regulations concerning investment	16 (66.7)	2 (8.3)	1 (4.2)	5 (20.8)	24	
(2)	Streamlining of administrative procedures	11 (52.4)	5 (23.8)	0 (0.0)	5 (23.8)	21	
(3)	Development of distribution network in Mozambique	15 (65.2)	4 (17.4)	0 (0.0)	4 (17.4)	23	
(4)	Improvement in physical infrastructure for production	17 (70.8)	3 (12.5)	0 (0.0)	4 (16.7)	24	
(5)	Improvement in physical infrastructure for living	13 (54.2)	8 (33.3)	0 (0.0)	3 (12.5)	24	
(6)	Easier access to information on Mozambique	12 (52.2)	9 (39.1)	0 (0.0)	2 (8.7)	23	
(7)	Skill development of local labor	12 (54.5)	6 (27.3)	1 (4.5)	3 (13.6)	22	
(8)	Eradication of corruption	17 (70.8)	3 (12.5)	0 (0.0)	4 (16.7)	24	
(9)	Reduction of tax rate	10 (45.5)	5 (22.7)	2 (9.1)	5 (22.7)	22	
(10)	Removal of foreign currency exchange/remittance barrier	11 (45.8)	6 (25.0)	2 (8.3)	5 (20.8)	24	
(11)	Provision of incentive measures	12 (52.2)	6 (26.1)	1 (4.3)	4 (17.4)	23	
(12)	Development of appropriate insurance system	8 (36.4)	10 (45.5)	0 (0.0)	4 (18.2)	22	
(13)	Other	1 (0.0)	0 (0.0)	0 (0.0)	1 (0.0)	2	

<b>Maputo</b>							
	Item	Very important (%)	Helpful (%)	Not important (%)	Not sure (%)	Total	
(1)	Simplification of laws and regulations concerning investment	5 (71.4)	0 (0.0)	1 (14.3)	1 (14.3)	7	
(2)	Streamlining of administrative procedures	3 (75.0)	0 (0.0)	0 (0.0)	1 (25.0)	4	
(3)	Development of distribution network in Mozambique	4 (66.7)	2 (33.3)	0 (0.0)	0 (0.0)	6	
(4)	Improvement in physical infrastructure for production	6 (85.7)	0 (0.0)	0 (0.0)	1 (14.3)	7	
(5)	Improvement in physical infrastructure for living	5 (71.4)	1 (14.3)	0 (0.0)	1 (14.3)	7	
(6)	Easier access to information on Mozambique	5 (83.3)	1 (16.7)	0 (0.0)	0 (0.0)	6	
(7)	Skill development of local labor	4 (80.0)	1 (20.0)	0 (0.0)	0 (0.0)	5	
(8)	Eradication of corruption	4 (57.1)	2 (28.6)	0 (0.0)	1 (14.3)	7	
(9)	Reduction of tax rate	5 (83.3)	0 (0.0)	0 (0.0)	1 (16.7)	6	
(10)	Removal of foreign currency exchange/remittance barrier	2 (28.6)	2 (28.6)	2 (28.6)	1 (14.3)	7	
(11)	Provision of incentive measures	5 (71.4)	1 (14.3)	0 (0.0)	1 (14.3)	7	
(12)	Development of appropriate insurance system	3 (50.0)	3 (50.0)	0 (0.0)	0 (0.0)	6	
(13)	Other	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0	

**Table A-7. Improvements Expected in Mozambique/Tete (2/3)**

**Lilongwe, Malawi**

Item	Very important (%)	Helpful (%)	Not important (%)	Not sure (%)	Total
(1) Simplification of laws and regulations concerning investment	5 (55.6)	2 (22.2)	0 (0.0)	2 (22.2)	9
(2) Streamlining of administrative procedures	4 (44.4)	3 (33.3)	0 (0.0)	2 (22.2)	9
(3) Development of distribution network in Mozambique	5 (55.6)	1 (11.1)	0 (0.0)	3 (33.3)	9
(4) Improvement in physical infrastructure for production	6 (66.7)	1 (11.1)	0 (0.0)	2 (22.2)	9
(5) Improvement in physical infrastructure for living	3 (33.3)	4 (44.4)	0 (0.0)	2 (22.2)	9
(6) Easier access to information on Mozambique	3 (33.3)	4 (44.4)	0 (0.0)	2 (22.2)	9
(7) Skill development of local labor	5 (55.6)	1 (11.1)	0 (0.0)	3 (33.3)	9
(8) Eradication of corruption	7 (77.8)	0 (0.0)	0 (0.0)	2 (22.2)	9
(9) Reduction of tax rate	3 (37.5)	1 (12.5)	1 (12.5)	3 (37.5)	8
(10) Removal of foreign currency exchange/remittance barrier	5 (55.6)	2 (22.2)	0 (0.0)	2 (22.2)	9
(11) Provision of incentive measures	4 (44.4)	2 (22.2)	0 (0.0)	3 (33.3)	9
(12) Development of appropriate insurance system	1 (12.5)	4 (50.0)	0 (0.0)	3 (37.5)	8
(13) Other	1 (50.0)	0 (0.0)	0 (0.0)	1 (50.0)	2

**Harare, Zimbabwe**

Item	Very important (%)	Helpful (%)	Not important (%)	Not sure (%)	Total
(1) Simplification of laws and regulations concerning investment	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	3
(2) Streamlining of administrative procedures	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	3
(3) Development of distribution network in Mozambique	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	3
(4) Improvement in physical infrastructure for production	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	3
(5) Improvement in physical infrastructure for living	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	3
(6) Easier access to information on Mozambique	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	3
(7) Skill development of local labor	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	3
(8) Eradication of corruption	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	3
(9) Reduction of tax rate	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	3
(10) Removal of foreign currency exchange/remittance barrier	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	3
(11) Provision of incentive measures	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	2
(12) Development of appropriate insurance system	2 (66.7)	1 (33.3)	0 (0.0)	0 (0.0)	3
(13) Other	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0

**Table A-7. Improvements Expected in Mozambique/Tete (3/3)**

**Johannesburg, South Africa**

Item		Very important (%)	Helpful (%)	Not important (%)	Not sure (%)	Total
(1)	Simplification of laws and regulations concerning investment	3 (60.0)	0 (0.0)	0 (0.0)	2 (40.0)	5
(2)	Streamlining of administrative procedures	2 (40.0)	1 (20.0)	0 (0.0)	2 (40.0)	5
(3)	Development of distribution network in Mozambique	4 (80.0)	0 (0.0)	0 (0.0)	1 (20.0)	5
(4)	Improvement in physical infrastructure for production	3 (60.0)	1 (20.0)	0 (0.0)	1 (20.0)	5
(5)	Improvement in physical infrastructure for living	3 (60.0)	2 (40.0)	0 (0.0)	0 (0.0)	5
(6)	Easier access to information on Mozambique	2 (40.0)	3 (60.0)	0 (0.0)	0 (0.0)	5
(7)	Skill development of local labor	3 (60.0)	1 (20.0)	1 (20.0)	0 (0.0)	5
(8)	Eradication of corruption	3 (60.0)	1 (20.0)	0 (0.0)	1 (20.0)	5
(9)	Reduction of tax rate	1 (20.0)	2 (40.0)	1 (20.0)	1 (20.0)	5
(10)	Removal of foreign currency exchange/remittance barrier	3 (60.0)	0 (0.0)	0 (0.0)	2 (40.0)	5
(11)	Provision of incentive measures	2 (40.0)	2 (40.0)	1 (20.0)	0 (0.0)	5
(12)	Development of appropriate insurance system	2 (40.0)	2 (40.0)	0 (0.0)	1 (20.0)	5
(13)	Other	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0

**Table A-8. Previous Attempt to Collect Information on Mozambique/Tete**

	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
Yes	5 (71.4)	4 (40.0)	2 (50.0)	4 (80.0)	15 (57.7)
No	2 (28.6)	6 (60.0)	2 (50.0)	1 (20.0)	11 (42.3)
Total	7 (100.0)	10 (100.0)	4 (100.0)	5 (100.0)	26 (100.0)

**Table A-9. Sources of Information on Mozambique and Tete**

Source	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
Centro de Promocao de Investimentos (Investment Promotion Center) in Maputo	4 (40.0)	1 (7.1)	1 (11.1)	0 (0.0)	6 (14.6)
Mozambican embassy in our city	0 (0.0)	3 (21.4)	4 (44.4)	1 (12.5)	8 (19.5)
Chamber of commerce or other business organization in our city	2 (20.0)	4 (28.6)	1 (11.1)	1 (12.5)	8 (19.5)
Companies & business people we know	2 (20.0)	5 (35.7)	1 (11.1)	3 (37.5)	11 (26.8)
Internet	0 (0.0)	1 (7.1)	2 (22.2)	1 (12.5)	4 (9.8)
Other	2 (20.0)	0 (0.0)	0 (0.0)	2 (25.0)	4 (9.8)
Total	10 (100.0)	14 (100.0)	9 (100.0)	8 (100.0)	41 (100.0)

**Table A-10. Success in Collecting Information**

Outcome	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
Success	2 (40.0)	3 (37.5)	0 (0.0)	1 (25.0)	6 (30.0)
Limited success	3 (60.0)	3 (37.5)	1 (33.3)	1 (25.0)	8 (40.0)
Unable to collect	0 (0.0)	2 (25.0)	2 (66.7)	2 (50.0)	6 (30.0)
Total	5 (100.0)	8 (100.0)	3 (100.0)	4 (100.0)	20 (100.0)

**Table A-11. Need for Creating New Mechanism of Information Dissemination**

	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
Yes, very much	5 (71.4)	6 (75.0)	2 (66.7)	4 (80.0)	17 (73.9)
Yes, somewhat	1 (14.3)	2 (25.0)	1 (33.3)	1 (20.0)	5 (21.7)
Not necessary	1 (14.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (4.3)
Total	7 (100.0)	8 (100.0)	3 (100.0)	5 (100.0)	23 (100.0)

**Table A-12. Importance of Information on Mozambique/Tete by Type (1/2)**

<b>Total</b>				
Item	Very important (%)	Useful (%)	Not necessary (%)	Total
1. Social & economic condition	19 (86.4)	3 (13.6)	0 (0.0)	22
2. Local administration	13 (61.9)	8 (38.1)	0 (0.0)	21
3. Flight schedule to Mozambique	9 (40.9)	9 (40.9)	4 (18.2)	22
4. Accommodations in Mozambique	10 (43.5)	9 (39.1)	4 (17.4)	23
5. Investment opportunities in Mozambique	20 (87.0)	2 (8.7)	1 (4.3)	23
6. Local partners	12 (54.5)	9 (40.9)	1 (4.5)	22
7. Laws & regulations	17 (77.3)	5 (22.7)	0 (0.0)	22
8. Tax system	13 (59.1)	9 (40.9)	0 (0.0)	22
9. Incentives	15 (71.4)	5 (23.8)	1 (4.8)	21
10. Detailed information on each district	9 (60.0)	6 (40.0)	0 (0.0)	15
11. Other	0 -	1 -	0 -	1

**Maputo**

Item	Very important (%)	Useful (%)	Not necessary (%)	Total
1. Social & economic condition	3 (60.0)	2 (40.0)	0 (0.0)	5
2. Local administration	3 (60.0)	2 (40.0)	0 (0.0)	5
3. Flight schedule to Mozambique	2 (40.0)	2 (40.0)	1 (20.0)	5
4. Accommodations in Mozambique	3 (50.0)	1 (16.7)	2 (33.3)	6
5. Investment opportunities in Mozambique	4 (66.7)	1 (16.7)	1 (16.7)	6
6. Local partners	1 (20.0)	4 (80.0)	0 (0.0)	5
7. Laws & regulations	4 (80.0)	1 (20.0)	0 (0.0)	5
8. Tax system	4 (80.0)	1 (20.0)	0 (0.0)	5
9. Incentives	4 (80.0)	1 (20.0)	0 (0.0)	5
10. Detailed information on each district	2 (66.7)	1 (33.3)	0 (0.0)	3
11. Other	0 -	0 -	0 -	0

**Lilongwe**

Item	Very important (%)	Useful (%)	Not necessary (%)	Total
1. Social & economic condition	8 (100)	0 (0.0)	0 (0.0)	8
2. Local administration	3 (37.5)	5 (62.5)	0 (0.0)	8
3. Flight schedule to Mozambique	3 (37.5)	3 (37.5)	2 (25.0)	8
4. Accommodations in Mozambique	3 (37.5)	3 (37.5)	2 (25.0)	8
5. Investment opportunities in Mozambique	8 (100)	0 (0.0)	0 (0.0)	8
6. Local partners	8 (100)	0 (0.0)	0 (0.0)	8
7. Laws & regulations	5 (62.5)	3 (37.5)	0 (0.0)	8
8. Tax system	5 (62.5)	3 (37.5)	0 (0.0)	8
9. Incentives	7 (87.5)	1 (12.5)	0 (0.0)	8
10. Detailed information on each district	4 (50.0)	4 (50.0)	0 (0.0)	8
11. Other	0 (0.0)	1 (100)	0 (0.0)	1

**Table A-12. Importance of Information on Mozambique/Tete by Type (2/2)****Harare**

Item	Very important (%)	Useful (%)	Not necessary (%)	Total
1. Social & economic condition	4 (100)	0 (0.0)	0 (0.0)	4
2. Local administration	3 (75.0)	1 (25.0)	0 (0.0)	4
3. Flight schedule to Mozambique	1 (25.0)	3 (75.0)	0 (0.0)	4
4. Accommodations in Mozambique	2 (50.0)	2 (50.0)	0 (0.0)	4
5. Investment opportunities in Mozambique	4 (100)	0 (0.0)	0 (0.0)	4
6. Local partners	0 (0.0)	3 (75.0)	1 (25.0)	4
7. Laws & regulations	4 (100)	0 (0.0)	0 (0.0)	4
8. Tax system	3 (75.0)	1 (25.0)	0 (0.0)	4
9. Incentives	2 (50.0)	2 (50.0)	0 (0.0)	4
10. Detailed information on each district	1 (100)	0 (0.0)	0 (0.0)	1
11. Other	0 -	0 -	0 -	0

**Table A-13. Interest in Tete province/Mozambique**

Response	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
a. Very interested in Tete province	0 (0.0)	7 (70.0)	0 (0.0)	n.a.	7 (50.0)
b. Interested/would consider collecting information	3 (100.0)	1 (10.0)	1 (100.0)	n.a.	5 (35.7)
c. Not interested	0 (0.0)	2 (20.0)	0 (0.0)	n.a.	2 (14.3)
Total	3 (100.0)	10 (100.0)	1 (100.0)	n.a.	14 (100.0)

**Table A-14. Kind of Business Potential in Tete**

Response	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
a. To sell products/services to Tete province	2 (66.7)	6 (54.5)	1 (100.0)	n.a.	9 (60.0)
b. To buy some commodities/services from Tete province	0 (0.0)	2 (18.2)	0 (0.0)	n.a.	2 (13.3)
c. To make investment in Tete province	0 (0.0)	3 (27.3)	0 (0.0)	n.a.	3 (20.0)
d. Not sure yet but would like to collect some information	1 (33.3)	0 (0.0)	0 (0.0)	n.a.	1 (6.7)
e. Other	0 (0.0)	0 (0.0)	0 (0.0)	n.a.	0 (0.0)
Total	3 (100.0)	11 (100.0)	1 (100.0)	n.a.	15 (100.0)



**Table A-15. Sources of Information on Tete**

Source	Maputo (%)	Lilongwe (%)	Harare (%)	Johannesburg (%)	Total (%)
Centro de Promocao de Investimentos (Investment Promotion Center) in Maputo	2 (40.0)	3 (17.6)	n.a.	n.a.	5 (22.7)
Mozambican embassy in our city	0 (0.0)	2 (11.8)	n.a.	n.a.	2 (9.1)
Chamber of commerce or other business organization in our city	1 (20.0)	4 (23.5)	n.a.	n.a.	5 (22.7)
Companies & business people we know	1 (20.0)	5 (29.4)	n.a.	n.a.	6 (27.3)
Internet	1 (20.0)	3 (17.6)	n.a.	n.a.	4 (18.2)
Other	0 (0.0)	0 (0.0)	n.a.	n.a.	0 (0.0)
Total	5 (100.0)	17 (100.0)	n.a.	n.a.	22 (100.0)

## **In-Depth Study on Tete City Water Supply Expansion Project (Project No. 1.2)**

### **1. Background**

#### General

The urban population is growing rapidly in Mozambique and represents approximately 40% of the national total. The huge influx of immigrants into the cities over the last decade, as a result of the prolonged civil war, has long exceeded the capacity of the water supply and sanitation systems, designed for much smaller population. Current water supply services are characterized by low levels of coverage, poor quality and reliability. The deficiencies contribute to poor health, a degraded quality of life and in particular impacts most on the poorer parts of the population.

The Government of Mozambique (GoM) is addressing the deficiencies within the water and sanitation sector with a range of innovative policies and strategies. In 1995, the GoM adopted a comprehensive sector policy/strategy document entitled the National Water Policy (NWP). The policies to which the GoM committed itself include:

- Recognition of water as an economic as well as social good and to bring 50 ~80% urban and peri-urban people under water supply system;
- Decentralized autonomous and financially self-sustained provision of water supply and sanitation services;
- Integrated water resource management taking environmental impact into consideration; and
- Increased consumer participation, focus on capacity building and improvement of private sector.

The GoM has prepared and approved a National Water Development Program (NWDP) to implement the above policy. Under the NWDP, the GoM has decided to undertake a sweeping reform program for urban water supply provision. The program includes institutional reforms, tariff increases that aim at full cost recovery, and the establishment of a regulatory board.

#### Project background

Population in Tete city is growing rapidly due to returned refugees and inflow of people from other regions, resulting in increasing stress on various urban infrastructure including water supply and degradation of urban environment by disorderly settlement patterns with squatters. The water supply for Tete city has been significantly improved by the DANIDA assisted project Phase 1 implemented during 1992-1995. Phase 2 of the project has been formulated for the target year 2010, but suspended for the decision by the Central Government involving, among others, institutional reform for the urban water supply

sector.

Given the on-going rapid urbanization, urgent measures need to be taken to alleviate the stress on the existing water supply system, while a better development plan and institutional arrangements are prepared for continual improvement of the quality of the city's water supply services.

## **2. Project Justification**

Tete city is located on both sides of the Zambezi river between latitude of  $16^{\circ} - 05' \sim 16^{\circ} - 15'$  and longitude  $33^{\circ} - 40' \sim 33^{\circ} - 45'$ . Tete city is on the routes of goods from the inland countries to the Mozambican ports of Ncala and Beira. As the capital of the province, Tete city has political and administration facilities for the Provincial government. The existing infrastructure is mainly concentrated in Tete Antiga. The bridge over Zambezi connects Tete Antiga with communities of Matundo and Chingodzi on the opposite side of the Zambezi river where the Tete airport is located.

The city has a surface area of  $283\text{km}^2$ . There are three fully urbanized and five semi-urbanized communities in the city. As of 2000, the estimated population of Tete is 109,200 which means population density is 386 per  $\text{km}^2$ .

The existing water demand of Tete Antiga and Mutemba is about  $6,500\text{m}^3/\text{day}$ . The present production capacity may cover the existing demand. Due to lack of distribution network in Mutemba area, however, people are not getting any water. The demand would be over  $12,000\text{m}^3/\text{day}$  in 2015 and in the target year of this master plan, i.e., in 2025, the demand would be  $21,000\text{m}^3/\text{day}$ .

The Urban Master Plan for Tete (1981) indicates that the expansion areas for industries, commerce and housing will be in the Matundo-Chingodzi area and at the present time many firms/organizations have initiated their development activities including acquisition of housing plots.

The existing demand for Matundo-Chingodzi is about  $1,000\text{m}^3/\text{day}$ . The demand would be over  $7,000\text{m}^3/\text{day}$  in 2025. The existing production cannot meet even the present demand. Further boreholes, distribution network, and reserve tanks including elevated tanks are necessary.

Although Phase 1 of DANIA has improved the system substantially, water supply by Tete Water Company (Agua de Tete) is still far from what it should be. For a large portion of the population, water is still not served by Agua de Tete. The technical, managerial and administrative capability of Agua de Tete are still too low to be able to reach the objectives of sustainable water supply for the population of Tete (Attachment 2). The main constraints of Agua de Tete may be summarized as follows.

- EAT cannot make its own policy decisions as it is operated by DNA in Maputo. Hence, it should get an independent status as soon as possible with the appointment of a Delegated Management Private Operator (DMPO);
- In view of the future expansion, a capability of the Agua de Tete staff in the organizational, technical, financial and administrative fields are lacking, therefore a training program should be implemented;
- Water supply in Tete Antiga is still not satisfactory. Hence the existing water supply system should be further rehabilitated and expanded (the pipe line was installed in 1973 and since then repairing works have been made seven times);
- There is hardly any water supply in the whole Mutemba area, causing outbreak of water borne diseases. This area shares about 25% of the city population, hence an underground piped water supply system should be installed in this area as early as possible;
- The water supply system in Matundo-Chingodzi is insufficient to supply the future population increase as it has been designated as the industrial city. Therefore, the existing system should be expanded to cope with the future demand; and
- The number of stand-spots is still insufficient and users are not organized. The number of stand-spots needs to be increased and well-functioning water committees should be established at each stand-spots.

### **3. Objectives**

The project has two objectives: one to meet urgent needs to relieve stress on the existing water supply system, and the other to address to medium to long term need of the city. They are:

- (1) To expand the coverage and urgently relieve the stress on the existing water supply system in Tete city due to rapid population increase; and
- (2) To improve the quality of city water supply continually to meet increasing demand, especially in the future industrial area of Chingodzi-Matundo.

### **4. Demand Projection**

According to the Angonia regional master plan, population of Tete city is expected to increase from 109,200 in 2000 to 273,000 in 2015 and 503,000 by 2025. The total water demand will increase accordingly from some 15,000m<sup>3</sup>/day at present to over 130,000m<sup>3</sup>/day by 2025 (Attachment 3). The combined population of Tete Antiga and Mutemba, in particular, may increase from 77,000 at present to 152,000 in 2015, with corresponding increase in water demand from 6,400m<sup>3</sup>/day at present to 10,800m<sup>3</sup>/day in 2015. For the Matundo-Chingodzi area, the existing water demand is about 1,000m<sup>3</sup>/day,

which would increase to over 7,000m<sup>3</sup>/day in 2025.

## **5. Project Formulation**

In line with the objectives presented above, the project will be implemented in stages. Overall development to the year 2025 and immediate development are defined as follows.

### **(1) Overall development**

#### **For Tete-Antiga system (existing)**

- appointment of a DMPO to manage Agua de Tete independently
- training programs for improvement of managerial/technical activities
- water quality test kit for periodical water quality test program
- two new BH and connect them to the existing supply system
- strengthening of the existing distribution of 26km by laying additional mains to supply areas which at present are without water on a regular basis
- 5,000 new house connections
- construction of new stand-spots and rehabilitation of old ones with washing slabs

#### **For Mutemba area (new system)**

- four new boreholes at the Nharthanda Valley well field and connect the BH to the existing well field
- one booster pump to lift water to the reserve tank
- two 500m<sup>3</sup> reserve tanks on the hill top
- chlorination unit
- 15km of primary distribution main
- 5km secondary distribution for new stand-spots and 2.0km for individual connections
- 100 stand-spots with washing slabs
- 3,000 new house connections

#### **For Matundo-Chingodzi area (expansion of existing system)**

- seven new borehole at the Revobue river bank
- one 500m<sup>3</sup> capacity ground level reserve tank
- one elevated reserve tank(200m<sup>3</sup>)
- 15,000 new house connections
- 10km primary distribution network
- 15km secondary distribution main
- secondary distribution main for standpots
- 50 standspots with washing slabs
- 50 washing slabs in the existing standpots

(2) Immediate development

For Tete-Antiga system (existing)

- appointment of a DMPO to manage Agua de Tete independently
- training programs for improvement of managerial/technical activities
- water quality test kit for periodical water quality test program
- one new BH and connect them to the existing supply system
- strengthening of the existing distribution of 26km by laying additional mains to supply areas which at present are without water on a regular basis
- 4,000 new house connections
- construction of 15 new stand-spots and rehabilitation of 20 old ones with washing slabs

For Mutemba area (new system)

- two new boreholes at the Nharthanda Valley well field and connect the BH to the existing well field
- one booster pump to lift water to the reserve tank
- two 500m<sup>3</sup> reserve tanks on the hill top
- chlorination unit
- 10km of primary distribution main
- 5km secondary distribution for new stand-spots and 2.0km for individual connections
- 50 stand-spots with washing slabs
- 1,000 new house connections

**6. Project Implementation and Costs**

The project may be implemented in two phases. Phase 1 should be implemented immediately to improve the existing water supply system for the Antiga area and to install a new system for the Mutemba area. Phase 2 may be formulated in detail along with Phase 1 implementation for subsequent implementation.

Project costs have been estimated for Phase 1 and Phase 2 (Attachment 5). Results are summarized below.

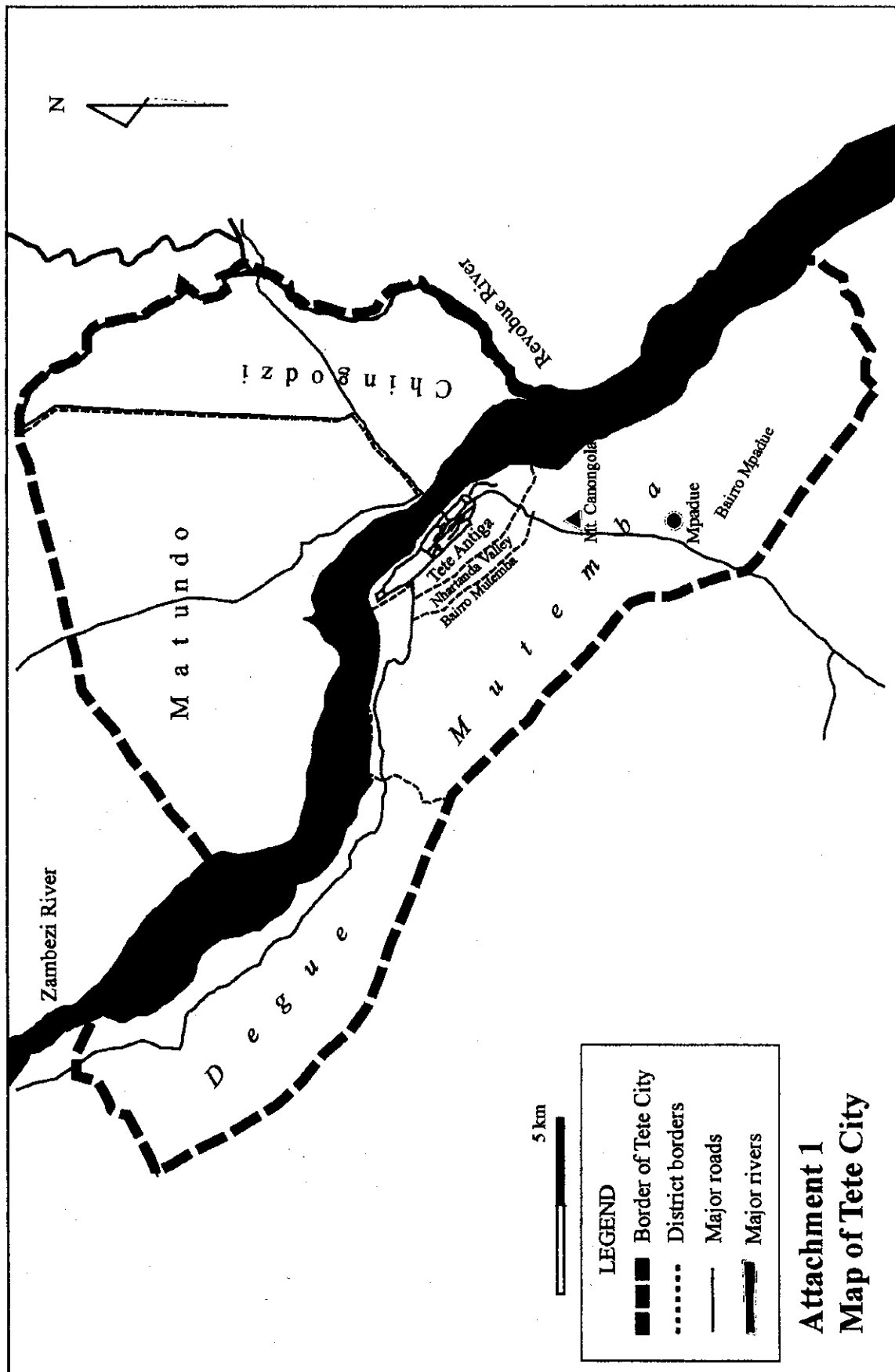
<u>Supply Area</u>	<u>Phase 1</u>	<u>Phase 2</u>
1) Tete Antiga	US\$1.2 million	US\$2.3 million
2) Mutemba	US\$1.1 million	US\$2.2 million
3) Matundo-Chingodzi		US\$9.1 million
Total	US\$2.3 million	US\$13.6 million

## **7. Conclusions**

The project is expected to contribute to the following:

- (1) expanded population coverage by piped water supply in line with the Government policy,
- (2) reduced risk of waterborne diseases and reduced costs of public health services as well as increase productivity, and
- (3) high quality water supply to attract investors and visitors.

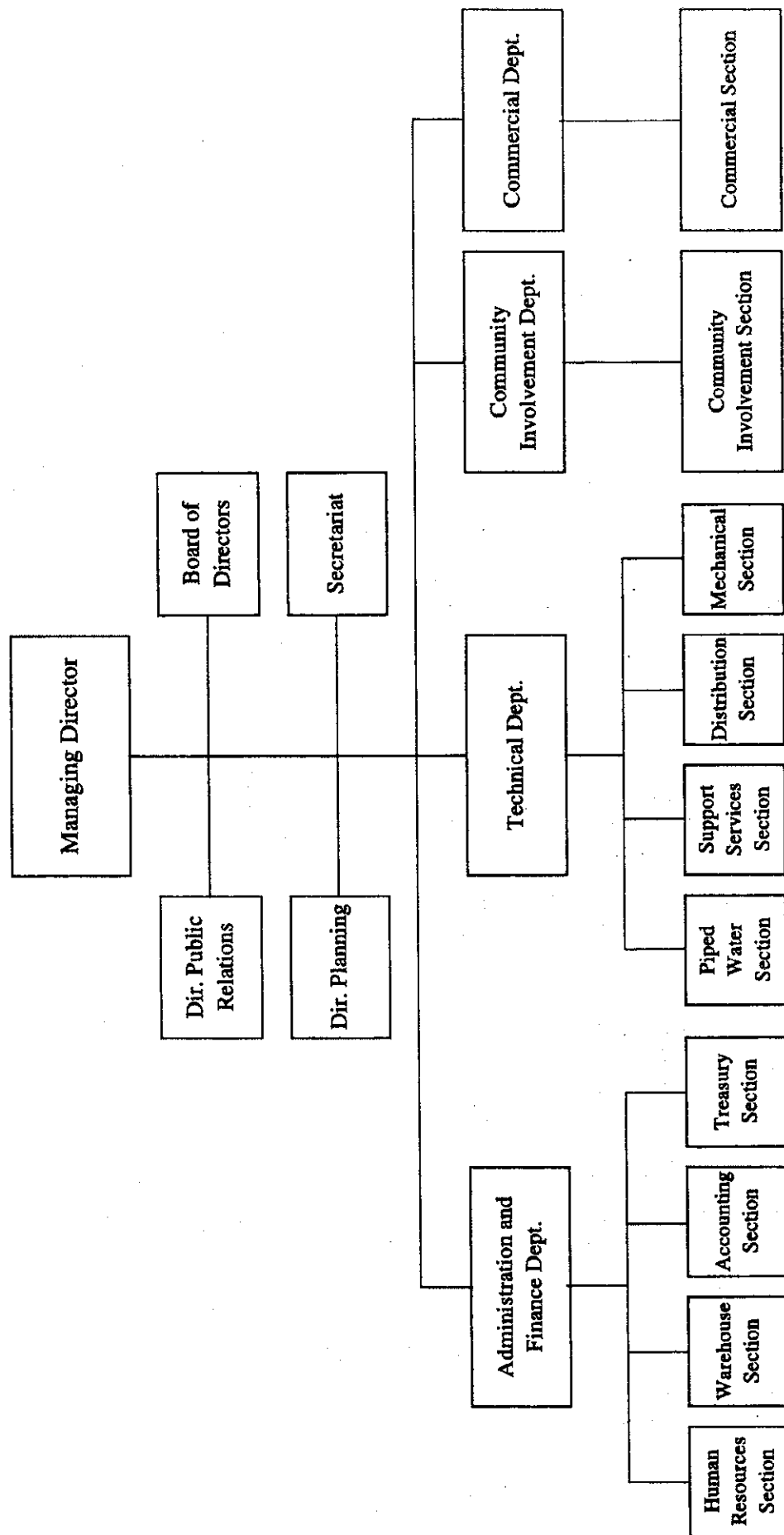
Tete city is expected to play vital roles for the development of the Angonia regional development as a whole according to its master plan. Rapid urbanization and expansion are expected through the year 2025. The project will relieve the stress on the existing water supply systems in the short run, and continually expand the supply capacity as a prerequisite to attracting investors and visitors from outside.



**Attachment 1**  
**Map of Tete City**



**Attachment 2. Organization Chart of Agua de Tete**



### Attachment 3a. Population and Water Demand of Whole Tete City

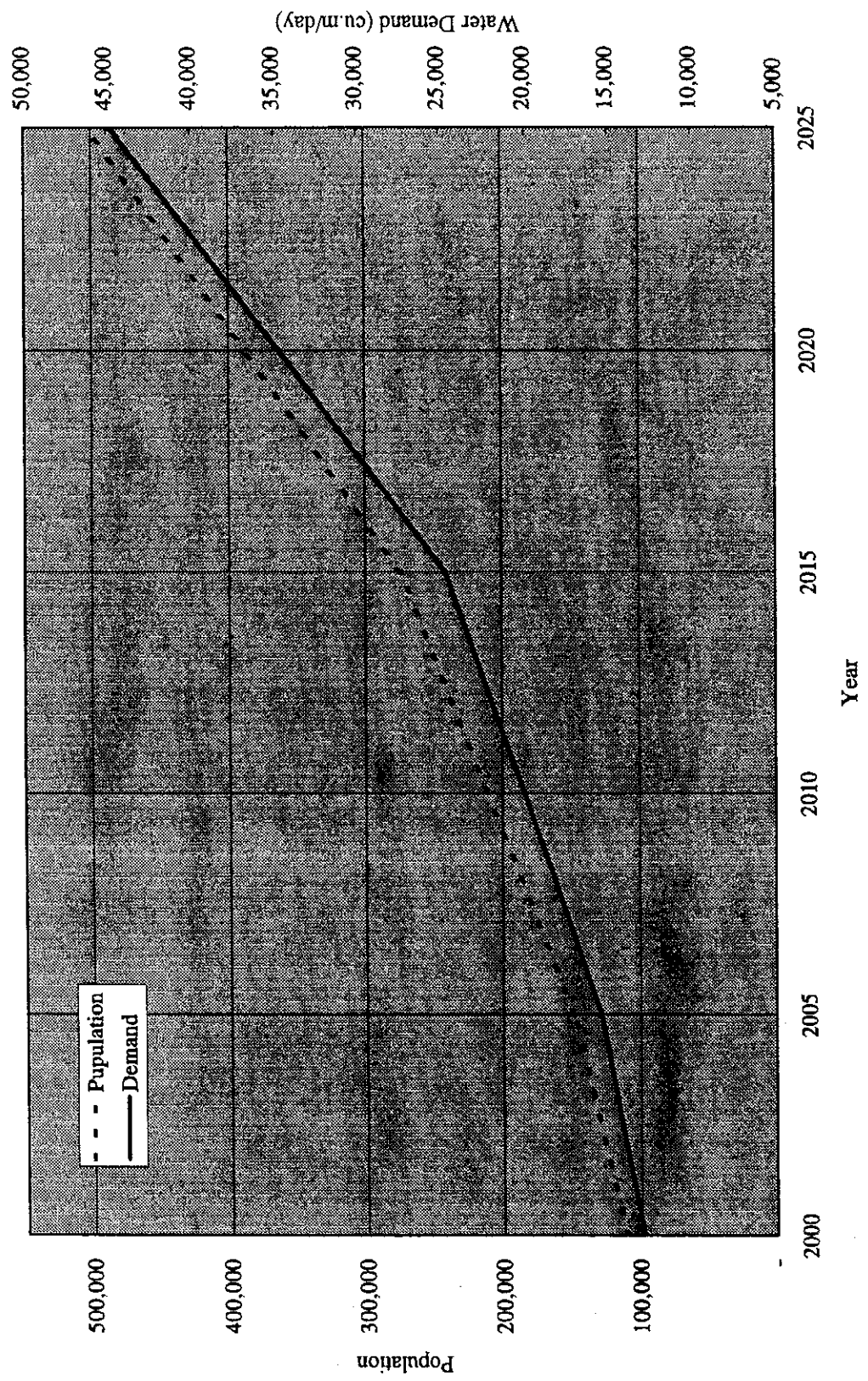
Area	Population 2000	Demand type	Demand m <sup>3</sup> /day	Population 2005	Demand type	Demand m <sup>3</sup> /day	Population 2015	Demand type	Demand m <sup>3</sup> /day	Population 2025	Demand type	Demand m <sup>3</sup> /day
Tete city Tete-Antiga	109,200			148,200			273,000			503,000		
	46,000	H.Connection	966	56,236	H.Connection	1,378	84,046	H.Connection	2,353	125,611	H.Connection	3,957
		Standpots	276		Standpots	394		Standpots	672		Standpots	1,130
		Indus.+Inst.	3,000		Indus.+Inst.	3,000		Indus.+Inst.	3,200		Indus.+Inst.	3,300
		Subtotal	4,242		Subtotal	4,771		Subtotal	6,226		Subtotal	8,387
		Loss (30%)	1,273		Loss (25%)	1,193		Loss (25%)	1,556		Loss (25%)	2,097
Mutemba		<b>Total</b>	<b>5,515</b>		<b>Total</b>	<b>5,964</b>		<b>Total</b>	<b>7,782</b>		<b>Total</b>	<b>10,482</b>
	27,000	H.Connection	567	36,733	H.Connection	900	67,987	H.Connection	1,904	125,835	H.Connection	3,964
		Standpots	162		Standpots	257		Standpots	544		Standpots	1,133
		Indus.+Inst.	57		Indus.+Inst.	90		Indus.+Inst.	190		Indus.+Inst.	396
		Subtotal	786		Subtotal	1,247		Subtotal	2,638		Subtotal	5,493
		Loss (25%)	196		Loss (25%)	312		Loss (25%)	659		Loss (25%)	1,373
Antiga+Mutemba	73,000	<b>Total</b>	<b>6,497</b>	92,969	<b>Total</b>	<b>7,523</b>	152,033	<b>Total</b>	<b>3,297</b>	251,446	<b>Total</b>	<b>6,866</b>
	25,000	H.Connection	525	43,946	H.Connection	1,077	93,528	H.Connection	3,666	200,000	H.Connection	10,500
		Standpots	150		Standpots	308		Standpots	299		Standpots	1,000
		Indus.+Inst.	105		Indus.+Inst.	215		Indus.+Inst.	733		Indus.+Inst.	2,100
		Subtotal	780		Subtotal	1,600		Subtotal	4,699		Subtotal	13,600
Chingodzi + Matundo		Loss (25%)	195		Loss (25%)	400		Loss (25%)	1,175		Loss (25%)	3,400
	25,000	<b>Total</b>	<b>975</b>		<b>Total</b>	<b>2,000</b>		<b>Total</b>	<b>5,874</b>		<b>Total</b>	<b>17,000</b>
	11,200			11,285			27,439			52,198		
	109,200	<b>Total</b>	<b>13,000</b>	148,200	<b>Total</b>	<b>15,500</b>	273,000	<b>Total</b>	<b>24,700</b>	503,644	<b>Total</b>	<b>44,800</b>

Population of Tete Antiga, Mutemba, Chingodzi/Matundo and others are adjusted from reference materials

#### Assumptions:

- For house connections each family will have 6 members, each will consume 70 l/day
- For standpots 20 litre/person, each will cover 600 persons
- From 2000-2005, the coverage will be 70%
- From 2005-2015, the coverage will be 80%
- From 2015-2025, the coverage will be 90%
- In 2025, Matundo/Chingodzi area will be 100% covered

**Attachment 3b. Population and Water Demand of Tete City**



#### Attachment 4a. Population and Water Demand of Tete Antiga and Mutemba

Area	Population 2000	Demand type	Demand m³/day	Population 2005	Demand type	Demand m³/day	Population 2015	Demand type	Demand m³/day
<b>Tete city</b>	<b>109,200</b>			<b>148,200</b>			<b>273,000</b>		
Tete-Antiga	46,000	H.Connection	966	56,236	H.Connection	1,378	84,046	H.Connection	2,353
		Standpots	276		Standpots	394		Standpots	672
		Indus.+Insti.	3,000		Indus.+Insti.	3,000		Indus.+Insti.	3,200
		Subtotal	4,242		Subtotal	4,771		Subtotal	6,226
		Loss(30%)	1,273		Loss(25%)	1,193		Loss(25%)	1,556
		<b>Total</b>	<b>5,515</b>		<b>Total</b>	<b>5,964</b>		<b>Total</b>	<b>7,782</b>
Mutemba	27,000	H.Connection	473	36,733	H.Connection	771	67,987	H.Connection	1,666
		Standpots	162		Standpots	257		Standpots	544
		Indus.+Insti.	47		Indus.+Insti.	77		Indus.+Insti.	167
		Subtotal	682		Subtotal	1,106		Subtotal	2,376
		Loss(25%)	170		Loss(25%)	276		Loss(25%)	594
		<b>Total</b>	<b>852</b>		<b>Total</b>	<b>1,382</b>		<b>Total</b>	<b>2,970</b>
<b>Antiga+Mutemba</b>	<b>73,000</b>	<b>Total</b>	<b>6,367</b>	<b>92,969</b>	<b>Total</b>	<b>7,346</b>	<b>152,033</b>	<b>Total</b>	<b>10,752</b>

#### Assumptions:

- For house connections each family will have 6 members, each will consume 70 l/day
- For standpots 20 litre/person, each will cover 600 persons

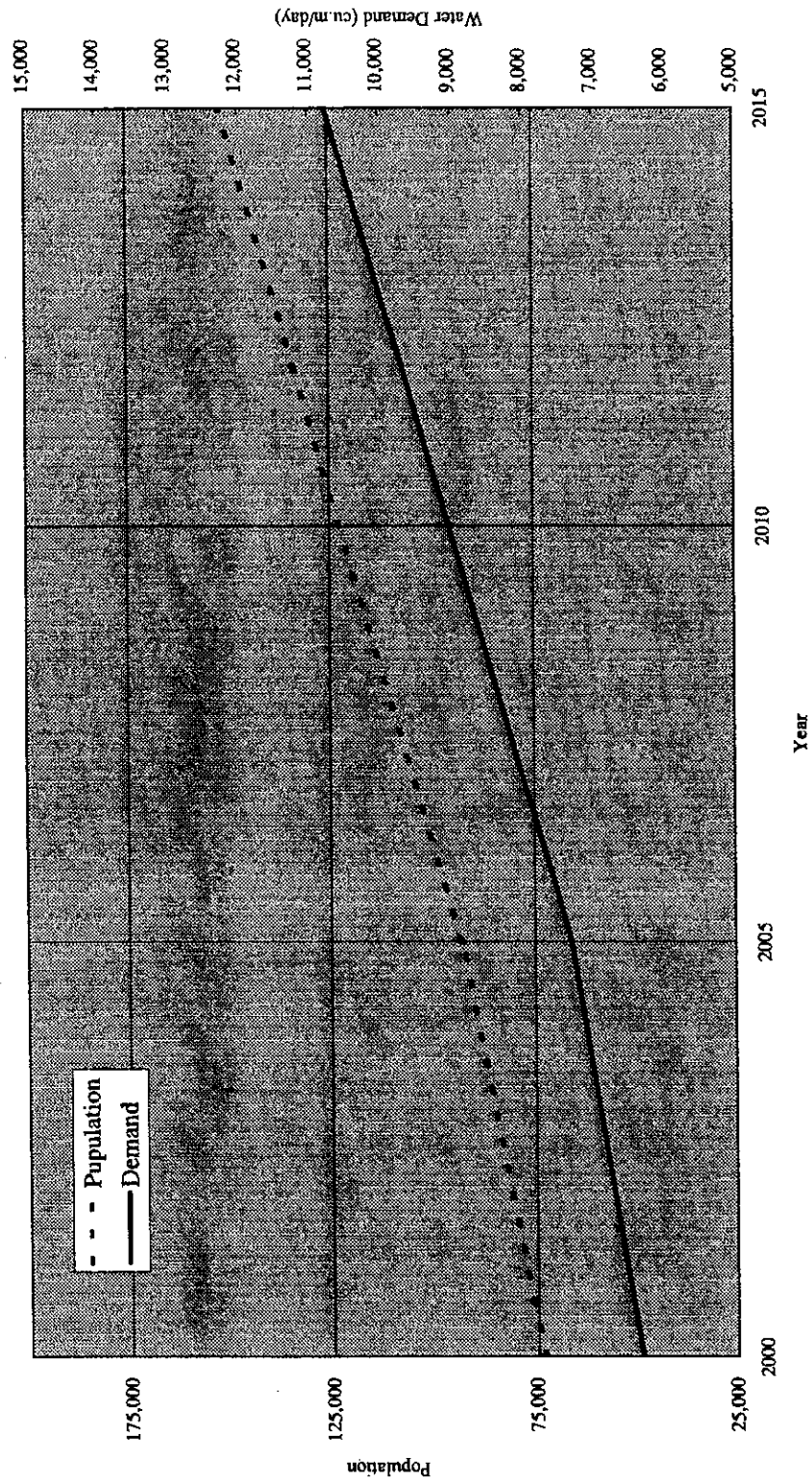
#### For Antiga

- From 2000-2005, the coverage will be 70%
- From 2005-2015, the coverage will be 80%

#### For Mutemba

- From 2000-2005, the coverage will be 60%
- From 2005-2015, the coverage will be 70%

**Attachment 4b. Population and Water Demand of Antiga and Mutemba**



**Attachment 5. Cost Estimation for Tete Antiga and Mutemba Water Supply**

No.	Item	Unit	1996		2000 25% up (DKK)	Unit price (US\$) US\$1=DKK8.41	Tete Antiga		Mutemba		Grand Total (US \$)
			Unit price (DKK)				Amount	Price US\$	Amount	Price US\$	
1	BH equipped w. pump	pump	330,000		412,500	49,049	1	49,049	2	98,098	
2	Primary dist. main	km	260,000		325,000	38,644	15	579,667	8	309,156	
3	Secondary dist. main	km	13,333		16,666	1,982	10	19,817	3	5,945	
4	New SP W.slabs	SP	38,235		47,794	5,683	15	85,245	50	284,148	
5	Rehabilitation of SP	Sp	15,455		19,319	2,297	20	45,942			
6	Washing Slab	slab	5,217		6,521	775					
7	Materials new Connect.	conn.	1,143		1,429	170	400	67,955	1,000	169,887	
8	Rehabili.of connections	conn.	413		516	61	1,000	61,385			
9	Chloronization unit	unit	40,000		50,000	5,945	1	5,945	1	5,945	
10	200 cu.m reserve tank	unit	330,000		412,500	49,049					
11	500 cu.m reserve tank	unit	400,000		500,000	59,453			1	59,453	
12	Training+off. equipment	lumpsum	training for 3 yrs			80,000		70,000			
13	Water Quality test kit	unit				1,000		1,000			
							<b>Sub-total</b>	<b>986,005</b>		<b>932,632</b>	
14	Contingency (10%)							98,601		93,263	
15	Consultancy (10%)							98,601		93,263	
							<b>Total</b>	<b>1,183,206</b>		<b>1,119,159</b>	<b>2,302,365</b>



**In-Depth Study on Power Development Program**  
**(Related to Project Nos. 1.1, 1.4, 1.11, and 2.10)**

**1. Introduction**

The basic strategy for energy development to support the Angonia regional development has been established with two components: (1) making the Angonia region a power export center, and (2) promoting environmentally sound and renewable energy use. In line with the first strategy, the establishment of a coal-fired thermal plant in Moatize is proposed in addition to major hydropower plants on the Zambezi river. Under the second strategy, the use of mini-hydro wind, solar and other renewable energy is recommended, but in some areas conventional diesel generation may be a more economical option at least as a transitional measure.

The viability of the coal-fired thermal plant is analyzed, and the economy of diesel generation examined here. In addition, the expansion of power supply in the proposed Tete-Moatize core urban area and beyond along the Tete corridor up to Zobue is also investigated.

**2. Coal-fired Thermal Power Plant**

**(1) Power demand**

Power demand in Mozambique for domestic use and export through the Southern Africa Power Pool (SAPP) has been projected at this time, referring to existing demand projections and introducing assumptions on future economic growth. The total power demand is projected to reach 31,900GWh by the year 2025. Even if all the major hydropower plants proposed on the Zambezi mainstream are implemented, the total supply capacity will be 21,700GWh in 2025. The balance, some 10,200GWh, may be met by a coal-fired thermal power plant at the mouth of the Moatize coalmine as proposed.

**(2) Project formulation**

It is expected that only some 3.0 million tons of coal be exported every year once the Sena railway line is restored. To enhance the viability of the Moatize coal mining, larger production is expected based on the large deposit through developing local demand and export to neighboring countries. The proposed coal-fired thermal will effectively utilize excess production of the Moatize coal. The total capacity of the plant is preliminary set at 2,400MW (4x600MW).

The quality of coal at Moatize is good with the average heat content of 6,300kcal/kg and a sulfur content of 0.7%. For power generation at 2,400MW and plant factor of 65%, 5.2 million tons of coal are required per year. The project will utilize low efficiency FGD,



estimated at a cost of US\$1,100 per kW with heat conversion efficiency at 36%. The demand for coal is calculated below.

**Table 1. Demand for Coal for Power Generation**

Capacity (MW)	Plant Factor (%)	Generation (GWh)	Coal Quality (Kcal/kg)	Coal Demand (t/year)
600	65.0	3,416	6,300	1,296,340
1,200	65.0	6,833	6,300	2,592,679
2,400	65.0	13,666	6,300	5,185,359
3,600	65.0	20,498	6,300	7,778,038
600	75.0	3,942	6,300	1,495,777
1,200	75.0	7,884	6,300	2,991,553
2,400	75.0	15,768	6,300	5,983,106
3,600	75.0	23,652	6,300	8,974,660

### (3) Project viability

The coal price is estimated by the Study Team at US\$11/ton with an annual escalation of 0.25%. Construction duration is set at five years and operation cost is 3% of the total investment cost. Life of the power plant is assumed at 25 years, and EDM's average selling price at US\$0.064/kWh in 1999 was used. The power plant attains the economic internal rate of return (EIRR) of 15% and an average incremental cost (AIC) of US\$0.028/kWh, which is competitive, even against some hydropower projects. This price, however, does not include the transmission cost that could be substantial. This may not be a disadvantage against the hydropower projects since they are all located in Tete province, far from the load centers in the region (Table 2).

### 3. Rural Electrification

The rural electrification project is proposed to electrify all the district centers, rehabilitate one hydropower plant, and expand electrification in villages through either grid extension or independent supply sources. The first priority will be given to diesel generation in Furancungo, which are planned with 75kW to be installed in 2002. There are small diesel generators operating in Furancungo by a tobacco company, the district administration and two NGOs, but the supply capacity is insufficient to cover residential areas.

A diesel system started to operate on June 22, 2001. The cost of 75kW diesel generator is US\$30,963 and that of distribution line is US\$67,329. The tariff was set by the National Directorate of Energy and FUNAE in consultation with local people. The project is a part of the World Bank lending program to electrify local districts. The program was started in 1997 and is now in its second phase. The temporary tariff, which has been used in Tsangano is very low, not enough to cover the operation cost. A brief calculation of tariff and operation cost in Chiuta shows that the current tariff structure cannot even cover diesel

and lubricant oil (Table 3). The tariff, however, is expected to increase when the farmers started to benefit from the electrification. The sustainable operation of the system, therefore, should be the priority.

**Table 2. Moatize Thermal Power Plant (2,400MW)**

Year	Capital cost (\$ mil.)	Power generated (GWh/yr)	Coal consumed (mil. t)	Coal price (\$/ton)	Fuel cost (\$mil.)	Operating cost (\$mil.)	Total oper. cost (\$mil.)	Total cost (\$mil.)	Total benefits (\$mil.)	Net benefits (\$mil.)
1	528							528.0	0.0	-528.0
2	528							528.0	0.0	-528.0
3	528							528.0	0.0	-528.0
4	528							528.0	0.0	-528.0
5	528							528.0	0.0	-528.0
6		6832.8	2.6	11.0	28.5	79.2	107.7	186.9	443.7	246.8
7		10249.2	3.9	11.0	42.9	79.2	122.1	201.3	650.6	449.3
8		13665.6	5.2	11.1	57.3	79.2	136.5	215.7	867.5	651.7
9		13665.6	5.2	11.1	57.5	79.2	136.7	215.9	867.5	651.6
10		13665.6	5.2	11.1	57.6	79.2	136.8	216.0	867.5	651.5
11		13665.6	5.2	11.1	57.8	79.2	137.0	216.2	867.5	651.3
12		13665.6	5.2	11.2	57.9	79.2	137.1	216.3	867.5	651.2
13		13665.6	5.2	11.2	58.0	79.2	137.2	216.4	867.5	651.0
14		13665.6	5.2	11.2	58.2	79.2	137.4	216.6	867.5	650.9
15		13665.6	5.2	11.2	58.3	79.2	137.5	216.7	867.5	650.7
16		13665.6	5.2	11.3	58.5	79.2	137.7	216.9	867.5	650.6
17		13665.6	5.2	11.3	58.6	79.2	137.8	217.0	867.5	650.4
18		13665.6	5.2	11.3	58.8	79.2	138.0	217.2	867.5	650.3
19		13665.6	5.2	11.4	58.9	79.2	138.1	217.3	867.5	650.1
20		13665.6	5.2	11.4	59.1	79.2	138.3	217.5	867.5	650.0
21		13665.6	5.2	11.4	59.2	79.2	138.4	217.6	867.5	649.8
22		13665.6	5.2	11.4	59.4	79.2	138.6	217.8	867.5	649.7
23		13665.6	5.2	11.5	59.5	79.2	138.7	217.9	867.5	649.6
24		13665.6	5.2	11.5	59.7	79.2	138.9	218.1	867.5	649.4
25		13665.6	5.2	11.5	59.8	79.2	139.0	218.2	867.5	649.3
26		13665.6	5.2	11.6	60.0	79.2	139.2	218.4	867.5	649.1
27		13665.6	5.2	11.6	60.1	79.2	139.3	218.5	867.5	649.0
28		13665.6	5.2	11.6	60.3	79.2	139.5	218.7	867.5	648.8
29		13665.6	5.2	11.7	60.4	79.2	139.6	218.8	867.5	648.7
30		13665.6	5.2	11.7	60.6	79.2	139.8	219.0	867.5	648.5
<b>Assumptions:</b>										
Plant factor	65%				Life	25 years				
Efficiency	38%				Duration of construction	5 years				
Capacity (MW)	2,400									
Capital cost	1,100				NPV of total generation at	10%	115,008			
Operating cost as cap. cost	3%				NVP of total cost at	10%	3,198			
Price of coal	US\$11.0/ton				NPV of total benefit at	10%	4,533			
Coal price increase per year	0.25%				Average incremental cost		US\$0.028/kWh			
					EDM average selling price		US\$0.63478/kWh in 1999			
					EIRR		15%			

**Table 3. Tariff Table for Diesel Generation System in Chiuta**

Customers	MT/MO	US\$/MO	No. of customers <sup>1</sup>	MT/MO	US\$/MO	Oper. cost MT/MO <sup>2</sup>
Residential	150,000	6.82	16+2=18	2,700,000	122.73	
Small Business	250,000	11.36	8	2,000,000	90.91	
Commercial	350,000	15.91	2	700,000	31.82	
Hospital	800,000	36.36	1	800,000	36.36	
School	400,000	18.18	1	400,000	18.18	
<b>Total</b>			<b>30</b>	<b>6,600,000</b>	<b>300.00</b>	<b>9,150,000</b>

Notes: <sup>1</sup> Residential Customers include one for the Administrator's Office and one for the residence.

<sup>2</sup> Operation cost includes MT9,000,000 of diesel cost and MT150,000 lub. & oil. Labor and spare cost is not included.

Exchange rate is assumed at US\$1.00= MT 22,000

Source: Directorate of Mineral Resources and Energy, Tete

In Chifunde, a solar charging center will be established, in the form of rural cooperative. In Ulongue, a 500kW station will be rehabilitated in substitute for, or in addition to, the imported power from Malawi.

#### **4. Tete Corridor Power Supply Expansion**

##### **(1) Scope of the project**

Tete and Moatize cities are served by electricity from HCB. In this area, Moatize coal mining companies are the largest customers, followed by a quarry company in Boroma. Two 5.3MVAs serve the region with a peak demand of 5.4MW in 1999. As the economy expands, the capacity will be over extended. Presently, EDM has a plan to expand its service across the river to Matundo, but the implementation of the project is slow, due to lack of financing. This project will support EDM Tete to expand its service into the suburban area with additional line extension and substation.

The second component of the project will expand the transmission line to Zobue, along the Tete Corridor. The expansion will pave the way for further extension to wire the whole Study area. With the new connection, Zobue can be served with cheaper HCB electricity in place for import from Malawi.

As part of the project, expansion of power supply system within Tete city (subproject-1) and strengthening of power supply in the Tete-Moatize core urban area (subproject-2) are further examined.

##### **(2) Tete-Moatize distribution subproject-1**

###### **Rehabilitation of Tete city electricity distribution system**

This component will upgrade the transmission lines from Matambo substation to Tete

substation. The current line of 33kV is in poor conditions. EDM has a plan to upgrade the power line from 33kV to 66kV to meet the future demand. Within the city, two switchgears, underground MV system, and circuit breakers will be replaced. The voltage level in the city should also be upgraded from 6.6kV to 11kV.

#### Expanding service to Matundo

As the area is expected to grow with offices and residential facilities, nine new transformers should be added, the voltage upgraded from 6.6kV to 11kV, and the substation should be upgraded from 5.0MVA to 20MVA. The total cost of this subproject is estimated to be US\$6,963,900.

For economic analysis, EDM's average purchase price from HCB in 1999 was used, at US\$0.007/kWh for the cost of power and EDM's average selling price in 1999 was used as selling price. The net price was derived at US\$0.059/kWh. Economic internal rate of return is estimated at 29%, and the average incremental cost (AIC) was US\$0.017/kWh (Table 4).

**Table 4. Economic Analysis of Tete-Moatize Distribution Subproject-1**

Unit: US\$ million					
Year	Cost	GWh	Benefits	Net Benefits	
1 2002	2.3213		0.0	-2.3	
2 2003	2.3213		0.0	-2.3	
3 2004	2.3213	20.0	1.2	-1.1	
4 2005		40.1	2.4	2.4	
5 2006		40.1	2.4	2.4	
6 2007		40.1	2.4	2.4	
7 2008		40.1	2.4	2.4	
8 2009		40.1	2.4	2.4	
9 2010		40.1	2.4	2.4	
14 2015		40.1	2.4	2.4	
19 2020		40.1	2.4	2.4	
25 2026		40.1	2.4	2.4	
Exchange rate MT/US\$				13,300	
Extra power supplied at 6.5MVx80% level (GWh)				40.086	
Distribution losses in 1999				12.00%	
			Mt.	US\$	
Purchase price per kWh			93	0.007	
Selling price			873.9	0.066	
Net selling tariff			780.9	0.059	
EIRR				29%	
NPV of Cost, million US\$ at			10%	5.77	
NPV of Benefit, million US\$ at			10%	16.39	
NPV of Power supply, GWh at			10%	337.87	
AIC US\$ per kWh				0.017	

Note: BOM's record of the exchange rate on the last day of 1999.

Source: EDM, *Annual Statistical Report 1999* (the selling price includes wheeling charge).

(3) Tete-Moatize distribution subproject-2

The second phase of the distribution project is expected to establish distribution infrastructure for the Tete-Moatize core urban area. Although it is hard to estimate the potential energy demand in the area, a rough estimate was made, based on the past trend and assumption of one kW for one household. The total energy demand in the area in the year 2025 is expected to be 730GWh, with per capita consumption at 1251kWh. For reference, per capita consumption was 3,800kWh in South Africa, 563kWh in Zambia and 919kWh in Zimbabwe in 1997. This demand forecast, however, does not consider possible large industry investments and backup generators for Moatize coal mine operations. The additional distribution capacity is expected to be 119MVA, which could cost US\$44.8million (Table 5).

Using the same method and assumptions, the economic internal rate of return (EIRR) could attain 39% and the average incremental cost (AIC) was US\$0.008/kWh (Table.6).

**Table 5. New Distribution Demand and Cost Estimate**

Population in Tete-Moatize core urban area:	583,644
Household Estimated, 4.2 persons per house	138,963
KW per household consumption in Mozambique	1.0
MW distribution capacity needed	139
Possible energy consumed (GWh) at a load factor of 60%	730
KWh per capita in Tete-Moatize core urban area	1,251
Total substation capacity needed (MVA)	174
Existing and phase 1 substation capacity (MVA)	25
New substation capacity in phase 2 (MVA)	149
Additional capacity in Phase 2 (MW)	119
Cost per MVA including lines*	300,000
Total cost in US\$	44,761,071

\*Based on phase 1 cost estimate

**Table 6. Economic Analysis of Tete-Moatize Distribution Subproject-2**

Unit: US\$ million

	Year	Cost	GWh	Benefits	Net benefits
1	2002	14.92		0.0	-14.9
2	2003	14.92		0.0	-14.9
3	2004	14.92	276.0	10.5	-4.5
4	2005		552.1	20.9	20.9
5	2006		552.1	20.9	20.9
6	2007		552.1	20.9	20.9
7	2008		552.1	20.9	20.9
8	2009		552.1	20.9	20.9
9	2010		552.1	20.9	20.9
14	2015		552.1	20.9	20.9
19	2020		552.1	20.9	20.9
25	2026		552.1	20.9	20.9
Exchange rate MT/US\$					13,300
Extra power supplied at 48MVx80% level (GWh)					552.087
Distribution losses in 1999					12.00%
					US\$
Purchase price per kWh from coal-fired plant					0.028
Selling price					0.066
Net selling tariff					0.038
EIRR					39%
NPV of Cost, million US\$ at				10%	37.10
NPV of Benefit, million US\$ at				10%	145.74
NPV of Power supply, GWh at				10%	4,653,36
AIC US\$ per kWh					0.008

Note: BOM's record of the exchange rate on the last day of 1999.

Source: EDM, *Annual Statistical Report 1999* (the selling price includes wheeling charge).



## **In-Depth Study on Integrated Rural Development (Project No. 2.1)**

### **1. Background**

A major constraint to the development of Zambezi lowland areas is the lack of sufficient population in the vast territories. Extensive agriculture is practiced at present, dominantly in the form of slash and burn, without adequate land and water management. The major crop is maize. The main development theme for these areas is to transform the subsistence agriculture into market-oriented agriculture.

Levels of social services are generally low, particularly in rural areas. This is not only due to insufficient social facilities, but also due to acute shortages of qualified manpower and their biased deployment against rural areas. To improve the deployment of services providers in favor of districts and rural areas, various rural infrastructure should be developed in selected areas to create rural service centers.

To improve the social services in rural areas effectively, rural service centers should be created in areas of high agricultural potentials. In the hinterland of such a center, highly productive agricultural activities should be established by and for those people currently engaging in extensive agriculture such as slash and burn.

### **2. Objectives**

General objectives of the project are:

- (1) To expand settlements in sparsely populated Zambezi lowland by improving rural infrastructure; and
- (2) To create productive rural environment based on more intensive agriculture.

As one of high potential agricultural areas, an area along the Mavuzi river in Chiuta has been selected. As productive agricultural activities, cultivation of maize in combination with soybean is recommended in this area. This project, therefore, will be instrumental in developing and accumulating experiences in irrigated agriculture in the Angonia region as well.

### **3. Project Area**

The selected project area is located at 35km from the district capital, Manje, and 14km from the main road from Tete city to Manje. It is along the old road connecting Cayuga and Chidzolomondo from Manje.

The area is located at the elevation 425m. It is an extensive plain with most fertile soil in the region of alluvial type. The total area of this soil type is 415.7km<sup>2</sup>, and the area for irrigated agricultural development is about 5,000ha.



At present, there is no settlement in this area, and agricultural support services are generally weak in Chiuta.

#### **4. Project Components**

The project will provide various rural infrastructure to this area of high potentials to create a rural service center. People will be settled in this area to enjoy improved living conditions with better social services as well as productive activities. The center will provide social services to rural people in its hinterland as well. The major infrastructure is irrigation facilities, but other infrastructure facilities will also be provided or improved.

The project area is located close to the national road EN 222 branching off at Matemo, passing through Massamba and Kazula, and to reach Furuncungo. This road passes through potentially most productive areas, and therefore should be improved into an alternate artery road according to the Angonia regional development master plan. The access roads from this future artery as well as from the district capital will also be improved. Other infrastructure will be installed under other projects: District Water Supply (No. 2.9), Rural Electrification (No. 2.10), and Rural Telecommunications (No. 3.10). These various project components will be implemented in an integrated manner for the new settlement area.

#### **5. Project Costs**

Project costs are estimated here only for the irrigation component, as costs of other infrastructure components are included under different projects, although they will be implemented in an integrated manner. The total investment cost is estimated to be US\$2.97 million, consisting of US\$369,000 for land preparation, US\$1,638,000 for irrigation canals, and US\$964,000 for equipment.

Annual costs of the irrigation component consist of US\$180,000 for seed, US\$63,000 for fertilizer, US\$56,000 for O&M of facilities including fuels, and US\$78,000 for labor. The total annual cost is US\$376,000. The investment cost is annuitized at the annual interest rate of 10% over 30 years to obtain US\$317,000. Thus, the total annuitized cost is US\$693,000. Detailed cost estimates are given in Appendix.

#### **6. Financial Analysis**

In the irrigated area, maize and soybean are cultivated partly under double cropping. Revenues, costs and profits are estimated. First, the unit cost and the unit revenue per ha are estimated for maize and soybean separately under the "with project" and the "without projects" conditions, respectively. Results are summarized in Table 1.

**Table 1. Unit Revenue and Profit from Cultivation of Maize and Soybean**

		Without project		With project		
Revenue		Unit price (Mt/ton)	Yield (ton/ha)	Revenue (Mt x10 <sup>6</sup> /ha)	Yield (ton/ha)	Revenue (Mt x10 <sup>6</sup> /ha)
Maize		1.5	1.0	1.5	2.0	3.0
Soybean		15.0	1.0	15.0	2.2	33.0
Costs		Unit price (Mt/man-day)	Quantity (man-day/ha)	Cost (Mt x10 <sup>3</sup> /ha)	Quantity (man-day/ha)	Cost (Mt x10 <sup>3</sup> /ha)
Maize:	Labor	25,000	25	625.0	30.5	762.5
	Others			31.3		38.1
	Total			656.3		800.6
Soybean:	Labor	25,000	20	500.0	24	600.0
	Others			25.0		30.0
	Total			525.0		630.0
Net profit (Mt x10 <sup>3</sup> )						
Maize				843.8		2,199.4
Soybean				14,475.0		32,370.0

As seen in Table 1, the incremental net benefit due to the project is Mt. 1,355,600 or US\$67.8 for maize and Mt. 17,895,000 or US\$894.8 for soybean per ha, respectively. The total cultivated area is assumed to be 4,500ha, of which 2,500ha may be doubled cropped with both crops. The total annual profit is calculated to be US\$3,369,100. The net profit after the annuitized investment cost is accounted for is US\$2,676,100 and the B/C ratio is 4.86 at 10% discount rate.

## 7. Conclusions

The irrigation component of the project is highly viable under relatively conservative assumptions on crop yields under irrigation and the extent of double cropping. Therefore, even if costs of other rural infrastructure are included, the project viability must be high. Successful irrigation development would provide a driving force for establishing the new rural service center through the implementation of the integrated rural development.

## **Appendix**

**Land Clearing Cost Estimate**  
**Canal Construction Cost Estimate**  
**General Operation Cost Estimate**

## Land Clearing Cost Estimate

Target area	=	5,000 ha
Dense forest	=	5% 250ha
Dense bush	=	25% 1,250ha
Medium bush	=	45% 2,250ha
Normal bush	=	25% 1,250ha
Total		5,000ha

### (1) Land clearing

Item	Unit	Unit cost (per ha)		Quantity (ha)	Cost	
		Mt	US\$		Mt10 <sup>3</sup>	US\$
Dense forest	ha	2,043,000	90	250	510,750	22,500
Dense bush	ha	1,702,500	75	1,250	2,128,125	93,750
Medium bush	ha	1,362,000	60	2,250	3,064,500	135,000
Normal bush	ha	1,021,500	45	1,250	1,276,875	56,250
Total				5,000	6,980,250	307,500

(2) Administration & etc. (15% of (1)):	1,047,038	46,125
(3) Contingency (5% of (1)):	349,013	15,375
Total (1)+(2)+(3):	8,376,300	369,000

## Canal Construction Cost Estimate

Canal density	50m/ha
Target area	5,000ha
Total length of each canal	250km
Type I (B0.7m×H0.5m)	50% 125km
Type II (B1.0m×H0.7m)	50% 125km

### (1) Cannal construction

Item	Unit	Unit cost (per ha)		Quantity (ha)	Cost	
		Mt	US\$		Mt10 <sup>3</sup>	US\$
Type I	m <sup>3</sup>	99,880	4.4	125	12,485,000	550,000
Type II	m <sup>3</sup>	106,690	4.7	125	13,336,250	587,500
Total				250	25,821,250	1,137,500

(2) Survey & design (10% of (1)):	25	2,582,125	113,750
(3) Cost of constructing appurtenant structure (10% of (1)):	25	2,582,125	113,750
(4) Total cost (1)+(2)+(3):	300	30,985,500	1,365,000
(5) Administration & etc. (15% of (4)):		4,647,825	204,750
(6) Contingency (5% of (4)):		1,549,275	68,250
Total (4)+(5)+(6):		37,182,600	1,638,000

Cost of canal per ha of irrigation land: US\$328/ha

### Notes:

US\$1= Mt 22,700

Dense forest unit price is the sum of slashing thick forest and clearing medium bush.

The unit price quoted above do not include administration and others.

## General Operation Cost Estimate

### (1) Cost of seed

Target area 5,000ha

Soybean 50% 2,500ha  
Maize 50% 2,500ha

Item	Unit	Unit price (per kg)		Quantity (kg)	Cost	
		Mt	US\$		Mt10 <sup>3</sup>	US\$
Soybean	kg	18,000	0.79	175,000	3,150,000	138,250
Maize	kg	15,000	0.66	62,500	937,500	41,250
Total				237,500	4,087,500	179,500

### (2) Cost of fertilizers

Item	Unit	Unit price (per kg)		Quantity (bag)	Cost	
		Mt	US\$		Mt10 <sup>3</sup>	US\$
Urea	kg	250,000	11.01	1,500	375,000	16,515
Potassium mix	kg	350,000	15.42	3,000	1,050,000	46,260
Total				4,500	1,425,000	62,775

### (3) Cost of equipment

Item	Unit price		Quantity	Cost	
	Mt10 <sup>3</sup>	US\$		Mt10 <sup>3</sup>	US\$
Water pump	85,000	3,740	50	4,250	187,000
Hoe	45	1.98	7,500	338	14,850
Pagan	75	3.30	7,500	563	24,750
Water can	160	7.05	7,500	1,200	52,875
Pick	675	29.74	5,000	3,375	148,700
Shovel	250	11.01	1,000	250	11,010
Rake	180	7.93	1,000	180	7,930
Ax	45	1.98	5,000	225	9,900
Tractor	650,000	28,634	5	3,250	143,172
Pickup truck	450,000	19,824	5	2,250	99,119
Truck (10-ton)	1,200,000	52,863	5	6,000	264,317
Total				21,880	963,623

### (4) Fuel/operation /maintenance

Item	Unit*	Unit Price		Quantity (unit)	Cost	
		Mt	US\$		Mt10 <sup>3</sup>	US\$
Fuel (water pump)	hour	11,000	0.48	24,000	264,000	11,520
Fuel (tractor)	liter	11,000	0.48	10,000	110,000	4,800
Fuel (pickup)	liter	11,000	0.48	36,000	396,000	17,280
Fuel (truck)	liter	11,000	0.48	36,000	396,000	17,280
O&M	year	—	—	—	116,600	5,137
Total					1,282,600	56,017

### (5) Salary for employees

Position	Nos.	Period (month)	Monthly salary		Annual salary	
			Mt10 <sup>3</sup>	US\$	Mt10 <sup>6</sup>	US\$
Manager/agro-tech. expert	3	12	11,350	500	408.60	18,000
Assistant/agri-extension	3	12	10,215	450	367.74	16,200
Supervisor	5	12	6,810	300	408.60	18,000
Security guard	10	12	3,405	150	408.60	18,000
Assistant	10	4	2,270	100	90.80	4,000
Laborer	10	4	2,270	100	90.80	4,000
Total					1,775.14	78,200

Notes:

US\$1= Mt22,700

\* 1 pump - 4 hours of operation per day, 120 days of operation per year (50 pumps install)

1 tractor - 50km of operation per day, 200days of operation per year, mileage 5km/liter

1 pickup truck - 100km of operation per day, 360days of operation per year, mileage 6km/liter

1 10-ton truck - 100km of operation per day, 360days of operation per year, mileage 5km/liter

10% of total cost

## **In-Depth Study on Revuboe Multipurpose Dam Project (Project No. 2.4)**

### **1. Background**

Water resources development and management in Mozambique are still at an early stage of development. Modern concepts related to this sector such as a river basin approach, watershed management and multipurpose development have not found much application yet. This is true for the Angonia region occupying an upstream basin of the largest international river of Zambezi in Mozambique.

The Angonia region is relatively well endowed with water resources. The annual average rainfall ranges generally in 600-1,000mm, sufficient for rain-fed agriculture. Tributary basins on the left bank of the Zambezi river have relatively rich groundwater and perennial flow. Reflecting less developed economic conditions, however, there exist practically neither substantive irrigation nor industrial water use. Hydropower has not been utilized even in a small scale. Service coverage by water supply is still very low, especially in dominant rural areas.

### **2. Objectives**

The project will pioneer multipurpose development and management of water resources in Mozambique. A medium size multipurpose dam will be constructed on the Revuboe river, a major tributary of the Zambezi, to provide irrigation water, hydropower for rural electrification and flood control. Urban water supply for the town of Moatize may also be stabilized by the project.

The project has two specific objectives as follows:

- (1) To pioneer multipurpose development and management of water resources in Mozambique; and
- (2) To contribute to enhanced agricultural productivity, stable power supply, flood control, and water supply expansion for Moatize.

### **3. Project Area**

#### Dam site and surroundings

A potential dam site is located along the lower reach of the Revuboe river constituting the border between the districts of Macanga and Moatize, between longitude of 15°-29' and 15°-30', and latitude of 33°-56' and 33°-57'. It is about 28km from the nearest locality called Muchena and about 70km north of Moatize township. The name of the mountain stands on the right hand side of the dam axis is locally called Monte Bombo and left hand side is Monte Mtengowanenepa. The elevations of the mountain crest are about 850m.

According to the site survey conducted during 4th through 7th of June, 2001, there are no people living in the upstream (reservoir area) of the proposed dam site. However, on the northeastern side of the proposed site, there is a village called Kamedza with 15 households. On the foot of the mountain "Mtengowanenepa", there are two more villages with a total of 90 households. In the downstream of the proposed dam site, which has a flat terrain, there are about nine villages. The main occupation of the villagers is farming. Total number of the household is 592.

#### Fauna and flora

The vegetation in the reservoir and surrounding area is predominantly covered by *Gmelinda Arborea*, *African Cordila*, *Cholophiospectrum*, *Mopane*, *Afzelia Quanzensis*, *Acacia Spp.*, *Mapaca Kinkiara*, *Massucu*, *Brobab*, and *Mauliana*. The survey confirmed the presence of crocodiles and variety of fish in the river. The main fish species are *Tilapia Mossambica*, *Oriocromis moatimeri*, *Mormyrops longirostris*, *Synodontis Zambezenris*, *Clarias Garicpinus*, etc., in the river. According to villagers, there are wild animals such as wild pig, kudo, wild duck, among others, living in the area.

#### Socio-economy

There is substantial fertile agricultural land in the downstream of the dam (about 30,000ha, average 5ha per household). At present, farmers grow maize, millet and groundnuts only in the limited area along the rivers with residual moisture.

The downstream people expressed their concern about the flood damages they experience occasionally (every 2-3 years with varying magnitudes). People in the area showed interests for the construction of the dam because they think it is part of the development of their area and they want to cultivate other cash crops if they have water and means for irrigation.

### **4. Project Formulation**

The project is formulated as a multipurpose dam for irrigation, hydropower generation, low flow augmentation, and incidental flood control. The dam site, reservoir area, and potential irrigation area have been examined on maps of 1: 50,000 scale as well as limited field surveys (Attachment 1). The following dimensions have been determined.

- i) Catchment area: 7,516km<sup>2</sup>
- ii) Basin rainfall: 1,027mm/year
- iii) Annual inflow: 1,698 MCM/year
- iv) Flow rate: 53.8m<sup>3</sup>/sec
- v) Reservoir area: 14.2km<sup>2</sup> (for 80m-high dam)  
24.01km<sup>2</sup> (for 100m-high dam)

- vi) Reservoir capacity: 241.4 MCM (for 80m-high dam)  
394.8 MCM (for 100m-high dam)
- vii) Active storage: 156 MCM (for 80m-high dam)  
257 MCM (for 100m-high dam)
- viii) Dam type: Earthfill and Rockfill
- ix) Embankment volume: 3,333,000m<sup>3</sup> (for 80m-high earthfill dam)  
5,617,000m<sup>3</sup> (for 100m-high earthfill dam)  
71,075,000m<sup>3</sup> (for 80m-high rockfill dam)  
4,783,000m<sup>3</sup> (for 100m-high rockfill dam)
- x) Irrigable area: 20,000~35,000ha
- xi) Power generation: 28,500kW (for 80m-high dam)  
35,600kW (for 100m-high dam)

## 5. Project Implementation and Costs

A full feasibility study (F/S) needs to be carried out to examine the project formulation presented above and to finalize it. Environmental impact assessment should be conducted as part of the F/S, covering both natural and social environments. The F/S may take 18 months, and detailed design (D/D) will follow for about two years. The implementation period, including the F/S and the D/D, will be about eight years.

Project costs have been estimated at a preliminary level. A crude estimate of the dam cost has been made based on dam type (rockfill or earthfill), dam height and embankment volume (Attachment 2). The total construction cost would be more or less US\$60 million for a rockfill or earthfill dam of 100m height. The cost of power plant, corresponding to the dam height of 100m, has been estimated at US\$27 million. Including costs of associated facilities, the total project cost is roughly estimated at US\$100 million.

## 6. Expected Effects

The project, as the first multipurpose dam, is expected to open up a new era for water resources development and management in Mozambique. To meet this expectation, the project needs to be further examined carefully and formulated in consideration of its effects on environment and social aspects as well as economic effects.

The project may not involve any adverse environmental impact, but rather may improve environmental conditions for fauna and flora in generally semi-arid project areas. A baseline survey on fauna and flora should be part of the F/S, as the project may change distribution and diversity of existing fauna and flora.

The project does not seem to involve any problems associated with relocation of villagers in or around the planned reservoir area. Most farmers can find more productive land under



irrigation after the relocation. Social issues involved in the relocation, however, need to be addressed properly, including possible conflicts between relocated villagers and farmers in the downstream area. Also introduction of new crops and new farming practice under irrigation may change some of the social habits of local people.

The dam and reservoir to be created by the project will change the rural landscape in generally monotonous terrains especially during the dry season. This change should be taken positively, and careful landscaping would further increase the environmental value of the project area. The reservoir may offer opportunities for weekend recreation for local people as well.

## **7. Conclusions**

Apart from the hydropower development on the Zambezi mainstream, multipurpose water resources development on the tributaries should be promoted. The Revobue multipurpose dam project should be the first to be implemented, also as a pioneer project for multipurpose water resources development and management in Mozambique. In view of the expected effects outlined above, the project should be supported by all the stakeholders concerned with the Angonia regional development. To realize this, local people and other stakeholders should be involved from the very beginning of project preparation.