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ENERGY PROFILE: MOZAMBIQUE

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1. INTRODUCTION

This report is one of a series summarizing the energy situation in sub-equatorial Africa. The purpose of the series is to analyze the energy position for those organizations trading or intending to trade with those countries, or for organizations entering into joint ventures with those countries. It is also the intention to use the individual reports to determine the possibility for energy interchange in the region and the potential for energy supply and demand in the region.

Use has been made of a number of sources for the statistical information and the various sources do not always agree because of differences in definitions used for the various components of energy and national accounts. Therefore a perfect match in the resultant data should not necessarily be expected.

Mozambique was ruled as a province of Portugal up to 1975 and statistics were generally not kept separately. There is therefore a shortage of data for the pre-independence period. Even after independence the available data was scarce until about 1980.

Substantial use has been made of World Bank information and permission to quote from their reports and to reproduce maps is gratefully acknowledged.

This series of reports has been solicited by the National Energy Council and their technical and financial assistance with the preparation of this report is gratefully acknowledged.

2. COUNTRY PROFILE

2.1 Introduction[1,2]

Mozambique has a land area of 799 380 km^2 and has a tropical and sub-tropical climate. It has large mineral resources and good agricultural prospects.

Until 1975 it was ruled as a colony of Portugal and was used as a cheap source of labour and as a province for emigrants, especially of the poorer sector of the mother country. After a ten-year struggle by the National Liberation Front against the Portuguese, the country obtained independence in June 1975. Under the terms of independence the National Liberation Front, Frelimo, became the sole political party and adopted a Marxist-Leninist form of socialism. The ten- member Political Bureau is the country's most important political body and the party president automatically becomes President of Mozambique. The first President was Samora Machel who died in an aircrash in October 1986. He was succeeded by Joaquim Alberto Chissano.

Frelimo is governed by a party congress held every 6 years with the two most recent being held in 1983 and 1989. The congress elects the Central Committee which in turn elects the Political Bureau. During the fifth congress in 1989 various changes were made to the constitution, allowing for the admission of some previously excluded sectors of the community to become members of the party, and it also dropped the strict Marxist-Leninist stance that had been the mark of Frelimo.

There is a structure of elected local, district, and provincial assemblies, as well as a national parliament. Besides the party structure, there are mass organizations for women, youth, children, etc.

Active opposition to the Government has been stifled because of the one-party system. However, active opposition to the Government has come from the Mozambique National Resistance (MNR) movement which has waged war on the Government since 1975. The MNR was originally supported by Rhodesia and later by South Africa. The Mozambiquean army has been unable to contain the war because of lack of equipment and people.

It has become evident that the Government could not overcome the MNR by military means, and various peace initiatives have been started and are still underway. Mozambique has also treatied directly with South Africa and the Nkomati Agreement was signed in March 1984. This was a non-aggression pact under which South Africa agreed to stop financing and equipping the MNR in exchange for Mozambique ceasing to support the African National Council. The signing of the accord did not, however, stop the war and there was evidence that certain components of the South African Government, and in particular the S.A. Defence Force, had not stopped helping the MNR. However, a new diplomatic endeavour took place in 1988 in order to revive the Nkomati Agreement. By 1989 relations between the two countries were significantly less strained.

2.2 Demography

Official figures put the population of Mozambique at 15,13 million in 1987. The population is young, with over 40% being under 15 years and more than 70% are under 30 years. Population density is low in the north of the country and high in the southern urban areas. The population density in Niassa is 4,8 per km^2, whilst in Maputo it is 1687 people per km^2.

Population growth rates have been rising. In the period 1960-1965 the growth rate was 2,0% per annum. In the period 1970-75 it was 2,4% and during 1975-80 it was 2,6%. Population estimates for 2000 vary between 20 and 40 million[2]. Life expectancy in Mozambique is between 40 and 43 years, amongst the lowest in Africa.

Historically the three southern provinces have provided labour reserves for South Africa, mainly for work on the mines and on farms in South Africa. The northern half of the country contains the most promising agricultural land and contains 40% of the population.

2.3 Economy

The gross domestic product (GDP) in real terms has been falling since 1980, as shown in Figure 1. The apparent GDP/capita appeared to have risen rapidly from 1986, but deflating the current price shows (Figure 2) that there has been a substantial decrease in personal wealth. Figures 3 and 4 show the GDP and GDP/capita in US$ terms. The largest contribution to GDP has been agriculture which provides over 40% of GDP, as shown in Figure 5. The manufacturing sector has been declining in terms of GDP contribution and its relationship to the agricultural sector is shown in Figure 6. GDP growth rate has been, on average, negative during the early 1980's, running at around -5% p.a. (see Figure 7).

Though Mozambique has good resources of minerals and agriculture and has more development potential than many other African countries, the almost continuous war has so severely damaged the economy that by 1985 the country was on the verge of economic collapse. A contributory factor to the poor economy has been the lack of trained technical and managerial staff, a factor exacerbated by the exodus of many Portuguese nationals following independence. There is some sign of recovery, with a positive growth rate in 1987.

3. ENERGY

3.1 Introduction

Mozambique is potentially rich in energy resources with hydropower and coal already being utilized. In addition, gas finds have been made and there is considered to be some potential for finding oil. At present the energy sector is under-utilized due to the poor state of the economy. The largest energy source is fuelwood which is used both for household and industrial use. Indiscriminate cutting down of fuelwood resources is likely to lead to supply problems in the future, though local shortages are already being felt in the main urban areas.

One of the main problems affecting the economy and the energy sector is the continuing sabotage of the infrastructure by the Mozambique National Resistance movement (MNR). Electricity supply from Cahora Bassa has been disrupted since 1981, and coal supplies have been affected since 1983. The consequence is that the Cahora Bassa hydro-electric power station and the Moatize Colliery are virtually out of action.

The energy sector also suffers from lack of skilled manpower and managerial expertise, and from a shortage of foreign exchange which has a serious effect on maintenance and on new capital development.

3.2 Energy Institutions[3]

The economy of Mozambique has been managed through a central planning procedure. Central agencies are assigned the exclusive responsibility for the definition of policy, setting norms, and for the control of the implementation of policy. Within the framework of the Central State Plan the responsibility for the energy sector rests with the Ministry of Industry and Energy (MIE). The Ministry has two groups responsible for the main sub-sectors, petroleum and electricity. The Empresa Nacional de Petroleos de Mozambique (PETROMAC) is responsible for the petroleum sub-sector, and Electricidade de Mozambique (EDM) is responsible for the electricity sub-sector. EDM was formed in 1977 and is responsible for the generation and distribution of electricity with the exception of Cahora Bassa. Since its formation it has experienced difficulties in integrating its various components inherited from a number of small producers.

The Ministry of Mineral Resources (MMR) is also involved in the energy sector through its responsibility for oil and coal exploration. The principal operating bodies reporting to the MMR are ENH for petroleum and gas, and CARBOMOC for coal.

The Ministry of Agriculture is responsible for fuelwood matters through its Directorate of Forestry, and the Ministry of Construction and Water is responsible for the construction of capital items such as dams. Many decisions affecting the energy sector are made through the Bank of Mozambique which controls all foreign exchange and domestic credit.

The present organization as described is very fragmented and difficult to co-ordinate. In addition, there is a serious lack of trained manpower to plan or oversee decision implementation. This also results in a serious lack of adequate statistics being collected.

The Government has realized that high-level co-ordination is required and is considering the formation of a National Energy Council who would be required to formulate an energy policy for the National Council of Ministers. It is proposed that the National Energy Council should consist of the Ministers and heads of the organizations in the energy sector and of sectors which have a strong link with energy.

The MIE set up a Department of Energy in 1985 to provide technical assistance to the Minister. However, staff shortages may limit the usefulness of this body.

In addition to the Governmental agencies identified above, the Cahora Bassa Power Station is owned and operated by the Hidroelectrica de Cahora Bassa

(HCB), a company owned and controlled by Portuguese interests (82%). The remaining 18% minority shareholding is held by Mozambique interests. There are also a number of small private producers of electricity, the largest being linked to a sugar mill.

4. ENERGY RESOURCES

4.1 Fuelwood

Fuelwood supplies approximately 90% of the total final energy requirements and is a commodity which is rapidly being depleted. Areas around the major cities have been deforested. There is little information on the potential for fuelwood, though recent work[2,5] is expanding the information database.

An inventory of forestry resources was carried out in 1979/80 and was based on satellite imagery and aerial photographs from 1972. This survey showed that Mozambique had 56,6 million hectares of forest, which is equivalent to 71% of the country's land area. This however includes large areas of open savanna with low levels of wood production potential. Relatively dense forest covers possibly only 5 million hectares[4].

There is little information on the productivity of forests in Mozambique. Table 1 summarizes the results of one spot survey carried out between 1979 and 1983.

Table 1. Estimates of forestry areas and volumes[4]

Forest	Area 000's ha	Total Volume Mill.m^3
High potential	596	41,7
Medium potential	3544	177,2
Low potential	14906	298,1
Total	19046	517,0

Total forestry area is 19 million hectares. It is estimated[4] that the natural increase in the standing volume in these forests is approximately equal to the country's demand for forestry products. However, there are serious imbalances between supply and demand in certain areas. The remaining dense forests are concentrated in the provinces of Sofala, Manica, Niassa, and Cabo Delgado, which all have low population densities and thus a fuelwood surplus.

A more recent report[2] indicates that the natural growth rate of the forests is 35 million m^3 per annum as opposed to the present demand of 16 million m^3.

Several plantations were started near Maputo in the 1960's in order to supply Maputo's rapidly increasing demand. Only 3 000 hectares of plantation were established and the project has now come to a standstill[4]. The World Bank estimates that to supply 70% of the demand of Maputo would require an annual harvesting and renewal of 8 000 hectares.

Similar afforestation schemes have been started around Beira and Nampula, but with similar poor results.

The World Bank has proposed that the first step in any programme for fuelwood planning is to obtain adequate data for land utilisation, especially around the main urban areas.

4.2 Petroleum

Geologically Mozambique consists mainly of pre-Cambrian and younger rocks which are not suitable sites for petroleum. However, there are a number of sections of Karroo sedimentary basins which may be suitable for deposits of hydrocarbons. Geological surveys have shown that there is more chance of gas in the onshore areas of Karroo sediment, whilst the offshore deposits could contain oil. Three gas deposits have been found and the oil exploration programme was revived in 1981 with three offshore surveys. ENH, who are responsible for the exploration and development of hydrocarbons, has made agreements with East Germany and the USSR in 1982 for technical assistance with the exploration programme.

Onshore exploration by private oil companies is unlikely because of the gas-prone nature of the area and ENH are carrying out their own seismological survey.

The most promising zones for oil are the Rovuma basin in the north on the border with Tanzania, the Zambezi basin, and off the coast of Gaza. Shell and Exxon explored the northern onshore area, but with little success and have now pulled out. However, ENH consider that there is still the potential for oil in this area and are discussing the possibility of a joint programme with Tanzania. In 1988 BP carried out test drilling off Xai-Xai but found no oil. In late 1989 it was expected that Amoco would start an offshore drilling programme[3].

The World Bank map at the back of the report shows the potential oil zones in the country.

4.3 Coal

There are three major known coal deposits in Mozambique, all located in the central west part of the country, in Tete Province, all at substantial distances from the main domestic markets and from the coast. In addition, there are a number of coal occurrences in the northern region at Maniamba and Lugenda, and one at Espungabera in the central region and on the Mozambique-Zimbabwe border.

The Tete Province deposits are located at Muchanha-Vuzi, on the north side of the Cahora Bassa Dam, at Senangoe, south-east of the Dam, at Moatize, near the town of Tete, and at Goma, east of the other deposits. The only operating colliery is at Moatize. Only the Moatize coal deposits are adequately surveyed, but estimates have been made of proven, probable, and possible reserves. These values[4] are shown in Table 2.

Table 2. Coal reserves in Mozambique

Region		Reserves	- Million	Tons
	Proven	Probable	Possible	Total
Moatize	87	737	1145	1969
Minjova			3000	3000
Sanangoe			1000	1000
Mucanha-Vuzi	851	749	1962	3562
Total	938	1486	7107	9531

In the Moatize region there are six coal seams with thicknesses ranging from 1,8 metres to 40 metres separated by some 40 to 50 metre layers of sandstone. The seams are at depths of between 100 and 200 metres. The amounts quoted in Table 2 are in-situ values, and allowance has to be made for extraction rates and for discard sections. The coal has an ash content of 15% to 25% and a sulphur content of 0,8%.

In addition to the reserves shown in Table 2, there are a number of other occurrences. At Maniaba thin coal seams have been located on the east side of Lake Nyasa. Very little is known about these deposits, but it is known that the ash content is high, in the range 35% to 40%. Outcrops have also been found along the Lugenda River. Little is known of these deposits, but it appears that they are scattered and individually small. The country has therefore enough reserves for domestic consumption and for exports.

4.4 Hydro-electricity

Mozambique is well endowed with hydropower for electricity generation. Its hydro potential has been surveyed during the mid-1980's and there is now a substantial database of site, river flow statistics, etc. Most of this survey work was carried out by Portuguese and Norwegian companies. About 100 sites have been identified. The result of this survey is that there are around 12 500 MW of available hydropower, with an estimated annual generation of 60 000 GWh.

Some of the areas have highly seasonal river flows and the development of hydropower would need to be coupled to the development of thermal power plant.

The main potential for hydropower can be divided into four areas:

Zone A. This lies south of the Save River. It has a relatively low potential of 230 MW, but it is near the main economic region of the country and therefore the exploitation of this zone will be highly desirable once economic conditions improve.

Zone B. There is a potential for 1150 MW of plant in the region between the Save and Zambezi Rivers. This region already has 90 MW of installed hydro-plant.

Zone C. The Zambezi River basin has the highest potential for hydropower, estimated as 10 000 MW with an energy potential of 45 000 GWh, two-thirds of which is on the Zambezi itself. Of this potential, 6500 MW could come from 4 sites within a stretch of river of 230 km.

Zone D. The region north of the Zambezi has a potential for 1100 MW, mostly on the Lugio and Lugenda Rivers. These rivers are very seasonal and therefore the firm energy would be low unless augmented with other forms of generation.

The largest single potential project is the extension of Cahora Bassa. Since the dam is already built, the cost of this expansion would be low and was estimated by the World Bank as being able to supply electricity at US cents 1,5/kWh at 1982 prices. The construction could involve six units of 200 MW each, giving an installed capacity of 1200 MW. The construction period would take 7 years from start to commissioning of the final set. Whilst there is enthusiasm for this project, it cannot take place until there is sufficient demand for it. Such a demand can only come from South Africa or from a new capital project. An ammonia plant is being considered by the Government as one possible large-scale use of the available indigenous gas.

Another proposal for hydropower is for the integrated use of the Kariba and Cahora Bassa Power Stations. In this concept Kariba Dam would be used as a regulating dam to increase the firm energy available from the two systems. Such an optimization could increase the firm power by 600 GWh/year.

4.5 Gas

Seismic surveys for gas were carried out in the early 1970's and large gas reserves were found in the Buzi area near Beira and at Pande, 150 km south of Buzi. It is estimated[3] that there are about 320 000 million cubic metres of gas in these fields. The potential for using these fields is receiving increased attention. Originally it was intended to pipe this gas to South Africa, but after independence this idea was abandoned. Recent interest has been on the development of the Pande field to produce gas for an ammonia plant and for other chemical purposes. Detailed exploration work on these fields has been disrupted by the action of MNR, but it was announced early in 1991 that exploration work would be resumed and that South African companies could be involved in the proposed projects. It is also reported that SASOL in South Africa might be interested in using the gas.

Exploration for oil has shown that the onshore Karroo deposits are more likely to produce gas than oil. At present the exploration interest is in finding oil. Therefore gas exploration is not taking place, especially since the known gas deposits are large enough for exploitation to take place before consideration need be given to any new fields. There is, however, the expectation that future finds of gas are possible.

4.6 Other energy sources

The Government is conscious of the deteriorating conditions in the supply of fuelwood and alternative methods of supplying household and small industrial concerns with energy are being investigated. The first survey of potential for the use of "new and renewable sources of energy" was carried out in the mid-1980's by SADCC and resulted in a report being issued in 1989[2]. The following sections are abstracted mainly from that reference.

4.6.1 Solar

Mozambique is similar to other countries in this region in having high solar radiation levels. The insolation in Maputo is above 5 kWh/m^2 per day and there is therefore scope for the application of solar radiation. However, the economic conditions in the country preclude any large-scale application in the foreseeable future.

4.6.2 Wind

Wind speeds are generally low, with average speeds being between 0,7 and 2,6 m/s. With such speeds there is scope for the use of wind for water pumping but not for any large-scale generation of electricity.

4.6.3 Biogas

Developments in the utilisation of biogas producers has shown that there is significant potential for biogas production, especially where fuelwood is scarce and expensive.

4.6.4 Ethanol

Ethanol has been produced on a small scale for hospital use from a number of vegetable crops, namely, sugar, cashew, manioc, maize, and fruit. No analysis has been made of the potential for the production of fuel alcohol.

4.6.5 Agricultural residues

Agricultural residues have traditionally been used as fuel. Three main sources are identified:

(a) coconut husks, shells, and wood,
(b) cashew nut shell, and
(c) bagasse.

No information is available concerning the national resource of these crop residues.

5. ENERGY SUPPLY AND DEMAND

5.1 General

Traditional energy sources supply some 88% of the total final energy demand in Mozambique, as shown in Figure 8. This percentage has been rising steadily since 1970. The largest consumer of energy is the household sector. The division of fuel by type and sectorial demand is shown in Table 3.

Table 3. Sectorial final energy consumption in 1984 by type, expressed as a percentage of total energy[5]

Sector	Oil	Coal	Wood	Charcoal	Total
Industry	2,0	1,0	15,1		18,1
Agriculture	1,1	0,2	1,3		2,6
Transport	5,1	0,1			5,2
Household	0,9		68,8	1,2	70,9
Other	3,2				3,2
Total	12,3	1,3	85,1	1,2	100,0

The demand for electricity was not given in the data from which Table 3 was taken, but the amount involved was small in comparison with the traditional fuels and oil.

The change in the demand for the various energy forms is displayed in Figure 9 and shows that the demand for coal has been falling steadily and is being replaced by oil. This decrease in coal demand has been due to problems with the supply of coal because of MNR activities, and because of problems with coal production at Moatize Colliery. Oil comes by sea and is therefore relatively immune from attack by the MNR.

The energy intensity of the country has been falling rapidly due to the worsening economic conditions in the country and the decrease in manufacturing activity (see Figure 10). The relationship between GDP/capita and energy/capita is shown in Figure 11, but the spread is too short for any meaningful conclusion to be made concerning the energy-economy relationship.

Table 4 shows the percentage utilization of commercial energy in 1987 by sector and fuel type. The division of energy into sectors is not very detailed with the "other" component accounting for 70,3% of total commercial energy.

Table 4. Percentage distribution of commercial energy in 1987[4]

Sector	Coal	Oil	Elect	Total
Industry	8,5			8,5
Transport		17,8		17,8
Residential	3,4			3,4
Other		54,6	15,7	70,3
Total	11,9	72,4	15,7	100,0

Energy consumption, since it is largely in the domestic sector, is very low by world standards. Table 5 gives a comparison of per capita energy consumption and per capita GDP for Mozambique compared with a number of African countries and with India. It will be seen that it is the country with the lowest GDP, but it has an energy consumption marginally higher than that of Angola or Zambia.

Table 5. Comparison of final energy consumption for various countries in 1985. (Figures include traditional energy forms.)

Country	GDP/capita US$	Energy/capita kgOE
Egypt	712	401
Zimbabwe	562	473
Angola	547	196
Zambia	388	261
Ghana	354	531
Kenya	294	313
Mozambique	233	282
India	280	211

5.2 Fuelwood

As shown above, fuelwood is the main source of energy and is important in both the household and industrial sectors. The domestic sector accounts for 81% of the total fuelwood consumption, industry for 18% and agriculture for 1%.

Fuelwood is in very short supply in the main urban areas, with Maputo having a very serious shortage. Pereira[5] reports that the country as a whole has no shortage of fuelwood, though there are local imbalances. He calculates that the ratio between annual possible production and demand in 1980 was 2.65, whilst by 2000 it will be 1.35. The World Bank study[4], however, warns of a serious shortage and that at present the natural forest volume increase across the whole country would just balance total national demand, i.e. a supply-to-demand ratio of 1 compared with 2,7 from the Pereira study.. Surveys of fuelwood imports into Maputo have shown that most of the wood is green, pointing to a deteriorating supply position.

Fuelwood for Maputo is brought in from distances as far as 500 km away. There does not appear to be any significant commercial trade in fuelwood due to the problems of operating transport in areas where MNR disrupt the infrastructure

The pressure on fuelwood has been compounded by the growing scarcity of alternative fuels such as kerosene and LPG. Fuelwood prices have escalated significantly and are now beyond the means of the poorer sector of the economy, whose eating patterns have had to be adapted to the use of more uncooked food or of food which does not require lengthy cooking. The escalation in fuelwood prices has resulted in the situation where virtually any fuel is cheaper than fuelwood. This is illustrated in Table 6 which has been drawn up for a range of fuels at the ruling prices in 1985[4].

Table 6. Cost of energy in the domestic sector

Energy form	Cost of energy - MT 000's per TOE Gross	 Utilizable
Kerosene - illuminating	6	20
- cooking	12	40
LPG	14	71
Electricity	45	70
Steam coal	0,4	2
Fuelwood	76	953
Charcoal	214	1068

The prices quoted seem very low for non-fuelwood energy. It must be remembered however that the energy prices are centrally controlled and do not adequately reflect the true economic cost. All the alternative fuels shown in the Table, with the possible exception of electricity, are heavily subsidized. One of the main reasons for the low cost of fuels which are imported, is the heavy over-valuation of the Metical. It is obvious, however, that at present energy costs are cheapest for those who have access to alternative sources. However, these alternatives are seldom available and therefore the cost of fuelwood becomes whatever the market will stand.

To put fuelwood prices into perspective, the World Bank study quotes the market price for fuelwood in Maputo in 1985 as MT 25/kg. Many families (of 7 members) reported spending MT 200 per day for fuelwood. The minimum wage in Mozambique was then MT 63 per day and monthly salaries for skilled and professional staff were in the range MT 2 000 to 10 000.

In the rural areas the fuelwood situation is generally easier and more than 90% of families use fuelwood. As elsewhere in Africa, the responsibility for fuelwood gathering rests with women who spend on average 8-14 hours per week on this task. In areas of shortage families use about 30 kg/week. In other areas the consumption is between 50 and 70 kg/week, with 50% of families using less than 50. Kerosene has been used as a fuel in rural areas but, with the present shortages and restrictions, it is less often used.

Serious consideration will need to be given to afforestation programmes and to resuscitate those programmes which have been started but which have been abandoned.

5.3 Petroleum

Until 1984 Mozambique refined its own products from imported crude oil. However, there were problems with satisfying the product mix because of the imbalance between design yield and local demand. This resulted in the importation of certain products, and at times there were exports of gasoline to inland countries. These exports were sold at international prices[4], but any excess to these quantities had to be sold through trading companies at unfavourable rates. For example, in 1981 the refinery production was 435 thousand tons, imports were 148 thousand tons and exports were 115 thousand tons.

Total oil demand rose steadily from 1965 to 1980 and after a slight decrease has remained constant from 1982, as shown in Figure 12. During the period 1971 to 1988 demand has not undergone any significant medium-term change but has shown significant differences in product segmentation (see Figure 13). The main growth in demand has been for diesel fuel with a reduction in gasoline demand. The diesel-to-gasoline ratio, which varied between 0,7 and 1,7 up to 1984, suddenly shot up to a value of around 5,5, as shown in Figure 14. There have been significant shortages in various sectors and especially of gasoline, diesel, and kerosene. The flat profile of the demand curve in Figure 13 is therefore due to limitations in supply, rather than due to internal economic exogenous forces. The gasoline demand has also decreased because of the scarcity of private vehicles. The main reason for the shortages have been the serious lack of foreign exchange, which started in 1984 and led to disruption in the procurement of crude oil. Small quantities of products were then imported at international spot prices, exacerbating the foreign exchange problem.

Due to foreign exchange problems it was not possible to import crude in bulk and the Matola Refinery was closed in 1984. The Refinery is 25 years old and gives a product mix which is inconsistent with the current and expected product demand pattern. The Government is now considering the future of the Refinery. One of the options being considered is to restart the Refinery but at a low throughput, in order to import the components which the Refinery is unable to produce in sufficient quantities. The alternative is to refurbish the plant with the addition of thermal cracking plant, to increase the percentage of gasoline and diesel.

The marketing of products throughout Mozambique is carried out by PETROMAC (69% of market), BP (23%), Mobil (6%), and Mocacor which handles, bottles, and distributes LPG.

There is a 287 km pipeline between Beira and the Feruka Refinery in Zimbabwe. This line is owned and operated by a company which is 50% owned by the Government of Mozambique, 45% by UK and Luxembourg companies, and 5% by private individuals. The only restriction on the operation of the pipeline is that due to the limitations in tanker capacity at the Port of Beira. A limit of tanker capacity to below 20 000 tons is in operation due to silting of the access channel. There would be a significant reduction in freight costs if larger ships could be used.

5.4 Coal

Coal has played a minor role in the Mozambique energy sector. The demand for coal increased steadily up to 1973, but declined rapidly thereafter, as shown in Figure 15. It is difficult to determine what the main use of coal is. In 1988 the IEA statistics show coal was used purely in the industrial sector. The World Bank report[4] shows that the main uses were for cement manufacture and power generation, as shown in Table 7.

Table 7. Coal sectorial demand in 1982[4]

Use	Demand 000's ton	%age
Power generation	62	29
Railways	46	21
Cement factories	67	31
Sugar mills	26	12
Other	14	7
Total	215	100

Of the above demand in 1982 60% was imported, mostly from South Africa, for the coal-fired power plant at Maputo. In 1988 imports amounted to 31% of demand. The only producer of coal in Mozambique is the Moatize Colliery in Tete Province. Up to 1982 significant amounts of coal were exported, mainly to Malawi, though some was exported to other countries by sea. At the same time coal was imported to the southern region since it was cheaper to import from South Africa than to rail coal from Moatize to Maputo. Production at the mine started in 1950 and peaked in 1975 at 575 000 tons. Production declined following underground gas and dust explosions in 1976 and 1977. Since 1981 disruptions of the railway line to Beira by sabotage have led to further declines. The export and import figures for coal are shown in Figure 16.

Little coal is used for domestic consumption except in the immediate vicinity of Moatize

One of the Government's priorities is the development of coal exports to earn foreign exchange. The proposed programme for Moatize is for an ultimate production of 6 Million tons/year. Significant amounts of coking coal could be produced and previous exports to Malawi consisted of 55% of coking coal. Such a programme would require the rehabilitation of the Beira export terminal. An alternate transport route would be via Malawi and on to Nacala, a total distance of 615 km. Nacala has the advantage of a natural deep-water harbour with good loading facilities. It is estimated[4] that the cost of shipping via Nacala would be less than that through Beira.

Any export proposal would require cessation of hostilities in the country.

5.5 Electricity

The Mozambique electricity system consists of 350 MW of generating capacity for local use, and the Cahora Bassa Dam 2075 MW plant mainly for the export of power to South Africa. Whilst the local plant has a name-plate rating of 350 MW it is badly in need of repair and the assumed available rating is 250 MW. There are 3000 km of high and medium voltage lines.

The system can be divided into four main components: the Northern, Central, and Southern Regions, and the Cahora Bassa system.

5.5.1 Northern Region

The northern region is supplied with power from Cahora Bassa by a line from Cahora Bassa down to Caia ending up at Nacala on the coast. The line down to Caia is a double line for stability purposes, whilst the line between Caia and Nacala is a 220 kV single line. Stand-by diesel units are installed at Nacala.

The far north of the region is isolated from the grid. There are a number of small diesel units in the region, but these are expensive to operate and the supply of fuel is erratic. The EDM have built a 0,7 MW hydro-plant and are constructing another 1 MW hydro-plant.

5.5.2 Central Region

The central system is served by a line from Tete down to Beira. This system is linked to the Cahora Bassa-Nacala line and is provided with 90 MW of hydropower generation on the Mozambique-Zimbabwe border. There is also an interconnection with Zimbabwe. Stand-by power at Beira is not available, but there is some stand-by capacity from local sugar plants which could meet part of the load. There is some old plant, totaling 11 MW, at a sugar mill near Beira which could be refurbished to provide additional security.

The line to Beira has suffered serious damage due to sabotage and requires a major overhaul.

5.5.3 Southern Region

The southern region is not linked with the other two and serves the area from Maputo to Xai-Xai. There are 50 MW of coal plant and 44 MW of gas-turbine plant in Maputo. The plant is old and has been derated from its name-plate rating of 142 MW down to 94 MW.

There is a link between Maputo and the South African grid for the import of power in line with Mozambique's entitlement of Cahora Bassa power. This line is only 75 kilometers long within Mozambique but it has nevertheless suffered from sabotage. The line was also severely damaged by a hurricane in 1985, which blew down 31 transmission towers.

5.5.4 Cahora Bassa

The Cahora Bassa system was built to transmit power from Cahora Bassa to South Africa. The Power Station consists of 5 turbines, each rated at 415 MW. The Power Station is rated at 2 075 MW, with a firm capacity of 1 660 MW. The transmission system is a +/- 533 kV DC line, with a rated capacity of 1 920 MW and capable of transmitting 80% of the rated capacity with one line out of action, via earth return. There is no draw-off from this line within Mozambique. This system is owned and operated by a company with 82% Portuguese and 18% Mozambique interests.

5.5.5 Supply and demand

The increase in installed capacity is shown in Figure 17. The large effect of the installation of Cahora Bassa can be seen with the increases after 1975. The main supplier of electricity is the EDM, though there are some small independent producers of electricity, mainly industry for its own use, e.g. sugar mills. The main supply component is hydropower, as shown in Figure 18.

Electricity demand in the country grew steadily until 1984, as shown in Figure 19. The reduction in demand since 1984 is the result of the serious decline in the economy of the country.

6. PRICING AND MARKETING

6.1 General

The Government policy on energy pricing is aimed at maintaining stability and producing energy at costs which are affordable to all. However, the gross over-valuation of the Metical has distorted the price system dramatically and where a market value does exist, as in fuelwood, the prices for substitutional energy forms are grossly biased. The distortion in price of some of the energy forms used in the domestic sector has already been illustrated in Table 6.

6.2 Oil products

The cost of oil products has remained virtually unchanged since 1979. The Government cross-subsidizes certain products. Thus fuel-oil, kerosene, and diesel fuel are heavily subsidized. Whilst such cross-subsidization is a Government matter, it would be expected that the full cost is covered across the total product mix. Table 8 shows the relationship between the costs of the various components and the import parity cost.

Table 8. Petroleum product prices in Maputo and import parity prices in 1986[4]

Product	Selling price MT/litre Ex-refinery	To customer	Import parity
Gasoline Prem	25,0	7,3	5,7
Reg	20,3	6,6	5,0
Diesel fuel	8,8	7,6	6,0
Illum kerosene	4,1	7,9	6,3
Jet fuel	9,1	7,3	6,5
Fuel oil	2,2	4,2	3,0
Butane	6,9	12,4	9,6

It can be seen that the ex-refinery price as set by the Government was some 400% of the import parity price for gasoline but only around 60% of import price for the other products.

The Government has set up a Petroleum Fund, operated at the Bank of Mozambique by PETROMAC, in order to stabilize the price of products.

Distribution of products is through PETROMAC, BP, Mobil, and Mocacor. There are a total of 242 retail outlets operated by these companies.

6.3 Electricity

The electricity tariffs charged to consumers had remained unchanged from the mid-1960's to 1985. In 1981 and in 1984 EDM proposed increases, but it was only in 1986 that new tariffs were introduced. These new tariffs increased EDM's revenue by 120%. However, EDM is still in a serious financial position with many bills unpaid and billing delays of up to six months.

The new EDM tariff structure allows for a demand charge and an energy charge even for domestic consumers. However, for domestic consumers the demand charge is based on switch overload capacity rather than on a measured maximum demand. Table 9 shows the tariff charges for the different class of consumer.

Table 9. EDM tariffs (as set in 1986)

Customer	Energy charge per kWh MT	Energy charge per kWh USCents	Demand charge per kW/month MT	Demand charge per kW/month USCents
Domestic	3,8	9,5	30	75
General	4,5	11,3	30-50	75-125
Medium voltage	2,8	7,0	80	200
High voltage	2,8	7,0	70	175

In 1986 the exchange rate was 40,0 MT/$; in 1987 it was 286.

The tariff, however, does not take into consideration the cost of imported power. The agreement on the Cahora Bassa tariff includes a special rate at which Mozambique buys back power via the transmission line between Maputo and South Africa when the DC link is operating, compared with the normal ESKOM bulk tariff when the DC link is not operating. In view of the long period during which the DC link has not been operating because of sabotage of the transmission line, the additional cost to Mozambique of imported power has been very high and this is not reflected in the tariff adjustments. Table 10 shows the difference between the charges on the EDM system for its own consumers, the ESKOM bulk tariff and the Cahora Bassa tariff which would apply if the DC link is operating, i.e. when Mozambique is exporting power to South Africa.

Table 10 Comparison of EDM, ESKOM, and Cahora Bassa related tariffs (1986)

Tariff	Energy charge MT/kWh	Demand charge MT/kW/month
EDM High-volts	2,8	70
ESKOM bulk	0,33	200
Cahora Bassa	0,05	96

At a constant demand the cost of power from ESKOM at bulk tariff rates would be 0,61 MT/kWh, whilst at the applicable Cahora Bassa rate it would be

0,18 MT/kWh. This means that EDM is paying over 3 times as much for energy from ESKOM during periods when the DC link is not operating as it would if the link was exporting power to South Africa.

The World Bank[4] has suggested that the tariffs should be reassessed in order to bring them more in line with true economic costs.

6.4 Coal

The domestic price for coal is set by the Government and is substantially below the production cost of coal at Moatize. This means that the returns to the colliery are insufficient to cover operation and do not allow for any funding for the rehabilitation of the colliery which is now a matter of urgency. The prices for various size fractions from Moatize are shown in Table 11. The prices shown should be compared with the cost of production, which in 1981 was estimated at 700 MT/ton.

Table 11. Coal prices (1985)

Coal	MT/ton
Domestic price	
Coking	1800
Steam	260
Moatize production (1981)	700
Exports - Malawi f.o.b border	
Coking	1800
Steam	1630
Price of South African coal in Maputo	
Steam	460

It appears that CARBOMOC can make a profit only on steam and coking coal for export. The Government is to equate coal cost with the cost of imported coal from South Africa. The World Bank has recommended that the parity cost of Moatize coal should be the international price less the transport cost to Beira and less shipping costs. In the longer term, as international demand for imports of coal increase, the South African price of coal to Mozambique is likely to approach the same international parity price.

7. DISCUSSION

The Mozambique energy scenario is dominated at present by the demand for traditional fuels and for the domestic sector. A growing shortage in this area will push up the price of fuelwood and charcoal even higher than it is at present. Because of the control on prices of energy, except for fuelwood which is sold at market prices, the traditional fuels are much more expensive than commercial fuels.

The main commercial fuel is oil which is currently imported because of the closure of the Matola Refinery. There is a shortage of many oil products because of difficulties with foreign exchange which limit imports. There has been a reduction in energy demand over the last decade because of the worsening economic situation caused by various phenomena such as droughts and floods, but due mainly to disruption by the MNR.

The sabotage action has led to the closure of the Moatize Colliery and to the closure of the DC power link to South Africa, which was a source of export earnings.

The pricing policy of the Government which has led to cheap energy has resulted in the inability of the various energy suppliers to maintain their capital assets and to provide new capacity. New capacity is not currently required because of the poor economy, but when the economy improves there may be serious shortages for energy production.

Once the MNR problems are resolved and foreign exchange becomes available the country has good resources to provide for economic growth. Besides the energy sources which have already been developed such as coal and hydropower, Mozambique is well placed to develop its gas fields and there is some hope for the discovery of oil. However, the rundown in maintenance of power plant and collieries may put a brake on the rapid development of the economy. The main shortage is however likely to be that of traditional fuels.

8. REFERENCES

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(5) Pereira, C.R. National survey of biomass/woodfuel activities - Mozambique. SADCC Energy Sector Technical and Administrative Unit, September 1989.

TABLES

TABLE A : ECONOMIC DATA BILLIONS OF NATIONAL CURRENCY (UNLESS INDICATED)

YEAR	POPULA-TION	GROSS DOMESTIC PRODUCT AT FACTOR CO				GDP AT	GDP	EXCHANGE	GDP IN US$		GDP PER
		+		=		FACTOR	AT 1985	RATE	CURRENT	AT 1985	CAPITA
	MILLIONS	AGRICUL-TURE	MANUFAC-TURE	OTHER INDUST	INDUSTRY	COST	PRICES FACTOR	MS PER US$	PRICE FACTOR	PRICE FACTOR	US$ 1985
1967	8.79	NA	NA	NA	NA	NA	NA	28.8	NA	NA	NA
1968	8.98	NA	NA	NA	NA	NA	NA	28.8	NA	NA	NA
1969	9.18	NA	NA	NA	NA	NA	NA	28.8	NA	NA	NA
1970	9.39	NA	NA	NA	NA	NA	NA	28.8	NA	NA	NA
1971	9.62	NA	NA	NA	NA	NA	NA	28.3	NA	NA	NA
1972	9.86	NA	NA	NA	NA	NA	NA	27.0	NA	NA	NA
1973	10.10	NA	NA	NA	NA	NA	NA	24.7	NA	NA	NA
1974	10.35	NA	NA	NA	NA	NA	NA	25.4	NA	NA	NA
1975	10.61	NA	NA	NA	NA	NA	NA	25.6	NA	NA	NA
1976	10.89	NA	NA	NA	NA	NA	NA	30.2	NA	NA	NA
1977	11.18	NA	NA	NA	NA	NA	NA	32.9	NA	NA	NA
1978	11.48	NA	NA	NA	NA	NA	NA	33.0	NA	NA	NA
1979	11.79	NA	NA	NA	NA	NA	NA	32.6	NA	NA	NA
1980	12.10	36.6	7.8	2.1	9.9	68.4	164.8	32.4	2.1	5.1	420.25
1981	12.42	37.0	8.6	2.3	10.9	71.6	165.7	35.4	2.0	4.7	377.25
1982	12.75	41.0	8.8	2.8	11.6	81.9	161.9	37.7	2.2	4.3	336.68
1983	13.09	38.8	8.1	3.2	11.3	80.2	140.0	40.2	2.0	3.5	266.14
1984	13.44	41.1	8.8	3.8	12.5	97.7	145.4	42.4	2.3	3.4	254.96
1985	13.79	49.2	11.7	4.2	16.0	138.9	138.9	43.2	3.2	3.2	233.20
1986	14.19	55.4	12.6	5.4	18.0	156.4	140.1	40.0	3.9	3.5	246.90
1987	14.59	213.6	36.8	15.8	52.5	426.2	159.2	286.0	1.5	0.6	38.15
1988	14.93	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1989	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE B : ENERGY DATA

YEAR	COMERCIAL ENERGY FORMS IEA ENERGY TOTAL FINAL CONSUMPTION 000'S TOE						ENERGY/GDP(BMT)		TRADITION	COMM/	TOTAL ENERGY	TRADITION	ENERGY PER CAPITA TOE/CAPITA	
							TOE/REAL	1985MT	ENERGY	TRADITION	TRAD+COM	AS % OF		
	COAL	OIL	GAS	HYDRO	ELECT	TOTAL	1PT	3PT MA	000'S T		000'S TOE	TOTAL	COMMERCIAL	TRAD
1950	166.1	NA	0.0	0.0	3.4	NA	NA	NA	NA	NA	NA	NA	NA	NA
1951	164.2	NA	0.0	0.0	4.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
1952	191.9	NA	0.0	0.0	3.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
1953	190.0	NA	0.0	0.0	4.3	NA	NA	NA	NA	NA	NA	NA	NA	NA
1954	199.3	NA	0.0	0.0	4.4	NA	NA	NA	NA	NA	NA	NA	NA	NA
1955	241.7	NA	0.0	0.0	4.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
1956	273.7	NA	0.0	0.0	7.1	NA	NA	NA	NA	NA	NA	NA	NA	NA
1957	315.5	NA	0.0	0.0	7.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
1958	316.1	NA	0.0	0.0	7.7	NA	NA	NA	NA	NA	NA	NA	NA	NA
1959	304.4	NA	0.0	0.0	8.4	NA	NA	NA	NA	NA	NA	NA	NA	NA
1960	309.9	NA	0.0	0.0	14.3	NA	NA	NA	NA	NA	NA	NA	NA	NA
1961	347.5	182.3	0.0	0.0	19.5	549.3	NA	NA	NA	NA	NA	NA	NA	NA
1962	353.0	105.8	0.0	0.0	22.3	481.1	NA	NA	NA	NA	NA	NA	NA	NA
1963	315.5	90.0	0.0	0.0	23.5	429.0	NA	NA	NA	NA	NA	NA	NA	NA
1964	311.2	170.3	0.0	0.0	25.6	507.1	NA	NA	NA	NA	NA	NA	NA	NA
1965	293.9	89.3	0.0	0.0	27.1	410.3	NA	NA	NA	NA	NA	NA	NA	NA
1966	269.4	178.5	0.0	0.0	28.5	476.4	NA	NA	NA	NA	NA	NA	NA	NA
1967	257.7	155.3	0.0	0.0	31.1	444.1	NA	NA	NA	NA	NA	NA	0.051	NA
1968	343.2	263.3	0.0	0.0	35.2	641.7	NA	NA	NA	NA	NA	NA	0.071	NA
1969	380.7	302.3	0.0	0.0	40.5	723.5	NA	NA	NA	NA	NA	NA	0.079	NA
1970	357.3	263.3	0.0	0.0	48.1	668.7	NA	NA	NA	NA	NA	NA	0.071	NA
1971	385.0	362.6	0.0	0.0	58.1	805.7	NA	NA	2162	0.37	2967.70	72.85	0.084	0.225
1972	330.3	352.4	0.0	0.0	58.6	741.2	NA	NA	2210	0.34	2951.20	74.88	0.075	0.224
1973	361.0	371.5	0.0	0.0	68.3	800.8	NA	NA	2239	0.36	3039.80	73.66	0.079	0.222
1974	346.2	317.9	0.0	0.0	82.9	747.0	NA	NA	2287	0.33	3034.00	75.38	0.072	0.221
1975	318.0	278.5	0.0	0.0	69.5	665.9	NA	NA	2312	0.29	2977.90	77.64	0.063	0.218
1976	306.9	305.0	0.0	0.0	79.1	691.0	NA	NA	2339	0.30	3030.00	77.19	0.063	0.215
1977	192.5	404.5	0.0	0.0	75.4	672.4	NA	NA	2770	0.24	3442.40	80.47	0.060	0.248
1978	151.9	354.2	0.0	0.0	82.0	588.1	NA	NA	2766	0.21	3354.10	82.47	0.051	0.241
1979	141.5	335.9	0.0	0.0	90.4	567.8	NA	NA	2832	0.20	3399.80	83.30	0.048	0.240
1980	177.1	433.8	0.0	0.0	99.0	709.9	4.31	NA	2973	0.24	3682.90	80.72	0.059	0.246
1981	180.8	391.8	0.0	0.0	107.5	680.1	4.11	4.03	3062	0.22	3742.10	81.83	0.055	0.246
1982	149.4	329.0	0.0	0.0	116.0	594.4	3.67	3.97	3228	0.18	3822.40	84.45	0.047	0.253
1983	111.3	338.1	0.0	0.0	129.0	578.4	4.13	3.78	3280	0.18	3858.40	85.01	0.044	0.251
1984	76.9	305.0	0.0	0.0	132.4	514.3	3.54	3.82	3307	0.16	3821.30	86.54	0.038	0.246
1985	65.2	339.2	0.0	0.0	121.3	525.7	3.79	3.52	3365	0.16	3890.70	86.49	0.038	0.244
1986	40.6	361.5	0.0	0.0	51.6	453.6	3.24	3.29	3353	0.14	3806.60	88.08	0.032	0.236
1987	38.7	345.5	0.0	0.0	71.4	455.6	2.86	NA	3344	0.14	3799.60	88.01	0.031	0.229
1988	40.0	348.0	0.0	0.0	68.8	456.8	NA	NA	3527	0.13	3983.80	88.53	0.031	0.236
1989	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE C: ELECTRICITY DATA

YEAR	INSTALLED CAPACITY (MEGAWATTS)									PUB INST. CAP.
	PUBLIC			SELF PRODUCERS			TOTAL	TOTAL	TOTAL	PER CAPITA
	HYDRO	THERMAL	TOTAL	HYDRO	THERMAL	TOTAL	HYDRO	THERMAL	INSTALLED	WATTS PER PERSON
1950	0	12	12	0	13	13	0	25	25	NA
1951	0	13	13	0	14	14	0	27	27	NA
1952	0	13	13	0	16	16	0	29	29	NA
1953	0	11	11	0	18	18	0	29	29	NA
1954	0	14	14	0	22	22	0	36	36	NA
1955	0	15	15	0	21	21	0	36	36	NA
1956	13	15	28	0	28	28	13	43	56	NA
1957	13	14	27	0	29	29	13	43	56	NA
1958	13	15	28	0	35	35	13	50	63	NA
1959	47	22	69	0	36	36	47	58	105	NA
1960	47	38	85	0	37	37	47	75	122	NA
1961	65	57	122	0	37	37	65	94	159	NA
1962	66	75	141	0	41	41	66	116	182	NA
1963	66	79	145	0	66	66	66	145	211	NA
1964	66	76	142	1	65	66	67	142	209	NA
1965	66	79	145	1	64	65	67	144	211	NA
1966	66	103	169	1	74	75	67	178	245	NA
1967	66	105	171	2	97	99	68	204	272	19.5
1968	66	110	176	2	97	99	68	209	277	19.6
1969	114	119	233	2	97	99	116	218	334	25.4
1970	114	140	254	2	99	101	116	241	357	27.1
1971	114	150	264	2	99	101	116	251	367	27.4
1972	143	165	308	3	110	104	146	269	415	31.2
1973	147	165	312	3	110	104	150	269	419	30.9
1974	147	166	313	3	110	113	150	279	429	30.2
1975	147	166	313	3	110	113	150	279	429	29.5
1976	562	166	728	3	110	113	565	279	844	66.9
1977	977	166	1143	3	110	113	980	279	1259	102.2
1978	1392	166	1558	3	110	113	1395	279	1674	135.7
1979	2222	166	2388	3	110	113	2225	279	2504	202.6
1980	2222	170	2392	3	110	113	2225	283	2508	197.6
1981	2222	170	2392	3	110	113	2225	283	2508	192.5
1982	2222	170	2392	3	110	113	2225	283	2508	187.6
1983	2222	170	2392	3	110	113	2225	283	2508	182.7
1984	2222	170	2392	3	110	113	2225	283	2508	178.0
1985	2206	154.7	2360.7	3	110	113	2209	267.7	2476.7	171.2
1986	2191	139.3	2330.3	3	110	113	2194	252.3	2446.3	164.3
1987	2176	124	2300	3	110	113	2179	237	2416	157.6

TABLE D : COAL CONSUMPTION

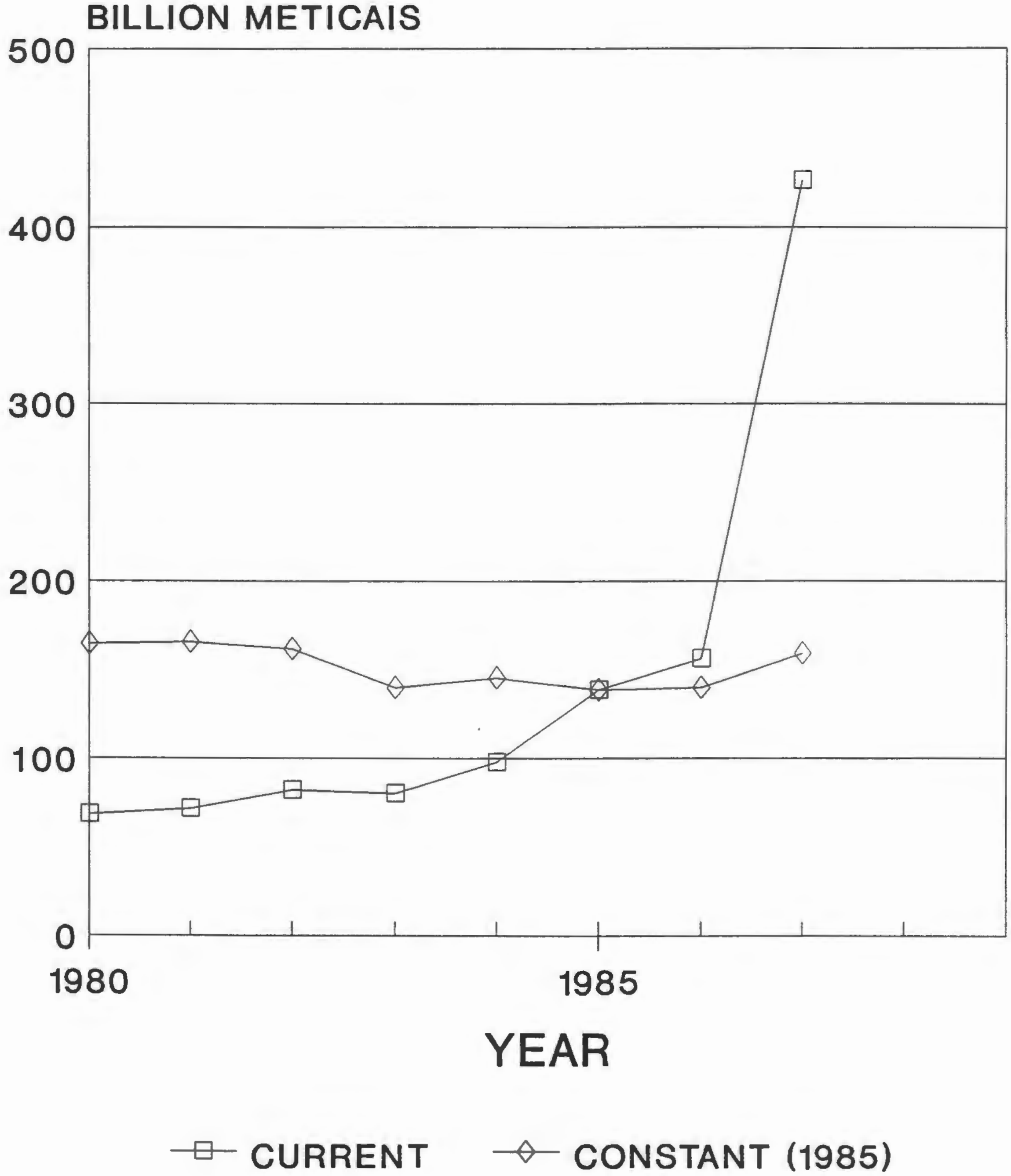
YEAR	000's OF TONS
1950	270.1
1951	267.0
1952	312.0
1953	308.9
1954	324.1
1955	393.0
1956	445.0
1957	513.0
1958	514.0
1959	495.0
1960	503.9
1961	565.0
1962	574.0
1963	513.0
1964	506.0
1965	477.9
1966	438.0
1967	419.0
1968	558.0
1969	619.0
1970	581.0
1971	626.0
1972	537.1
1973	587.0
1974	562.9
1975	517.1
1976	499.0
1977	313.0
1978	247.0
1979	230.1
1980	288.0
1981	294.0
1982	242.9
1983	181.0
1984	125.0
1985	106.0
1986	66.0
1987	62.9
1988	65.0
1989	NA
1990	NA

TABLE E: ELECTRICITY CONSUMPTION

YEAR	GWh
1950	9.44
1951	46.40
1952	44.08
1953	49.88
1954	51.04
1955	53.36
1956	82.01
1957	88.04
1958	88.97
1959	97.44
1960	165.88
1961	226.20
1962	258.68
1963	272.60
1964	296.96
1965	314.36
1966	330.60
1967	360.76
1968	408.32
1969	469.80
1970	557.96
1971	673.96
1972	679.76
1973	792.28
1974	961.64
1975	806.20
1976	917.56
1977	874.64
1978	951.20
1979	1048.64
1980	1148.40
1981	1247.00
1982	1345.60
1983	1496.40
1984	1535.84
1985	1407.08
1986	598.56
1987	828.24
1988	798.08
1989	NA
1990	NA

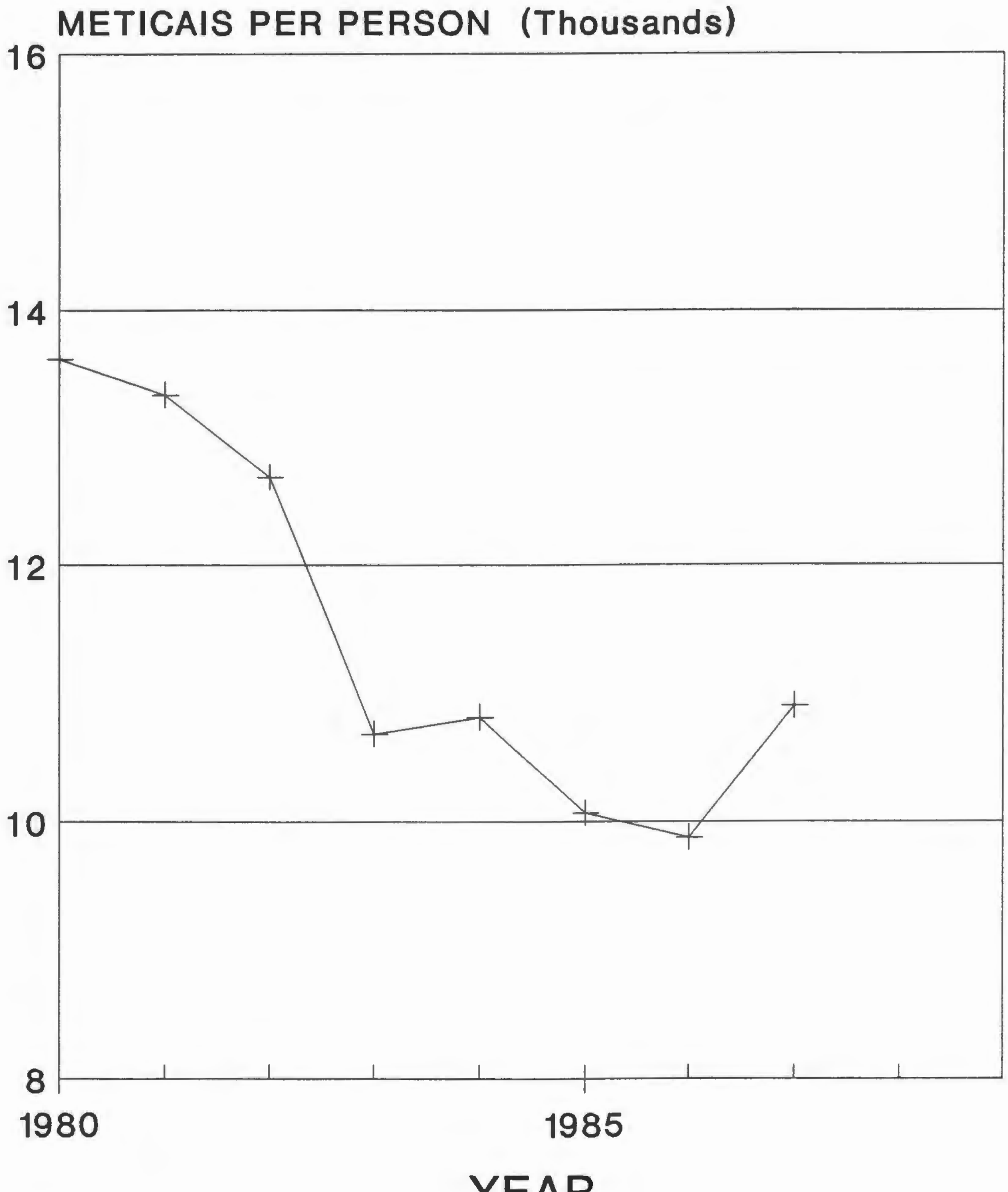
FIGURES

FIGURE 1. GROSS DOMESTIC PRODUCT (AT FACTOR COST)



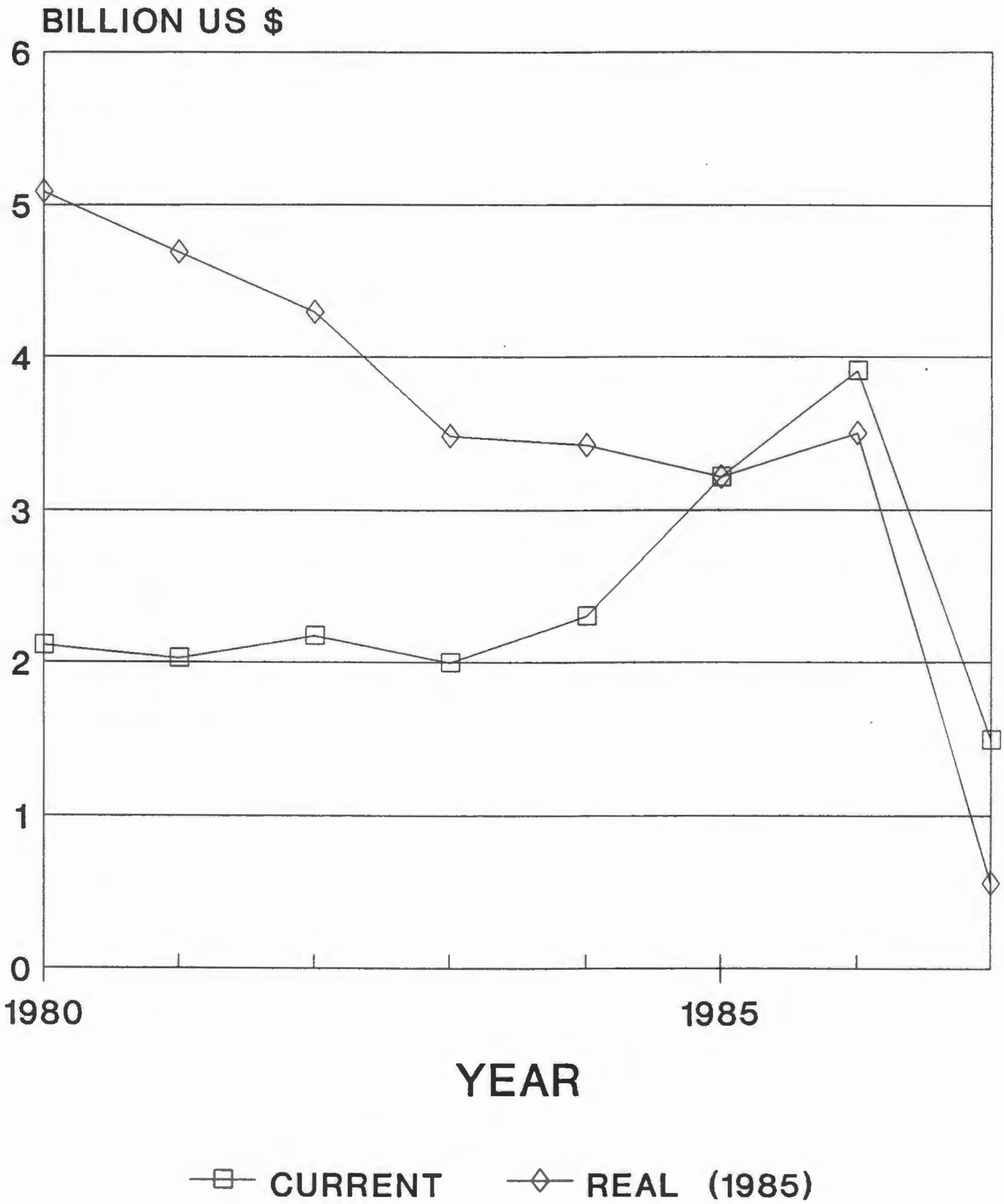
MOZAMB/GDP1/2005

FIGURE 2. GDP PER CAPITA
(CONSTANT 1985 PRICES)



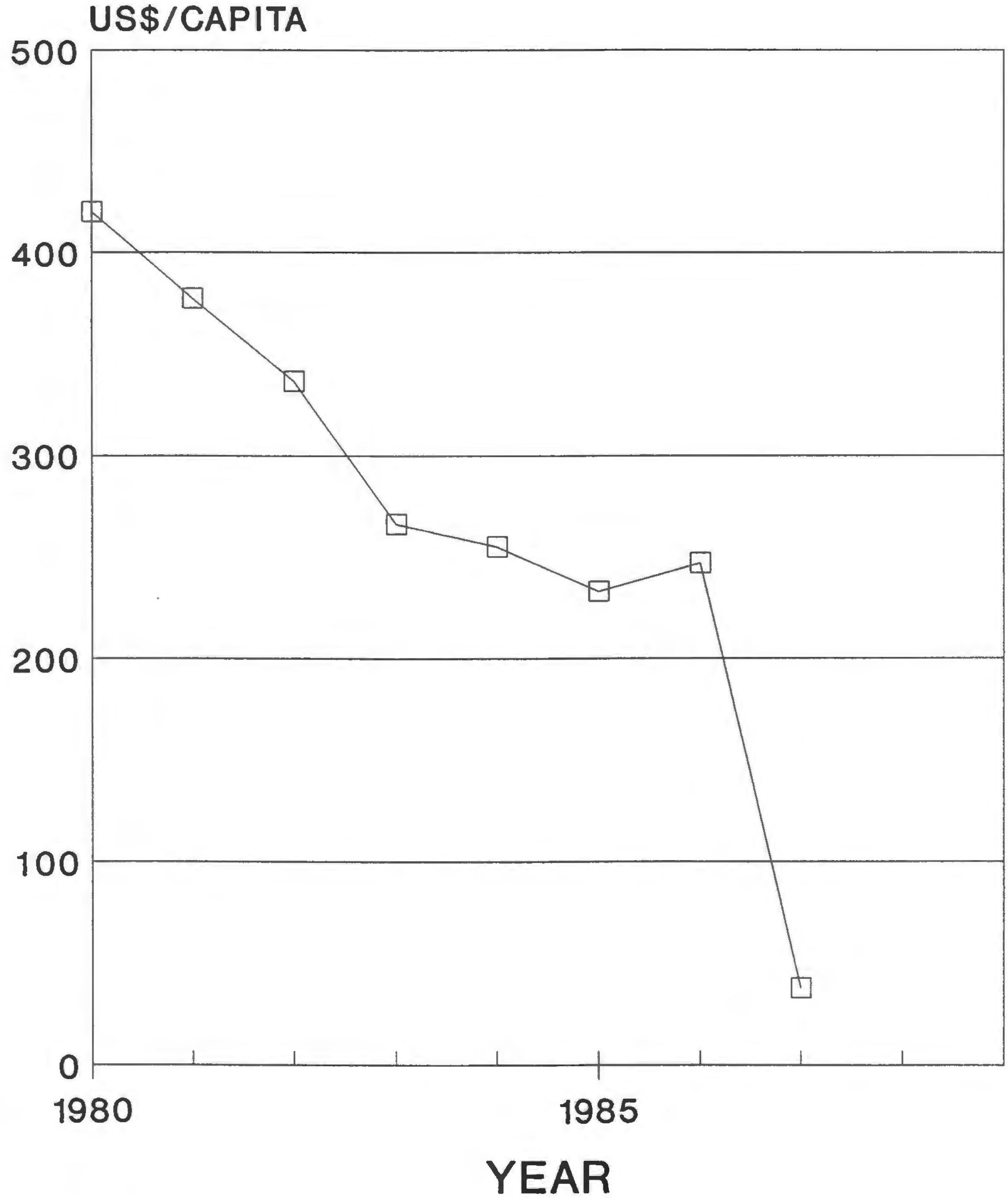
MOZAMB/GDP3/2005

FIGURE 3. GDP IN US $



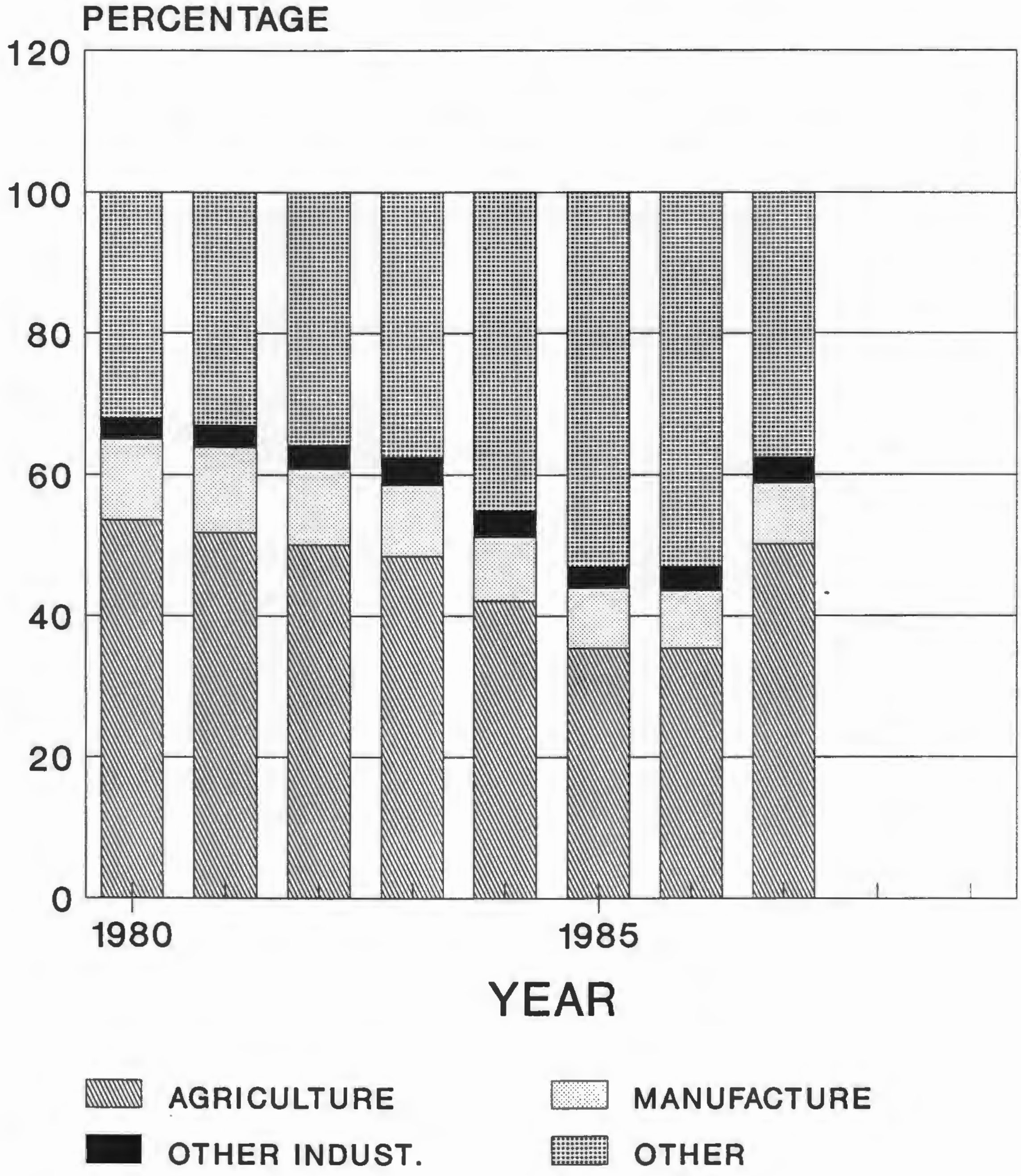
MOZAMB/GDP8/2005

FIGURE 4. GDP PER CAPITA
US$ (1985)



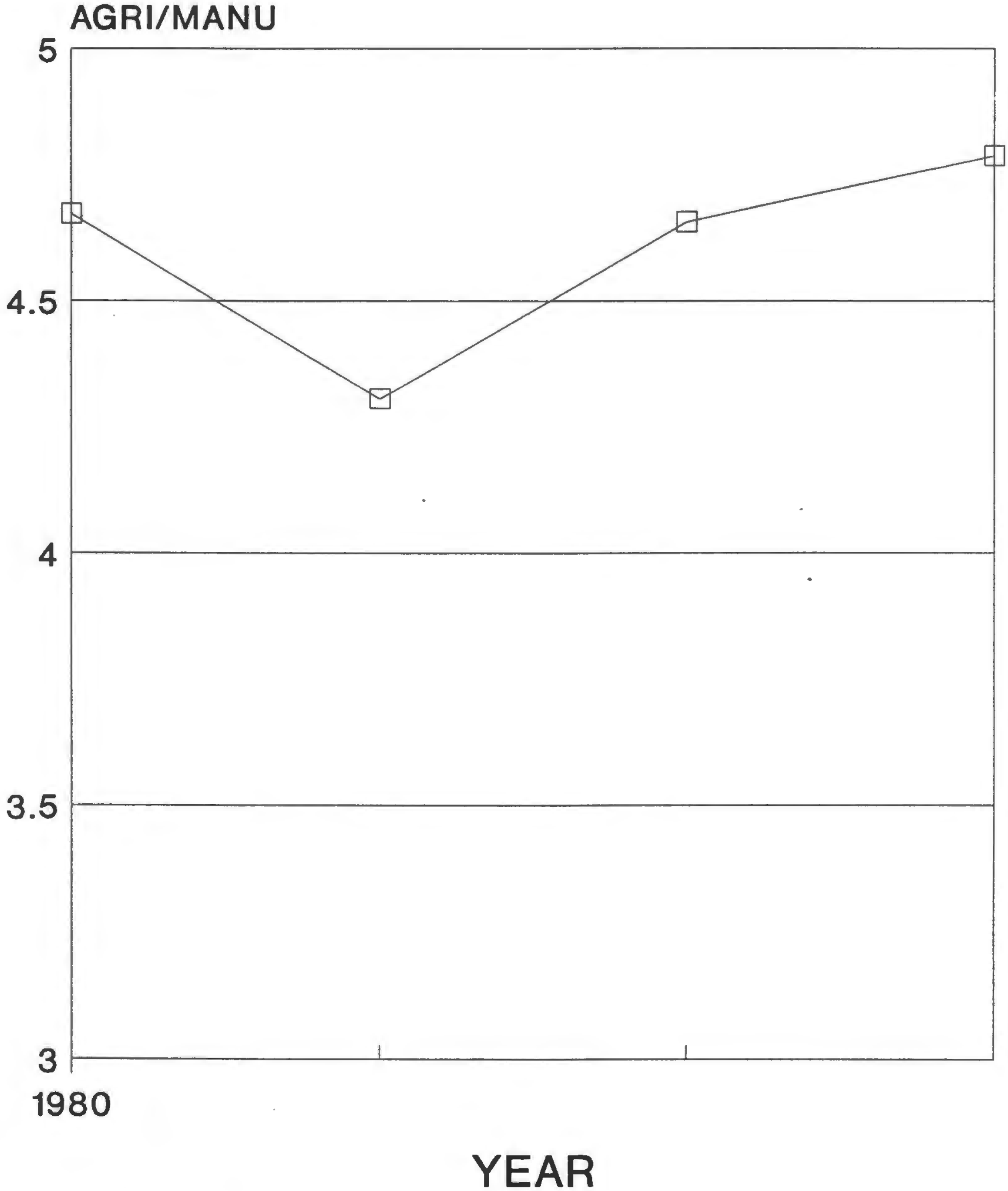
MOZAMB/GDP12/2005

FIGURE 5. GDP COMPONENTS AS % OF TOTAL



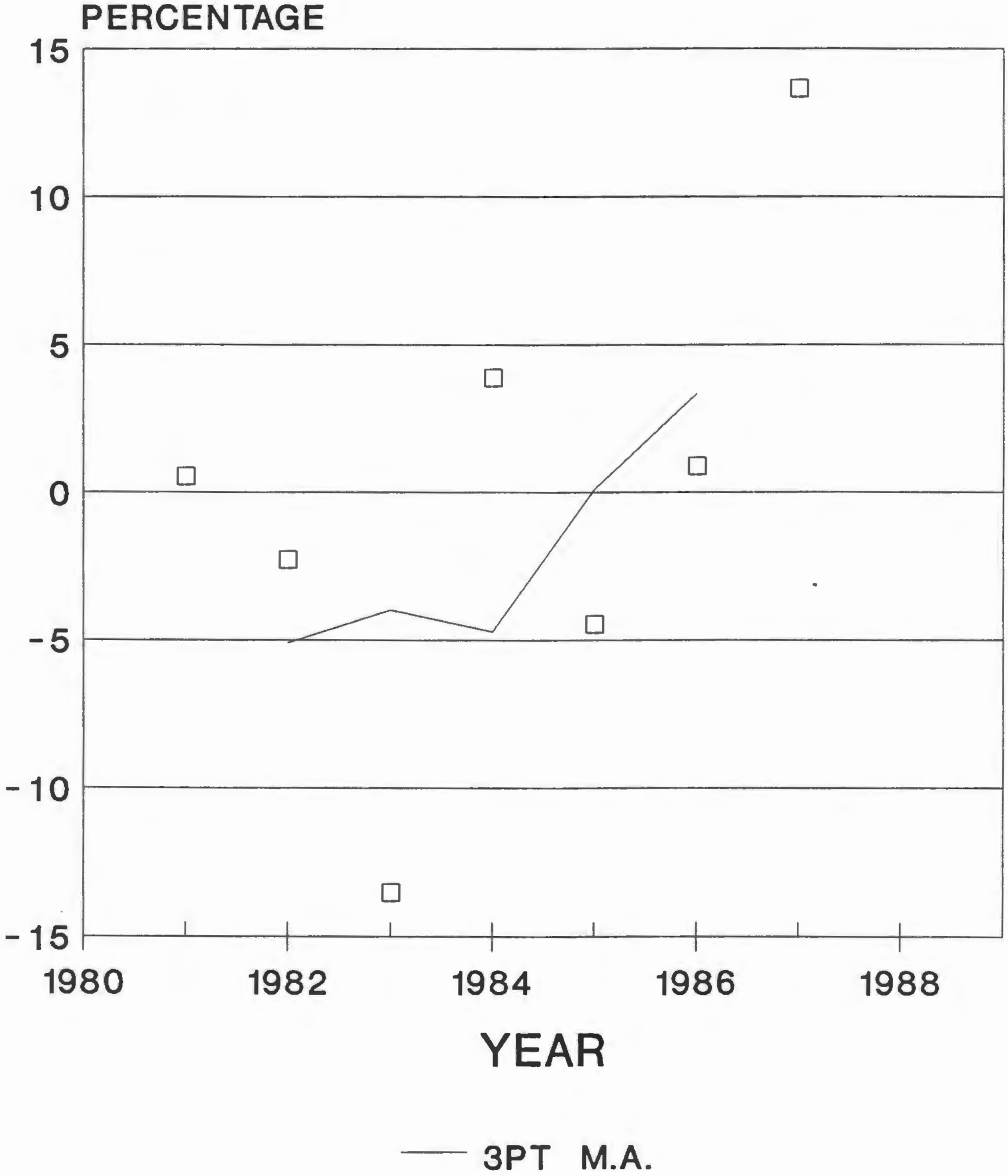
MOZAMB/GDP4/2005

FIGURE 6. RATIO OF CONTRIBUTION TO GDP BY AGRICULTURE AND MANUFACTURE



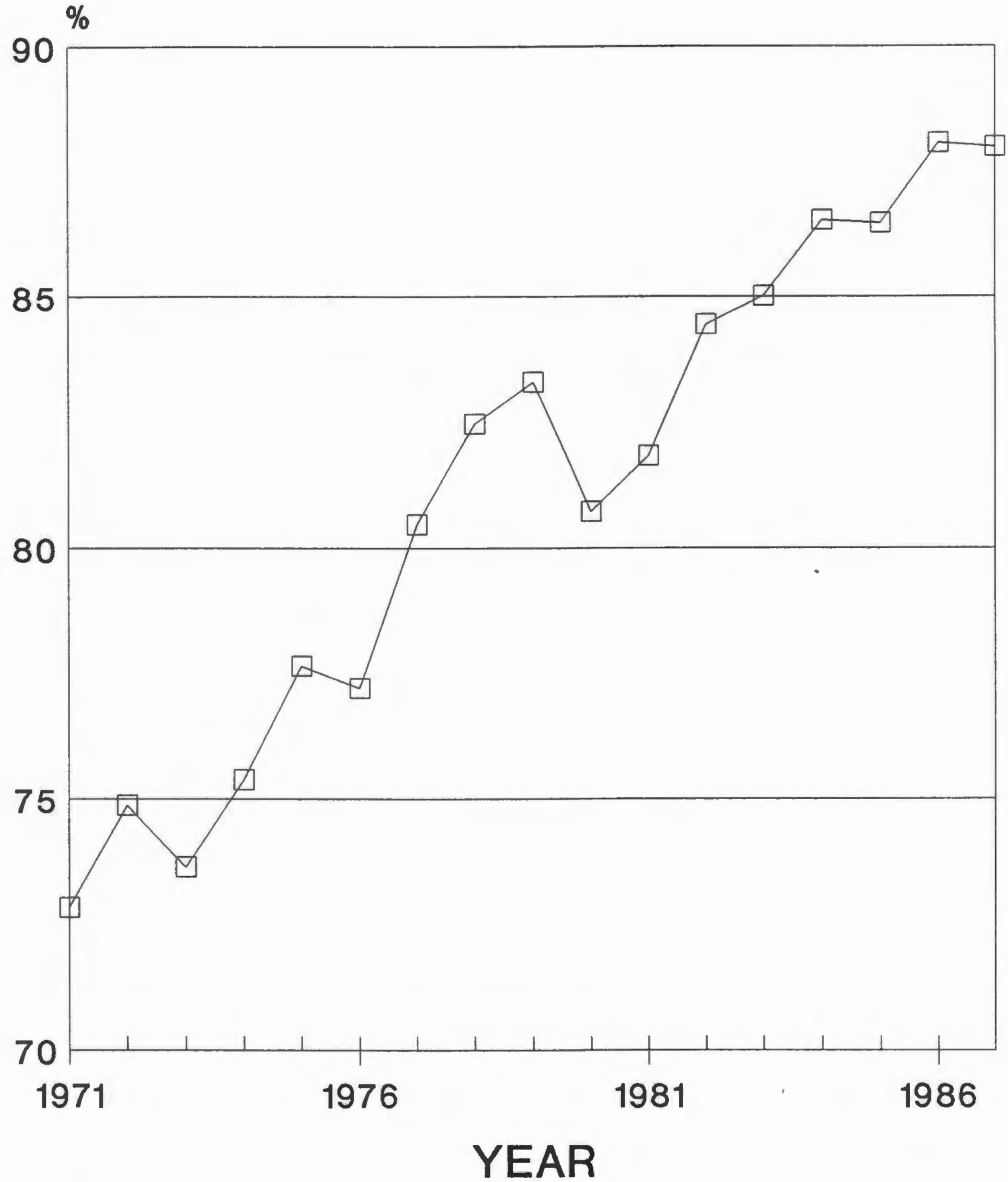
MOZAMB/GDP1/2005

FIGURE 7. GDP GROWTH RATE
% PER YEAR (CONSTANT 1985 FACTOR PR)



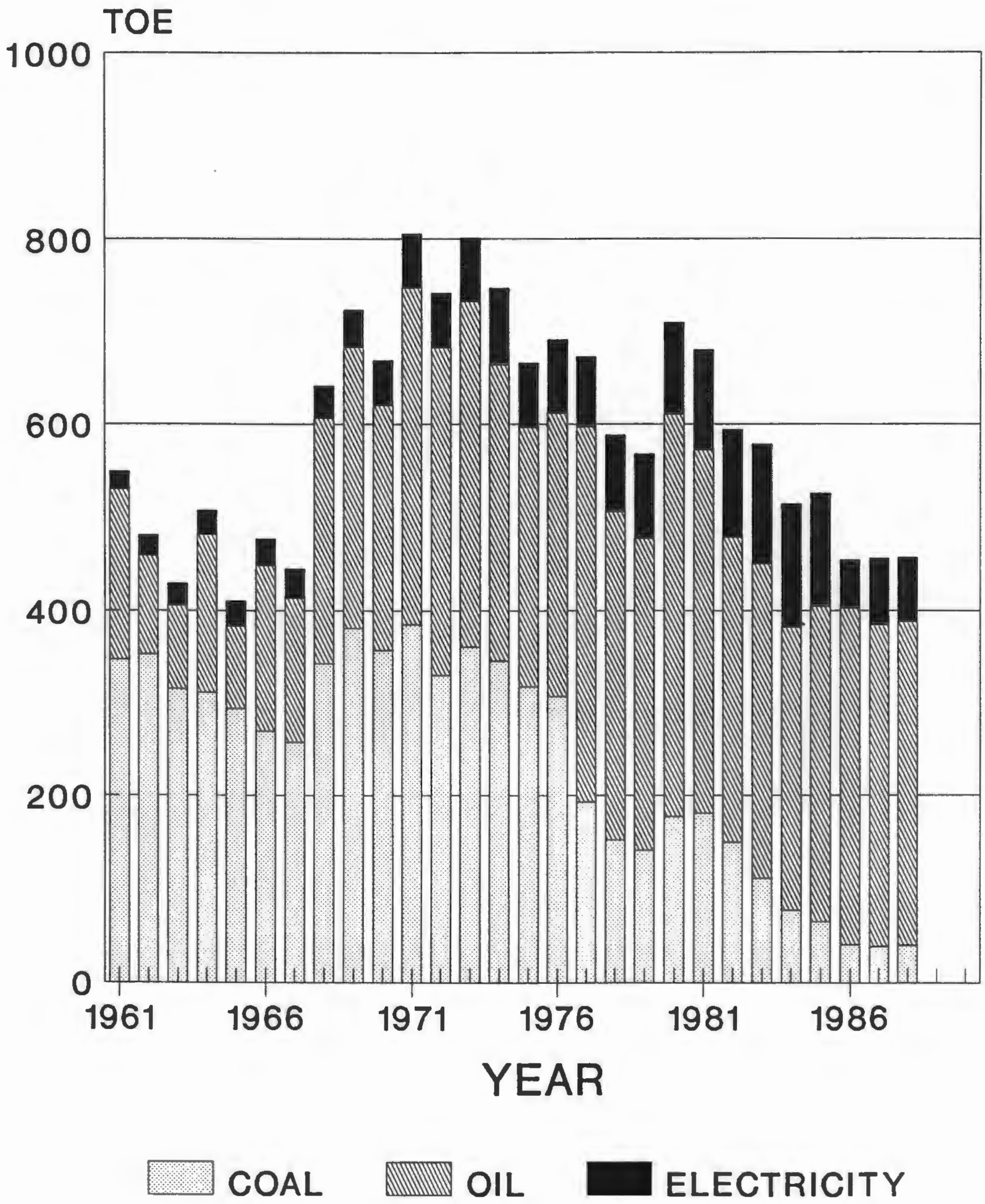
MOZAMB/GDP7/2005

FIGURE 8. TRADITIONAL ENERGY CONSUMED AS % OF TOTAL



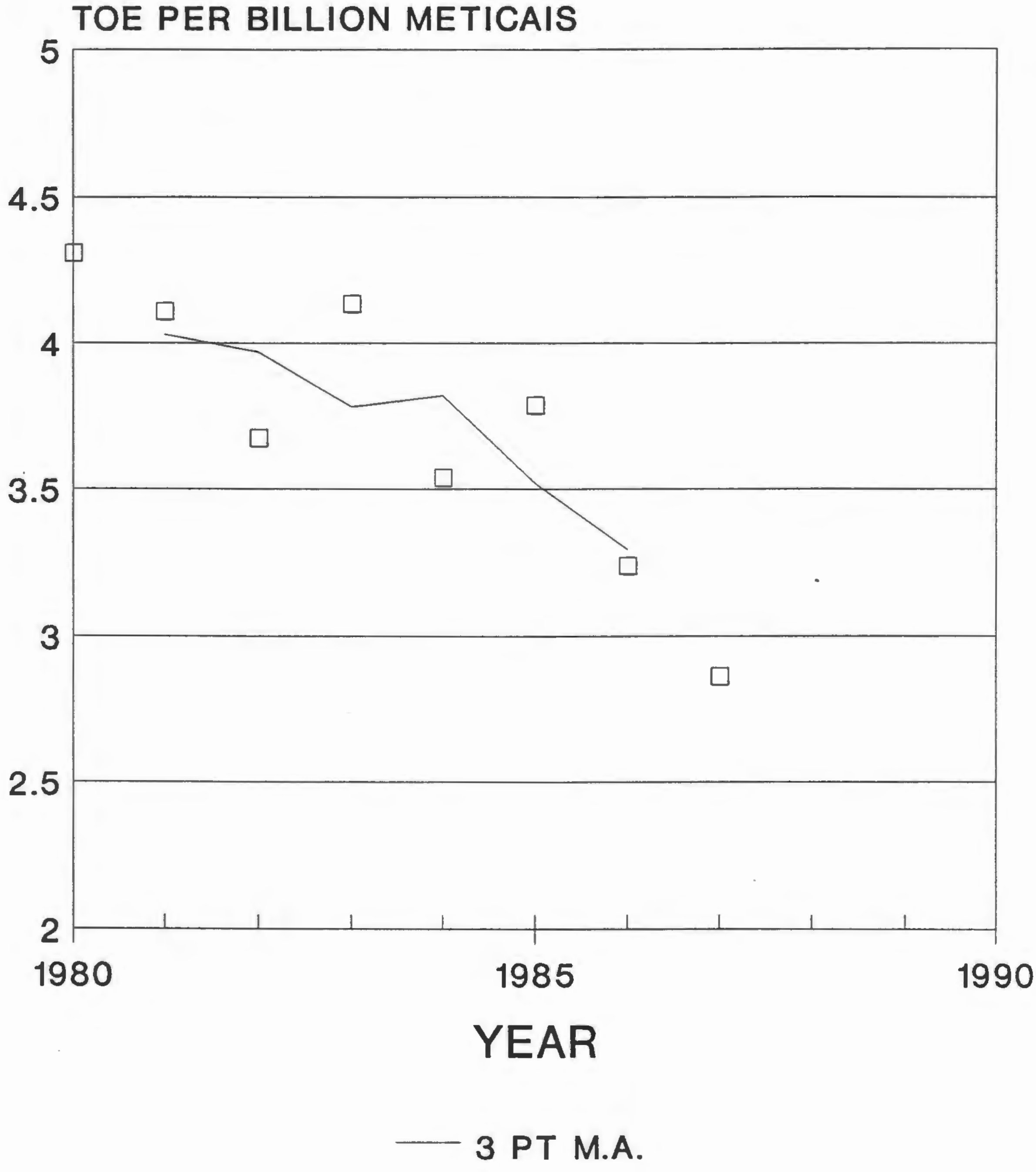
MOZAMB/TFC2/2005

FIGURE 9. TFC COMPONENTS



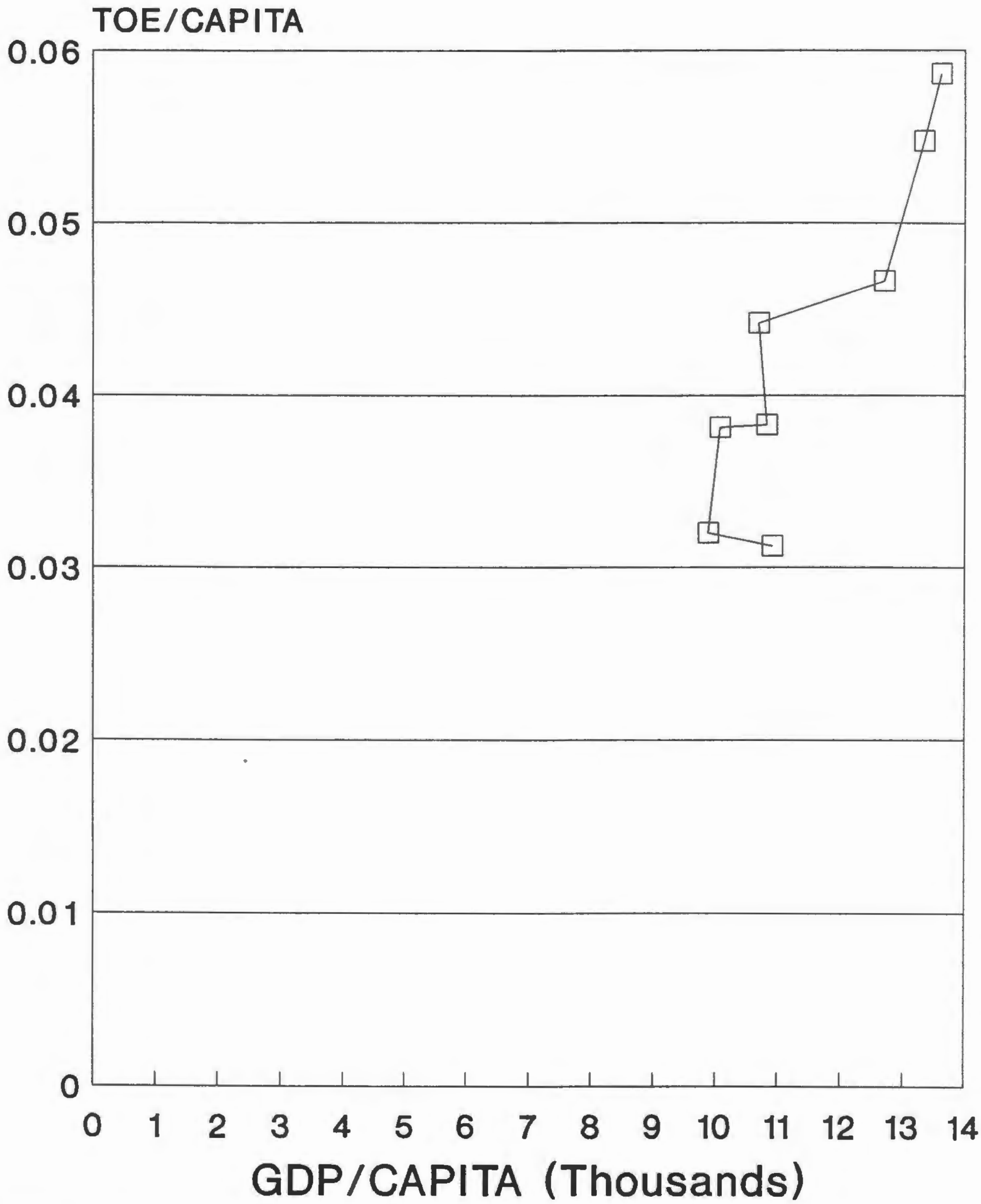
MOZAMB/TFC20/2005

FIGURE 10. COMMERCIAL ENERGY INTENSITY TFC/GDP(CONSTANT 1985)



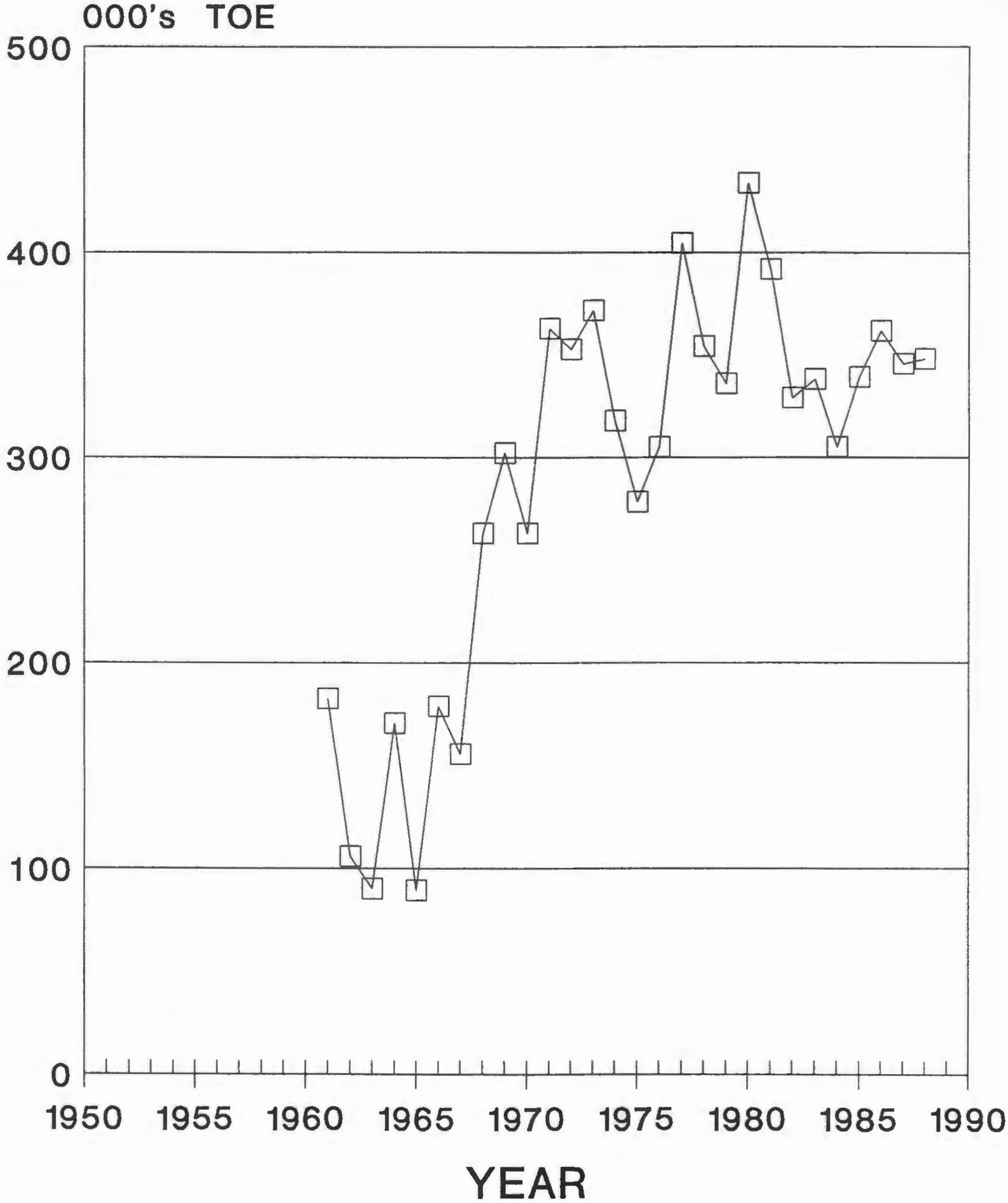
MOZAMB/TFC21/2005

FIGURE 11. TOE/CAPITA vs GDP/CAPITA



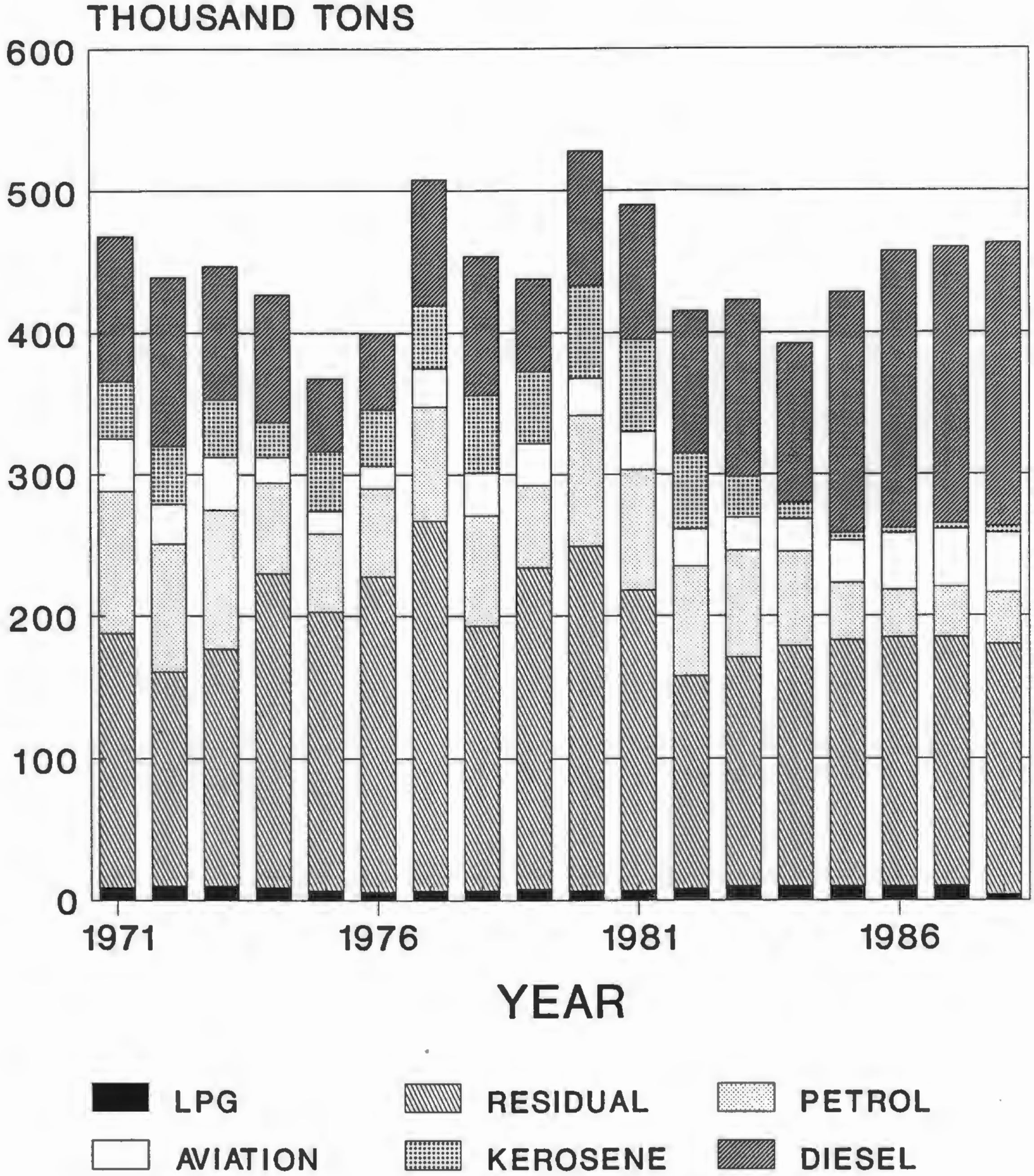
MOZAMB/TFC4/2005

FIGURE 12. OIL : FINAL CONSUMPTION



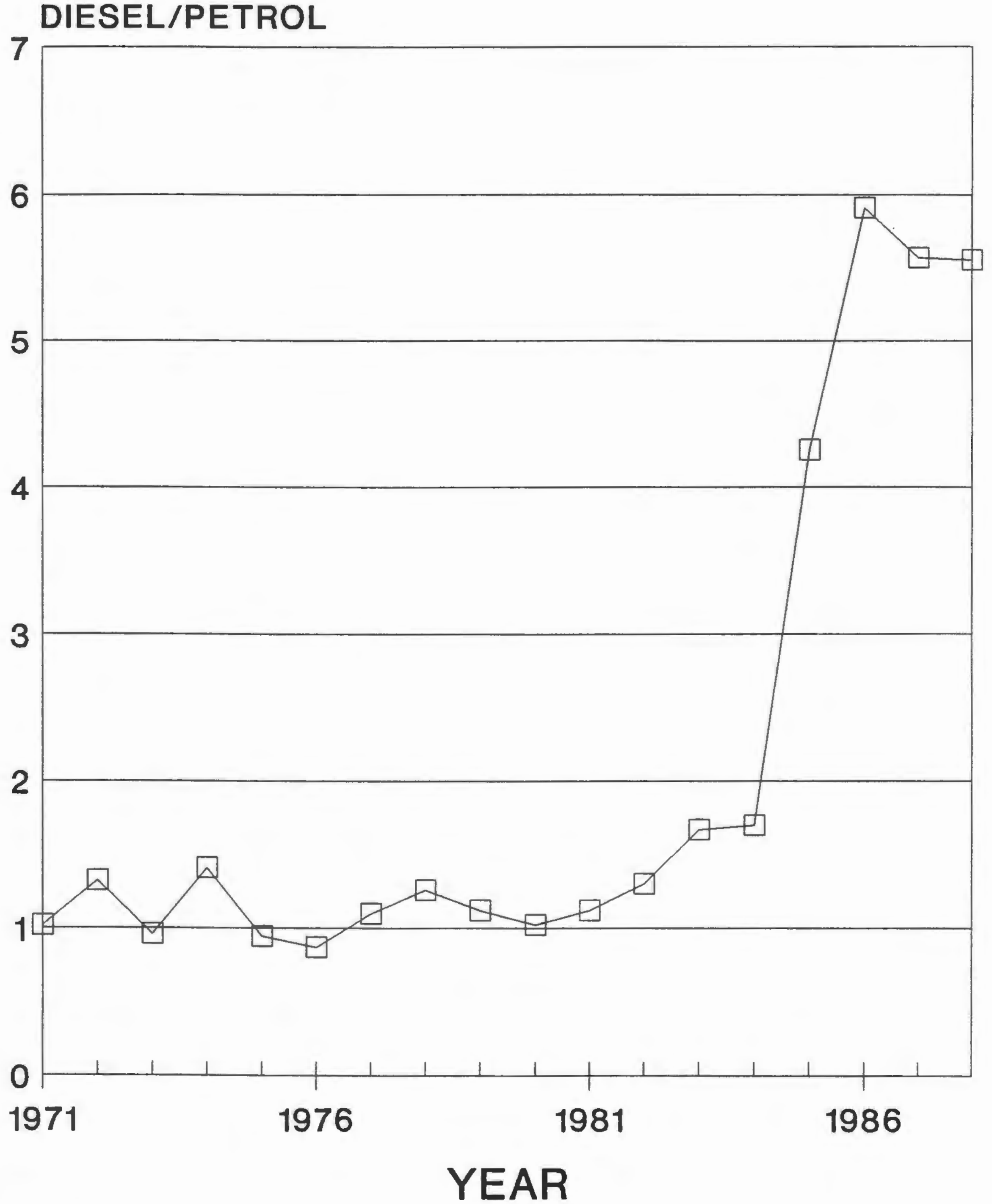
MOZAMB/TFC5/2005

FIGURE 13. OIL PRODUCT CONSUMPTION BY TYPE



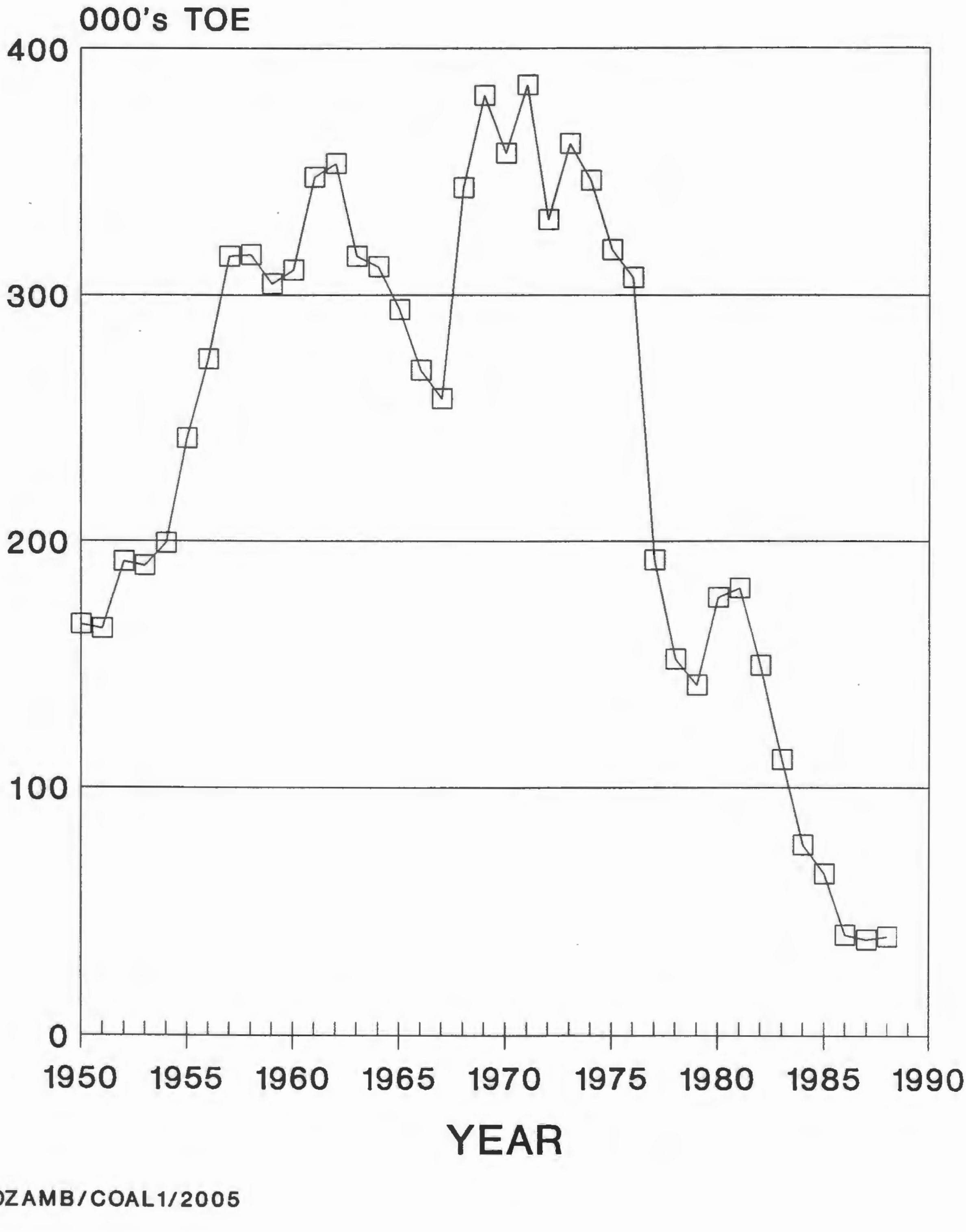
MOZAMB/OIL1/2005

FIGURE 14. RATIO OF DIESEL TO PETROL



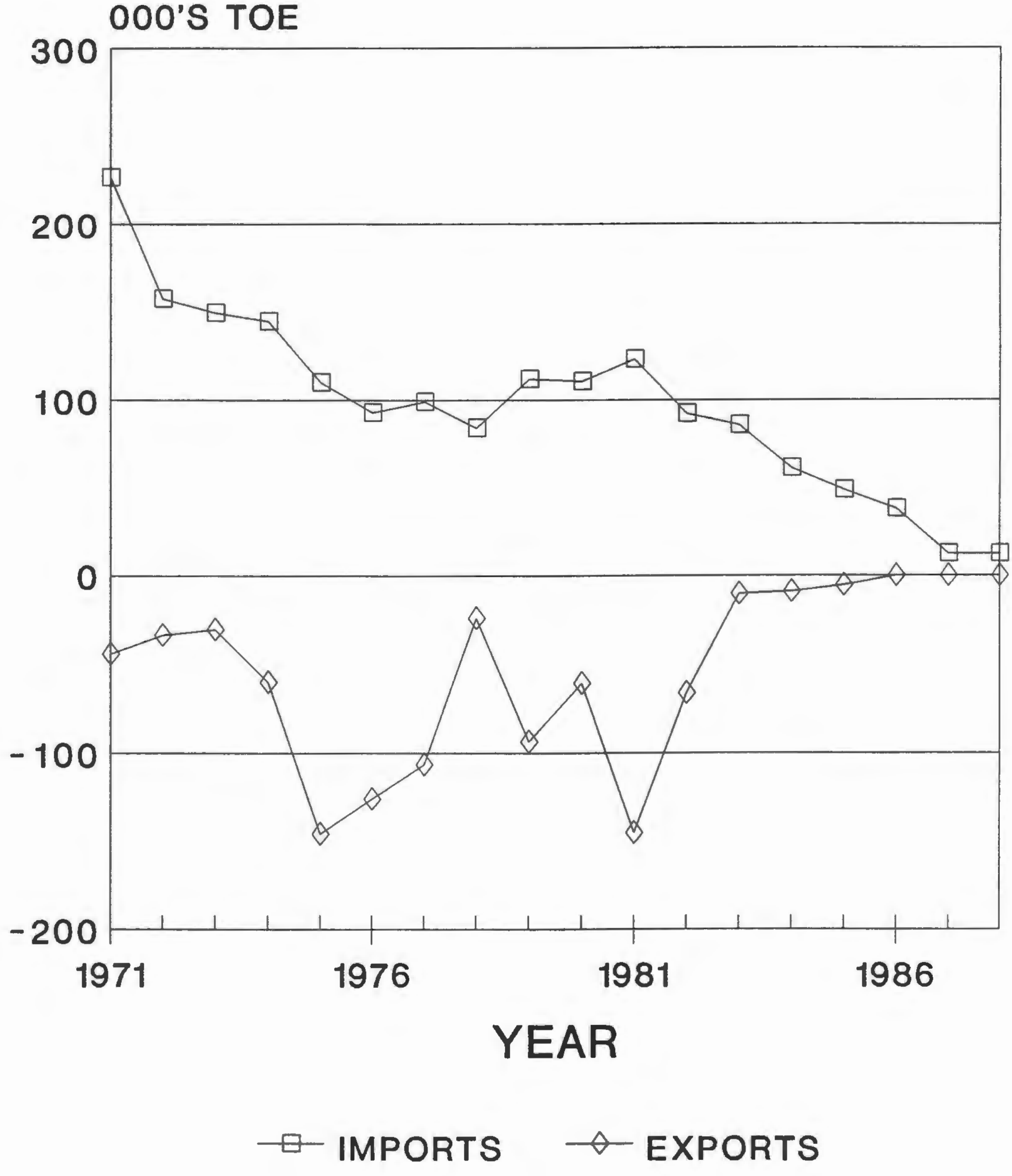
MOZAMB/OIL2/2005

FIGURE 15. COAL : FINAL CONSUMPTION



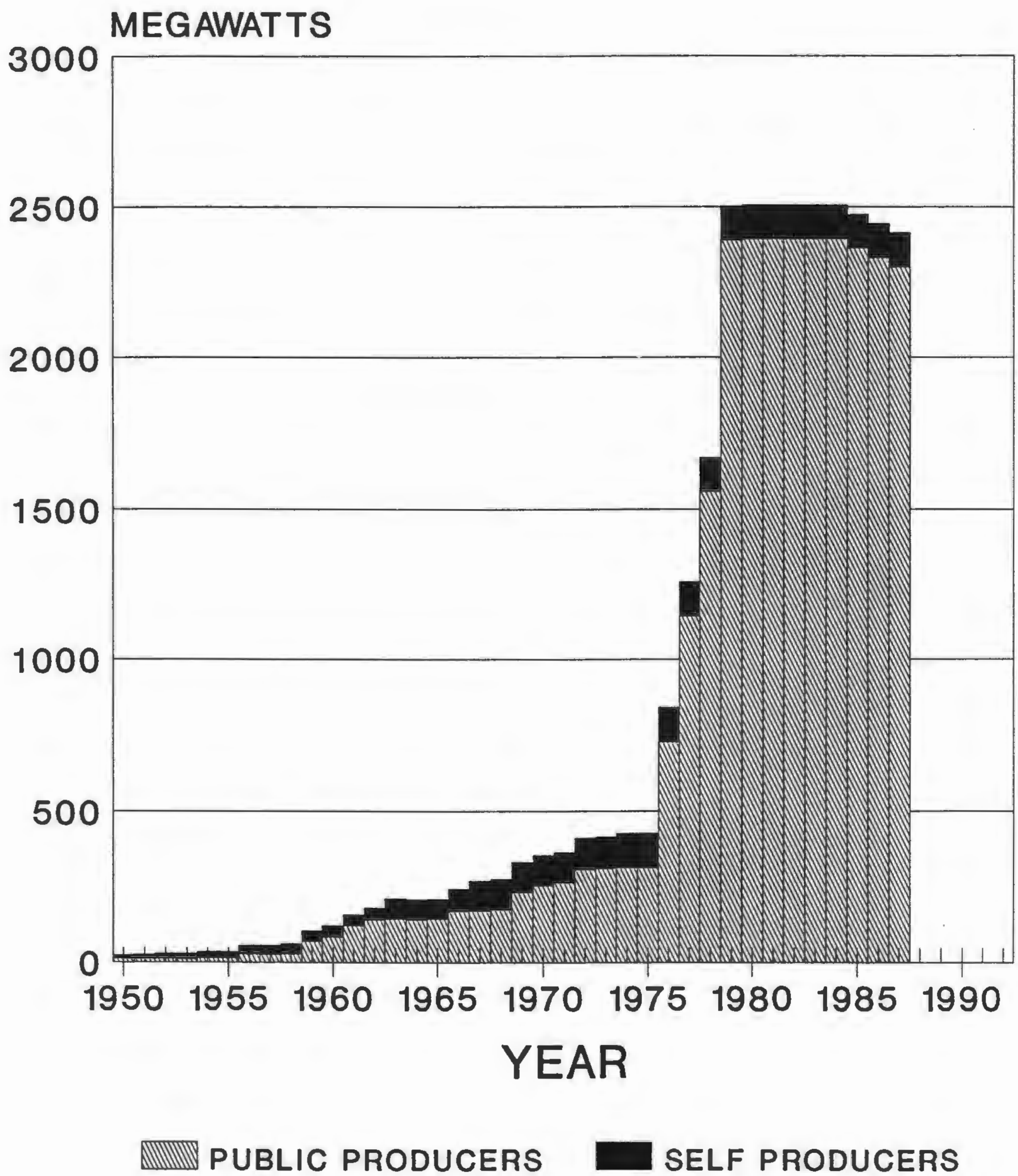
MOZAMB/COAL1/2005

FIGURE 16 COAL : IMPORTS AND EXPORTS
000's TOE



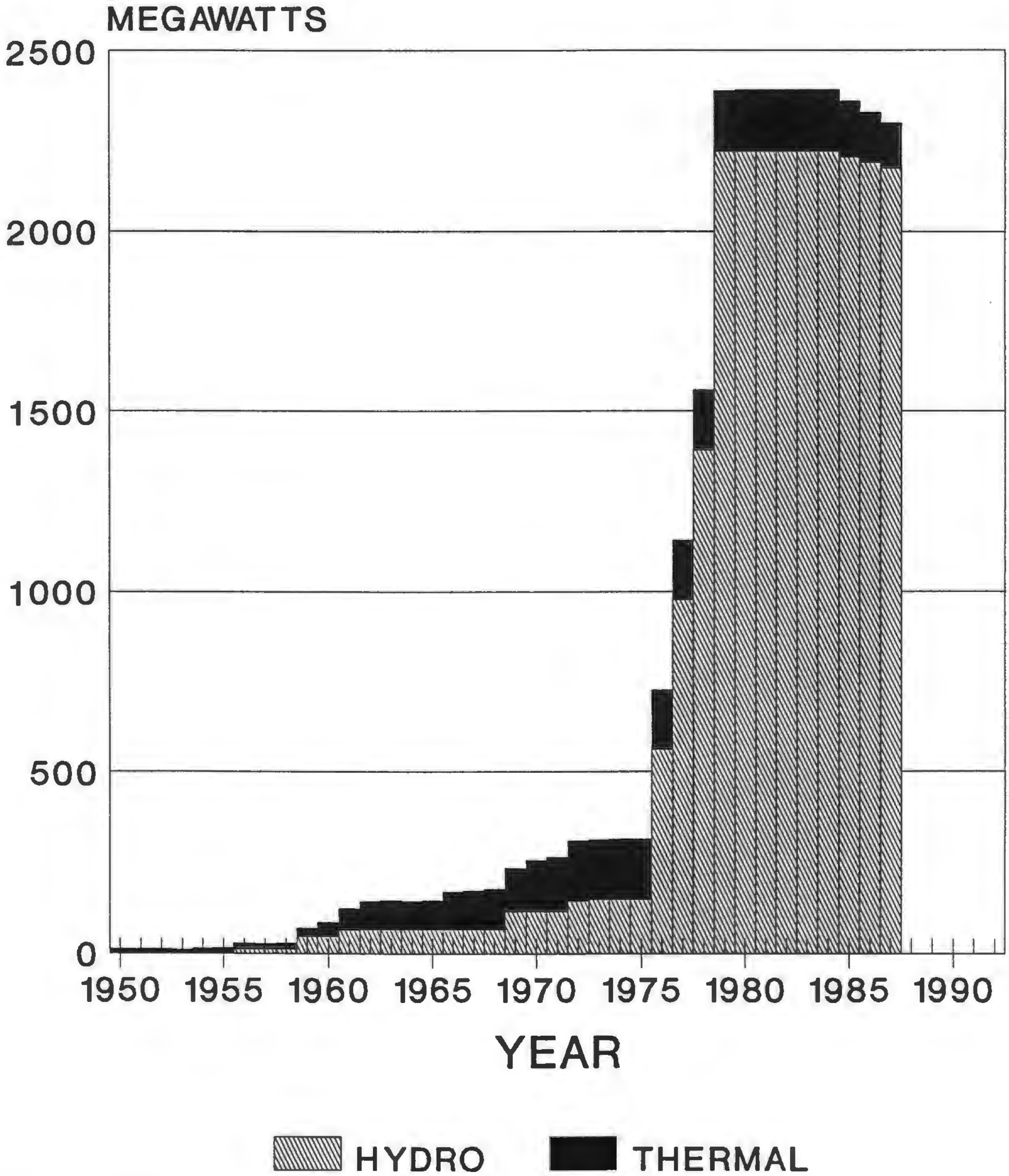
MOZ7188/TFC4/2005

FIGURE 17. ELECTRICAL INSTALLED CAPACITY



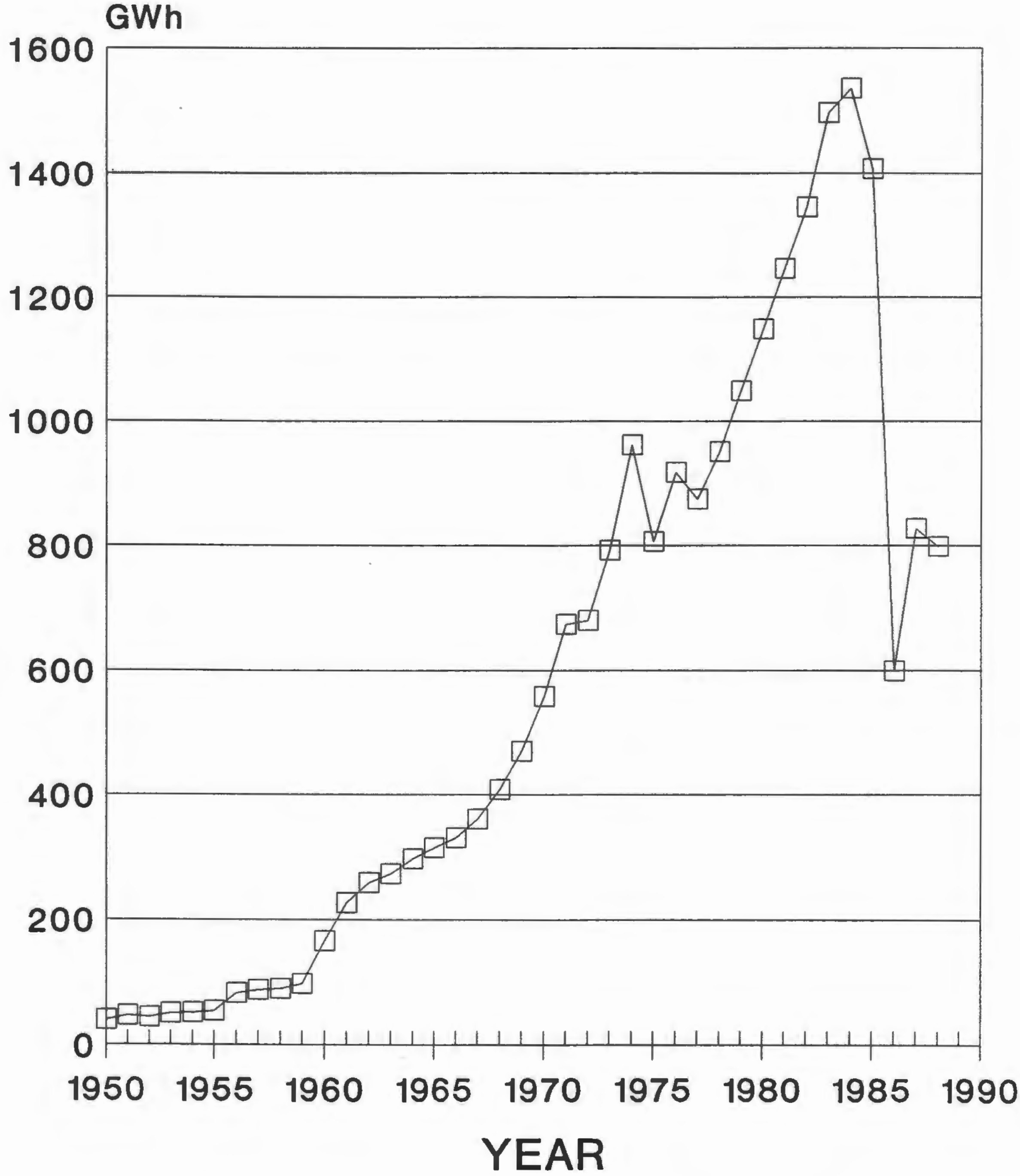
MOZAMB/ELEC1/2005

FIGURE 18. PUBLIC ELECTRICAL INSTALLED CAPACITY



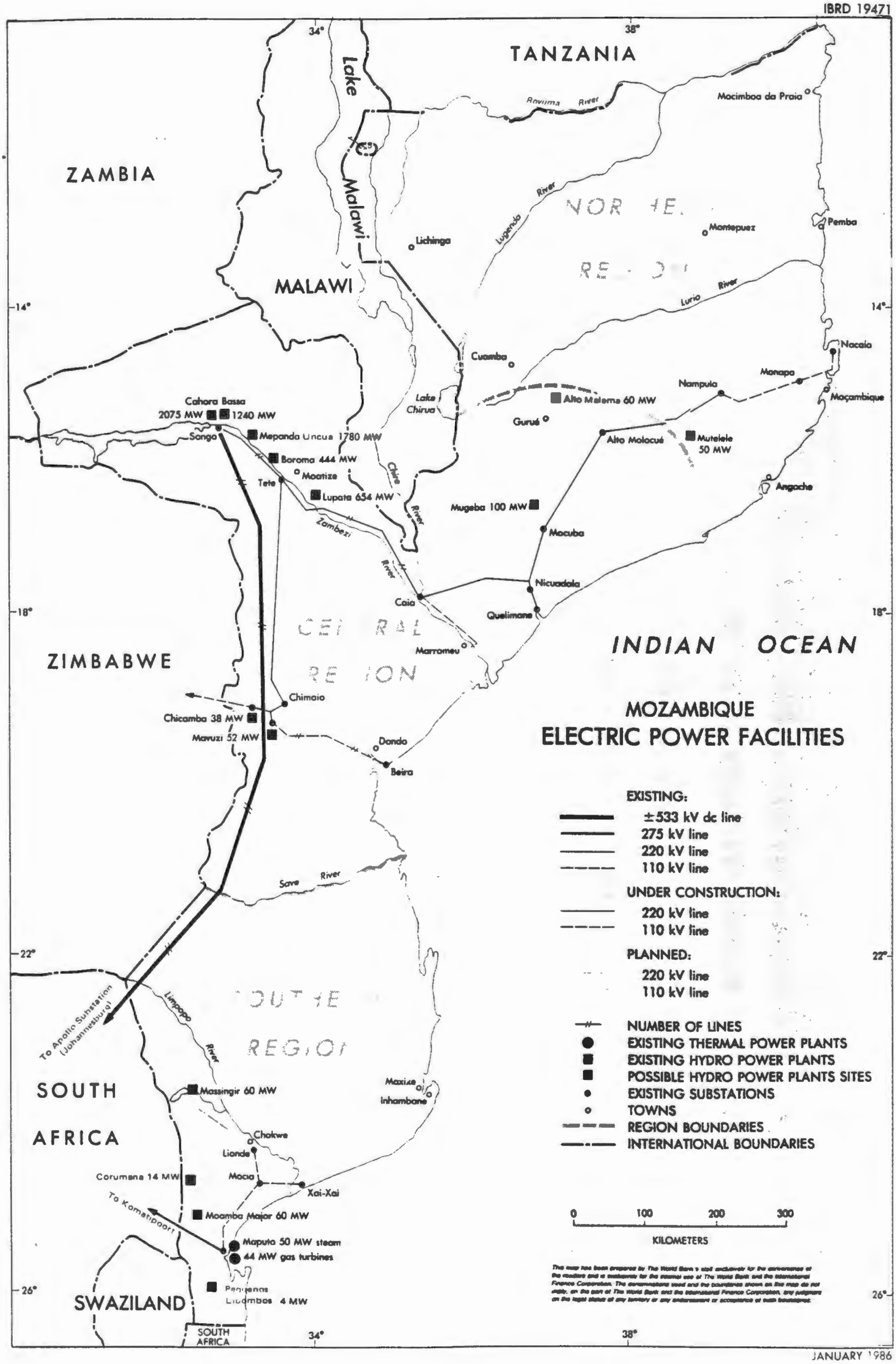
MOZAMB/ELEC2/2005

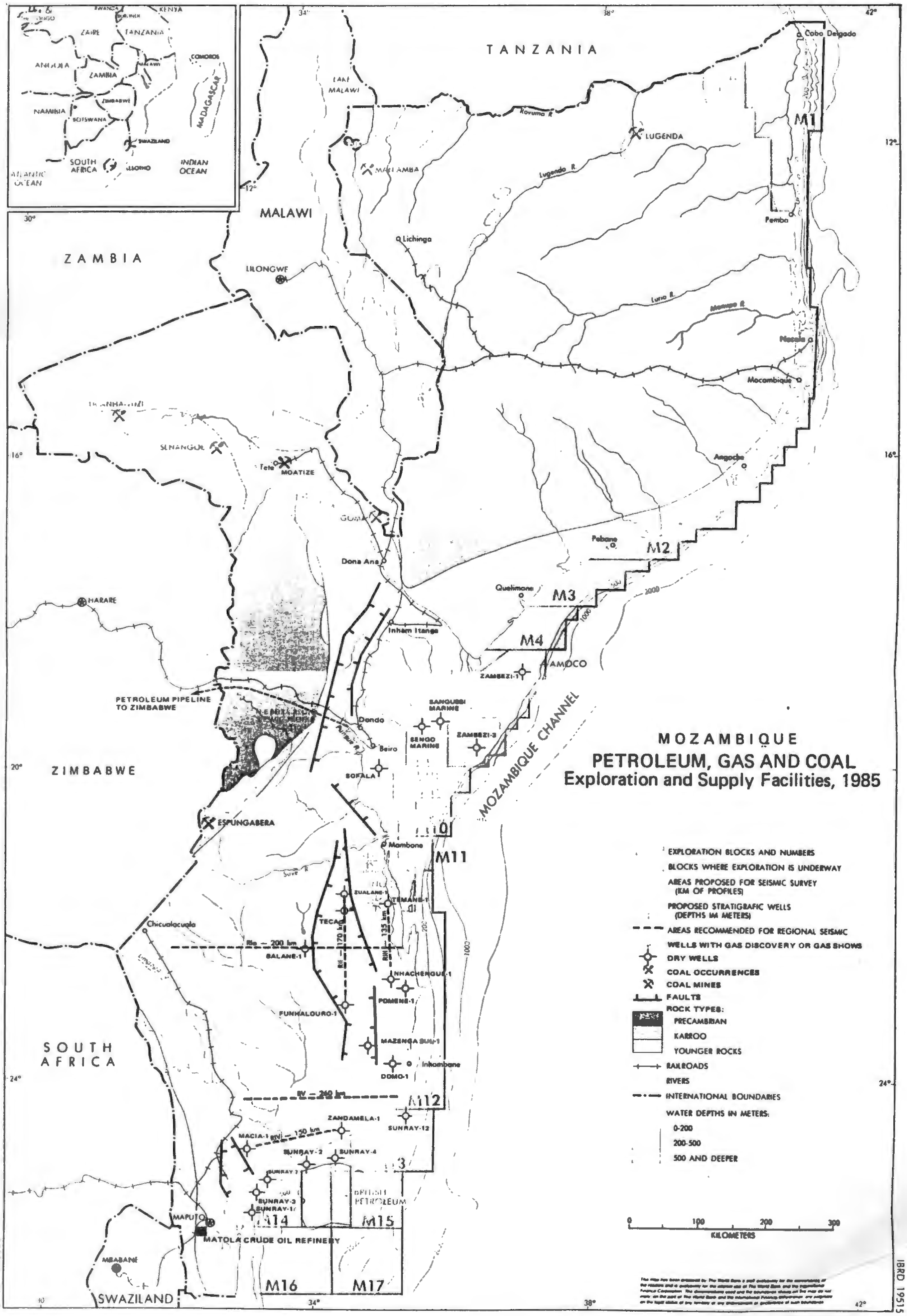
FIGURE 19. ELECTRICITY : FINAL CONSUMPTION



MOZAMB/ELEC6/2005

MAPS


IBRD 19471
MOZAMBIQUE
ELECTRIC POWER FACILITIES
EXISTING:
±533 kV dc line
275 kV line
220 kV line
110 kV line
UNDER CONSTRUCTION:
220 kV line
110 kV line
PLANNED:
220 kV line
110 kV line
NUMBER OF LINES
EXISTING THERMAL POWER PLANTS
EXISTING HYDRO POWER PLANTS
POSSIBLE HYDRO POWER PLANTS SITES
EXISTING SUBSTATIONS
TOWNS
REGION BOUNDARIES
INTERNATIONAL BOUNDARIES
0
100
200
300
KILOMETERS
TANZANIA
ZAMBIA
MALAWI
ZIMBABWE
SOUTH AFRICA
SWAZILAND
SOUTH AFRICA
INDIAN OCEAN
Lake Malawi
Rovuma River
Lugenda River
Lurio River
Zambezi River
Chire River
Save River
Limpopo River
Lake Chirua
Mocimboa da Praia
Pemba
Montepuez
Lichinga
Cuamba
Nacala
Monapo
Nampula
Moçambique
Alto Molocué
Mutelele 50 MW
Alto Malema 60 MW
Gurué
Angoche
Mugeba 100 MW
Mocuba
Nicuadala
Quelimane
Caia
Marromeu
Cahora Bassa
2075 MW
1240 MW
Songo
Mepanda Uncua 1780 MW
Boroma 444 MW
Moatize
Tete
Lupata 654 MW
Chimoio
Chicamba 38 MW
Mavuzi 52 MW
Dondo
Beira
To Apollo Substation (Johannesburg)
Massingir 60 MW
Maxixe
Inhambane
Chokwe
Lionde
Macia
Xai-Xai
Corumana 14 MW
To Komatipoort
Moamba Major 60 MW
Maputo 50 MW steam
44 MW gas turbines
Pequenos Libombos 4 MW
34°
38°
14°
18°
22°
26°
JANUARY 1986


MOZAMBIQUE
PETROLEUM, GAS AND COAL
Exploration and Supply Facilities, 1985
EXPLORATION BLOCKS AND NUMBERS
BLOCKS WHERE EXPLORATION IS UNDERWAY
AREAS PROPOSED FOR SEISMIC SURVEY (KM OF PROFILES)
PROPOSED STRATIGRAFIC WELLS (DEPTHS IM METERS)
AREAS RECOMMENDED FOR REGIONAL SEISMIC
WELLS WITH GAS DISCOVERY OR GAS SHOWS
DRY WELLS
COAL OCCURRENCES
COAL MINES
FAULTS
ROCK TYPES:
PRECAMBRIAN
KARROO
YOUNGER ROCKS
RAILROADS
RIVERS
INTERNATIONAL BOUNDARIES
WATER DEPTHS IN METERS:
0-200
200-500
500 AND DEEPER
0
100
200
300
KILOMETERS
TANZANIA
MALAWI
ZAMBIA
ZIMBABWE
SOUTH AFRICA
SWAZILAND
MOZAMBIQUE CHANNEL
Cabo Delgado
LUGENDA
Pemba
Lichinga
LILONGWE
Lunio R.
Nacala
Mocambique
Angoche
Pebane
Quelimane
Tete
MOATIZE
SENANGOE
Dona Ana
HARARE
Inhaminga
AMOCO
ZAMBEZI-1
SANGUSSI MARINE
SENGO MARINE
ZAMBEZI-2
PETROLEUM PIPELINE TO ZIMBABWE
Dondo
Beira
SOFALA
ESPUNGABERA
Mambone
Save R.
Chicualacuala
ZUALANE-1
TEMANE-1
TECA
BALANE-1
NHACHENGUE-1
POMENE-1
FUNHALOURO-1
MAZENGA SUL-1
DOMO-1
Inhambane
ZANDAMELA-1
SUNRAY-12
MACIA-1
SUNRAY-2
SUNRAY-4
SUNRAY-3
BRITISH PETROLEUM
MAPUTO
MATOLA CRUDE OIL REFINERY
MBABANE
M1
M2
M3
M4
M11
M12
M14
M15
M16
M17
ZAIRE
KENYA
ANGOLA
NAMIBIA
BOTSWANA
COMOROS
MADAGASCAR
INDIAN OCEAN
ATLANTIC OCEAN
FEBRUARY 1986
IBRD 19515