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# A SURVEY OF THE IRON AND STEEL SECTOR IN PTA AND SADCC COUNTRIES*

VOL. I: MAIN STUDY

Prepared by the

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## Preface

This study was carried out by Regional and Country Studies of UNIDO's Department for Programme and Project Development within the framework of the Industrial Development Decade for Africa. It forms part of UNIDO's ongoing activities to support industrial development in the African region.

Extensive work both in the field and at headquarters was undertaken to collect and analyse a large amount of data. UNIDO staff was greatly assisted in this task both by three consultants; B.U.N. Igwe (Nigeria), K.-H. Plaetzer (West Germany) and A. Trickett (U.K.), by the PTA and SADCC Secretariats and by numerous officials in the countries of the sub-region who took time to discuss with study missions and to supply information.

It is hoped that the findings will serve industrial policy-makers as well as organizations involved in financial and technical assistance to countries of the sub-region.

# Chapter 1

## INTRODUCTION

1. This study deals with the production and consumption of basic steel products in 20 East and Southern African countries: Its major objective is to compile information for the establishment of a factual and analytical framework to be used as a basis for making decisions on sub-regional collaboration and co-ordination in the iron and steel sector.

2. The study was requested by two (overlapping) sub-regional groups of countries, the Preferential Trade Area for Eastern and Southern African States (PTA)1/ and the Southern African Development Co-ordination Conference (SADCC)2/ which are both active in a broad range of development activities in the area.

3. The study seeks to complement and quantify main aspects of the self-reliance strategies of the PTA and SADCC by projecting possible future trends and exploring options. In the case of PTA, the sectoral strategy contains three main stages:

(i) Backward integration, initially making use of billets and blooms from Zimbabwe in the national rolling mills for the manufacture of bars, rods, beams, channels, sections, etc.;

ii) The production of sponge iron (DRI) to feed electric arc-furnaces to produce billets for the rolling mills;

iii) Integrating rolling/electric arc-furnaces to iron making where demand justifies.

4. Several steps have already been taken in the implementation of the strategy. The latest breakthrough has been the conclusion of supply/purchase argreements between Zimbabwe and Kenya/Ethiopia. Examination of concrete technical options for upgrading, rehabilitation and harmonization of rolling mills have been made for some countries and will be continued. Important preparatory work is underway or planned in the fields of manpower development, metallurgical technology, and the production of sponge iron.

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1/ Members are Burundi, Comoros, Djibouti, Ethiopia, Kenya, Lesotho, Malawi, Mauritius, Rwanda, Somalia, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Angola, Botswana, Madagascar, Mozambique and Seychelles are potential members with status as observers.

2/ Members are Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe.

5. UNIDO has taken a keen interest in supporting the implementation of the sub-regional strategies and have been or will be involved in most of the activities mentioned above. This will take place within the framework of the Industrial Development Decade for Africa (IDDA). The present study should also be seen in that contex and takes into account the resolution adopted by the Seventh Conference of African Ministers of Industry on the implementation of IDDA. The resolution inter alia called for the preparation of a survey of African demand/supply requirements, especially in the strategic core industries and support areas as an input for the preparation of an Industrial Map of Africa.

6. The report is in two volumes. Volume I contains the main report and six annexes which give details and background information in the following fields; a general outline of the iron and steel sector (I); the present status of the industry in the sub-region (II); transport infrastructure and costs (III); iron and steelmaking resources of the sub-region (IV); indirect steel consumption (V) and methodology and assumptions (VI).

7. The main report is built up from these annexes and Volume II which contains all the detailed data material by country and a "users guide" to the tables. Chapter 2 of the main report contains a summary and conclusions of the study and Chapter 3 a general description of the sector with special emphasis on its relation to the engineering sector. Chapters 4 and 5 are the main chapters; the former gives a description of the current status of the industry in the sub-region and the latter an analysis of projections made for 1990 and 1995, focussing on the balance between demand and supply, requirements for additional production capacity and intertrade prospects. The analysis covers the basic iron and steel products as well as billets, crude steel and steelmaking metallics. Particular attention is given to the possibility of the production of Direct Reduced Iron (DRI) in one or more locations of the sub-region.

# Chapter 2
# SUMMARY AND MAIN CONCLUSIONS

## 2.1 Objectives

1. The main objective of this study is a systematic compilation of existing information on the supply and demand for basic steel products in PTA and SADCC in order to establish a factual and analytical framework that may be used as a basis for making decisions on sub-regional collaboration and co-ordination in the iron and steel sector. Recommendations were guided by the sectoral strategies outlined in in the Introduction (Chapter 1), involving prominently an emphasis on sub-regional self-sufficiency.

## 2.2 Definitions, methodology and data

2. The study focuses on demand and supply for a range of basic (rolled) steel products (bars, rods, angles, shapes, various types of plate, hoop, strip, rails and rail track material, wire and tubes). For these products, individual demand projections by country were developed for 1990 and 1995 using a linear regression method based on cross section data for the base period 1981-1983. The model assumes that differences between countries and changes over time in the consumption of basic steel products depend on variations in the explanatory variables; GDP, GDP per capita and a third variable[1/] depending on the type of product under analysis.

3. As there is considerable uncertainty regarding future (1990 and 1995) levels of the explanatory variables, three alternative projections ("high growth case", "base case" and "low growth case") were developed for each country. For each of these, two different assumptions were made about the degree of domestic replacement of imported goods with a steel content (and thus increased domestic demand for basic steel products) through an expansion of the domestic engineering industries ("main projection" and "projection with accelerated absorption"). As it would be impracticable to consider the resulting six alternatives throughout, the analysis is mainly built on the main projection base case. It is not implied however, that this alternative *a priori* is a much more likely one than the others.

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1/ Gross investment, manufacturing value added or value added in building and construction.

4. The reliability of the projections depend on the macro-economic assumptions made as well as the statistical quality of the coefficients estimated. Although indications are that the estimates are statistically acceptable, the large range of equally probable macro assumptions imply a large spread of projections. Technological innovations that are known to cause decreasing steel intensities in developed countries have not explicitly been taken into account.

5. An illustrative assumption was made about the structure and level of sub-regional production of basic steel items; It was assumed that the overall capacity utilization of existing rolling plant, being less than 25 per cent in the base period, would increase to 70 per cent in 1990 and 80-90 per cent in 1995. Firmly planned new capacity was assumed to operate at similar rates of utilization. On the basis of the demand/supply balance as arrived at above it was possible to consider the need for addtional capacities both at the level of basic steel products and at the various upstream levels (billet making, crude steel, and metallic inputs for steelmaking, e.g. scrap and direct reduced iron (DRI)).

6. Data had to be compiled from verious sources, the main one being national data obtained through study missions to 17 of the 20 countries in the sub-region. These data were complemented with trade and industry data derived from the UN statistical office and the UNIDO data bank.

7. Data storage, preparation of projections and printing of the country tables contained in Volume II have been done through an integrated system of computer data files and programmes. Assuming compatibility with regard to hardware and software, the system could be transferred to the PTA/SADCC secretariats. It would then consitute a framework for continuous monitoring and ad hoc analyses of the state of the iron and steel sector in the sub-region. Particularly, it would lend itself to the analysis of various national plans and policies in a sub-regional perspective.

### 2.3 Present production and consumption

8. In terms of crude steel equivalents, the 1981-83 sub-regional consumption was 1.2 million tpy of which 0.8 tpy had to be imported because of low capacity utilization of existing plant and a production profile ill-

matched to the profile of consumption. Per capita steel consumption, 7.8 kg per annum is exceedingly low, e.g. only 10 per cent of Latin American and 20 per cent of Asian consumption. There are however great differences in national per capita consumption levels; Zimbabwe's consumption is presently at the same level as some Latin American countries. On the other hand, Ethiopia, Somalia, Mozambique and Uganda have very low per capita consumption.

9. The basic steelmaking materials are all found in the region. Iron ore reserves of which Zimbabwe and Angola have the major share (59 per cent of total) amounts to at least 6,344 million tonnes for the region as a whole. Coal resources amount to 54,600 million tonnes (51 per cent in Zimbabwe). Commercial exploitation is at an infant stage. Only Zimbabwe produces coke but cokable coal occurs also in Mozambique and Swaziland. Careful evaluation would be needed to determine whether and how any particuler source would be useable for DRI processes. Alloying minerals are also found in large quantitites; Zimbabwe has 86 per cent of the world's reserves of high chrome ore. Refractory materials of high quality are found in the sub-region. Fluxing minerals are also found in abundant quantities.

10. Both production and consumption of steel is unevenly spread throughout the region; Kenya and Zimbabwe in 1981-83 stood for 68 per cent of sub-regional steel consumption but only 17 per cent of population. Zimbabwe has 81 per cent of the region's crude steelmaking capacity. The SADCC countries as a whole with some 40 per cent of population and 50 per cent of total GDP has 60 per cent of total steel consumption and nearly 90 per cent of steel production capacity.

## 2.4 Conclusions for future sub-regional development

### Projected consumption for basic steel products

11. Consumption projections showed wide variations between the different alternatives. For the sub-region as a whole, the 1.2 million tpy consumption in 1981-83 would increase to 3.13 million tpy in the highest alternative and 1.71 million tpy in the lowest. The base case indicates a consumption of 1.7 million tpy in 1990 and 2.2 million tpy in 1995 meaning a growth rate per annum of 4.3 per cent from 1981-83 to 1990 and 5.8 per cent from 1990 to 1995 which is considerably above the forecast

growth of population and GDP. The projections also strongly indicate a change in the structure of consumption with the emphasis shifting away from bars, rods and angles towards plate and sheet items.

Rolling capacity

12. Rolling capacity (existing and planned) for the basic, non flat steel products (bars, rods, light and medium angles and shapes) appear on main base case demand projections to be sufficient up to 1995, even when assuming the same level of extra regional exports as in the base period. The main challenge in this product range is to increase capacity utilization from the current 25 per cent to the region of 70 per cent by 1990 and beyond by 1995. If this is done, current national plans for capacity expansion appear very sensible giving a good market balance for the above mentioned products with some sub-regional export to non producers from Zimbabwe, Kenya and Mauritius. The study thus re-confirms the appropriateness of the urgent attention of both individual countries and the sub-regional organizations to capacity utilization and rehabilitation.

13. A major reason for low capacity utilization is the generally rundown condition of most steel plant equipment. Studies of mill deficiencies completed indicate a whole range of improvements needed. (Introduction of continuous casting, better process monitoring, reduction of heat losses, improvements in powering of roughing stands, roll calibration and roll cooling). In general, the major process units now in operation are at least ten years old, having been installed in the 1960s or early 1970s. For some mills the cost of rehabilitation to reach a high fraction of design capacity could come close to the price of a new mill. Most of the steel plants in the region are government owned or controlled. Only in Kenya, Mauritius and Madagascar are plants generally privately owned.

14. Improvement in capacity utilization may bring net import requirement down from the present two-thirds to around 40 per cent in 1995 but for further increase of sub-regional self-sufficiency in basic steel, the production of plate and sheet in the region is imperative. All these products are presently imported, whereas aggregate demand appears sufficient to justify low capacity techniques for plate production. By 1990, if base case projections hold and it is feasible to produce all plate and sheet

items consumed, demand in both Kenya and Zimbabwe would be sufficient for production units based on local plate demand. If in addition sufficient relatively small amounts of heavy angles and rails, wire and tube and special steels could be produced, full sub-regional self-sufficiency could be achieved before 1995.

Billet making

15. The need for new billet making capacity would depend on the capacity utilization of existing and planned rolling mills and billet producing plant. A major factor would also be whether or not the substantial amount of billets presently exported from Zimbabwe would be available for covering sub-regional demand. The recently concluded (PTA promoted) supply/purchase agreements between Zimbabwe and Kenya and Ethiopia indicate that present market conditions are in favour of Zimbabwe increasing its deliveries to the region. Future changes in market prices and profitability for billet production, Zimbabwe's own use of billets for special steel products and its need for foreign exchange earning exports will determine the continuation of the export in the longer run. Base case projections indicate a sub- regional billet deficit at some 100,000 tonnes by 1995 which if 250,000 tpy of billets were exported overseas from Zimbabwe would increase to 360,000 tpy. Even though the low growth projections indicate no need for extra capacity, the probability of higher than base case growth makes it difficult not to conclude that substantial additional billet capacity may be needed between 1990 and 1995.

Crude steel

16. Given the forecast substantial increase in demand for basic steel products, it will be the sub-regional bottlenecks in steel rolling and semis (billets, slabs) production which will determine the demand for crude steel. Two major factors in this regard are the possibility of plate and sheet production and the possibility of overseas exports from the region (most likely from Zimbabwe). If no extra capacity other than what is planned at present is assumed and Zimbabwe does not export billets overseas, there would be no need for extra production capacity in crude steel. If plate production and/or Zimbabwean billet export is assumed the need for additional crude steel capacity would be upwards of 250,000 tpy. If all upstream capacity bottlenecks were removed, the crude steel output needed could by 1995 increase to over 3 million tpy, more than three times the capacity envisaged in that year.

Demand for steelmaking metallics

17. The metallics demand can be derived from the required crude steel production. Since Zimbabwe would most likely remain self-sufficient in steelmaking metallics only the metallics demand of the sub-region ex-Zimbabwe was considered. Even when using the lowest demand alternative implying that the crude steel capacity presently planned for 1995 would be underused by more than 30 per cent, an additional requirement for 200,000 tpy of steelmaking metallics would arise.

DRI production

18. Coverage of such a deficit by production of DRI in the region is considered feasible. Considering the rather low demand indicated by the lowest growth alternative, the SL/RN production process would appear the most suitable although the method does suffer from technical and operational handicaps that deserve fuller analysis before a decision is taken.

19. A consideration of the most suitable location alternatives for DRI plants gave no firm conclusions and further technical investigation is needed. Possible locations in Mozambique and Tanzania were highlighted, both based on a revival of projects formerly considered.

Scrap availability

20. All steel producing units in the sub-region except ZISCO in Zimbabwe use ferrous scrap as their main input. Even if DRI in adequate quantitites can be supplied in future, present electric arc furnances in the region does not allow more than approximately 65 per cent DRI metallic feedstock. The additional 35 per cent would most likely have to be scrap. Even if scrap availability is assumed to increase by 5 per cent per annum, this could only satisfy the lowest forecast for total metallics demand on a 35/65 basis. Estimates of scrap availabibility compared to present and potentially required use strongly confirms the popular opionion that the sub-region is running out of scrap. Therefore the likelihood is that improvements in gathering and processing practices as well as utilization of new sources would be necessary if increased scrap imports was to be avoided. Such improvements could consist in:

a) Setting up collection and processing systems

b) Giving various incentives for scrap utilization to local melt shops

c) Promote inter-regional trade in scrap

d) Expand the shipbreaking operations now taking place in Mauritius and Kenya.

Availability of other raw materials

21. Several intermediate products of critical importance are imported. As capacity underutilization were found in part to be due to the lack of such materials it would be important in the short-term to devise strategies for ensuring a reliable supply of imported intermediates and in the longer term to produce them in the sub-region.

22. Refractory materials of high quality are also available in the region. The production of refractories is hampered by small national markets but would represent a good opportunity for production if seen in a sub-regional context.

Sub-regional trade in steel

23. The scope for sub-regional trade in steel will depend much on whether plate production will take place and the extent to which billets are supplied from Zimbabwe to the rest of the sub-region. If production for sub-regional consumption remain limited to present products, trade patterns will largely be as at present. If plate production covering only half of sub regional demand is started by 1995, intertrade flows in basic steel products would at least increase by a factor of 5. If projected regional demand for billets in 1995 was covered as far as possible by Zimbabwean exports it would mean a 6-7 fold increase in the volume of billet trade.

24. Production costs and prices (using official exhcange rates for conversion of local currency amounts) for the scrap based mills appear to vary considerably between the countries of the sub region and is indicative of the prevalence of captive (non competitive) markets. Production costs calculated in a realistic (illustrative) example appear to imply that several producers might be able to cut costs substantially. Also, if domestic production costs are compared with import prices for European/US steel it is indicated that the rationale for local production may be not so much total cost saving but rather the saving of foreign exchange. This is so even though the foreign exchange cost component may be as high as 50 per cent

25. Zimbabwe steel seems however to be price competitive for most destinations in the region, given that ZISCO can produce at ex-factory costs comparable to those of overseas producers.

26. Apart from cutting production costs, the sub-region's competitiveness vis a vis external steel producers can be increased by reducing the price of local (sub-regional) steel delivered to the consumer and exploiting the particular advantages to consumers of having a sub-regional supplier:

a) Lead times in delivery can be reduced, also reducing the financial burdens of the credit pipeline;

b) Increasing accuracy of deliveries according to speficiation;

c) Reducing transport costs by looking into new transport routes, the scope for intermediate warehousing, and negotiation of global transport agreements with overalnd transporters and maritime shipping companies;

d) Building of long term business connections and rendering technical support services;

e) Improve product quality.

The role of Zimbabwe

27. Zimbabwe's advanced position in the sub-region, both in steel production and in engineering, should be consciously used for the advancement of the region. Zimbabwe would in turn benefit from growth and development in the surrounding economies. Whereas Zimbabwe's decisions in substantial part must be based on its self-interest, it is of paramount importance that the country plans sectoral investment and production in conjunction with the other countries in the sub-region. In a sub-regional context Zimbabwe would seem the natural potential supplier of special steels, high alloy products and new products like plate and sheet where a relatively high technological level is required.

Planning and co-operation

28. Even when combined, the 20 national markets constitute, in terms of GDP, a market only the size of a small European country like Denmark. It is therefore urgently necessary for a start in developing a regional steel industry that all 20 countries co-operate. This study consequently does not aim to present separate conclusions for SADCC and PTA, although the analysis gives separate figures for the two groupings. The good working relations between the two overlapping sub-regional groupings PTA and SADCC in the iron and steel sector must be further strengthened as well

as consultation and co-ordination mechanisms for sectoral development between all 20 countries. For the purpose of transport and trading systems it may however prove appropriate to divide the region operationally into sub-entities, e g. a northern and a southern area.

29. Demand projections are sensititve to assumptions made about macro economic development and the progress of the engineering sector. The considerable spread between likely alternatives as to future steel consumption leads to a problem of uncertainty. The degree of uncertainty is however affected by the development approach chosen:
Firstly, the production of basic steel is one element in a series of linked industries. Upstream industries deal with the production of billets and crude steel, ironmaking and mining processes. Downstream industries are those which further process the basic products and incorporate basic steel into final goods. In the study, considerable emphasis is placed on the fact that the growth of the engineering sector is most important for basic steel demand. It is argued that the pull effect of the engineering industry is required to create demand for rolled products, and that the often assumed push effect on engineering by local steel production has played a minor role. The lower investment cost, higher employment potential and the crucial role of local engineering capacity in the development of the whole manufacturing sector are other reasons why the development of engineering should be seen as a precedent for the development of an iron and steel industry rooted in sub-regional demand. Also, the proven existence of such demand would play a decisive role for international and bilateral financing institutions whose support would most probably be required for establishing new upstream production facilities. Both sub-regional groupings at present have launched studies in this field which should form the basis for an added emphasis on the promotion of engineering in a sub-regional framework.

Secondly, in the steel sector proper an integrated planning approach should be used, taking fully into consideration the interplay between the various links in the production chain (rolling, billet making, crude steel, steelmaking inputs). Most importantly, the planning and development of upstream capacity would seem to be crucially dependent on whether or not plate and sheet capacity is installed, and clarification on this level should be sought at an early stage.

Thirdly, by building up the production system, to the extent technically possible, in smaller rather than larger steps, the probability of waste implied in over-planning can be reduced. Should, on the other hand unexpected sub-regional steel deficits appear over the next decade, the likelihood is that they can be easily made up for by cheap imports from overseas.

30. In seeking external finance for sectoral development both nationally and sub-regionally arguments will be strengthened by considering projects in a sub-regional framework and as part of a well conceived sub-regional investment programme based on the sub-regional strategies. The present study could be considered as an input to such a programme in confirming the correctness of prevailing strategies and pointing out some directions for further investigations.

Chapter 3

## THE IRON AND STEEL SECTOR, DEFINITION AND CHARACTERISTICS

1. The iron and steel production sector can most appropriately be defined by referring to the International Standard Industrial Classification (ISIC) which classifies the sector under the Major Division No.3, Manufacturing, in Division 37, Basic Metal Industries, as major Group 371, Iron and Steel Basic Industries. This sector is defined as follows:

2. "The manufacture of primary iron and steel products, consists of all processes from smelting in blast furnaces to the semi-finished stage in rolling mills and foundries, that is, the production of billets, blooms, slabs or bars; hot and cold rolling and drawing into basic forms such as sheets, tin-plate, terne plate and black-plate, strips, tubes and pipes, rails, rods, and wire rods and heavy gauze wires, castings and forgings. Establishments primarily engaged in manufacturing of ferrous wire and wire products from purchased rods are classified in group 3819 (Manufacture of fabricated metal products except machinery and equipment n.e.c.). The foundries included here are part of establishments primarily engaged in producing and rolling of iron and steel or are primarily engaged in manufacturing castings and forgings for sale to others. Foundries in establishments primarily engaged in the manufacture, e.g., stamping, pressing, machining, assembling of a given class of goods, are included in the group to which the parent establishment is classified. Also included are coke ovens, which are associated with blast furnaces and which can be separately reported coke ovens which can be separately reported are classified in group 3540 (Manufacture of miscellaneous products of petroleum and coal)."

3. This study covers the iron and steel basic industries by concentrating on the supply and demand for basic rolled products and then considering the derived implications for prior stages of the production chain. The foundry sub sector which has different economic and technological characteristics is not included in this study. The forging industry hardly exists in the sub region and should, owing to its scope of production, be treated in an analysis of downstream industries.

4. Being one stage of the production chain, the rolling of basic products is linked to other industries. Upstream industries are iron and steel production, production of 'semis', billets, slabs, mining and preparation of raw materials, additives to iron production such as limestone or, in the case of production of special steels, other metals like vanadium, chromium, nickel, titanium or aluminimum, and energy carriers and reducing agents. The production of refractories used in iron and steel making should likewise be mentioned in this context. Downstream industries are the construction and engineering industries. Construction normally uses the steel products as supplied by the steel producer after cutting to appropriate sizes, sometimes bending and joining them adequately. Engineering industries transform the steel products purchased from steel producers into new and mostly complex products such as fabricated metal products, machinery, electrical and transport equipment as well as scientific, measuring and controlling instruments. Steel usually represents the most important raw material for the engineering industries. Exceptions from this are the production of electrical equipment (e.g. electronics, telecommunications equipment) and scientific measuring and controlling instruments.

5. Engineering industries produce both capital goods (i.e. machinery and equipment to produce other goods or services) and consumer durables (e.g. motorcars, refrigerators, radios and television sets).

6. They are classified under ISIC 38 and are sub-divided into five major groups:[1/]

- Manufacture of cutlery, hand tools and general hardware (ISIC 381)
- Manufacture of engines and turbines (ISIC 382)
- Manufacture of electrical machinery, apparatus, appliances and supplies (ISIC 383)
- Manufacture of transport equipment (ISIC 384)
- Manufacture of professional and scientific, measuring and controlling equipment not elsewhere classified, and of photographic and optical goods (ISIC 385).

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1/ Each of these major groups is sub-divided into several sub-groups which are described in Annex I. For more details reference is made to the UN publication, "International Standard Industrial Classification", New York, 1968.

7. Engineering industries have played an important role in the economic advancement of all industrialized countries and also of newly industrialized countries such as the Republic of Korea, Singapore and Brazil. The sector's share in manufacturing value added is around 40 to 50 per cent in industrialized countries (on the average) and around 28 to 35 per cent in newly industrialized countries (Singapore: 50 per cent). Engineering industries have played and play a catalytic role in technological innovation. In the past these technological innovations have stimulated the steel sector, both in expansion of its volume and in development of new steel products such as alloy steels for special applications.

8. The present wave of technological innovations is, however, combined with a reduction in steel consumption of the engineering industries. This process is quite complex, but in general terms it can be said that present technological innovation within the engineering industries takes place in areas with low links to the steel industry, like micro-electronics. Also, innovations appear to promote a process where steel is substituted by new materials glass and carbon fibres and high durable plastics, which for example partially have replaced steel in the production of pumps. Technological innovation has also led to a reduction of specific steel requirements per unit output. Hence, the iron and steel industry gradually loses its predominant supply position for the engineering industries and, overall, new steel products are of less vital importance to technological innovation in the engineering industry. This does not mean, however, that technological innovation in steel production and application as well as development of new steel products will not be of importance in the future. At present, technological innovation in the iron and steel sector is however, economically less important than the one of non-steel related areas of the engineering industries.

9. The technological innovation referred to will, however, over the next decade have a less pronounced effect on the sub-region where engineering is generally not highly developed. Looking at the history of more developed countries one main driving force for steel demand have been the engineering industries. The demand of increasingly diversified

engineering industries allowed the production of a great variety of steel products. It was mainly the "pull-effect" of this sector which led to the importance of the steel industry. The "push-effect", i.e. the expansion of engineering because of an expanding steel production has played a minor role. Even though both sectors depend heavily on each other it can be said generally that steel consumption is boosted by an active and growing engineering industry. Engineering development, on the other hand, does not necessarily require a national basic iron and steel industry. There are examples of industrialized or newly industrialized countries (e.g. Switzerland, Denmark, Singapore) which have little or no basic iron and steel industry but a highly diversified engineering sector which obtains its steel supplies from other countries.

10. Other factors also explain why a strategy of early concentration on the development of a strong engineering sector more and more is being recommended; The iron and steel sector requires high investments both in absolute terms and per employee. In most engineering industries investments are considerably lower, especially in ISIC major group 381, fabricated metal products. Therefore, development planning in many developing countries puts strong emphasis on the development of the engineering industries and similar industries with relatively low investment and a high potential of employment creation and entrepreneurship development, especially by promoting small scale industries. Decisive factors for entering into high investment areas are normally import substitution combined with foreign exchange generation through exports. Local supply aspects alone are considered insufficient by development planners. The massive requirement of skilled manpower at a fixed date, i.e. the start up of major investment project like an iron and steel plant, which hardly can be made available in many developing countries also represents an obstacle to successful implementation of such ventures.

11. The sub-regional groupings, PTA and SADCC have recognized the importance of the engineering sector. Studies of the sector are now underway or completed. These should form the basis for an added emphasis on the promotion of this sector in a sub-regional framework and with appropriate links to the plans for the iron and steel industry.

12. In the iron and steel production itself, distinction is made between different steps of production (for details see Annex I). The steps are:

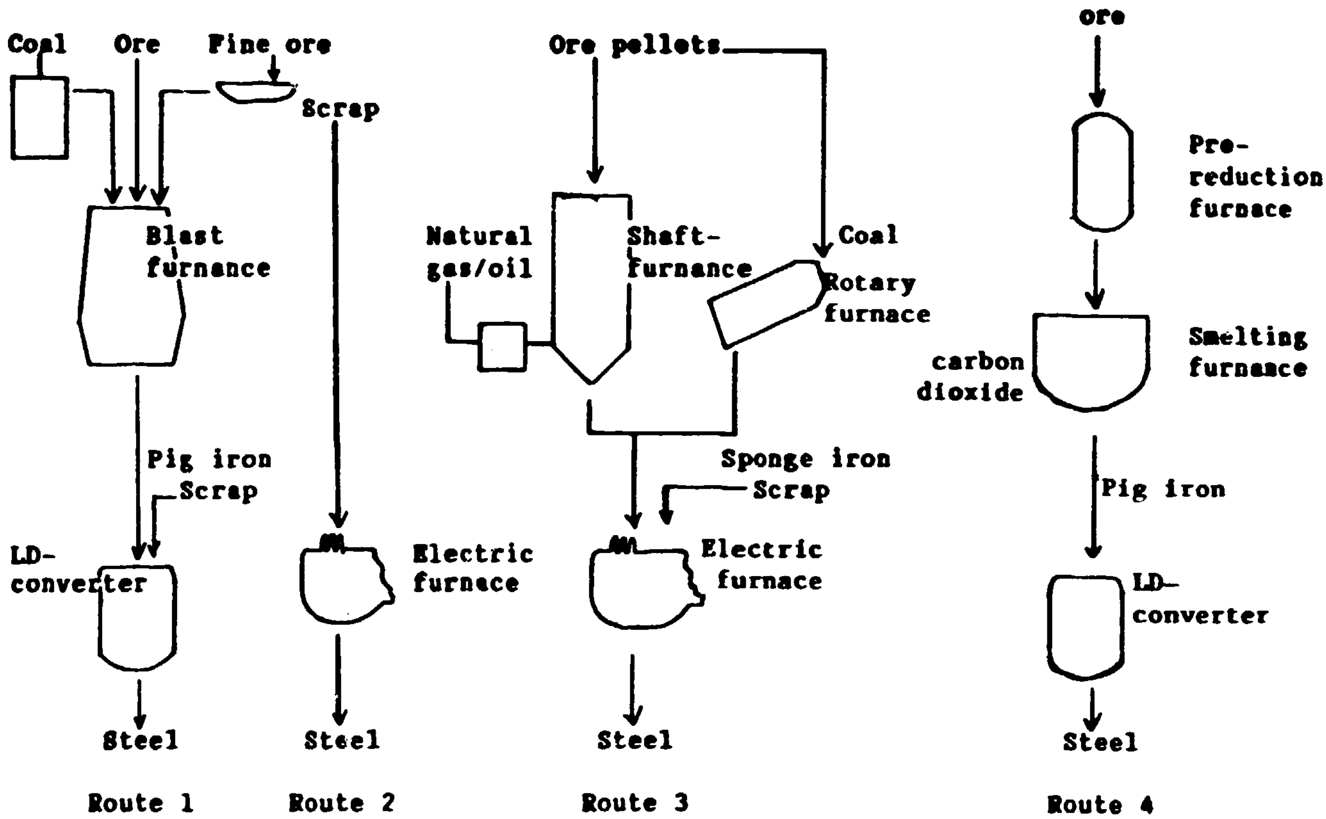
- mining and preparation of raw materials
- iron production
- steel production (semis)
- rolling of products
- coating of rolled products

13. There are at present four routes for steelmaking (see figure 3.1). Route 1 is the traditional blast furnace oxygen converter (BF-BOF) also known as an integrated steel plant; route 2 is based on scrap and/or direct reduced iron (DRI) for steelmaking in an electric arc furnace (EAF), route 3 is the DRI and electric arc furnace (EAF) process; and route 4, at present at the development stage, the smelting reduction process. Of economic interest are at present routes 1, 2 and 3 of which 1 and 3 are iron and steelmaking processes and 2 is only a steelmaking process. Route 1 requires relatively high investments and has a considerably higher minimum capacity than route 2 or 3. In each case, rolling of steel is the subsequent production step.

14. In rolling operations, distinction is made between rolling of flat products and rolling of shapes (cf. figures A.I.6 and A.I.7 of Annex I). Material input for the rolling of flat products are slabs and blooms. Rolling of shapes is subdivided into heavy sections for which the material inputs are blooms, and light shapes which are rolled from billets. Flat products consist of plates for example in ship-building and construction of containers and storage tanks, hot rolled sheets as used for lighter engineering works, and cold rolled sheet.

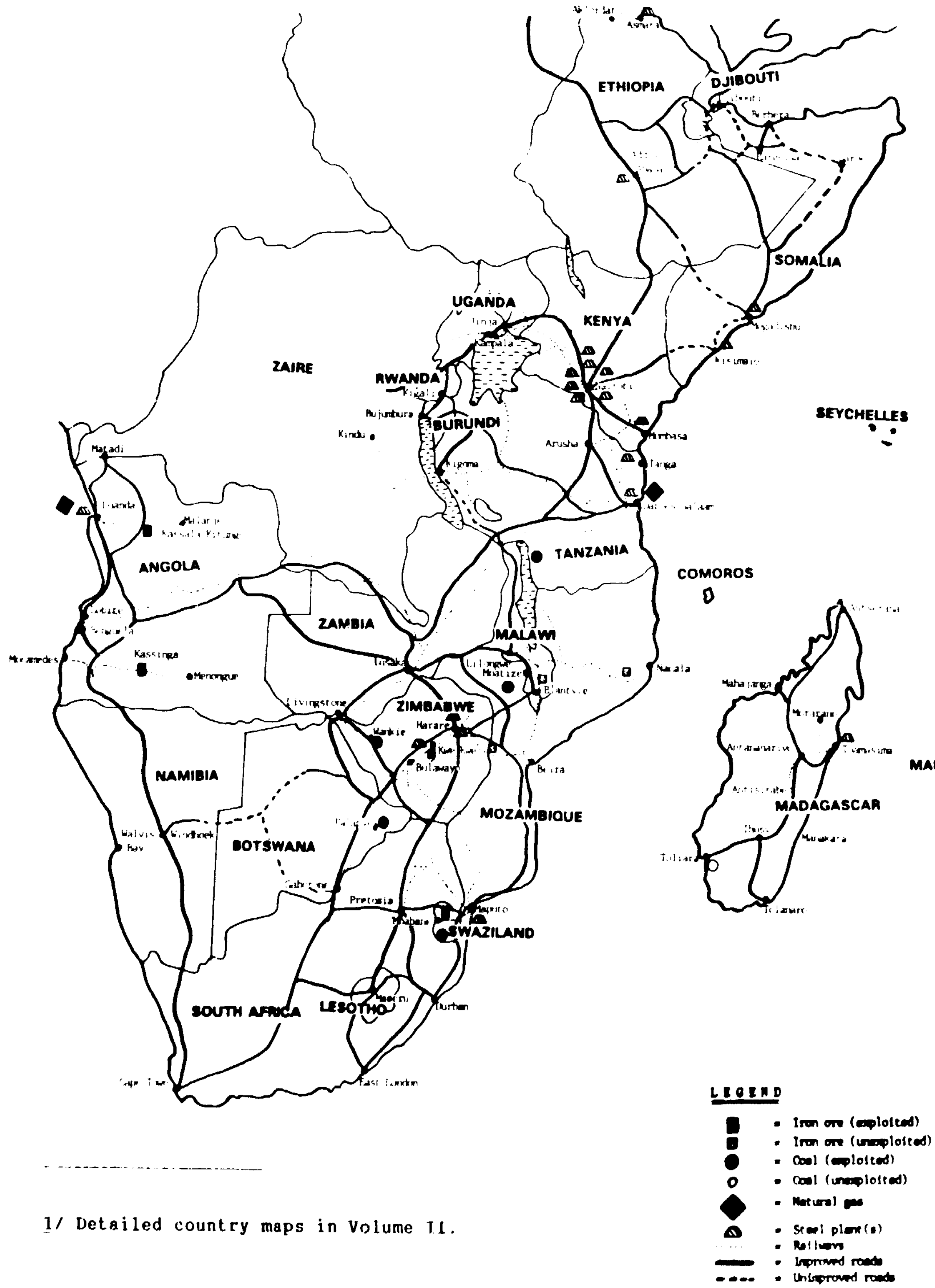
15. The future growth in the iron and steel industry in the sub- region will much depend on the growth of the construction sector and the development of the engineering industries. While the construction sector growth will mainly influence the development prospects of the products already rolled in the region, the engineering industry development will be essential for a diversification of the rolling mills into new products such as rolling of forged shapes and of flat products. The "pull-effect" to steel

Figure 3.1: Possible routes for steel production




consumption of the engineering industries is required to create the demand for new rolled products. The proven existence of such demand plays a decisive role for international and bilateral financing institutions whose support would most probably be required for establishing new facilities. Hence, future growth of the iron and steel industry, especially as to diversification into new rolled products, will above all depend on the development of the engineering industries.

Map of the subregion[1/]




1/ Detailed country maps in Volume II.

# Chapter 4

# THE IRON AND STEEL INDUSTRY IN THE PTA/SADCC SUB-REGION

## 4.1 Geographical distribution, production capacity and ownership pattern

1. As of the fourth quarter of 1985, there were 23 steel plants in nine countries in the Eastern and Southern African sub-region.[1/] In numerical terms, Kenya had the highest concentration of steel mills (8, of which 7 were in and around Nairobi), with Mauritius accounting for 4, three in Zimbabwe, and two each in Tanzania and Ethiopia (although the latter's Ethiosider Iron and Steel Foundry in Asmara has been inoperative for the past few years). The remaining steel mills were in Angola, Madagascar, Mozambique and Uganda. (See Annex II, Table A.II.1).

2. The sub-region's largest and only integrated steelworks is that of the Zimbabwe Iron and Steel Company, Ltd., (ZISCO), at Redcliff, which is equipped with blast furnaces and oxygen converters, and has a realistic steel production capacity of 850,000 tonnes per year (tpy). Eight other plants in the sub-region would fit the definition of "mini-mills" in the sense that they operate scrap-based meltshops for producing billets and/or ingots as well as rolling mills for producing simple bars, shapes, and sections. The balance of the sub-region's mills are either meltshops producing billets or ingots for their sister-companies or other rolling mills, or pure rolling mills based on local and/or imported billets.

3. The sub-region's aggregate (liquid) steelmaking design capacity was in the base period (1981-83) 1.0191 million tpy,[2/] 850,000 tonnes (81 per cent) of which was contributed by ZISCO. Kenya, the second ranking steel producer, was responsible for 85,100 tpy.

4. Because 12 steel plants in the sub-region are only re-rollers and because of the general tendency on the part of mini mills to build rolling capability in excess of what can be fed from their own billet/ingot

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1/ By definition, a steel plant or mill refers to a facility that performs one or both of the following operations: (a) melts ferrous metallic raw materials in a furnace for casting into billets, blooms, slabs, or ingots (the so called "semis") for subsequent processing by a rolling mill. Foundries are thus not included: (b) rolls "semis" into finished mill products such as bars, sections, sheets, etc.

2/ Refer to table A.II.1. Rolmil Kenya and Ethiopia's Asmara plant capacities not included.

capacity, the aggregate sub-regional steel rolling capacity of 1.61 million tonnes exceeds the steelmaking capacity by 57 per cent. In other words, if steel mills and rollers operated at maximum capacities, the sub-region would stand in need of billet/ingot importation to the tune of about 50 per cent of its local production capacity.

5. The ownership of the sub-regional steel industry reflects the ideological outlook and philosophies of the various governments in the sub-region regarding how best to harness the claimed catalytic effect of the industry in economic and industrial development. In those countries where the steel industry is perceived to be so critical that it must be under the direct control of the governments, all steel plants are government-owned, operating as parastatals under a supervising ministry. Such is the case in Angola, Ethiopia, Mozambique, Uganda, Tanzania, and Zimbabwe, although in the last two countries, there is minority private participation.

6. In contrast, all steel plants in Kenya, Mauritius, and Madagascar are privately-owned. A feature of these privately-held enterprises is that their owners and the top echelons of their management are generally expatriates. Whereas expatriate ownership may not necessarily be incompatible with the policies of the governments to attract foreign investment into the industry, expatriate dominance over technical and managerial issues may not augur well for the indigenization and long-term self-reliance of the industry. What is called for is a sustained effort at attracting indigenous investment and qualified high-level manpower (especially technical) coupled with skills up-grading programmes at all levels.

## 4.2 Sub-regional production and capacity utilization

7. Data gathered in the course of country missions show a downward trend in the subregional production of the basic (rolled) steel products included in the study. This is the case for both PTA and SADCC. Non-availability of raw and input materials, political conflicts in the sub-region, and poor equipment rehabilitation and maintenance have contributed towards this decline. For the PTA as a whole, aggregate production of basic products was about 401,000 tonnes in 1981, 372,000 tonnes in 1982, and 361,000 tonnes in 1983. The distribution by country is shown in Table 4.1.

Table 4.1: Sub-regional production of basic (rolled) steel[1/]
(metric tonnes)

| Country | 1981 | 1982 | 1983 |
|---|---|---|---|
| Angola | 2,670 | 1,670 | 2,330 |
| Ethiopia | 14,540 | 16,109 | 17,668 |
| Kenya | 54,670 | 62,100 | 53,495 |
| Mauritius | 8,949 | 8,899 | 9,000 |
| Mozambique | 12,700 | 8,500 | 8,000 |
| Tanzania | 16,273 | 13,352 | 12,424 |
| Uganda | 5,000 | 10,000 | 15,000 |
| Zimbabwe | 286,004 | 251,293 | 243,360 |
| Total PTA | 400,806 | 371,923 | 361,277 |
| Total SADCC | 317,647 | 274,815 | 266,114 |

1/ Note that Zimbabwe's production of billets is not included

8. Given the sub-regional aggregate rolling mill design capacity of 1.61 million tpy, these figures represent an overall sub-regional capacity utilization of 25 per cent in 1982, which declined to 23 per cent in 1983, and to 22 per cent in 1983. Circumstantial information indicate a similar development for following years.

9. Zimbabwe's predominance is highlighted by the fact that its shares of the sub-regional output were 71.4 per cent in 1981, 67.5 per cent in 1982, and 67.3 per cent in 1983. The decline in Zimbabwe's production, mostly due to shutdown because of blast furnace relining was the major cause of decline.

4.3 Sub-regional trade in steel

10. The steel industry's product mix consists of blooms and billets (for further rolling) as well as "long" products for the construction and engineering industries, in the form of bars (round, square, and flat, plain and twisted), rods (for wire production), and light and medium sections (angles, channels, beams, and light rails). There is no facility for production of "flat" sheets, strips and plates, and the sub-region's demand for this category of steel mill products is supplied through imports.

11. With the exception of Zimbabwe and to some extent Kenya, none of the countries of the sub-region participate regularly in the steel export trade, whether within or outside the PTA. Table 4.2 shows intra PTA steel trade flows of some regularity as an average for 1981-83. Zimbabwe's export to both SADCC and non- SADCC countries is bigger than that of Kenya. The greater part of Zimbabwe's inter region exports goes

to SADCC members whereas Kenya's export is largely concentrated on non-SADCC members of the sub-region. The absolute quantity of steel traded within PTA is small both in the context of Zimbabwe's total exports and the sub-region's total imports of steel from all sources. The prospects clearly exist for an exploitation of the sub-regional market by producers in the region, in the near term, particularly Zimbabwe. Zimbabwe exported in addition to the quantities shown in Table 4.2 as an average for 1981-83 about 90,000 tonnes of basic steel products outside the sub-region. The larger part of its steel exports are, however, in the form of low-margin (semi processed) blooms and billets of which 208,000 tonnes were exported, in 1981. Only 10 per cent of this went to countries in the sub-region. High transportation cost for delivering steel to the overseas customers tends to make Zimbabwean product less competitive on the world market, a situation that cuts into potential profit margins. In the medium and long-term, and in the interest of maximizing profits from the export trade, it would be in Zimbabwe's interest (as the leading steel producer in the sub-region) to re-orient its product mix in favour of more sophisticated and higher-margin flat and high-alloy products, for which there are currently no producers in the sub-region.

Table 4.2: Regular trade in steel products within PTA and SADCC, 1981-1983
(tonnes)

| | | Exports from Kenya to | | | Exports from Zimbabwe to | | | Total intra PTA exports to | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Product name | SITC | SADCC | Non SADCC | All PTA | SADCC | Non SADCC | All PTA | SADCC | Non SADCC | All PTA |
| Bars and rods | 6732 | 249 | 1887 | 2136 | 4486 | 7388 | 11874 | 4735 | 9275 | 14010 |
| Angles shp, hm | 6734 | | | | 1815 | 398 | 2212 | 1815 | 398 | 2212 |
| Angles shp, l | 6735 | 87 | 865 | 952 | 346 | 76 | 422 | 434 | 941 | 1375 |
| Plates, heavy | 6741 | | | | | | | | | |
| Plates, medium | 6742 | | | | | | | | | |
| Plates, light | 6743 | | | | | | | | | |
| Tinplate | 6747 | | | | | | | | | |
| Other coat, p | 6748 | 79 | 867 | 947 | | | | 79 | 867 | 947 |
| Hoop and strip | 6750 | | | | | | | | | |
| Rails | 6761 | | | | 614 | | 614 | 614 | | 614 |
| Other rl track | 6762 | | | | 111 | | 111 | 111 | | 111 |
| Wire | 6770 | 9 | 780 | 789 | 757 | 0 | 757 | 766 | 780 | 1546 |
| Seamless tubes | 6782 | | 0 | 0 | 655 | | 655 | 655 | | 655 |
| Welded tubes | 6783 | 8 | 453 | 461 | | | | 8 | 453 | 461 |
| Total | | 433 | 4852 | 5285 | 8785 | 7862 | 16646 | 9217 | 12714 | 21931 |

4.4 Condition of capital equipment

12. The under utilization of installed steelmaking and rolling equipment in the sub-region is due, in part to such factors as non availability of raw and input materials, poor maintenance and obsolescence of plant and equipment, and inadequacy of skilled manpower. The high incidence of equipment down-time is also attributable to the fact that virtually all plant equipment, as well as spare parts are imported.

13. The generally run-down condition of most steel plant equipment has prompted studies of possible rehabilitation programmes on a sub-regional basis. Several regional and international organizations such as ECA, the Commonwealth Secretariat and UNIDO have been involved, technical expertise having been provided in part by ZISCOSTEEL. Among the more specific technical deficiencies identified so far and which require rectification are the following:

- the continued production in many plants of largely out-moded "pencil ingots" as opposed to the more modern continuous casting of billets which, in addition to enhancing productivity and metal yield, after results in improved product quality;

- the general inadequacy of instrumentation for process monitoring and control, particularly in relation to reheating furnace temperature profiles and liquid steel chemical analysis and temperature;

- thermal inefficiencies and substantial heat losses in the oil-fired reheat furnaces; furnace performances could be significantly improved in most cases by heat recuperation and installation of more efficient burners;

- under powered roughing stands which severely limit the size of billets that can be handled;

- improper roll calibration resulting in poor dimensional control of the finished product;

- inadequate roll cooling facilities. Implementation of these and other corrective measures could result in increased productivity and less equipment down time. As at present, the labour productivity in the sub-region, measured in terms of steel tonnage output per man year, is only a small percentage of the internationally accepted norms, and it is important to significantly improve the situation if products from the sub-region are to be cost-competitive.

14. Following this diagnosis, remedial measures would be taken in the general interest of the sub-region's steel industry. With general improvements in the national economies and therefore in the demand for steel mill products, avenues would be created for export of Zimbabwean billets, pig iron, and wire rods to foundries, re rollers and wire products manufacturers in the sub region, which would, in turn assist ZISCO to reduce the degree of its dependence on the extra regional export market.

4.5 Production cost and product prices

15. The production cost of rolled steel products varies between countries in the sub-region, and even between steel plants in the same country, depending on the relative accessibility to and delivered prices of raw materials, the specific unit operations employed, labour productivity, and the level of capacity utilization, among other factors. Accordingly, generalizations must be made with great caution.

16. Notwithstanding these variabilities, it is instructive to synthesize an indicative production cost for rolled products of the types manufactured by the mini-mills in the sub-region. It is assumed that the scrap-based EAF process is employed and that crude steel is continuously cast into billets and rolled into bars and simple shapes. The total project capital cost is taken as $875 per ton of installed capacity, based on a recent quotation for a 25,000 tonnes/year (crude steel) capacity mini-mill in the sub-region.

17. Table 4.3 shows an itemization of the various cost elements incurred to produce a tonne of product. This amounts to $393.50, of which one-third is accounted for by capital-related charges. Other major cost contributors are scrap (20 per cent), electricity (9.5 per cent), electrodes and ferro-alloys 9 per cent), and salaries and wages (8.4 per cent). Estimates have also been made of the foreign exchange proportions of the various cost elements. This shows that up to 46 per cent of the effective production cost could be incurred in foreign currency. This observation is important in that it points out the inadequacy of the popular simplistic assumption that the foreign exchange saving achieved by local manufacturing is merely the foreign exchange equivalent of the same units of imports.

18. As with production costs, the prices for rolled products vary widely within the sub-region and often reflect the short-term supply/demand balance of the steel market. Also, because of the large number of small-lot sales, there is an important role for "middle men" retailers who often exploit temporary shortages by escalating prices. For instance, whereas a major importer in Lusaka could offer reinforcing bars at 1,600 Kwacha ($760) per tonne, it is not unusual to find the same product offered in the local market at a 50 per cent mark up. Outside Lusaka, private retailers often add mark ups well in excess of 100 per cent.

Table 4.3: Indicative bar/shape production cost for an EAF-based scrap consuming mini-steel mill in the ESA sub-region (mid-1985)

Assumption: Mini-steel mill rated at 25,000 tpy of bars/angles/ channels, employing continuous casting of billets.

Project (capital) cost = $875 per ton of installed capacity, amortized over 10 years.

| Cost item | Unit consumption per ton of rolled product | Unit price (US $) | Cost per ton of bar/shape (US $) | Percentage Forex (%) |
|---|---|---|---|---|
| Scrap | 1.2 tonnes | 65.00/tonne | 78.00 | 0 |
| Fluxes | 10.0 kg | 0.20/kg | 2.00 | 0 |
| Refractories (melting and casting) | 15.0 kg | 0.75/kg | 11.25 | 80 |
| Refractories (reheating furnaces) | 5.0 kg | 0.75/kg | 3.75 | 75 |
| Rolling mill consumables | | | 5.50 | 100 |
| Electricity | 750.0 kwh | 0.05/kwh | 37.50 | 0 |
| Electrodes and ferro-alloys | 7.5 kg | 4.70/kg | 35.25 | 100 |
| Repair and maintenance | | | 23.30 | 25 |
| General administration and miscellaneous | | | 32.70 | 25 |
| Salaries and wages | 11.0 man-hrs | 3.00/man-hr | 33.00 | 25 |
| Amortization (15 per cent of fixed charges) | | | 131.25 | 80 |
| Ex-factory production cost .. .. | | | $393.50 | |
| of which foreign currency component = | | | $179.72 | = 45.7% |
| and local currency component = | | | $213.78 | = 54.3% |

19. As of mid-1985, a Kenyan mini-mill's ex-factory (Nairobi) price (exclusive of 17 per cent sales tax) for hot-rolled round bars (5.5mm-32mm), for minimum orders of one tonne, ranged from Kshs. 5,890-6,810 (i.e. $368-$425) per tonne. The same product (10-25mm) in Tanzania was available, ex-factory to major customers, at Tsh. 14,269-15,089 ($790-$838) per tonne. This indicates a prevalence of captive (non-competitive) markets and it is not possible to draw any categorical conclusions concerning the level of profitability or

otherwise of bar production in the sub-region merely on the basis of comparing these sales prices with the production cost synthesized in Table 4.3. Steel production may or may not be profitable depending on the specific cost structure experienced by a given plant. Comparing however, the market price range of US$400 to US$800 per tonne indicated above for bars produced by local small scrap based mills with a landed import price from Europe for bar of US$360 US$520[1/] indicates that the rationale for steel production is not the price calculation *per se* (at current foreign exchange rates) but possibly rather the saving of foreign exchange.

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1/ Based on a fob price from European harbour of US$240 per tonne and transport handling and duty charges of US$120-US$280 per tonne depending on where in the sub-region the purchaser is located.

Table 4.4: 1981-83 Steel industry direct employment in the Eastern and Southern Africa Preferential Trade Area

| Country | Total steel plant capacity: Crude steel | Total steel plant capacity: Rolled products | Total industry employment: High level management and technical | Total industry employment: Middle level (technician etc.) | Total industry employment: Low level | Total industry employment: Total |
|---|---|---|---|---|---|---|
| Angola | 30,000 tonnes/yr | 50,000 tonnes/yr | [illegible]2 | 70 | 348 | 450 |
| Ethiopia | 24,000 tonnes/yr | 64,000 tonnes/yr | 10 | 29 | 515 | 554 |
| Kenya | 85,100 tonnes/yr | 277,500 tonnes/yr | 50 | 140 | 1,310 | 1,500 |
| Madagascar | | 6,000 tonnes/yr | 6 | 10 | 64 | 80 |
| Mauritius | | 80,000 tonnes/yr | 35 | 75 | 390 | 500 |
| Mozambique | | 50,000 tonnes/yr | 45 | 100 | 505 | 650 |
| Tanzania | 18,000 tonnes/yr | 30,000 tonnes/yr | 27 | 40 | 536 | 603 |
| Uganda | 24,000 tonnes/yr | 30,000 tonnes/yr | 10 | 20 | 270 | 300 |
| Zimbabwe | 850,000 tonnes/yr | 1,022,000 tonnes/yr | 385 | 975 | 5,140 | 6,500 |
| Total | 1,031,100 tonnes/yr | 1,609,500 tonnes/yr | 600 | 1,459 | 9,078 | 11,137 |

4.6 Employment, manpower and training

20. As of mid 1985, the 23 steel plants in the Eastern and Southern African sub-region (consisting of one blast furnace based integrated steelworks in Zimbabwe, ZISCO Ltd., ten (10) electric furnace based meltshops, and twenty (20) rolling mills, furnished direct employment to about 11,1[illegible] persons.

The distribution by country is shown in Table 4.4. Because of the very low capacity utilization, most steel plants have had to operate on (at best) a two-shift-per-day basis.

21. The national totals shown in Table 4.4 represent actual figures from UNIDO missions. The break-down into the three job categories (high, middle and low-levels) represent, in a few cases where actual figures were not available, estimates based on steel industry experiences (i.e. about 7 per cent for high-level, 15 per cent for middle, and the balance low-level). "High-level" would apply to the managerial and engineering cadre in both production and administration, while "middle-level" applies to the supervisory, foreman, and skilled technician categories.

22. Because of the current under-utilization of installed capacity, the aggregate employment of 11,137 is considered short of the industry's employment potential. If the steel market were such as to permit normal full capacity (three-shift) operation, employment would be around 15,000, consisting of about 625 high-level, 2,250 medium-level, and 12,125 low-level personnel.

23. Currently on-going capacity expansions and committed new projects which are planned to be in operation by 1990 are expected to increase the sub-region's crude steel production capacity to 1.17 million tpy, and the rolling capacity to 1.77 million tpy by 1990. In national terms, 31,000 tonnes of the additional crude steel capacity would come from Kenya, 50,000 tonnes from Mauritius, 25,000 tonnes from Tanzania, 2,500 tonnes from Uganda, and 27,000 tonnes from Zambia. The incremental rolling capacity would be from Ethiopia (30,000 tonnes), Kenya (12,000 tonnes), Madagascar (24,000 tonnes), Tanzania (48,000 tonnes), and Zambia (43,000 tonnes).

24. The projected 1990 sub-regional steel industry direct employment would be distributed as shown in Table 4.5, assuming that the various national economies will have recovered sufficiently by then to permit three shift utilization of installed capacities. The total is 16,210, with 46 per cent based in Zimbabwe and 18 per cent in Kenya.

25. It is pertinent to observe that in virtually all countries of the sub-region, the high-level technical category is dominated by expatriates, accounting for about 75 per cent of the numerical totals in many steel plants. There is clearly a need to intensify efforts to train nationals of the sub-region in the engineering disciplines at the university level to eventually replace expatriates. But this objective should not be pursued to the detriment of the middle level skilled cadre which is in short supply in most sub-Saharan African countries. Unfortunately, most government manpower development policies have tended to glamorize tertiary (university) education to such a degree as to discourage intermediate institutions such as polytechnics and technical institutes. As a result, the desirable ratios between engineers and technologists/technicians have been distorted in favour of engineers, leaving a manpower gap that is often filled only by expatriates.

Table 4.5: Projected 1990 sub-regional steel industry direct employment (three shift operation)

| Country | Total steel plant capacity, tonnes/year | | Total direct industry employment | | | |
|---|---|---|---|---|---|---|
| | Crude steel | Rolled products | High-level | Middle-level | Low-level | Total |
| Angola | 30,000 | 50,000 | 70 | 120 | 510 | 700 |
| Ethiopia | 12,000 | 94,000 | 25 | 100 | 825 | 950 |
| Kenya | 131,000 | 289,000 | 100 | 250 | 2,500 | 2,850 |
| Madagascar | - | 30,000 | [illegible]5 | 40 | 120 | 175 |
| Mauritius | 50,000 | 80,000 | [illegible]5 | 130 | 700 | 885 |
| Mozambique | - | 50,000 | 60 | 175 | 850 | 1,085 |
| Tanzania | 43,000 | 78,000 | 55 | 100 | 1,000 | 1,155 |
| Uganda | 26,500 | 30,000 | 25 | 65 | 400 | 490 |
| Zambia | 27,000 | 43,000 | 15 | 80 | 300 | 395 |
| Zimbabwe | 850,000 | 1,022,000 | [illegible]0 | 1,025 | 6,000 | 7,425 |
| Total | 1,169,500 | 1,766,500 | 8[illegible] | 2,185 | 13,205 | 16,210 |

## 4.7 Raw materials for steelmaking

26. Depending on the production practices and process units at a specific steel plant, the raw materials consumed during iron and steel production include iron ore (as lump ore, pellets, and sinter feed), metallurgical coal (which is first converted to coke), the alloying elements, scrap, sponge iron (which is currently neither produced nor consumed in the sub-region), fluxes (limestone, dolomite, and fluorspar), refractories, and such other operating materials as graphite electrodes, water, and electricity.

a) Iron ore: Large resources of iron ore are known to occur in several countries of the sub-region as shown in Table 4.6. For the 13 countries listed, the geological (i.e. proven, probable, and inferred) reserves amount to at least 6,344 million tonnes. Obviously only a fraction of these reserves would be technically extractable and economically beneficiable for purposes of iron and steel production; nevertheless, their occurrence holds out the promise of becoming the basis of domestic iron and steel industries in the sub-region. By far the largest reserves are in Zimbabwe (with about 59 per cent of the total) and in Angola (which accounts for 19 per cent).

Only the integrated blast furnace based steelworks of Zimbabwe Iron and Steel Company, (ZISCO) currently operates on the basis of iron ore from the sub-region. Its sinter plant at the Redcliff works is fed with a blend consisting of 58-61 per cent Fe ore from the Buchwa mine (200 km south of Redcliff) and friable limonitic ore from Ripple Creek (17 km south-east of Redcliff). Plans have been formulated to extend the remaining life of the Buchwa mine (now estimated to be 8 to 12 years) by reclaiming up to 3.5 million tonnes of fine ores that had been hitherto discarded and stockpiled. By so doing, it is hoped that through programmed exploitation of all Buchwa and Ripple Creek resources, ZISCO's iron ore requirements would be assured for the next 30 to 40 years.

b) Coal: The coal resources of the sub-region are also shown in Table 4.6. The aggregate resources amount to about 54,604 million tonnes, of which Zimbabwe accounts for 51 per cent. Other major reserves occur in Botswana (with 15,200 million tonnes), Mozambique (8,000 million tonnes), Tanzania (1,500 million tonnes), and Swaziland (967 million tonnes).

In spite of the vast reserves, commercial exploitation of coal is still at a relatively infant stage. Only Botswana, Mozambique, Zambia, Zimbabwe, and (to a small extent) Tanzania now operate coal mines. In all cases except Zimbabwe, coal is produced for power generation and export. Whereas cokable coal occurs also in Mozambique and Swaziland, only that of Zimbabwe is employed for iron and steelmaking. ZISCO's metallurgical coal is supplied from the Hwange Colliery, supplemented also by coke deliveries from the same source.

Table 4.6: Iron and steel resources in the Eastern and Southern African sub-region

| Country | Iron ore reserves: Size, $10^6$ tons | Iron ore reserves: Ore type | Coal reserves: Size, $10^6$ tons | Coal reserves: Type | Hydro-electric resources (in MW) |
|---|---|---|---|---|---|
| Angola | 1,220 | Haematite and quartizitic haematite/ magnetite | - | - | 11,000 |
| Botswana | - | - | 15,200 | High-ash, medium-volatile bituminous | - |
| Ethiopia | 12.5 | Low-grade | - | - | - |
| Kenya | 42.0 | Low-grade | - | - | |
| Madagascar | 405 | Quartzitic haematite/ magnetite | 84 | High-ash, medium-volatile bituminous | 73,000 |
| Malawi | - | - | 810 | Bituminous and sub-bituminous | 91 |
| Mozambique | 250 | Banded iron-stones | 8,000 | Bituminous plus up to 3 billion tons cokeable | 12,000 |
| Somalia | 180 | Low-grade haematite/ magnetite, and titani-ferrous magnetite | | - | - |
| Swaziland | - | - | 967 | Cokeable anthracite, low-volatile | - |
| Tanzania | 118 | Titaniferrous magnetite with Cr and V impurities | 1,500 | Medium-ash, high-volatile | 18,995 |
| Uganda | 71 | Haematite, magnetite, and pyrite | - | - | 16,439 |
| Zambia | 301 | Haematite and magnetite | 90 | Low-ash, high sulphur bituminous | 4,600 |
| Zimbabwe | 3,738 | Haematite and limonite | 27,953 | Bituminous and up to 2,535 million tons coking | 4,566 |

The sub-region's coal resources could be potentially useful as a reductant in coal-based iron ore direct reduction processes for the production of sponge iron, - a metallic alternative to ferrous scrap. However, the technical compatibility of a particular coal reserve and direct reduction process, as well as the economic viability of a given project, would need to be carefully evaluated prior to embarking on any investment exercise.

c) Minor steel industry minerals: The exploitable alloying minerals that occur in the sub-region are shown in Table 4.8. Zimbabwe has reserves of high chrome ore (for which it accounts for over 86 per cent of the world's known resources), cobalt, and nickel ore. Madagascar's resources are chrome and nickel ores, while Burundi has the largest nickel ore reserves in the sub-region. Other potential sources of alloying minerals are Zambia (for cobalt), Botswana (for nickel ore), and Mozambique and Tanzania (for titanium).

Refractory materials serve multiple chemical, structural/mechanical, and thermal functions in iron and steel production. They usually contain one or more of the following minerals: - silica, aluminosilicate, magnesite, graphite, chromite, dolomite, and zirconia, and the wide range of uses includes fireclay and high-alumina for direct reduction furnaces, tar-bonded basic refractories for oxygen steelmaking converters, magnesite and magnesite-chromite for electric arc furnace walls, and zirconium material for nozzles of continuous casting ladles.

Although several countries in the sub-region are endowed with commercial reserves of some of the refractory minerals, only a narrow range of refractories, - the simple fireclays, - are now manufactured in Zimbabwe and Kenya for local consumption. The balance is imported from South Africa, Europe and North America. With the possible exception of Zimbabwe, no individual country's refractories demand is sufficient to justify establishment of a viable plant to manufacture a wide range of refractories for its internal consumption. Accordingly, the refractories area presents an opportunity for sub regional industrial co-operation aimed at supplying the needs of countries in the entire sub-region.

Table 4.7: Resources of the minor steel industry minerals in the Eastern and Southern African sub-region

| Mineral | Significant source countries | Resource size | State of exploitation |
|---|---|---|---|
| High-chrome ore | Zimbabwe | 1.12 billion tonnes | Significant production with 1982 mining output of over 396,000 tonnes. |
| | Madagascar | 7.3 million tonnes | Commercial production with 1978 output of 92,000 tonnes |
| Cobalt | Zambia | 0.35 million tonnes | By-product of copper industry; 1983 mine production of 2,407 tonnes. |
| | Zimbabwe | Not available | 1982 production of about 100 tonnes. |
| Nickel ore | Zimbabwe | 6.1 million tonnes | Produced 12,000 tonnes of contained Ni in 1982. |
| | Burundi | 12.84 million tonnes | Unexploited but being developed under World Bank auspices. |
| | Madagascar | 1.75 million tonnes | Undeveloped. |
| | Botswana | 0.66 million tonnes | By-product of copper extraction. |
| Titanium | Mozambique | 12.6 million tonnes | Ilmenite bearing beach sands of Maganja-Moma have not been exploited. |
| | Tanzania | 3.5 million tonnes | Occurs in association with Fe and V at Liganga. |
| Fluorspar | Kenya | 1.77 million tonnes | Commercially exploited. |
| | Zimbabwe | 0.204 million tonnes | Commercially exploited. |

Sources: UNIDO/IO.391/Rev.1, 1981 and various geological surveys departments.

The fluxing minerals in steelmaking are limestone, dolomite, fluorspar and silica. Limestone, dolomite, and silica reserves of suitable metallurigical quality occur widely across the sub-region. Even where a particular country has no local resources, it should be possible to supply its requirements from other sub-regional sources. As for fluorspar, Table 4.7 indicates that significant exploitation is currently going on in both Kenya and Zimbabwe. Other fluorspar resources may be located in other countries as the need for it in metallurgical applications develops.

d) Ferrous scrap: Ferrous scrap for the sub-region's eleven electric arc furnaces is supplied in part from local sources, and in part through imports. The local availability (estimated in to be at most 127,950 tpy) is constrained by the under-developed and currently depressed status of the economies of the sub-region. This, among other things leads to an enforced longevity of automobiles and other household appliances as consumers conserve and rehabilitate rather than dispose of servicable assets. Furthermore, bottlenecks exist in inefficiencies of scrap collection, processing and delivery to steel plants. For these reasons, the differential between the prices of local and imported scrap has been narrowing, making the latter increasingly attractive, although its accessibility is now restricted by the prevailing foreign currency scarcity in the sub-region. In the face of escalating scrap prices, as well as the obvious demand for it in the sub-region, there is a need for establishment of enterprises devoted to the collection and processing of all available scrap resources. Included among these sources are ships and carriers that could be the basis of ship-breaking enterprises at such ports as Mombasa, Dar-es-Salaam, Maputo, Luanda, Toamasima, Djibouti, Mogadishu, and Port Louis. In fact, such enteprises already exist in Mombasa and Port Louis and should serve as models for similar establishments in the other parts of the sub-region.

e) Electricity: The electricity resources (particularly hydro) of the sub-region have hardly been exploited. As shown in Table 4.6, virtually all the countries listed have ample potentials that, if properly exploited, would guarantee ample supplies at reasonable costs for the foreseeable future. In the context of sub-regional co-operation, the collaborative development of hydro-electric resources would undoubtedly be in the interest of the industrial sector in the area.

f) Imported inputs: Certain input materials which, in terms of quantities consumed and value, may be regarded as secondary are often of critical importance in steel production. Among such inputs are ferroalloys, graphite elec[illegible], lubricating oils, water treatment chemicals, certain refractories, thermocouples, roll grinding wheels, etc. In most cases, these items are imported and instances abound of operations having been halted due to non-availability of ore or more of these materials. It is therefore important for steel producers to devise short-term strategies for ensuring a reliable supply of these critical materials, as well as long-term efforts to produce them (or their acceptable substitutes) locally.

4.8 The world market and the scope for increased sub-regional competitiveness

27. The region's geography hardly provides any price advantage to local steel producers. Centres of steel consumption are widely dispersed. Intra-regional transport links tend to have high operating costs, not least because of low capacity utilization. For many market areas, steel imported from overseas may have lower landed prices than steel produced elsewhere in the region (see Annex III). If all costs were calculated in terms of e.g. US dollars, using official exchange rates, it would be entirely possible that one may show that the region could cut its total outlay on steel products by importing more steel products from third countries. As illustrated above (para 19), however, a foreign-exchange cost calculation would be likely to come out in support for local production of basic steel products.

28. There are many differing price levels for steel on the international market. Domestic producers' list prices in the United States, the European Community and Japan, supported by formal market regulation or informal agreement, are usually higher than quoted export prices. For example at mid-1985 the United States producers' list price for plate was around $530 per metric ton, but the U.S. spot, or free market price was only $375. European and Japanese list prices for plate were around $375, but with free market prices around $300, and the European export quote at $260.

29. It would be prudent to take free market, rather than export price levels for comparative purposes. The export quotations are sensitive to the supply/demand balance, and if the current overhang of excess capacity in the industrialized countries disappears, the export price discount which

has been characteristic of the past decade could also shrink. Free market f.o.b. prices are currently around the following levels: billets $180 per metric ton, re-inforcing bars $240, structurals, plate and hot-rolled wide coil $300, cold-rolled coil $370, and galvanized sheet $450.

30. In the stagnant steel market conditions of the past decade, real steel prices have developed a downward trend, but this is not likely to be prolonged: the closure of high-cost capacity, and other cost-cutting measures by the industry, are reaching levels at which further gains will be relatively small. The industrializing countries including the People's Republic of China will be raising their steel consumption, probably by about 65 million tonnes or almost 40 per cent of their current consumption over the next ten years, but most of this will be met by increased domestic production so that the effect on demand and prices for internationally traded steel will be slight. In the main industrial steel market countries of the United States, Europe and Japan, consumption levels are widely expected to stagnate.

31. There is perhaps one area where some degree of caution is necessary. If a bottleneck were to arise, it would probably be at the coke-making stage in the United States, leading to a shortage of pig iron. Even without such a bottleneck, the U.S. is currently importing growing quantitites of semi- finished steel rather than undertaking the prohibitively large investments which would be required to renew its aged and inefficient coke, pig iron and crude steel production facilities. For the present, Brazil with a recently opened semis plant at Tubarao, and several other countries with excess crude steel production facilities, are able to supply semis in adequate quantities, but there is just a possibility that, if the demand continued to grow over the next decade, this currently rather over-supplied area of the market could become one of scarcity, leading to upward pressure on semis prices. However total steel demand in the U.S. is likely to stagnate or decline, and if the share of the U.S. market taken by imported basic steel products continues to increase, there will be relatively little growth in the U.S. steel industry's imports of semi-finished steel products.

32. With this area as a possible exception, it is unlikely that there will be pressures on the international steel market sufficient to alter real prices much from current levels over the next decade, although of course any changes in the U.S. dollar parity would be mirrored in the quoted prices. Steel- making raw materials are in abundant supply, and although new integrated capacity can be expensive the stagnant market outlook in the major industrial countries, together with the current surplus of steel-making capacity, suggests that higher prices will not result from the need to finance the building of new capacity. The f.o.b. prices quoted above can therefore be retained as the probable constant-price cost of imports over the next decade. At these prices, and the foreign exchange freight and insurance costs connected with imports there is a chance that new production capacity for crude steel in the region would benefit its overall balance of payments. However, as shown in Table 4.3, a high proportion of the capital cost would be foreign exchange spending, and spare parts, technical assistance, and some raw materials would have to be imported.

33. Assuming that the foreign exhange cost comparison for new capacity come out favourable, there is still the issue of total local currency cost. Locally-produced steel must compare favourably if steel-consuming industries are not to be penalised for the sake of the steel producer.

34. Sub-regional steel producers have not yet taken full advantage of their competitive position in the PTA member countries. The field work gave the impressions that most producers attach less importance to marketing of their products than to other areas of their operations. This is quite understandable due to the lack of a price advantage vis-a-vis outside producers and to problems encountered in technical areas, maintenance and replacement of equipment, production planning, lack of qualified manpower and training of staff.

35. There are, however, areas where sub-regional producers have or more easily could develop a competitive edge. The ex-factory per tonne price of steel is only one (but important) element in compeition. A fresh drive for inc.:eased competitiveness should concentrate on all areas which are important to steel purchasers of the region for their decision making on order placements:

- terms of delivery
- deliveries according to order specification
- price (including transport costs)
- past business experience and technical support services
- quality products
- terms of payment

Terms of delivery

36. Orders from abroad (Europe or Japan) normally have high lead times. For normal orders these lead times are about 3 months or more for coastal countries and up to 9 months for landlocked countries (e.g. Rwanda, Burundi). These high lead times are a heavy burden on steel purchasers, mainly for two reasons: firstly, order planning is extremely difficult, especially for engineering industries and, as regards steel for construction purposes, for special dimensions or types of steel. Secondly, the financial burden is considerable. In some cases the whole order volume has to be paid at the moment of the order, but in any case the letter of credit has to be financed which can cause additional purchasing costs of up to 9 per cent of the fob order value.

37. Rwandan steel importers, e.g., tried to avoid these unfavourable conditions by switching to Kenyan suppliers for construction steel. Their experience, however, was unsatisfactory to them as agreed delivery times of one month were not complied with by the supplier (supplies arrived 6 months later) so that they switched again to European suppliers. A Burundese steel importer has recently made his first trial order for shipment from ZISCO Steel via Zambia by truck and from Mpulugu by lake shipping. He expects a reduction of his lead time by 7 months. Mauritian importers prefer purchases from South Africa via Port Elizabeth with lead times of one to two months.

Deliveries according to order specifications

38. Some steel purchasers have had negative experiences with regional steel suppliers in terms of deliveries according to their order specifications. Dimensions (e.g. diameter of bars) were other than ordered or partial shipments were made by the steel producers resulting in increased transport cost for the purchases, delay in execution of works until final shipment was received and additional financing costs.

As European companies generally supply from stocks, at least in the case of relatively small order sizes as customary in the region, partial shipments are not experienced. It is proposed that steel producers in the region improve their stocking systems and constantly compare expected market demand, goods in stock and production planning.

Price

39. The price of steel products is an important criterion for the purchaser in the region. He is, however, less interested in ex-works or fob prices, but rather in the total price of goods received in his warehouses. Therefore steel producers should rather look at total costs for the purchaser than their ex-factory prices.

40. Total costs for the purchases include the ex-works or fob price of the product, transport costs, duties and levies and financing costs of the order. The two cost components, transport costs and order financing costs can be directly influenced by the steel producers of the region and should in the future be of more concern to them.

41. Transport costs are extensively referred to in Annex III. It is recommended that the major steel producers, above all ZISCO Steel, increase their efforts in the areas of transport logistics and negotiation of global transport contracts of annual or biannual duration allowing for partial shipments. Transport logistics activities should concentrate in the beginning on planning of rapid delivery systems, opening of new transport routes and analysis of intermediate warehousing of steel products at key trans-shipment points, e.g. in a Mozambican port and, for servicing Zambia, Burundi, Rwanda, west of Tanzania and south and east of Zaire, in a location to be selected in Zambia. The Lake Tanganyika shipping route apparently offers a competitive transport connection for steel supplies to Burundi, Rwanda, west of Tanzania and east of Zaire. It should also be determined in detail whether the railroad connection to Dar-es-Salaam can be a cost and time-saving transport route. Above all, a major transport cost reduction can be expected by negotiating global transport agreements with land and maritime shipping companies. So far, the small order volumes have, besides political factors affecting the Mozambiquean railroads and ports,

caused high shipping rates from Mozambiquean ports to East African and Indian Ocean islands ports. These rates can be considerably reduced by negotiating with selected shipping lines on annual or biannual lump transport volumes to be effected in partial shipments. Frequencies of calls at the ports can likewise be stipulated in the contracts.

42. Improved transport operations will contribute to speed up deliveries to customers and hence reduce their delivery lead times to an extent that it could become a major factor in their order placement decisions. An additional benefit would be the fact that financing of their letters of credit will no longer be required. This could lead to reductions of their landed costs of steel products of up to 9 per cent as an example from Burundi shows (see Annex III).

Past business experience and technical support services

43. An important factor in decision making on order placements by the steel users is reliability of supplies. In periods of worldwide excess steel capacity even the relatively small quantities ordered by the importers of the region are honoured without delay. Furthermore, the importers can rely on the technical support services of, e.g. European steel producers provided on many occasions without additional charges. Technical support services are of considerable importance in the building, construction and engineering industries when new products are designed. Past business experience has shown the value of reliability and technical support services to the steel purchasers of the region who will also have a demand in this respect in the future, especially for high-priced steel, types or dimensions. It is therefore recommended that the steel producers of the region who intend to diversify into high-priced steel products (as in the case for ZISCO Steel) establish a technical support service system and pay special attention to the reliability requirements of the customers.

Quality of products

44. Quality of steel products is not a major factor in purchases of steel for general construction purposes (e.g. reinforcing bars, light sections). Correct dimensions of the products can, however, be an important competition factor. Quality plays a more and more decisive role for higher grade steels, either for special applications (e.g. rails) or for special steels as used in advanced engineering industries. Quality

aspects will therefore have to be monitored more carefully when entering into the production of high grade and high priced steel products. In the past there have been a few cases of off-specification carbon contents in billets from ZISCO Steel but these problems have apparently been overcome by the company through improved quality control.

Terms of payment

45. Payment is generally made through letters of credit (60 or 90 days) for all imports of steel regardless of the source of supply. These terms are widely accepted by the steel importers and can therefore be considered of less importance for the improvement of competitiveness of the regional steel producers.

## 4.9 Indirect steel imports and the engineering industry

Indirect imports

46. Indirect steel imports refers to the steel contained in imported manufactured goods. The steel demand for those basic steel products which are manufacured in the region is part of the direct demand. The determination of indirect steel imports is difficult due to the scarcity of data on imports from the countries of the sub-region.

47. Table 4.8 summarizes an estimate made of the more important indirect steel imports[1/] by country for 1981 to 1983. Total indirect steel imports amounted to an average of 490,000 tpy and an import cost of US $1.74 billion per year. The decline from approximately 540,000 tonnes in 1981 to approximately 450,000 tonnes in 1983 indicates the continued economic and foreign exchange difficulties of the countries. The decline is very pronounced in Angola, Kenya, Tanzania and Zambia. The countries with the highest share in indirect steel imports are Angola (12 per cent), Ethiopia (11 per cent), Kenya (10 per cent), Somalia (10 per cent), and Mozambique (8 per cent), Zimbabwe (7 per cent), Tanzania (6 per cent) and Zambia (6 per cent).

48. Table 4.9 shows the indirect steel imports of the three digit SITC-product groups included. For the region as a whole, road vehicles are by far the most important single product group with 52 per cent of indirect steel imports (approximately 260,000 tpy for the three year

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1/ For estimation method, see Annex VI, paras 25-27.

average), metal structures are in second place with 18 per cent (approximately 86,000 tpy), followed by agricultural machinery with 6 per cent (approximately 28,000 tpy) and wire products, tanks and vessels as well as bicycles with 4 per cent.

49. The present indirect steel imports represent a major potential for import substitution as is demonstrated in Chapter 5 below. It is therefore important to consider the main factors behind the demand for such products and how it may be satisfied from local sources.

50. As the main producer of products containing steel, the engineering sector transforms demand for downstream products into a demand for basic steel (direct demand). However, if engineering industries have only a small share in manufacturing value added other users of steel products, like repair shops of mining companies or sugar factories, might have high share in indirect steel consumption.

51. Although one may, with limited confidence make estimates of indirect steel imports, the determination of input demands by the engineering industries on a statistical basis is hardly possible. First, production and trade statistics are incomplete, for some countries figures are not available, particularly for recent years. Likewise, production figures of the engineering industries in the PTA member countries are only available for six countries. Furthermore, their sources of supply (domestic, regional and international) are not known. Without detailed data on their sources of supply a double counting of their steel demand under direct and indirect supply cannot be avoided. More extensive field work than permitted by the present study would be required to overcome the data shortage. Because of the importance of the engineering industry as a driving force in the replacement of indirect imports, its structure and possible expansion is considered below in some detail.

<u>The engineering industry</u>

52. Even though statistical data for the engineering industry are insufficient it is quite clear that in general terms, the sub-regional engineering sector is as yet poorly developed compared to industrialized or even other developing countries.

## Table 4.8: Estimated indirect steel imports, 1981-1983 and averages
(values in thousand US$, quantities in tonnes)

| COUNTRY | 1981 VALUE | 1981 QUANTITY | 1982 VALUE | 1982 QUANTITY | 1983 VALUE | 1983 QUANTITY | AVERAGE VALUE | AVERAGE TONNES | AVERAGE TONNES IN PCT OF TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| ANGOLA | 319311 | 92668 | 164275 | 48047 | 110963 | 36617 | 198183 | 59111 | 12 |
| BOTSWANA | 108712 | 20546 | 119760 | 28293 | 120000 | 22680 | 116157 | 23840 | 5 |
| BURUNDI | 24064 | 6046 | 34949 | 12916 | 26351 | 9749 | 28455 | 9570 | 2 |
| COMOROS | 12167 | 3605 | 5940 | 2508 | 8380 | 4240 | 8829 | 3451 | 1 |
| ETHIOPIA | 145146 | 46208 | 131201 | 46806 | 169434 | 66292 | 148594 | 53102 | 11 |
| DJIBOUTI | 30797 | 8981 | 31943 | 10556 | 34833 | 13220 | 32524 | 10919 | 2 |
| KENYA | 207134 | 64187 | 152554 | 45344 | 109664 | 29036 | 156451 | 46189 | 9 |
| LESOTHO | 89534 | 21151 | 106845 | 20193 | 110000 | 20671 | 102126 | 20672 | 4 |
| MADAGSCAR | 64957 | 22307 | 43451 | 11024 | 58348 | 14131 | 55585 | 15821 | 3 |
| MALAWI | 38396 | 10841 | 32883 | 9802 | 27968 | 6435 | 33062 | 9026 | 2 |
| MAURITIUS | 37765 | 10892 | 19768 | 6319 | 24001 | 9457 | 27178 | 8889 | 2 |
| MOZAMBIQUE | 122064 | 43741 | 119945 | 38947 | 105310 | 33634 | 115773 | 38774 | 8 |
| RWANDA | 27852 | 8361 | 39490 | 12891 | 41517 | 13422 | 36286 | 11558 | 2 |
| SEYCHELLES | 10203 | 3155 | 9538 | 3074 | 6666 | 2089 | 8802 | 2773 | 1 |
| SOMALIA | 132467 | 31426 | 164372 | 45596 | 191187 | 63841 | 162675 | 46954 | 10 |
| ZIMBABWE | 137882 | 35041 | 145762 | 32850 | 135833 | 31181 | 139826 | 33024 | 7 |
| SWAZILAND | 69836 | 20531 | 67693 | 19671 | 66430 | 15072 | 67986 | 18425 | 4 |
| UGANDA | 80419 | 16495 | 49279 | 11759 | 47000 | 13974 | 58899 | 14076 | 3 |
| TANZANIA | 144799 | 35923 | 113839 | 32148 | 88489 | 25388 | 115709 | 31153 | 6 |
| ZAMBIA | 128171 | 36227 | 149188 | 35540 | 93061 | 22352 | 123473 | 31373 | 6 |
| TOTAL | 1931676 | 538332 | 1702675 | 474284 | 1575375 | 453481 | 1736575 | 488699 | 100 |

## Table 4.9: Estimated steel imports, 1981-1983 and averages (values in thousand US$, quantities in tonnes)

| | YEAR 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
|---|---|---|---|---|---|---|---|---|---|
| SITC | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| MET. STRUCTURES | 105160 | 94234 | 113190 | 86601 | 91727 | 76428 | 103359 | 85754 | 18 |
| TANKS, VESSELS, ETC | 31898 | 23377 | 27898 | 15145 | 31338 | 26866 | 30378 | 21796 | 4 |
| WIRE PRODUCTS | 52307 | 29644 | 23052 | 15516 | 16287 | 13472 | 30549 | 19544 | 4 |
| NAILS, NUTS,BOLTS | 17940 | 9829 | 13790 | 8687 | 9002 | 6534 | 13577 | 8350 | 2 |
| HAND TOOLS | 64847 | 13294 | 51815 | 13056 | 43051 | 11667 | 53238 | 12672 | 3 |
| CUTLERY | 7402 | 690 | 4318 | 309 | 4447 | 635 | 5389 | 545 | 0 |
| DOM. UTENSILS | 15989 | 3355 | 11124 | 2563 | 10782 | 2747 | 12632 | 2888 | 1 |
| AGR.MACH.,TRACTORS | 126037 | 30891 | 116484 | 30138 | 92431 | 22543 | 111651 | 27857 | 6 |
| DOM. EL. EQUIPMENT | 24879 | 4967 | 18716 | 3444 | 15816 | 3173 | 19804 | 3861 | 1 |
| RAIL. LOCOS ETC. | 97990 | 14976 | 78888 | 11158 | 80989 | 15426 | 85956 | 13853 | 3 |
| ROAD VEHICLES | 1280689 | 276330 | 1160578 | 256134 | 1092835 | 236720 | 1178034 | 256395 | 52 |
| BICYCLES ETC. | 47324 | 18740 | 39636 | 14436 | 40511 | 19254 | 42490 | 17477 | 4 |
| HEATING, SANITARY | 25096 | 8224 | 16853 | 7167 | 17357 | 7182 | 19769 | 7524 | 2 |
| FURNITURE | 34118 | 9781 | 26333 | 9930 | 28802 | 10834 | 29751 | 10182 | 2 |
| TOTAL | 1931676 | 538332 | 1702675 | 474284 | 1575375 | 453481 | 1736575 | 488699 | 100 |

53. Some of the countries however already have an engineering industry of relatively considerable size namely Kenya, Zambia and Zimbabwe. In Zambia and Zimbabwe, engineering industries contribute respectively 20.2 (1981) and 19.1 (1980) per cent to manufacturing value added (MVA). This is almost at the same level as for the Latin American countries. Kenya's engineering industries also have a relatively strong position contributing a share of 18.8 per cent to MVA. In Mauritius and Tanzania, the sector has shares of respectively 12.4 and 11.5 per cent. Although smaller than for the three other countries it compares favourably with Central American countries (less than 10 per cent) which are about the same size. Madagascar (7.5 per cent) and Malawi (8 per cent) lie in the same range of importance, while in other countries for which data are available the engineering industries contribute 5 per cent (Swaziland) or less (Angola, Ethiopia, Lesotho) to manufacturing value added.

54. Data on other countries were not available. Field work showed that Angola and Mozambique had considerable potential in the engineering industries which in 1975 contributed 32.5 per cent to the manufacturing value added, the highest share reported in the region. The production units are, however, partly out of operation mainly due to lack of skilled personnel and lack of foreign exchange for the purchase of raw materials and spare parts. Zambia's engineering industry is especially strong in the fields of production and repair of mining equipment and their components. The downward development of mineral prices has affected Zambia's engineering industries whose share in manufacturing value added dropped from 30.8 per cent in 1973 to 20.2 per cent in 1981. Zimbabwe's engineering industries are relatively diversified. The engineering industries in Tanzania suffer from the shortage of foreign exchange for the purchase of production inputs and spare parts leading to under-utilization of capacities. Even small countries like Burundi and Rwanda, where the growth rate of metalworking industries in the last ten years was in the order of 9 per cent and is expected to continue growing at a rate of 7 per cent until 1990, are establishing engineering industries. It is estimated that for all PTA countries, the share of engineering industries in manufacturing value added is in the order of 12.5 per cent.

55. A fundamental characteristic of the engineer[illegible] dustry of the region is that it mainly service domestic markets and that exports are relatively scarce. This is in contrast to this sector in industrialized countries

or Asian developing countries where in specific cases engineering industries export 50 per cent or more of their production. It is also a fact that participation in foreign markets increases the competitiveness of the engineering industries and leads to a stronger specialization of particular enterprises. Banning competition, e.g. through import prohibition, has had by and large negative effects on the growth and technological advancement of the engineering industries. Measures of this type have only proven appropriate for a determined length of time to allow for initial growth and strengthening of the industries.

56. Experience in industrialized and developing countries show that the growth of the engineering industries does not require a basic iron and steel industry (e.g. Switzerland, Denmark and Singapore). The linkage between these two sectors is rather the other way around: basic iron and steel industry needs for its growth and expansion in product ranges a strong and growing engineering industry to cause a "pull-effect" as far as steel consumption is concerned. This effect can also be expected in the region once economic recovery allows high growth rates of the engineering industries.

57. The overall growth rate of engineeri , industries in the region is, due to incompleteness of statistical data, hard to determine. Macro economic constraints have caused a reduction of the share of engineering industries in the manufactuirng value added in some countries (e.g. Kenya, Mozambique, Zambia and Zimbabwe) in the past years. Judging by the imports of relatively simple products however, (see Table 4.9) the sector has a considerable growth potential. For its development, national industrial policy measures and human resource development efforts are required. Within the framework of PTA and SADCC, measures should be geared towards regional co-operation to increase market sizes and specialization of the industry. In this context, the promotion of inter-industrial linkages, such as subcontracting and product complementation, are of fundamental importance. Linkage support measures will be a prime mover to penetrate new technological areas.

58. It is also characteristic of engineering industries that minimum capacities vary from small production units to large installations (e.g. motor or vehicle production). In general, engineering industries are more labour intensive than capital intensive, even though new production methods (e.g. computer aided manufacturing) make the sector more capital

intensive than before, but these do not necessarily have a negative effect on minimum capacities. On the contrary, these new production technologies may increase the flexibility of the industry and reduce the minimum capacity per single product.

59. In most countries, of the sub-region, fabricated metal products (ISIC group No. 381) have the highest share of production (see Table 4.10). Exceptions are Angola, Kenya and Tanzania where transport equipment (ISIC No. 384) has a higher share and Mauritius which only gives data for ISIC No. 382 to 384. The production of non-electrical machinery (ISIC No. 382) is only significant in Mauritius, Zambia and Zimbabwe. Electrical

Table 4.10: Share of the engineering industry in manufacturing value added in selected countries and for selected years
(in per cent)

| Country | Years | Total ISIC 38 | ISIC group number | | | | |
|---|---|---|---|---|---|---|---|
| | | | 381 | 382 | 383 | 384 | 385 |
| Angola | 1970 | 3.5 | 1.7 | 0.3 | 0.5 | 1.0 | - |
| Botswana | 1975 | 2.7 | 1.9 | - | 0.1 | - | - |
| Ethiopia | 1973 | 2.0 | 1.9 | - | 0.1 | - | - |
| | 1979 | 2.6 | 2.5 | - | 0.1 | - | - |
| Kenya | 1973 | 22.5 | 7.3 | 0.5 | 5.8 | 8.9 | - |
| | 1980 | 18.8 | 7.2 | 0.7 | 5.2 | 5.7 | - |
| Lesotho | 1975 | 0.1 | - | - | | - | - |
| Madagascar | 1973 | 9.8 | 6.2 | - | 2.2 | 1.4 | - |
| | 1979 | 7.5 | 5.0 | - | 1.5 | 1.0 | - |
| Malawi | 1980 | 8.0 | 6.2 | 0.7 | 0.7 | 0.4 | - |
| Mauritius | 1981 | 12.4 | - | 5.1 | 4.1 | 3.2 | - |
| Mozambique | 1975 | 32.5 | 13.7 | 3.3 | 5.4 | 10.1 | - |
| Swaziland | 1980 | 5.2 | 4.5 | 0.2 | 0.5 | - | - |
| Tanzania | 1973 | 11.1 | 2.9 | 0.7 | 2.4 | 5.1 | - |
| | 1979 | 11.5 | 2.8 | 1.0 | 3.1 | 4.6 | - |
| Zambia | 1973 | 30.8 | 14.2 | 5.0 | 6.2 | 5.3 | 0.1 |
| | 1981 | 20.2 | 9.2 | 3.3 | 4.1 | 3.5 | 0.1 |
| Zimbabwe | 1973 | 22.5 | 11.3 | 3.3 | 3.5 | 3.9 | 0.1 |
| | 1980 | 19.1 | 10.5 | 3.1 | 3.6 | 2.9 | 0.1 |

machinery (ISIC No. 383) already have significance in several countries, namely, Kenya, Madagascar, Mauritius, Tanzania, Zambia and Zimbabwe. Transport equipment is of importance in all countries except Lesotho, Mauritius, Malawi and Swaziland.

60. Fabricated metal products represent in general the technologically less complex products compared to machinery and transport equipment. Hence the high share of ISIC 381 in most countries and the comparatively lower share of the other product groups indicate that the engineering industries in these countries are still an early stage of development. It can be assumed that future increase in the contribution of engineering industries will mainly come from strengthening the production capacities of ISIC groups No. 382 to 384, even though ISIC group 381 will also grow albeit at a lower rate (compare figures for Latin America as a whole, 1950 to 1977, Table A.I.4).

61. The future development of the engineering industry can be expected to be a main engine for growth and diversification of the iron and steel industry in the region. Its growth will, above all, increase the regional demand of plate and sheet, pig iron for foundry products, and hot and cold rolled bars. To which extent this "pull-effect" on iron and steel consumption will take place, will heavily depend on industrial policy measures to foster growth of the engineering industries.

62. Brazil gives an example of the influence of development policies on the growth of the engineering industries. Due to incentives especially for the promotion of joint ventures and tax rebates, the country was able to double the share of engineering industries to manufacturing value added in approximately 15 years (from 1950 to 1965), Latin America as a whole in approximately 20 years (from 1950 to 1979). Indonesia, whose engineering industry was relatively insignificant until 1972, was able to triple its importance in only 8 years (from 1972 to 1980), mainly due to the establishment of a local automotive industry and a general local content regulation to all important products of the engineering industry sector. Here incentives combined with regulatory measures were even more strongly pronounced and more strictly applied than in Latin America. It is noteworthy that both in Brazil and Indonesia, the basic iron and steel

industry was in infant stages when the rapid growth of the engineering industries started. Their additional demand for steel products contributed to the strengthening of the steel industry which found developed markets to absorb their additional output. Some other countries which first developed their basic iron and steel industry and then the user industries have experienced sales difficulties in their early years of operation which negatively affected cash flow and profitability of the steel mills.

63. If PTA member countries decide to give high priority to the development of the engineering industries and to introduce additional incentives and promotional efforts it can be assumed that the share of engineering industries in MVA could be raised considerably in the next 10 to 15 years. However, a thorough analysis of the present stage of development of the engineering industry sector, its constraints and potential and, in relation to the present study, its present and future steel demand seems of great importance as a basis for an industrial development strategy for this sector. Priority should also be given to this sector due to its relatively labour-intensive (yet skill-intensive) production operations (annual production output per employee is in the order of US$15,000 to US$20,000 in the engineering industries in East African countries).

64. The share of engineering industries in manufacturing value added generally grows with the degree of industrialization of a country. Hence, the growth rate of the engineering industries in industrializing countries normally is higher than the manufacturing growth rate as a whole. For example, the share of engineering industries in 19 Latin American countries which in 1955 had a share in manufacturing value added (12.2 per cent) similar to the one for the sub-region grew in 10 years to 19.9 per cent. Other countries (e.g. Egypt, Thailand), achieved an even higher growth rate in only 7 years (see Table 4.11). The growth of the engineering industries in countries with high growth rates are the result of active promotion and support measures by the governments directed towards foreign and domestic potential investors as well as to training of skilled personnel on all levels. It can also be seen that some

countries were able to increase their engineering industry share in manufacturing value added in spite of adverse external factors (e.g. oil price increases) while in the sub-region only Ethiopia and Tanzania were able to increase this share slightly. The absence of promotional measures has certainly contributed to the sluggish development of the engineering industries.

Table 4.11: Growth of share of engineering industries in manufacturing value added for selected countries
(in per cent)

| | Share in 1973 | Most recent year | |
|---|---|---|---|
| Ecuador | 10.8 | 17.5 | (1979) |
| Egypt | 13.2 | 21.7 | (1980) |
| Republic of Korea | 20.3 | 25.3 | (1980) |
| Singapore | 50.2 | 62.6 | (1981) |
| Hong Kong | 23.4 | 33.8 | (1980) |
| Thailand | 10.9 | 19.9 | (1980) |
| Ethiopia | 2.0 | 2.6 | (1979) |
| Kenya | 22.5 | 18.8 | (1980) |
| Madagascar | 9.8 | 7.5 | (1979) |
| Tanzania | 11.1 | 11.5 | (1979) |
| Zambia | 30.8 | 20.2 | (1981) |
| Zimbabwe | 22.5 | 19.1 | (1980) |

65. As the MVA has been used as a proxy for engineering value added in the projections dealt with in Chapter 5, it is important to consider what might happen to engineering's share of MVA in the future. The two most likely developments are:

a) Continuation of the engineering industries' share in manufacturing value added at roughly the present level: in this case the growth rates of the manufacturing sector and the engineering industries will nearly be the same. This type of development is illustrated by the so-called main projection.

b) Rise of the share of the engineering industries in manufacturing value added from the present 12.5 per cent to, say, 20 per cent in 1995: experience of other countries in Asia and Latin America show that such an increase is quite possible, especially at the present stage of engineering industries where a sound basis for stronger growth has been established, where external factors are favourable and policies and support measures properly implemented (promotion, regional co-operation, specialization leading to sub- contracting arrangements, technological innovation, entrepreneur- ship and labour skill development). The strong past growth of the metalworking industries in small countries like Rwanda and Burundi (approximately 9 and 7 per cent per annum, respectively) and the fact that in 1975 the engineering industries in Mozambique contributed 32.5 per cent to manufacturing value also indicate that the likelihood for such a scenario is substantial. This case is illustrated by the projections with "accelerated absorption of indirect imports" (for assumptions under this alternative see Annex VI).

# Chapter 5

## FUTURE DEVELOPMENTS IN STEEL CONSUMPTION PRODUCTION AND IMPORTS

1. This chapter outlines projections made for sub-regional demand and supply of steel over the next decade, and draws conclusions on the background of strategies for the iron and steel sector adopted by the sub-regional groupings, PTA and SADCC. After an overview of structures and trends (5.1) the market situation for basic steel products is assessed, indicating structural change and sub-regional trade opportunities (5.2). The conclusions from this assessment forms the basis for analysis and recommendations in the fields of billet production and trade (5.3), steelmaking capacity (5.4), and the demand/supply balance for steelmaking metallics (5.5). The final section 5.6 discusses the magnitude of a foreseen sub-regional metallics deficit and considers ways of closing it. The focus in particularly on the possibility of producing Direct Reduced Iron (DRI). Process options and project locations are considered. Main data and projections are given separately for SADCC and PTA.

2. The two overlapping sub-regional organisations covered by this study are different in structure and levels of steel consumption. The obvious explanation for this is that Zimbabwe, which belongs to both groupings and is the major steel producer and consumer weighs more heavily in relation to the smaller sub-group of SADCC. SADCC has at present some 40 per cent of the population of the whole PTA area, but over 50 per cent of total GDP, 60 per cent of total steel consumption and nearly 90 per cent of steel production capacity. Steel consumption per head, low by international standards, differs considerably between the two sub-regional groupings and will not (according to the base case projections) be evened out over the coming decade. The future of the steel sector in PTA and SADCC does however, hold problems which are both similar and require co-operation between a broad group of countries.

### 5.1 Overview, structures and trends

3. Tables 5.2 and 5.3 and figures 5.1 and 5.2 show summary results of the projection exercise, country projections are given in Volume II of this study. The reliability of forecast levels of steel consumption are dependent on several factors; firstly, the choice of projection model, secondly, the reliability of the method used for estimating the coefficients of the model and thirdly, on the alternative growth

assumptions made with respect to the explanatory variables. These variables are: Gross Domestic Product (GDP), GDP per capita, and depending on the steel item analysed, either gross investment value added in manufacturing or value added in building and construction.[1/] (On methodology, see Annex VI). Overall, the multiple correlation rates ($R^2$s) for the linear regression analysis applied to estimate co-efficients were very high, indicating that a large part of the variation in steel consumption is explained by the model chosen. Exceptions were the projected consumption of rails (SITC 6760) and tubes (SITC 6780) which tend to be highly dependent on major investment projects. Because of the depressed state of most of the economies in the base period leading to a low level of investment, the consumption of these products may well be under-estimated. The considerable variation between the countries of the sub-region with respect to steel consumption and explanatory variables, made a cross sectional analysis possible. A certain degree of multi- collinearity has however made it difficult to judge the reliability of projection with standard statistical methods (see Annex VI).

4. Three alternative sets of assumptions were made with respect to GDP, gross investment and sectoral value added, each connected with different scenarios for the countries' external environment. The <u>base case</u> was built on World Bank projections of commodity prices and international economic growth; the <u>low growth case</u>, based on the same external environment is meant to illustrate the effect of adverse developments with regard to South Africa's destabilization and rainfall in the region. The <u>high growth case</u> assumes favourable external circumstances and a relatively favourable scenario with regard to weather and political/military turbulence. An additional three scenarios was created by the overall assumption that an extra 60 per cent of selected items of present indirect steel imports was replaced by local production by 1995 through an accelerated growth of the engineering sector (30 per cent by 1990) thus creating a greater consumption of the basic steel products included in the survey. The latter alternatives are referred to as the <u>accelerated import replacement projection</u>, wherewas the former is called the <u>main projection</u>.

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1/ The latter is generally referred to below as the "special explanatory variable".

5. Generally, the growth rates forecast for steel consumption are well over the projected rates of growth in population and GDP. For some items, consumption growth however lie below or only slightly above the growth rate of the special explanatory variable, (see Annex VI) indicating a decline or slow increase in the steel intensity of the sector. The alternatives show that there is a wide range of possibilities with regard to total consumption in 1990 and 1995. For PTA as a whole with a consumption of about 1.19 million tpy in 1981-83 the highest projection points at over 3 million tpy in 1995 and the lowest case gives 1.71 million tpy. In the case of SADCC with an initial consumption of 0.72 million tpy the outer points for the projections in 1995 lie at 1.71 and 0.97 million tpy.

Table 5.1: Apparent steel consumption in PTA and SADCC 1981-83 - 1995; Summary of Projections

| | | Million tonnes crude steel equivalent per annum | | | Annual compound growth rates | |
|---|---|---|---|---|---|---|
| | | 1981-83 | 1990 | 1995 | 1981-83 to 1990 | 1990 to 1995 |
| Base case | PTA | 1.19 | 1.67 | 2.21 | 4.3 | 5.8 |
| | SADCC | 0.72 | 0.98 | 1.30 | 4.0 | 5.7 |
| High growth | PTA | 1.19 | 1.92 | 2.74 | 6.2 | 7.4 |
| | SADCC | 0.72 | 1.10 | 1.58 | 5.5 | 7.6 |
| Low growth | PTA | 1.19 | 1.44 | 1.71 | 2.4 | 3.5 |
| | SADCC | 0.72 | 0.84 | 0.97 | 2.0 | 2.9 |
| Accelerated import replacement | | | | | | |
| Base case | PTA | 1.19 | 1.86 | 2.59 | 5.8 | 6.9 |
| | SADCC | 0.72 | 1.09 | 1.51 | 5.3 | 6.8 |
| High growth | PTA | 1.19 | 2.11 | 3.13 | 7.5 | 8.2 |
| | SADCC | 0.72 | 1.20 | 1.79 | 6.7 | 8.3 |
| Low growth | PTA | 1.19 | 1.64 | 2.10 | 4.1 | 5.1 |
| | SADCC | 0.72 | 0.95 | 1.18 | 3.5 | 4.5 |

6. Tables 5.2 and 5.3 presents an overview of the main projections: In the base period,(1981-83) total sub-regional consumption of basic steel products stood at a total (crude equivalent)[1/] of 1.2 million tpy. This was covered by local production of around 0.5 million tpy and import of 0.8 million tpy leaving some 0.1 million tpy for exports out of the

1/ For method of calculation refer to Annex VI.

## Table 5.2: PTA total, main projection

A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 34895 | 153 | 228 | 43765 | 199 | 220 | 53470 | 235 | 228 | 2.9 | 4.1 | 3.3 | 3.4 | -0.5 | 0.7 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. CONSUMPTION | | EXPL. VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT_NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 245977 | 239057 | 99803 | 92883 | 319340 | 405000 | -85660 | 398094 | 526000 | -127906 | 3.3 | 4.5 | 2.8 | 3.9 |
| ANGLES SHP. H | 6734 | 78728 | 68667 | 20219 | 10158 | 83531 | 77500 | 6031 | 88294 | 83500 | 4794 | 0.7 | 1.1 | 3.1 | 3.8 |
| ANGLES SHP.,L | 6735 | 86529 | 56932 | 32498 | 2901 | 127668 | 123000 | 4668 | 176238 | 222500 | -46262 | 5.0 | 6.7 | 3.8 | 5.4 |
| PLATES, H.+ M | 6740 | 70881 | 0 | 70881 | 0 | 106933 | 0 | 106933 | 134847 | 0 | 134847 | 5.3 | 4.7 | 3.1 | 3.8 |
| PLATES, LIGHT | 6743 | 127517 | 0 | 127517 | 0 | 215523 | 0 | 215523 | 325738 | 0 | 325738 | 6.8 | 8.6 | 3.8 | 5.4 |
| TIN.& COAT.PL | 6749 | 128152 | 6000 | 123564 | 1411 | 204466 | 40000 | 164466 | 297460 | 60000 | 237460 | 6.0 | 7.8 | 3.8 | 5.4 |
| HOOP AND STRP | 6750 | 19039 | 0 | 19039 | 0 | 20800 | 0 | 20800 | 22946 | 0 | 22946 | 1.1 | 2.0 | 3.8 | 5.4 |
| RAILS+ MATER. | 6760 | 26196 | 3882 | 24123 | 1809 | 28229 | 9500 | 18729 | 31518 | 11500 | 20018 | 0.9 | 2.2 | 3.1 | 3.8 |
| WIRE | 6770 | 59794 | 35949 | 27156 | 3311 | 89033 | 72000 | 17033 | 121755 | 100000 | 21755 | 5.1 | 6.5 | 3.8 | 5.4 |
| TUBES | 6780 | 55449 | 4465 | 52222 | 1238 | 61157 | 10400 | 50757 | 67017 | 14500 | 52517 | 1.2 | 1.8 | 3.8 | 5.4 |
| TOTALS | | 898263 | 414951 | 597023 | 113710 | 1256681 | 737400 | 519281 | 1663908 | 1018000 | 645908 | 4.3 | 5.8 | 3.5 | 4.8 |
| CRUDE EQUIVALENT | | 1188597 | 530659 | 803048 | 145109 | 1666500 | 946556 | 719944 | 2208867 | 1307177 | 901690 | 4.3 | 5.8 | | |
| BILLET EQUVIVALENT | | 1014158 | 452779 | 685193 | 123812 | 1421925 | 807640 | 614285 | 1884694 | 1115336 | 769358 | 4.3 | 5.8 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 1188597 | 530659 | 803048 | 145109 | 1920173 | 946556 | 973616 | 2742822 | 1307177 | 1435645 | 6.2 | 7.4 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.3 | 3.3 | 0.9 |
| 1990 TO 1995 | 5.5 | 3.4 | 2.1 |

D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 1188597 | 530659 | 803048 | 145109 | 1441242 | 946556 | 494685 | 1712931 | 1307177 | 405754 | 2.4 | 3.5 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.3 | 3.3 | -2.0 |
| 1990 TO 1995 | 2.3 | 3.4 | -1.0 |

## Table 5.3: SADCC total, main projection

### A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ 75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 17926 | 61.5 | 291 | 21690 | 79.3 | 274 | 26410 | 92.8 | 285 | 2.4 | 4.0 | 3.2 | 3.2 | -0.8 | 0.8 |

### B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| PRODUCT NAME | SITC | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | NET IMPORT | 1995 CONS | PROD | NET IMPORT | GROWTH RATES PA. CONSUMPTION TO 1990 | 1990-1995 | EXPL.VARIABLE TO 1990 | 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BARS AND RODS | 6730 | 134206 | 174633 | 49910 | 90337 | 178988 | 264000 | -85012 | 220650 | 323000 | -102350 | 3.7 | 4.3 | 2.6 | 3.7 |
| ANGLES SHP. H | 6734 | 73751 | 68667 | 15242 | 10158 | 74841 | 75000 | -159 | 76829 | 80000 | -3171 | 0.2 | 0.5 | 3.1 | 3.5 |
| ANGLES SHP.,L | 6735 | 55699 | 35545 | 22090 | 1937 | 77638 | 75500 | 2138 | 105896 | 107000 | -1104 | 4.2 | 6.4 | 3.4 | 5.5 |
| PLATES, H.+ M | 6740 | 46556 | 0 | 46556 | 0 | 65858 | 0 | 65858 | 81320 | 0 | 81320 | 4.4 | 4.3 | 3.1 | 3.5 |
| PLATES, LIGHT | 6743 | 66611 | 0 | 66611 | 0 | 119433 | 0 | 119433 | 188554 | 0 | 188554 | 7.6 | 9.6 | 3.4 | 5.5 |
| TIN.& COAT.PL | 6749 | 53389 | 0 | 53389 | 0 | 96889 | 0 | 96889 | 152827 | 0 | 152827 | 7.7 | 9.5 | 3.4 | 5.5 |
| HOOP AND STRP | 6750 | 15088 | 0 | 15088 | 0 | 15456 | 0 | 15456 | 16459 | 0 | 16459 | 0.3 | 1.3 | 3.4 | 5.5 |
| RAILS+ MATER. | 6760 | 19400 | 3882 | 17327 | 1809 | 20145 | 7000 | 13145 | 21805 | 8000 | 13805 | 0.5 | 1.6 | 3.1 | 3.5 |
| WIRE | 6770 | 37390 | 28667 | 11194 | 2471 | 55544 | 36500 | 19044 | 74916 | 50000 | 24916 | 5.1 | 6.2 | 3.4 | 5.5 |
| TUBES | 6780 | 40401 | 3465 | 37601 | 665 | 37032 | 8400 | 28632 | 38909 | 12000 | 26909 | -1.1 | 1.0 | 3.4 | 5.5 |
| TOTALS | | 542491 | 314859 | 335009 | 107376 | 741824 | 466400 | 275424 | 978166 | 580000 | 398166 | 4.0 | 5.7 | 3.2 | 4.7 |
| CRUDE EQUIVALENT | | 716751 | 402364 | 451166 | 136780 | 981663 | 596421 | 385242 | 1296669 | 742200 | 554469 | 4.0 | 5.7 | | |
| BILLET EQUVIVALENT | | 611561 | 343313 | 384953 | 116706 | 837594 | 508890 | 328704 | 1106370 | 633275 | 473095 | 4.0 | 5.7 | | |

### C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD-1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNES | 716751 | 402364 | 451166 | 136780 | 1098890 | 596421 | 502469 | 1583351 | 742200 | 841151 | 5.5 | 7.6 |

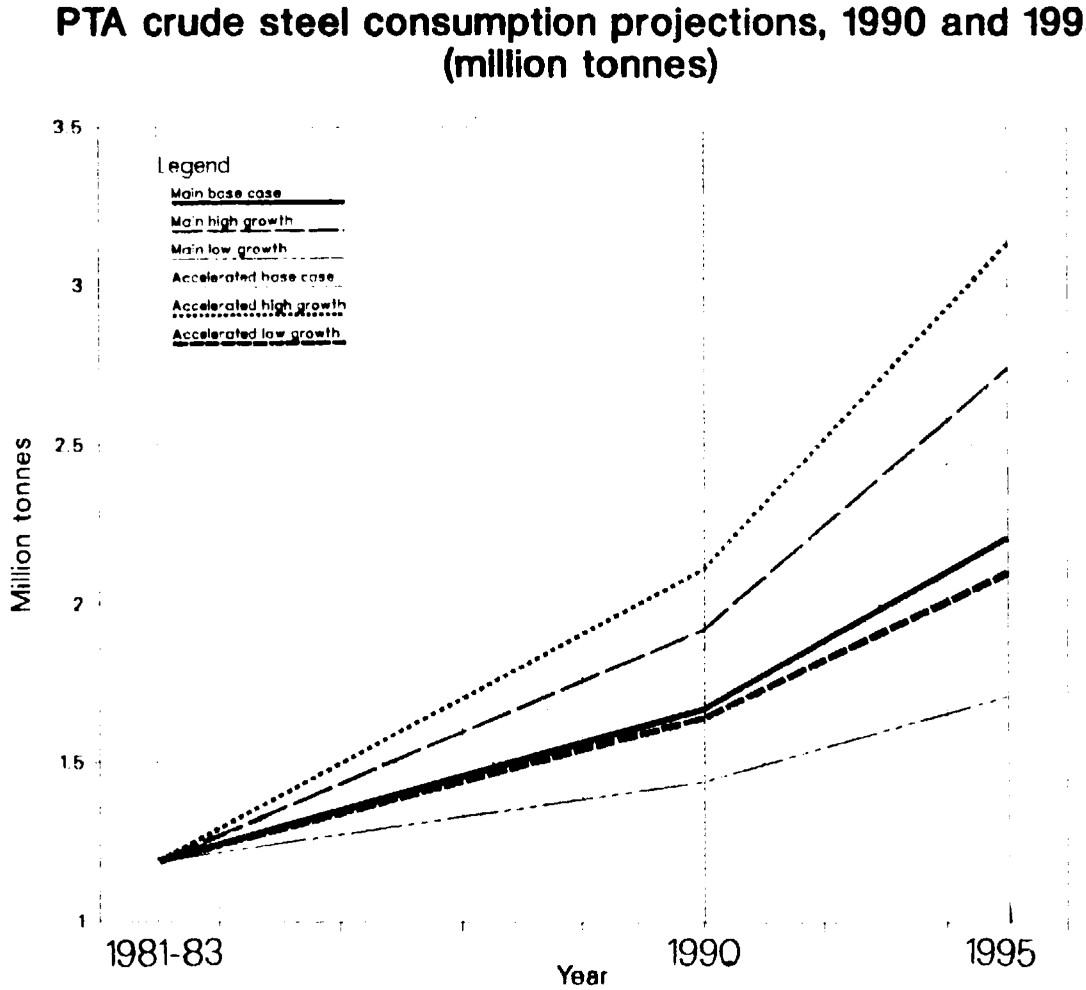
| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 3.7 | 3.2 | 0.5 |
| 1990 TO 1995 | 5.4 | 3.2 | 2.2 |

### D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD - 1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNE | 716751 | 402364 | 451166 | 136780 | 841904 | 596421 | 245483 | 969161 | 742200 | 226961 | 2.0 | 2.9 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 0.8 | 3.2 | -2.4 |
| 1990 TO 1995 | 2.1 | 3.2 | -1.1 |

Figure 5.1.

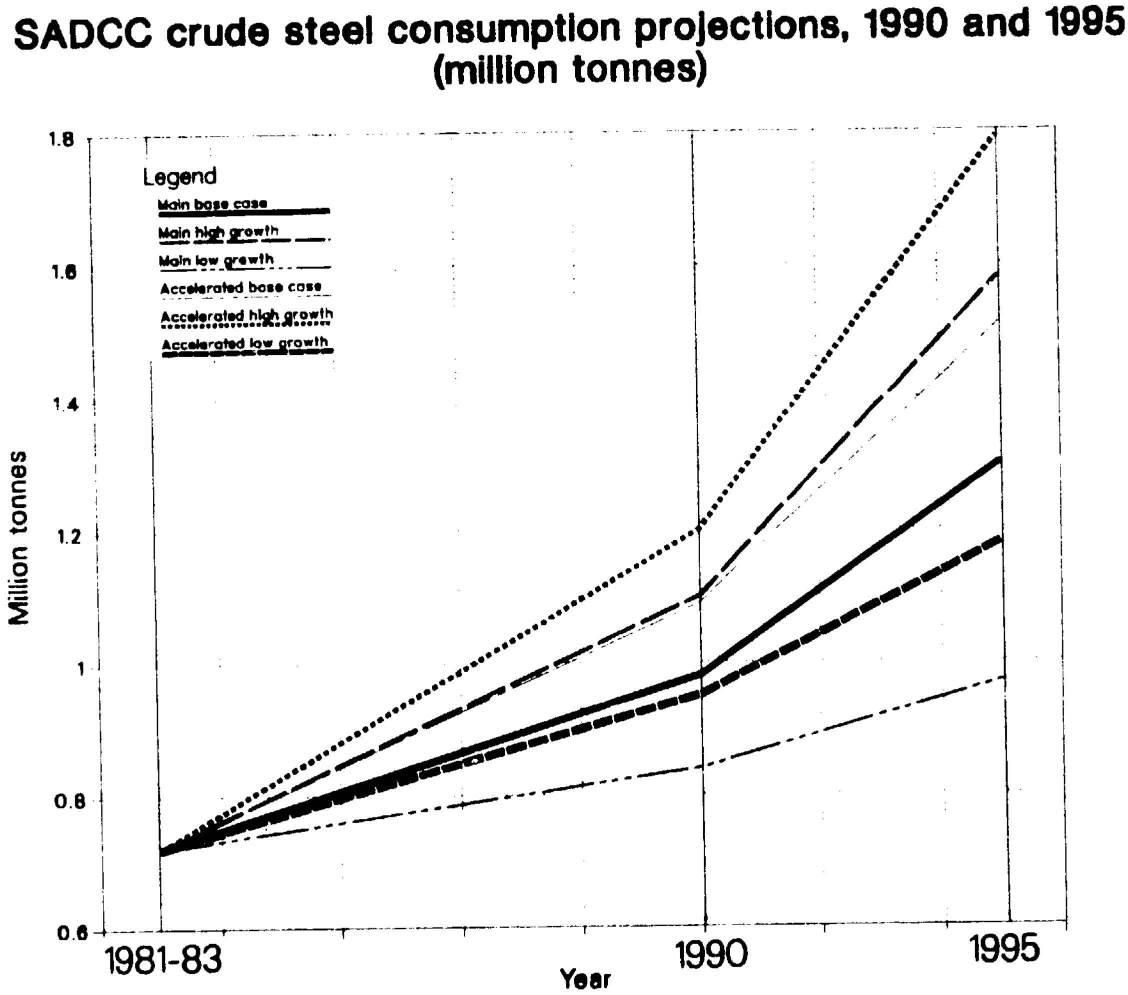



region. This gives a net import requirement of about 55 per cent. Average consumption per capita was 7.8 kg per year which is very low by international standards, see Table 5.4

7. The sub-region has possibly the lowest per capita consumption of steel in the world, SADCC average consumption being higher than the overall average mainly because of the stronger influence in this sub-group of the higher per capita consumption of Zimbabwe. For the PTA as a whole, consumption per capita is 5 per cent of the world average and only 2 per cent of the average for developed countries. Latin America uses nearly 10 times as much steel per capita and Asia uses nearly five times as much. Also compared to the average for Africa, the PTA per head consumption is low, about one third (SADCC one half) of the average. The main reasons for this are the higher incomes and higher per capita consumption of some populous African countries outside the sub region,

particularly Algeria (approximately 100 kg per capita) and Egypt (approximately 45 kg per capita). The low consumption rates are not entirely surprising on the background of income data; GDP per capita in 1981 was US $317 in PTA (US $420 in SADCC) compared to an overall African average of US $694.

Figure 5.2.




There is, however, a great deal of variation between countries of the sub-region as shown in Table 5.5. Zimbabwe has reached higher levels than e.g. Egypt, Colombia and China. Some of the small, relatively rich economies; Botswana, Seychelles and Mauritius are approaching Asian levels. On the other hand, consumption per head in countries like Ethiopia, Madagascar, Mozambique, Somalia and Uganda are exceedingly low.

8. By 1995, the end year of the projection, it is estimated that (in the main projection base case) consumption will have roughly doubled (up from 1.2 million tpy to 2.2 million tpy), giving a per capita consumption of 9.4 kg and a drop in net import requirement from 55 per cent to 41 per cent.[1/] A further downward climb of import dependence is is prevented by the regional supply/demand imbalance in rolled products, which based on present firm plans will remain to the mid 1990s.

9. For the SADCC group of countries, SADCC (see Table 5.3) consumption (in the main base case) would increase from 0.7 million tpy in 1981-83 to 1.3 million tpy in 1995, implying a rise in per head consumption from 11.7 kg to 14.0 kg and a drop in net import requirement from 44 per cent to 42 per cent. The reason for the latter nearly insignificant drop is that consumption of the types of rolled steel products that the SADCC countries can produce today is well covered by local production and the scope for improvement, therefore, limited without expansion of production into other types of products.

10. The range of projection alternatives may also be illustrated in terms of per capita consumption. For PTA the upper and lower bounds (respectively accelerated replacement high growth and main projection low growth) in 1995 would be 13.3, and 7.2 kg/capita, the former representing a 70 per cent increase from 1981-83 and the latter a <u>decline</u> from 1981-83. The range for SADCC would be 19.3 kg/capita to 10.4 kg/capita, the former representing a 65 per cent increase and the latter a fall from the 1981-83 level of 11.7 kg/capita.

11. In terms of net import requirement the difference between upper and lower projections are influenced by the mentioned structural imbalance. In the high alternatives, import requirements in 1995 would <u>increase</u> to 58.2 per cent and 58.6 per cent for PTA and SADCC respectively. Only in the undesirable case of the low scenario would the import dependency decline to 23.7 per cent and 23.4 per cent respectively. It should be stressed that the assumption leading to this is an illustration rather than a forecast. Indeed, a main recommendation from this study is that the structural imbalance, which mainly is due to the fact that plate and

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1/ The latter assuming no other expansion in production capacity than those already firmly planned, Table A.II.3.

sheet is not produced in the sub-region should be corrected. This aspect is dealt with in 5.2 below. The foreign exchange leakage as a result of underused capacity and structural imbalance could be considerable. It is estimated that the aggregate sub-regional import cost of basic steel products in 1981-83 amounted to about US$270 million, of which the SADCC countries accounted for US$150 million. (See Table A.II.2).

Table 5.4: Apparent crude steel consumption in selected countries and regions, average 1981-83

| | Population million | Total thousand tpy | Kg per capita/ year |
|---|---|---|---|
| World | 4,586 | 719,665 | 156.9 |
| Total industrialized countries1/ | 795 | 317,823 | 399.8 |
| Total developing countries1/ | 2,358 | 103,393 | 43.8 |
| Total Latin America | 382 | 28,079 | 73.5 |
| Total Asia | 1,624 | 64,739 | 39.8 |
| Total Africa | 499 | 10,575 | 21.2 |
| Total PTA | 1.53 | 1,189 | 7.8 |
| Total SADCC | 61.5 | 717 | 11.6 |
| India | 768.7 | 13,836 | 18 |
| China | 1,041.0 | 44,754 | 43 |
| Brazil | 117.2 | 10,200 | 87 |
| Colombia | 33.7 | 1,146 | 34 |
| Egypt | 43.8 | 1,970 | 45 |

Source: Steel Statistical Yearbook 1985. International Iron and Steel Institute, Brussels 1985. Exclusive of indirect consumption. Population figures from UN Statistical yearbook and UNCTAD Handbook of International Trade.

1/ Excluding centrally planned economies.

12. It is hard, with any degree of confidence, to select one most likely projection alternative or discard upper or lower limits: If the low growth scenario materializes, which does not seem wholly unlikely on the basis of developments over the latest years, there will be less of a chance that the countries can mobilize the resources necessary to accelerate the replacement of indirect imports by developing their engineering industries. On the other hand, if the (relatively modest) high growth scenario is realised, the probability of additional development resources and hence the probability for the highest alternative will increase.

13. Two sets of external factors are crucially important for development in the medium term and will also influence what happens in the longer term; world market prices and the degree of economic disruption in the region generated by South Africa. Whereas developments in South Africa are still very unclear, the world market situation, particularly the decline of oil prices, gives reason for believing in an alternative higher than the base case. With the oil price trend continuing and an early end to unrest in the sub-region, steel consumption may turn out to equal high case levels.

Table 5.5: Projected development of apparent steel consumption by country 1/

| Country | 1981 - 83 Population million | 1981 - 83 Steel consumption thousand tpy | 1981 - 83 Steel consumption per capita kg/year | 1995 Population million | 1995 Steel consumption thousand tpy | 1995 Steel consumption per capita kg/year | Annual per cent increase of consumption 1981-83 to 1995 |
|---|---|---|---|---|---|---|---|
| Angola | 7.5 | 56.9 | 8 | 10.6 | 80.8 | 8 | 2.7 |
| Botswana | 0.8 | 25.3 | 32 | 1.4 | 38.9 | 28 | 3.4 |
| Burundi | 4.5 | 12.4 | 3 | 6.6 | 37.0 | 6 | 8.7 |
| Comoros | 0.4 | 3.3 | 8 | 0.5 | 5.7 | 11 | 4.3 |
| Ethiopia | 33.3 | 70.7 | 2 | 51.2 | 152.9 | 3 | 6.6 |
| Djibouti | 0.3 | 5 | 17 | 0.4 | 7.5 | 18 | 2.9 |
| Kenya | 17.9 | 258. | 14 | 31.3 | 369.8 | 12 | 2.8 |
| Lesotho | 1.4 | 13.0 | 9 | 2.1 | 21.9 | 10 | 4.1 |
| Madagascar | 9.3 | 32.4 | 3 | 13.4 | 79.3 | 6 | 7.1 |
| Malawi | 6.6 | 25.1 | 4 | 10.2 | 51.1 | 5 | 5.6 |
| Mauritius | 1.0 | 34.8 | 35 | 1.2 | 71.6 | 60 | 5.7 |
| Mozambique | 11.1 | 26.9 | 2 | 15.9 | 100.2 | 6 | 10.6 |
| Rwanda | 5.2 | 24.7 | 5 | 8.3 | 43.4 | 5 | 4.4 |
| Seychelles | 0.1 | 2.5 | 25 | 0.1 | 3.5 | 29 | 2.6 |
| Somalia | 5.0 | 7.9 | 2 | 6.5 | 15.8 | 2 | 5.5 |
| Swaziland | 0.6 | 9.7 | 16 | 0.9 | 18.3 | 20 | 5.0 |
| Tanzania | 19.2 | 84.1 | 4 | 29.1 | 122.9 | 4 | 3.0 |
| Uganda | 14.1 | 19.7 | 1 | 22.4 | 115.6 | 5 | 14.5 |
| Zambia | 6.2 | 96.4 | 15 | 9.8 | 156.9 | 16 | 3.8 |
| Zimbabwe | 8.0 | 379.3 | 47 | 12.8 | 705.6 | 55 | 4.9 |
| Total PTA | 152.5 | 1,188.5 | 7.8 | 234.7 | 2,208.7 | 9.4 | 4.8 |
| Total SADCC | 61.5 | 716.8 | 11.7 | 92.8 | 1,296.7 | 14.0 | 4.7 |

1/ Main projection, base case, totals do not always coincide with those of tables 5.2 and 5.3 because of rounding.

14. Table 5.5 shows a summary of country data and projections. In general, it illustrates the great variation in the sub-region with respect to population and steel consumption. Kenya and Zimbabwe, the major centres of steel consumption in 1981-83 stood for 68 per cent of total sub-regional consumption but only 17 per cent of the population. This is a reflection of the variation in present development levels and economic structures among the countries of the sub-region. Foreseen variations in development prospects lead to differing projections of future consumption.

15. There appears to be a tendency for convergence over time of per capita consumption levels. One noteable feature however is the relatively high per capita consumption in some very small countries: Botswana (32), Djibouti (17), Mauritius (35), Seychelles (25), Swaziland (16). This may partly be a problem of statistical sources, partly a coincidence caused by heavily steel consuming projects in these small economies in the base period. For example, the generally high degree of industrialization in Mauritius and mining sector development in Botswana explain the high consumption levels in those two countries. Because, in the regression analysis, a low population becomes positively associated with a high per capita consumption, projections for these countries may tend to overestimate consumption. For Mauritius, where economic prospects are considered good and the population growth rate is low, a very steep increase in per capita consumption from high initial levels result.

16. Six countries have very low per capita consumption (under 4 kgs per year). Four of them: Burundi, Madagascar, Mozambique and Uganda are projected to reach more "normal" consumption levels by 1995. In the case of Burundi, this is based on the expectation of a quite rapid development with emphasis on the manufacturing sector. For the three others the rapid growth represents more predominantly a return to normal from the depressed consumption levels of the base period.

17. Kenya and Zimbabwe seem to have somewhat different developments in per capita steel consumption. For Kenya, a tendency for declining steel intensity is forecast. Together with rather low growth up to 1990 and a very high increase in population this results in a slight decline in steel consumption per head up to 1995. In Zimbabwe, high forecast growth rates, particularly for manufacturing value added in the period 1990-1995 balances off a tendency for declining steel intensity.

18. The remaining seven countries show more "normal" per capita consumption levels, growth of total consumption in the 3-6 per cent range and therefore levelling or slightly increasing per capita consumption levels.

5.2 Structural change and opportunities for trade and specialization

19. Projections indicate that considerable structural change will take place as steel consumption grows over the next decade. Tables 5.6 and 5.7 show projected changes in consumption patterns for PTA and SADCC. Several tendencies are involved. Firstly, consumption patterns of the countries included have a tendency to converge. This may be seen from a comparison of the tables (1) in Volume II of the study and is largely due to the underlying assumption that industrially less developed countries become more diversified during a growth and development process (see Annex VI). Secondly, there is a general tendency for a change in consumption profiles away from bars and rods, angles and shapes, towards other items, particularly light plate. This is connected to the assumption of a strong growth of the manufacturing sector relative to building and construction. The more sophisticated products produced by the manufacturing sector tend to require more plate. For PTA as a whole, it is estimated that bars, rods and angles which constituted 45.8 per cent of total consumption in 1981-83 will decline to 37.8 per cent in 1995, whereas light, tinned and coated plate will increase from 28.5 per cent of the total to 37.0 per cent over the same period. Thirdly, items like heavy plate, rail track and line material as well as tube, show a receding trend. These items are notoriously difficult to forecast because of the large fluctuations in their consumption which are often experienced in connection with the beginning or phasing out of large investment projects. In view of the depressed economic situation in the base period permitting few large projects, the growth potential for these items may well be underestimated.

20. The extent to which demand for the various steel products can be satisfied by sub-regional producers depends on overall capacities for steelmaking and rolling, and on how well the product range is matched with the structure of demand. It was not possible to deal with all types of steel qualities and shapes needed by, e.g. the engineering sector, but the demand projections give a basis for judging where bottlenecks in the supply of the main rolled products may occur. Tables 5.2 and 5.3 indicates problems and opportunities.

Table 5.6: Projected structural change in consumption of rolled steel, PTA base case

| | Per cent of total | | |
|---|---|---|---|
| | 1981-83 | 1990 | 1995 |
| Bars and rods | 27.4 | 25.4 | 23.9 |
| Angles and shapes, heavy and medium | 8.8 | 6.6 | 5.3 |
| Angles and shapes, light | 9.6 | 10.2 | 10.6 |
| Plates, heavy and medium | 7.9 | 8.5 | 8.1 |
| Plates, light | 14.2 | 17.1 | 19.5 |
| Tinned and coate plate | 14.3 | 16.2 | 17.8 |
| Hoop and strip | 2.1 | 1.7 | 1.4 |
| Rails and railtrack materials | 2.9 | 2.2 | 1.9 |
| Wire | 6.7 | 7.1 | 7.3 |
| Tubes | 6.2 | 4.9 | 4.0 |
| Total | 100.0 | 100.0 | 100.0 |

Table 5.7: Projected structural change in consumption of rolled steel, SADCC base case

| | Per cent of total | | |
|---|---|---|---|
| | 1981-83 | 1990 | 1995 |
| Bars and rods | 24.7 | 24.1 | 22.6 |
| Angles and shapes, heavy and medium | 13.6 | 10.1 | 7.9 |
| Angles and shapes, light | 10.2 | 10.4 | 10.8 |
| Plates, heavy and medium | 8.6 | 8.9 | 8.3 |
| Plates, light | 12.3 | 16.1 | 19.3 |
| Tinned and coate plate | 9.8 | 13.1 | 15.6 |
| Hoop and strip | 2.8 | 2.1 | 1.7 |
| Rails and railtrack materials | 3.6 | 2.7 | 2.2 |
| Wire | 6.9 | 7.5 | 7.7 |
| Tubes | 7.4 | 5.0 | 3.9 |
| Total | 100.0 | 100.0 | 100.0 |

Percentages may not add up to 100 due to rounding.

21. In the base period, virtually all producers in the region had installed capacities for production of bars and rods, light angles and shapes. Zimbabwe in addition produced heavy angles, light rails and tubes. Wire was produced in Ethiopia, Kenya and Zimbabwe. There was no production of plate, sheet or strip in the sub-region. (Data from Kenya shows that some coating or tinning of plate took place there in 1981-83).

22. Looking at PTA net imports by basic product (Table 5.2) in 1981-83 it appears clear that there is scope for import substitution for all items. Given the present poor capacity utilization, the first step to be considered should be a better match of production to current and prospective demand by better utilization of the already installed capacity. The scope for this is illustrated by assuming an increase from the low levels of 1981-83 to a utilization of 70 per cent in 1990 and in the region of 90 per cent in 1995. In addition, firmly planned new capacities as at mid-1985 have been included in the production forecast. In the base case, this would, as mentioned above, bring the net import requirement of the region down from 55 per cent in 1981-83 to 42 per cent in 1995.

23. Table 5.8 illustrates the sub-regional market balance and the scope for trade in basic steel products under the above assumptions. Trade appears in future as at present, mainly to be centred on rods, bars and light angles and on exportable surpluses in Kenya, Zimbabwe and in future, Mauritius. In most other countries that plan to roll steel by 1995 there would appear to be a quite well balanced market situation for rods, bars and light angles. Assuming that surpluses and deficits (e.g., positive and negative projections of net imports in 1995) below 2,000 tpy are well within margins of error, five of the ten expected steel producers will have a need for international trade in bars, rods and light sections; Kenya, Zimbabwe, Mauritius and to some extent Mozambique would have exportable surpluses of these products and Uganda would need to import a significant amount of rods and bars. The total exportable quantities of the four would be 173,500 tpy of bars and rods and 73.7 tpy of light angles. The consumption in Uganda and the non-producers would be 34.2 tpy and 24.7 tpy respectively, indicating some capacity for exports outside the PTA. As existing and planned capacities for bars, rods and light angles appears to be sufficient up to 1995, it may be concluded that it is indeed appropriate to attach the highest priority to improving capacity utilization. The sum total of present individual national plans for additional capacities in these products appear appropriate when seen in a sub-regional context.

Table 5.8: Trade opportunities in steel products

| Country | Net import 1995, thousand tonnes: Bars, rods | Net import 1995, thousand tonnes: Light, angles and shapes |
|---|---|---|
| Angola | -0.8 | -0.4 |
| Botswana | 9.9 | 4.3 |
| Burundi | 1.9 | 3.4 |
| Comoros | 1.3 | 0.3 |
| Ethiopia | 1.1 | 1.7 |
| Djibouti | 2.8 | 0.1 |
| Kenya | -35.3 | -40.1 |
| Lesotho | 1.8 | 1.2 |
| Madagascar | 0.2 | 0.0 |
| Malawi | 7.6 | 4.2 |
| Mauritius | -16.5 | -17.2 |
| Mozambique | -9.0 | -2.7 |
| Rwanda | 5.2 | 3.6 |
| Seychelles | 1.0 | 0.3 |
| Somalia | 1.7 | 0.8 |
| Swaziland | 1.2 | 4.7 |
| Tanzania | 0.0 | 1.2 |
| Uganda | 11.0 | 1.8 |
| Zambia | -0.3 | 0.2 |
| Zimbabwe | -112.8 | -13.7 |
| Total PTA1/ | -127.9 | -46.3 |
| Total SADCC1/ | -102.4 | -1.1 |

1/ Totals do not always coincide with those of tables 5.2 and 5.3 because of rounding.

24. The main bottleneck appears in plate and sheet, where the sub-region for the time being has no producer. Furthermore, as shown above, the plate products will increase their share of total consumption quite rapidly over the next decade. The PTA sub-region consumed nearly 350,000 tpy of the different items of plate in 1981-83 (including hoop and strip). This is, in the base case, projected to increase to nearly 550,000 tpy in 1990 and 780,000 tpy in 1995. These projections may be an overestimate because of the strong influence on the regression analysis by heavier users of plate like Kenya. However, even if one accounts for this and for the special qualities which cannot readily be produced within the sub-region, total demand would be high enough to support sub-regional production of plate. This runs contrary to opinions heard during mission. It was often stated that the higher economic minimum capacities and the higher investment costs were main obstacles to starting plate production in the region. There are, however, traditional technical solutions (e.g. steckel rolling mill) which will reduce minimum capacity for flat rolled products to the region of 100,000-200,000 tpy.

25. At such a level of production even the 1981-83 demand could have justified at least one plate producer in the sub-region. If base case projections hold, it appears a realistic proposition to have two plate mills in the region by 1990. Demand oriented locations would be Kenya (plate demand of 120,000 tonnes in 1990) and Zimbabwe (140,000 tpy). Choosing these locations would enable investors to start from a national demand base. Zimbabwe would be near the centre of a "southern" group of countries (Angola, Botswana, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Swaziland, Zimbabwe) representing about 60 per cent of total sub-regional plate demand. Kenya would be the centre of the "northern" group (Burundi, Comoros, Ehtiopia, Djibouti, Rwanda, Seychelles, Somalia, Uganda, Tanzania) with about 40 per cent of the demand.

26. A substantial coverage of plate demand by sub-regional producers nearly eliminate sub-regional import requirements for basic steel products. If three-quarters of plate and sheet demand in 1995 was satisfied sub-regionally, it would bring total net import requirements (crude equivalents) down from the 41 per cent mentioned in para 7 above to 8 per cent. The implications for crude steel demand of various alternatives for production of basic products are discussed under 5.4 below.

5.3 Billet production and trade

27. As plate is not produced in the sub-region, inputs for rolling are mainly billets (pencil ingots are treated as billets for current purposes). The billet equivalent of consumption, production and imports in the base case has been calculated for all countries by assuming a fixed relation between crude steel and billets (see Annex VI) the results are shown by country in Volume II and summarized in Table 5.2. and 5.3 above. The actual demand for billets from existing sub-regional rolling mills would be smaller than indicated by such a calculation since plate items, heavy angles, heavy rails, hoop, strip and tubes are generally not produced from billets. The derived billet demand is given in Table 5.9.

28. For the PTA as a whole, billet producing capacity stood at some 770,000 tpy in 1981-83, 600,000 tonnes[1/] of which was located in Zimbabwe, 85,000 tonnes in Kenya and smaller amounts in Angola, Ethiopia, Uganda and Tanzania. No other country in the region produced billets but there was a demand for billets also from re rollers in Mauritius and

Table 5.9: Derived demand for billets by country[1/]
(thousand tonnes)

| Country | 1981 - 83 Capacity | Demand | Production | Net import | Projection 1995 Capacity | Demand | Production | Net import |
|---|---|---|---|---|---|---|---|---|
| Angola | 30.0 | 2.4 | 2.2 | 0.2 | 30.0 | 29.8 | 27.0 | 2.8 |
| Ethiopia | 12.0 | 17.8 | 10.1 | 7.7 | 12.0 | 58.7 | 10.8 | 47.9 |
| Kenya | 85.1 | 62.9 | 51.4 | 11.5 | 131.1 | 211.2 | 118.0 | 93.2 |
| Madagascar | - | - | - | - | - | 27.8 | - | 27.8 |
| Mauritius | - | 9.5 | - | 9.5 | 50.0 | 78.6 | 45.0 | 33.6 |
| Mozambique | - | 10.5 | - | 10.5 | - | 47.7 | | 47.7 |
| Tanzania | 18.0 | 15.2 | 12.0 | 3.2 | 43.0 | 46.6 | 38.7 | 7.9 |
| Uganda[2/] | 24.0 | 10.8 | 10.8 | - | 26.5 | 29.3 | 23.9 | 5.4 |
| Zambia | - | - | - | - | 27.0 | 38.5 | 24.3 | 14.2 |
| Zimbabwe | 600.0 | 236.3 | 480.5 | -244.2 | 600.0 | 368.8 | 540.0 | -171.2 |
| Total PTA | 769.1 | 365.4 | 567.0 | -201.6 | 919.6 | 937.0 | 827.7 | 109.3 |
| Total SADCC | 648.0 | 264.4 | 494.7 | -203.3 | 700.0 | 531.4 | 630.0 | -98.6 |

1/ Assuming billet demand for all items except plate, tubes and heavy angles. Assuming a capacity utilization in the region of 90 per cent in 1995 and demand as in the main projection base case.

2/ Import of billets may have taken place into Uganda. Trade statistics for the country for the relevant period are deficient or non-existent.

Mozambique. Overall capacity utilization was as high as 73 per cent, heavily influenced by the capacity utilization of 80 per cent for Zimbabwe, which exported over half of the billets produced. Capacity utilization for other billet producers were lower, averaging about 50 per cent. The substantial billet export from Zimbabwe led to a net export for the region as a whole. The region excluding Zimbabwe, however, imported one-third of its billet requirement of some 42,600 tonnes.[1/] Zimbabwe's export in 1981 (see Table 5.10) indicate that nearly half of this would have been supplied by Zimbabwe, the rest from overseas. About 10 per cent of Zimbabwe's billet export for that year went to the three PTA countries which had the greatest import requirement; Zimbabwe's steel covered some 40 per cent of Kenya's requirements, all of Mauritius' and 60 per cent of Mozambique's.

1/ The quoted capacity, strictly speaking, also include heavy sections.

Table 5.10: Zimbabwe's exports of blooms, billets, slabs, sheets, bars in 1981

| | thousand tonnes | per cent of total |
|---|---|---|
| Kenya | 4.8 | 2.3 |
| Mauritius | 9.9 | 4.7 |
| Mozambique | 6.0 | 2.9 |
| Republic of South Africa | 10.5 | 5.1 |
| Other Africa | 17.5 | 8.4 |
| Other developing counries | 150.9 | 72.6 |
| Industrialized countries | 8.4 | 4.0 |
| Total | 208.0 | 100.0 |

29. In line with its sectoral strategy, PTA has actively promoted supply/purchase agreements between Zimbabwe and billet deficit countries of the sub-region. ZISCO teams have examined the technical state of rolling mills in Ethiopia and Mozambique and their billet requirements. The Commonwealth Secretariat has completed a similar exercise for Kenya, and it is hoped, with assistance from ZISCOSTEEL to do the same for Tanzania and Madagascar. A first breakthrough was achieved in March 1986 when MMCZ/ZISCO agreed on a supply contract with Ethiopian authorities involving an annual 4,000 tpy billet and 2,000 tpy wire rod. Later, in May 1986, MMCZ/ZISCO and various Kenyan rollers confirmed orders for a total of 45,000 tonnes of steel, mostly billets.

30. Projections show considerable scope for expansion of the trade in billets: On present plans, billet making capacity would expand from the 1981-83 levels of 769,100 tpy to 919,600 tpy in 1990 and remain at this level up to 1995. Assuming a 90 per cent capacity utilization and derived demand as in the base case, this would give a surplus at some 160,000 tpy for the sub-region in 1990.

31. By 1995 the demand/supply balance assuming base case demand would have changed into one of sub-regional billet <u>deficit</u> in the region of 110,000 tonnes (see Table 5.9). Zimbabwe would still be able to produce a considerable surplus of 170,000 tpy but the combined demand from other countries of the sub-region would be about 280,000 tpy. Ethiopia, Kenya, Mauritius and Mozambique would stand for roughly 80 per cent of the total. This would mean a potential 6-7 fold increase in the volume of sub-regional billet trade (from 42,400 tpy in 1981-83 to 280,000 tpy in 1995). To release this potential and maintain overall self-sufficiency, there would be a need for expansion in sub-regional billet producing

capacity between 1990 and 1995. Several factors would have to be taken into account to determine the best location. Using concentration of demand as the only factor, would make a northern location, e.g. Kenya appear advantageous.

32. Whether such capacity expansion and trade will actually take place are dependent on numerous factors, the most important of which are the price competitiveness and profitability for Zimbabwean billets, general demand assumptions and the possibility of a demand for other primary steel products than billets. These points are considered briefly below.

33. The following list of comparative transport costs in US$ gives some indication of ZISCO's transport advantage for sub-regional supply of billets to major importers.

| To | From ZISCO (Redcliff) | From Europe (Anvers) |
|---|---|---|
| Ethiopia | | |
| Landed Djibouti1/ | 105 | 60 |
| Kenya | | |
| Landed Mombasa1/ | 76 | 78 |
| Madagascar | | |
| Cif Antanarivo | 150 | 196 |
| Mauritius | | |
| Landed Port Louis | 92 | 89 |
| Mozambique | | |
| Landed Maputo | 30 | 70 1/ |

1/ Does not include port charges in respectively Djibouti, Mombasa and Maputo.

Data is drawn from Annex III and must be regarded as approximate only (sea freights Maputo-Djibouti, Anvers-Maputo and Maputo-Port Louis are informed guesses).

34. The transport cost differences between supplies from ZISCO and from Europe vary considerably. Only in one case, Ethiopia do European producers seem to have a transport cost advantage. The US$60 quoted as sea freight costs from Europe relates to earlier billet supplies from Poland. The billet supply/purchase agreement between Zimbabwe and Ethiopia is said to be based on prices somewhat above those of deliveries from the most competitive European producers.

35. Apart from the case of Ethiopia it seems clear that ZISCO supply will have a transport cost advantage for all the main points of supply listed. For Kenya and Mauritius however, margins appear to be small, meaning that ZISCO only by charging an ex-works price of around US$180 (the approximate free market fob Europe cost for billets) can compete effectively at all locations. The several ways of reducing transport costs as suggested in Chapter 4 and Annex III could further improve ZISCO's competitive position.

36. A further argument favouring ZISCO supplies is the fact that a proportion of the various countries' billet imports could be paid for in the currencies of the sub-region through the the PTA clearing arrangement. This is a strong argument in favour of ZISCO at a time of severe hard currency shortages in virtually all the countries of the sub-region. If the billet deficiency of 110,000 tonnes projected for 1995 is to be supplied from outside the sub region, the foreign exchange (C & F) outlay would be about US $35 million based on the Lusaka C & F price stipulated above. The extent to which the potential of the clearing arrangement can be used is however dependent on the size and inter country balance of sub-regional trade.

37. While recognising the advantages, in terms of sub-regional integration and self-sufficiency, of obtaining "semi" steel products from Zimbabwe in preference to external sources, it is worth observing that this strategy must be seen as a short-term expedient. In the long term, the sub-region would have to install additional steelmaking capacity to satisfy its future needs. What is more, in the interest of effective decentralization of the industry, future steel capacity increases should be implemented outside Zimbabwe which, as previously stated, in the base period accounted for 83 per cent of the sub-region's crude steel capacity. In fact, it is in Zimbabwe's long-term interest not to be saddled with the obligation of being the billet supplier to the sub-region. It is a well-known fact that billet production for sale as such is, at best, a low-margin venture. In fact, given its present profit squeeze, engendered in part by Zimbabwe's high dependence on the highly competitive export market for a large fraction of its output, ZISCO's medium and long term strategy should involve progressive diversification into higher-valued products such as flat steel, high alloy and stainless steels, and forging billets.

38. The above calculation of the demand for billets is based on the input needs for the rolling of a certain range of basic steel products. As the forecast for level and structure of basic steel production is given in one variant only (based on 70 per cent capacity utilization in 1990 and 90 per cent in 1995, and in addition, new capacity) the various alternatives for consumption of basic steel products will have only an indirect effect on billet demand.

3 The conclusion that considerable new billet making capacity would be needed between 1990 and 1995 would depend on the market balance in basic steel products for this period. In the base case, our production assumptions result in a certain net export of bars, rods and light angles in 1995. If such exports could not be realized and production had to be tailored to PTA demand only, billet demand would be reduced by some 196,000 tonnes, swinging the overall 1995 balance from a sub-regional deficit of 110,000 tpy to a surplus of 80,000 tonnes, meaning that new capacity would not be needed. The low growth cases (both main projection and accelerated replacement) would also tend to support such a conclusion, while the high growth case and accelerated base case would point to a definite need for capacity extension.

40. The assumptions made about Zimbabwe's propensity to export outside the PTA and the possibility of sub-regional plate production would strongly effect the conclusions made about the need for additional billet making capacity. Zimbabwe has traditionally exported between 200,000 tpy and 300,000 tpy of billets, only a minor part to PTA markets. If this is assumed to continue and ZISCO's billet making capacity is not expanded, Zimbabwe would have a net import requirement of some 80,000 tpy (250,000 - 170,000) by 1995, meaning that the sub-region would have a billet deficit of 360,000 tpy (110,000 + 250,000). Alternatively, assuming that Zimbabwe would balance its market and export residual amounts of billet the deficit would amount to 280,000 tpy. Both alternatives would indicate a need for an additional substantial billet producer in the region between 1990 and 1995. To what degree Zimbabwe would prefer to export to world markets or not would depend inter alia on world market prices and arrangements within PTA to secure the foreign exchange on which Zimbabwe depends for certain industrial inputs.

41. Above, it is pointed out that a main constraint to the increase of steel self-sufficiency in the sub-region is the absence of sub-regional plate and sheet production. It is also illustrated, using base case projections that a market sufficient to warrant economic production already exists. Installation of plate production facilities in the region would require input of slabs, the quantities depending on what portion of present and projected imports of plate and sheet products could be replaced by local production. Requirements could be substantial; if only 50 per cent of projected base case demand in 1990 was to be covered by sub-regional producers, additional input needs in terms of crude steel would be in the region of 350,000 tonnes. If Zimbabwe was supposed to supply this, on top of local sub-regional requirements for the product ranges presently produced, it would lead to a deficit in the production of crude steel (billets, slabs). In 1995, the combined consumption of plate items having grown to 750,000 tonnes, the demand/supply gap would have widened considerably. Given sub-regional production of plate and sheet and given substantial exports of billets from ZISCO outside the sub-region a sizeable under-capacity in crude steel could develop. This is dealt with in more detail below.

5.4 Steelmaking capacity

42. Crude steel makers in the sub-region except Zimbabwe cast the whole of their production into billets.[1/] Crude steel capacities for these producers are therefore roughly equal to their billet producing capacities listed in Table 5.9 above. For Zimbabwe, total steelmaking capacity is 850,000 tpy[2/] giving a total sub-regional capacity of 1.0191 million tpy in 1981-83.[3/] By 1990 capacity expansions in Kenya (46,000 tpy ), Uganda (2,500 tpy) and Tanzania (25,000 tpy) together with the establishment of new furnaces in Mauritius (50,000 tpy) and Zambia (27,000 tpy) would overall increase capacity by slightly over 150,000 tpy to 1.1696 million tpy (see Table A.II.3). Based on current plans, capacity would remain at this level up to 1995.

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1/ In Kenya, mostly pencil ingots which for current purposes are considered as billets.

2/ Based on assessment as at mid 1985. A capacity of 1 million tpy may be achieved by removing certain bottlenecks in oxygen and hot metal supplies.

3/ Figures refer to Annex Table AII.1. The Asmara EAF is not included. The Rolmil Kenya 7 ton EAF is not included in 1981-83.

43. The demand for steelmaking or crude steel capacity originates in the demand for basic steel products. However, supply bottlenecks in processing (rolling) of basic steel products as well as in billet/bloom/slab making mayl pose limitations on the crude steel requirement. The demand projection alternatives worked out and the various possible assumptions on bottleneck removal could produce a large number of alternatives. Below, a selection of them have been examined and crude steel requirement derived. Table 5.11 gives the results.

Table 5.11: Sub-regional crude steel requirements

| Assumptions on | | | Crude steel production thousand tonnes | | | |
|---|---|---|---|---|---|---|
| | | | Total output required | | Additional production required | |
| Demand | External exports | Removal of bottlenecks | 1990 | 1995 | 1990 | 1995 |
| 1. High accelerated | 250 | All | 2,230 | 3,190 | +1,180 | +2,140 |
| 2. Base accelerated | None | Plate production | 1,450 | 1,650 | +400 | +600 |
| 3. Base main | 250 | Plate production | 1,660 | 1,820 | +610 | +770 |
| 4. Base main | 250 | None | 1,300 | 1,300 | +250 | +250 |
| 5. Base main | None | None | 1,050 | 1,050 | - | - |
| 6. Low main | None | None | 800 | 800 | -250 | -250 |

44. The table is based on the following assumptions: Total capacity in 1990 and 1995 is 1,169,600 tpy, equivalent to Zimbabwe's capacity of 850,000 tpy + billet making capacity of 319,600 tpy for the other countries. Capacity utilization of 90 per cent gives a forecast output of 1,050,000 tpy. The demand side alternatives (not included in Table 5.11) are based on "crude equivalents" of summary tables 5.2 and 5.3, adjusted to account for the fact that crude and billet weight would coincide for certain products and producers. The demand originating from projected consumption of basic products will however only have an indirect effect on total crude output, namely by indicating the need for an expansion of capacity. The capacities of billet/slab making facilities would be the actual capacity constraint for crude (liquid) steel. If no expansion took place at the former level, no additional production of crude steel would be needed. This is examplified in alternative 5 where no bottlenecks are removed. Therefore, no additional production is needed and the output required stays the same in 1990 and 1995, since all planned capacity expansions are assumed to take place before 1990.

45. In terms of supply demand balance for basic products alternative 5 relates to the main projection base case. Note that this case involves a small amount of outside sub-region net exports of steel products in 1990 and 1995. This illustrates a situation with a balanced sub-regional market and exports outside the region roughly at the levels of 1981-83, an assumption which is also contained in all other alternatives except No.1.

46. Alternatives 1 and 6 represent extremes.
Alternative 1 assumes that all demand for basic products are reflected in the demand for crude steel. In other words, all bottlenecks in rolling and billet/slab making are assumed to be removed to make a complete matching of sub-regional production with sub-regional demand for basic steel products and to provide for 250,000 tpy billet exports for Zimbabwe.

47. Alternative 6 is based on such a low demand for basic products in the region that in order to prevent excessive stockpiling in a situation where exports out of the sub-region cannot be stepped up above its 1981-83 level, production has to be cut by approximately 250,000 tpy from its level of 1,050,000 tpy.

48. Alternative 2 conservatively assumes that 50 per cent of sub-regional demand for plate and sheet can be produced in the region and the required slab input produced. It is also asssumes that Zimbabwe's present export of billets outside PTA will be made available for purchase by the countries in the sub-region as and when needed. The basic steel demand projection for this alternative includes the assumption that considerable replacement of indirect imports by local production will take place.

49. In alternative 3, the assumption demand for basic steel products is that of the main base case projection. The assumption on production of plate and slabs are the same as in alternative 2. In addition, this alternative however assumes that Zimbabwe will continue its exports of billets at a level of some 250,000 tpy thus excluding these tonnage from the PTA market and increasing the need for additional production to achieve balance within the PTA.

50. Alternative 4, also built on the main base case demand assumption, does not assume plate production, but includes Zimbabwean extra PTA exports of 250,000 tpy.

51. The alternatives considered largely support the view that substantial additional crude steelmaking capacity could be required even by 1990. In the case that all bottlenecks could be removed, requiring substantial investment in both rolling, billet and slab making, plate and sheet production a tripling of present production and capacity would be needed by 1995.

52. Conclusions as to new capacity requirements are very sensitive to the assumption made regarding the production of plate. Deficit tonnages in alternatives 2 and 3 may be doubled if a 100 per cent coverage of plate demand is assumed instead of 50 per cent. On the other hand, if production of plate was not started in the sub-region there would hardly be a need for extra crude steel capacity. There is in other words little need for contemplating expansion of crude capacity before plans for slab/plate/sheet production are firmly in place. Zimbabwe's interest in exporting billets is also a crucial factor. If market conditions are so that an export above 250,000 tpy becomes attractive, the projected needs for additional production may be increased by the additional tonnages.

53. The chance that demand may be satisfied by making existing plant more efficient and utilize capacities better is slight. Even if overall crude steel capacity utilization could be increased to 95 per cent and Zimbabwean capacity increased to 1 million tpy, this would mean an increase of approximately 200,000 tpy. Substantial new capacity would still be needed under alternatives 2 and 3. Again, for a decision about the location of such capacity, several factors would be weighed. From the demand point of view, assuming as indicated above major expansion of billet production and perhaps slabs in a northern location, this would naturally have to be linked with additional crude steel capacity.

54. Two major points emerge from the above discussion:

a) Steelmaking capacity in the PTA sub-region estimated at 1.019 million tpy in 1985 and 1.1696 million tpy in 1990 would most probably need an extension by 1990 if sub-regional self-sufficiency was to be achieved;

b) The size of new capacity needed is, however, highly uncertain. Assuming 90 per cent capacity utilization, the highest projected addition to the 1.1696 million tpy assumed in 1990 would be 1.3 million tpy. In 1995 the maximum projected need for additional capacity would be nearly 2.4 million tpy, the minimum no extension at all.

55. At the present time, none of the alternatives examined above may be said to be much more likely than the others. Since feasibility studies, design and construction of steel plants require considerable time, the commissioning of new plant in 1990 would require decisions at an early stage. The uncertainty involved leads to a planning problem which may be ameliorated in two ways:

a) Since the demand for crude steel is highly dependent on what happens to rolling capacity and billet/slab making capacity, a considerable part of the uncertainty can be eliminated by integrated planning of all three production stages. Decision on crude steel capacity should only be taken on the basis of firm plans on the rolling and billet/slab making stages.

b) There is some degree of choice between different size of plant and technologies. The basic choice seems to be between a large plant which, in case the higher consumption alternatives fail to materialize, would be such a cheap producer that profitable extra PTA exports would be assured, and several smaller plants which could be built in step with increasing consumption. Such plants would be likely to have higher capacity production costs but there would be advantages in reducing the chance of excess capacity, minimizing transport costs and an opportunity for a degree of specialization. Given the advantages of the small-plants option in terms of a regionally balanced development of the steel industry, smaller scale production units should be given particular attention.

5.5 <u>Demand/supply balance for steelmaking metallics</u>

56. The demand for metallic inputs for the steelmaking process is derived from the demand for crude steel. This means that the uncertainty with regard to crude steel demand apply to the steelmaking inputs and that integrated planning is necessary.

57. ZISCOSTEEL in Zimbabwe is the only integrated steel mill in the region, producing basic steel products from local ore and coal. Although purchased scrap does not constitute a major input to ZISCO, the majority of scrap used being clean mill scrap, the mill is still the country's major scrap consumer. The estimated 50,000 tpy of scrap generated appears to be fully utilized by ZISCO and the local foundry industry

which is well developed. Since Zimbabwe is thus self-sufficient in metallic input for steelmaking, is likely to remain so and since exports of steelmaking inputs is not very likely, the country has not been included in the analysis below.

58. Table 5.12 shows the situation in 1981-83. The five countries shown were the only PTA countries which demanded metallics import for their scrap based steelmaking. The column "scrap from local sources" is calculated as the difference between the "required metallics input" and imported scrap. Although imports may possibly be underestimated, and thus result in an overestimation of local scrap consumed in mills, and the estimates of scrap generation are somewhat tentative, the regions annual use of scrap was certainly well above the amounts generated annually. This conclusion is strengthened by the fact that part of the scrap also would be used by foundries in the sub-region. The study mission which took place in mid-1985 clearly confirmed that scrap generated did not level with demand and that any stocks of scrap which had existed now were about to be depleted in the countries where smelting takes place.

Table 5.12: Supply and demand for steelmaking metallics 1981-83
(thousand tpy)

| | Billet production | Required[1/] metallics input | Imported scrap | Scrap from local sources | Estimated[2/] scrap generation |
|---|---|---|---|---|---|
| Angola | 2.2 | 2.4 | 1.3 | 1.1 | 6.0 |
| Ethiopia | 10.1 | 11.1 | 1.1 | 10.0 | 5.0 |
| Kenya | 51.3 | 56.5 | 2.0 | 54.5 | 25.0 |
| Uganda | 10.8 | 11.9 | -- | 11.9 | 3.5 |
| Tanzania | 12.0 | 13.2 | 1.1 | 12.1 | 10.0 |
| Other countries | - | - | - | - | 28.0 |
| Total | 86.4 | 95.1 | 5.5 | 89.6 | 77.5 |

1/ Conversion factor of 1.1 from billets.

2/ Does not include mill scrap.

59. This general impression does not mean that scrap utilization will be unimportant for the sub-region as a whole. Improvements in gathering and processing practises as well as utilization of new sources of scrap may well give substantial economic gains;

- Angola, which is the one country where annual utilization seems to be lower than generation has taken steps, supported by UNIDO, to improve collection procedures with good results.

- According to information obtained in Tanzania, the operation of the system for allocation of foreign exchange had represented an incentive for scrap imports rather than collection of local scrap; It had been possible to obtain foreign exchange for importation of scrap but not for spares for vehicles which would have enabled the mill to collect local scrap.

- In Kenya (Mombasa) and Mauritius, shipbreaking activities supply considerable scrap: Mauritius has plans for an extension of the present operation which would provide suitable furnace inputs and also produce material which could be used directly as an input in cold rolling of plate.

- Countries in the sub-region which do not have smelting capacities in total probably generate 30,000 tonnes scrap annually. Although part of this would be used by foundries, there are indications, for example in Malawi, of considerable accumulated stocks of scrap and even exports out of the sub-region. An opportunity thus exists for some intratrade in scrap at least for a medium term period.

- Scrap generation in 1981-83 was depressed by the economic contraction in most of the economies in the sub-region. If a substantial economic upturn occurs, availability will again increase and make a concerted effort on scrap utilization increasingly interesting.

- The existing electric arc furnances in the sub-region require a certain minimum input of scrap in addition to possible future input of DRI. Generally a scrap percentage much below 35 per cent could cause technical difficulties with smelters (for the very smallest capacities an even higher scrap fraction would be required).

60. The various alternatives for additional crude steel demand shown in Table 5.11 may be converted into demand for metallics by assuming that 1.1 tpy input is required to make 1 tonne of steel. Using alternative 6 which is

the lowest alternative with only firm plans for expansion built in, projected demand for metallics (ex-Zimbabwe) would still increase from 95,000 tpy in 1981-83 to 315,000 tpy in 1990. Assuming that the availability of scrap increases by 5 per cent annually (roughly the growth of overall consumption of basic steel products) to 115,000 tonnes in 1990 and no opportunity for the use of accumulated stocks exist the metallics deficit in that year would be 200,000 tpy. Main ways of covering this deficit is discussed below. Coverage of the entire deficit with DRI would give no difficulty with respect to the scrap/DRI mix which would be very near the 35/65 distribution referred to in para 51 above. If however tonnages exceeding 200,000 per year was needed, for which there is a considerable chance, the production of DRI could only cover 65 per cent of this and one would have to acquire 35 per cent as scrap if technologies employing larger fractions of DRI could not be used.

5.6 Meeting the metallics deficit

61. If the projected 1990 metallics deficit is made up with imported scrap delivered to a port location (e.g. Mombasa, Dar-es-Salaam, Beira or Maputo), the foreign exchange outlay for 200,000 tonnes, at a CIF price of US $110 per tonne, would amount to $22 million in constant 1985 dollars. On the other hand, if sponge iron were to be imported, the corresponding foreign exchange outlay, assuming a DRI price (CIF) of $135 per tonne, would be $27 million. These figures must be taken with some caution. In the first place, imported scrap prices generally fluctuate widely depending on the supply-demand balance at source. Secondly, although the per tonne cost of DRI has traditionally been higher than that of scrap, this differential could conceivably be erased in future as more DRI enters into international trade, and as DRI production and handling costs decline with process improvements and maturity.

62. It is useful to compare these estimates with the foreign exchange implications of locally producing DRI. If a DRI project is to be commissioned by 1990, iron ore importation would have to be adopted as a short-term expedient, pending the development and/or rehabilitation of local iron ore mines. Sub-bituminous coal is considered to be readily available from active mines within the sub-region.

63. For purposes of this illustration, a project employing the coal-based SL/RN 2-kiln process is envisaged, with a production capacity of 220,000 tpy of sponge iron per year. For a similarly-sized plant on a US

East-Coast location, a battery-limits budget estimate of US $154 per tonne of installed capacity had been made in 1981. In recognition of probable capital cost escalations since then, as well as the cost differentials due to locational factors, an upward adjustment of 25 per cent may be applied for a location on the East coast of Africa (e.g. Dar-es-Salaam Beira, Nacala, Maputo), resulting in a mid-1985 budget cost estimate of about US $192.50 per tonne of annual installed capacity.

64. Table 5.13 summarises the various production cost elements, along with an indication of their respective foreign exchange components.[1/] The estimated production cost of DRI is US$163 per ton, of which US$111 (68 per cent) is in the form of foreign exchange.

65. Table 5.13 illustrates certain general peculiarities of local manufacturing in the developing countries of Africa in particular:

(i) The production cost of DRI (US$163 per tonne) is apparently higher than the CIF cost of imported material (US$135), tending to support the view in some quarters that it might be better to import DRI than to produce it locally;

(ii) Each of the cost elements is shown to contain a foreign exchange component. In other words, there is no cost item that is totally defrayed in local currency. This reflects the fact that even though at the enterprise level, a specific cost may be incurred in local currency, from the national viewpoint, there are foreign exchange components in the form of imported equipment, know-how, and expertise. For instance, the 10 per cent foreign exchange content of locally-produced coal represents the proportion ascribeable to imported mining, beneficiation and transportation machinery, expatriate personnel costs, spare parts and consumables, etc.

66. The foreign exchange costs of importing or locally producing 200,000 tpy of metallic inputs in 1990 are projected from the above analysis to be as follows:

| | | |
|---|---|---|
| Imported scrap | @ $110/tonne | = $22 million |
| Imported DRI | @ $135/tonne | = $27 million |
| Locally produced DRI | @ $111/tonne | = $22.2 million |

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1/ It should be emphasized that data for forex components are very weak and may largely be described as a guesstimate.

Table 5.13: Estimated DRI production costs[a/]

| Cost - Item | Unit consumption per tonne DRI | Unit price (US dollars) | Cost per ton DRI, dollars | Currency |
|---|---|---|---|---|
| Raw materials: | | | | |
| Iron ore pellets | 1.43 tonnes | 42.00 | 59.64 | Forex |
| Coal | 0.94 tonnes | 30.00 | 28.20 | 10% Forex |
| Dolomite | 0.07 tonnes | 8.00 | 0.56 | 10% Forex |
| Electricity | 100 Kwh | 0.06 | 6.00 | 20% Forex |
| Water | 1.5 cubic metres | 1.00 | 1.50 | 10% Forex |
| Consumables + utilities | | | 1.00 | 50% Forex |
| Spares, incl. refractories | | | 12.00 | Forex |
| Labour and supervision | 2.6 man-hrs. | 3.00 | 7.80 | 10% Forex |
| Overheads @ 100% of labour and supervision | | | 7.80 | 20% Forex |
| Fixed charges (20% of investment) | | | 38.50 | 85% Forex |
| Total production cost | | | 163.00 | |

a/ Basis: East African coastal location, employing the SL/RN coal-based process; plant capacity of 220,000 tpy.

The choice in terms of minimizing foreign exchange expenditure would appear to lie between scrap importation and local DRI production. In the long-term interest of the sub-region, however, the local production option would be preferred since, notwithstanding the apparent lack of any obvious foreign exchange advantage in local production, other accrued socio-economic benefits whose values cannot be so readily quantifiable nor casually dismissed (such as local employment creation, technology acquisition, manpower training, possible linkage effects, etc.) must be factored into the decision.

67. A note of caution needs to be sounded, however, concerning the fragility of the so-called "foreign exchange savings". For instance, in the analysis above, it would appear that there is little to choose, in terms of foreign exchange outlays, between scrap importation and local DRI production. However, the market for scrap (which is controlled in large measure by the developed countries) could move in such a manner as to severely depress its CIF price, to such an extent that substantial savings in foreign exchange could be realized by scrap importation vis-à-vis local production of DRI. If decisions are to be made only on the basis of foreign exchange savings it is therefore subject to considerable uncertainty.

5.6.1 Optimal DRI process option

68. It is recognized that in terms of both age and proven commercial success, the SL/RN process lags behind the gas-based HyL-process (which has been in commercial operation since 1957) and the Midrex-process. In fact, as of the end of 1984, HyL-based installations in operation world-wide represented a cumulative production capacity of about 6.9 million tpy of DRI, with another 3 million tpy of capacity under construction. For the Midrex-process, the total operating capacity amounted to 6.7 million tons, with additional 7.6 million tpy reportedly under construction. The SL/RN (Stelco-Lurgi-Republic Steel - National Lead) process, on the other hand, had a global installed operating capacity of only about 1.5 million tonnes, with another 800,000 tpy under construction.

69. Nevertheless, the following factors argue in favour of the SL/RN process for the PTA sub-region:

- there is the overriding objective of making the sub-regional DRI project as intensively resource based as possible, even in the short term. Given the apparent short-term inevitability of importing iron ore pellets (if a project is to be implemented by 1990), it would be desirable to tie this to a process based on locally available coal;

- the gas based processes would entail the consumption of a hydrocarbon resource that should best be applied to the production of other higher-valued commodities such as fertilizers and petrochemicals;

- several of the countries in the sub-region have in the recent past, articulated plans for DRI production based on coal. There are advantages, in terms of faster project mobilization and perhaps lower costs, in associating and aligning any proposed sub-regional DRI project plans with one or more of these already identified and defined national projects or modified variants of them;

- there is a certain flexibility in the SL/RN process in terms of project sizing. For instance, whereas the HyL and Midrex process modules range from 250,000 to 1 million tpy per year and 400,000 to 800,000 tpy per year respectively, the SL/RN process can operate

- economically in modules as low as 50,000 tpy per year. With the projected minimum potential DRI consumption in the sub-region at about 200,000 tpy in 1990, the more modest SL/RN process would appear to be more compatible with the needs of the sub-region;

- although the specific economics of a particular DRI project must be determined in detail as part of the project planning phase, indications are that the cost of production of DRI via the SL/RN process is, on a per tonne basis, generally lower than those of the HyL and Midrex processes.

70. On the negative side, the SL/RN and other coal-based processes suffer from a number of technical and operational handicaps that deserve fuller analysis prior to any decision as to an optimal process for sub-regional DRI projects. The various process vendors are well aware of these and are working to resolve them. In the first place, they are characterized by relatively high levels of energy consumption and low energy efficiencies. Secondly, there is a great propensity for the pellet burden to stick to the furnace walls during the reduction process. Thirdly, the pellet reduction is highly variable and sensitive to the specific chemical composition of the reductant coal. And finally, heat transfer limitations are encountered during scale-up to higher capacities.

5.6.2 Optimal project location option

71. Following are preliminary appraisals of the primary candidate-locations for coal-based DRI projects in the sub-region:

Angola: In spite of plans to reactivate the Kassinga iron ore mine by the end of 1985, it is reasoned that the non-availability of coal from local sources weighs against Angola as a preferred location for a DRI project at this time. A gas-based project could ostensibly be sited in the Luanda area, but this would depend on the country's priorities for using its gas resources and, as suggested above, those priorities should preferably go to fertilizers and petrochemicals. Furthermore, Angola is located at a considerable distance from the potential sponge iron consumers of the sub-region. Given the present poorly-developed transportation and communications infrastructures, delivery of DRI to these steelworks from Angola is likely to introduce a high transportation penalty.

72. Madagascar: Neither Madagascar's iron ore nor its coal resources are developed, although there are plans to do so in the medium-term. Even such medium-term plans are focused on the production of sinter feed in the first instance, with DRI production to follow. Accordingly, it is unlikely that the latter project would materialize by 1990.

73. Uganda: Uganda would have to depend on imported coal and iron ore in the short term, as there are no known local coal resources and the high-quality Muku iron ore reserves are undeveloped. Delivery of both coal and ore from the world or other sub-regional market could be logistically difficult and expensive, since it would have to depend so heavily on a rather under-developed, unintegrated, and expensive transportation network.

74. Mozambique: The areas around the port cities of Beira and Nacala appear to offer good prospects for siting DRI projects in the near term. Both prospective locations could readily receive iron ore from international commerce. What is more, Mozambique has sizable coal resources and, in fact, currently produces coal from the Moatize coal field in Tete Province. From here, coal could be conveniently transported by road and rail to both Beira and Nacala. Additionally, the local existence of an alternative reductant, - natural gas, - offers a measure of flexibility in process selection. As for transportation connections, both Beira and Nacala are well placed for shipping DRI to Dar-es-Salaam, Tanga, and Mombasa by sea, and onwards by rail to Nairobi and Jinja in Uganda. Similarly, DRI could readily be shipped to Ethiopia's steelworks near Addis Ababa (via Djibouti and onwards by rail) and at Asmara (by sea and rail).

75. Tanzania: The Dar-es-Salaam area presents another good locational prospect. As a port city, it is accessible to ocean-going carriers for the purpose of iron ore delivery from sources in Europe, North America, and Australia. Tanzania also has large coal reserves and there is active production from the Songwe colliery, although it may require rehabilitation and expansion in order to supply the requirements of a commercial-scale DRI plant.

76. Tanzania also has large proven reserves of natural gas in Sango-Sango island and, in the event that a gas-based DRI process is found to be preferable, the gas offers an alternative process route. Dar-es-Salaam is

an acknowledged transportation hub, with relatively good access by sea and/or rail to the major steelmaking centres of the sub-region in Kenya, Uganda, and Ethiopia.

77. Although a detailed feasibility study may show the Dar-es-Salam (or some other area in Tanzania) geographically suitable for locating a DRI project in the short term on the basis of imported pellets, there are serious technical questions regarding long-term supplies of iron ore from Tanzanian sources. Admittedly, the Liganga ore deposit could be large enough to supply the requirements of a moderately-sized plant; however, several beneficiation tests have shown that the best concentrate obtained from Liganga would still contain up to 4% $TiO_2$ and 0.4% Vanadium. Because of the non-metallization of $TiO_2$ during direct reduction, the resulting DRI contains only about 82% Fe, which is considered unsuitable due to large slag volumes generated in electric arc furnace smelting. Moreover, $TiO_2$-bearing slags are highly corrosive to furnace refractories. Also, the vanadium and chromium in the metallized pellets wind up in the liquid metal, necessitating an additional steel-making step (preferably in a converter-type vessel) to produce steel conforming to international specifications. These technical problems must be satisfactorily resolved as a part of the long-term viability analysis for a resource based DRI project in Tanzania.

78. As indicated in Annex II, both Mozambique and Tanzania have recently considered the implementation of DRI projects. The Mozambican project, under joint sponsorship with Angola, would be rated at 150,000 tpy DRI, while the idea had been recently floated for a Tanzanian project rated at 60,000 tpy.

79. It is suggested that both these projects be now re-evaluated, with a view towards sizing one or both to supply the 1990 DRI consumption of the entire sub-region. An aggregate production capacity of 220,000 tpy has been suggested above. This could be achieved by scaling-up either the above mentioned Dar-es-Salaam project or the Mozambican project by retaining both at their originally planned capacities, giving an aggregate sub-regional DRI capacity of 210,000 tonnes.

80. In either case, the technology adopted should be that of the SL/RN process. In addition to the reasons adduced previously in favour of this process, UNIDO/UNDP had assisted in setting up an SL/RN demonstration plant (in collaboration with Sponge Iron India Ltd.) at Paloncha, near Kothagudem in Khammam District of Andra Pradesh in India. The plant offers pilot-scale facilities (30,000 tpy per year) for testing various iron ores and coals to establish their techno-economic feasibility for producing sponge iron. Thus, as a first step in project implementation and in line with TCDC objectives, the iron ore and coal resources of Mozambique and Tanzania could be tested at this plant to provide design and operating data for commercial-scale sub-regional DRI projects.

# ANNEX I

## Processes and products of iron and steel making and their relation to Engineering Industries - with special reference to Africa

### Introduction

1. The technology of steel production can be subdivided into the following steps:

   - mining and preparation of raw material
   - iron production
   - steel production
   - rolling of products
   - coating of products

2. Iron ore is mined and concentrated to an Fe-content of 64 to 68 per cent (some ores with such a high Fe-content do not require concentration) in the form of fines, pellets or sinter feed.

3. There are at present four routes to liquid steelmaking (see Figure A.I.1): Route 1 is the traditional blast furnace - Oxygen converter (BF-BOF); route 2 is based on scrap and/or direct reduced iron for steel making in an electric arc furnace (EAF), route 3 is the direct reduced iron (DRI) and EAF process; and route 4, at present at the development stage, the smelting reduction process. Of economic interest at present are routes 1, 2 and 3. Route 2 is only a steelmaking process and also forms part of route 3. In each case, rolling of steel is the final process operation.

4. The entities involved in iron and steel making and shaping can be divided into three groups: commodities which are transformed from inputs to outputs; this is done in the productive units which operate by distinctive processes requiring specific commodities inputs. Table A.I.1 gives an overview on commodities, productive units and processes in iron and steelmaking and shaping.

Figure A.I.1. Possible routes for steel production

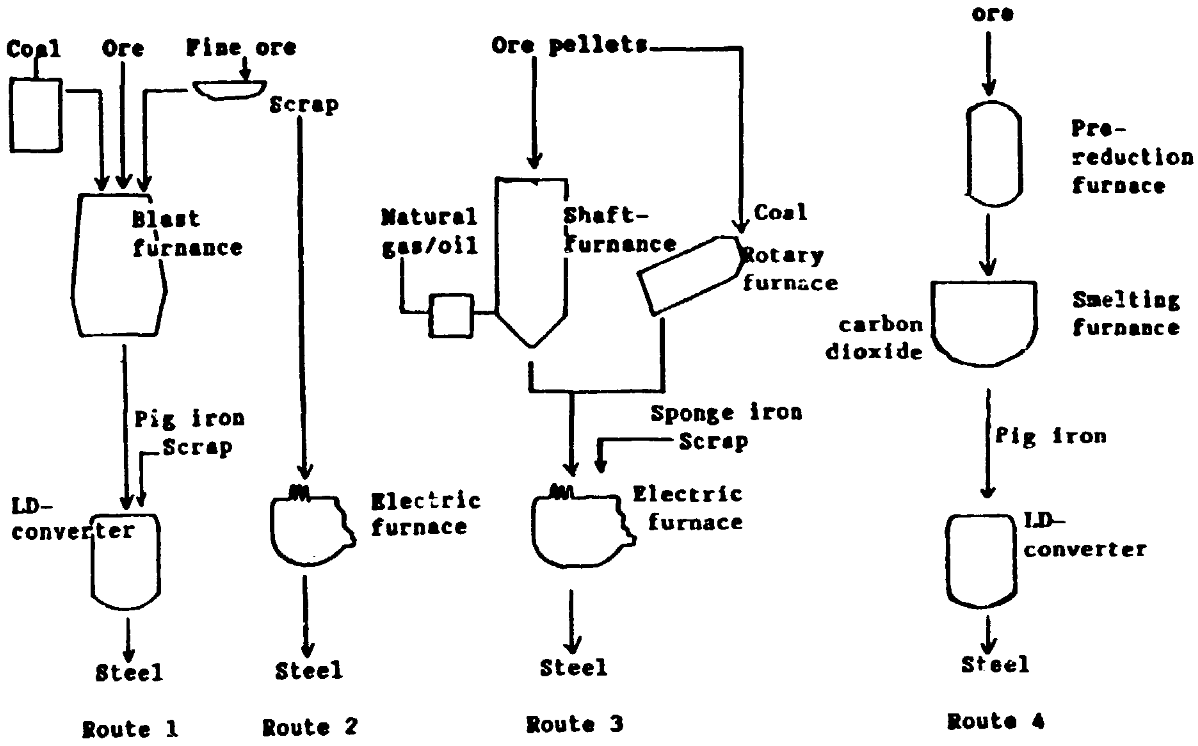



Table A.I.1: Process units in steel production

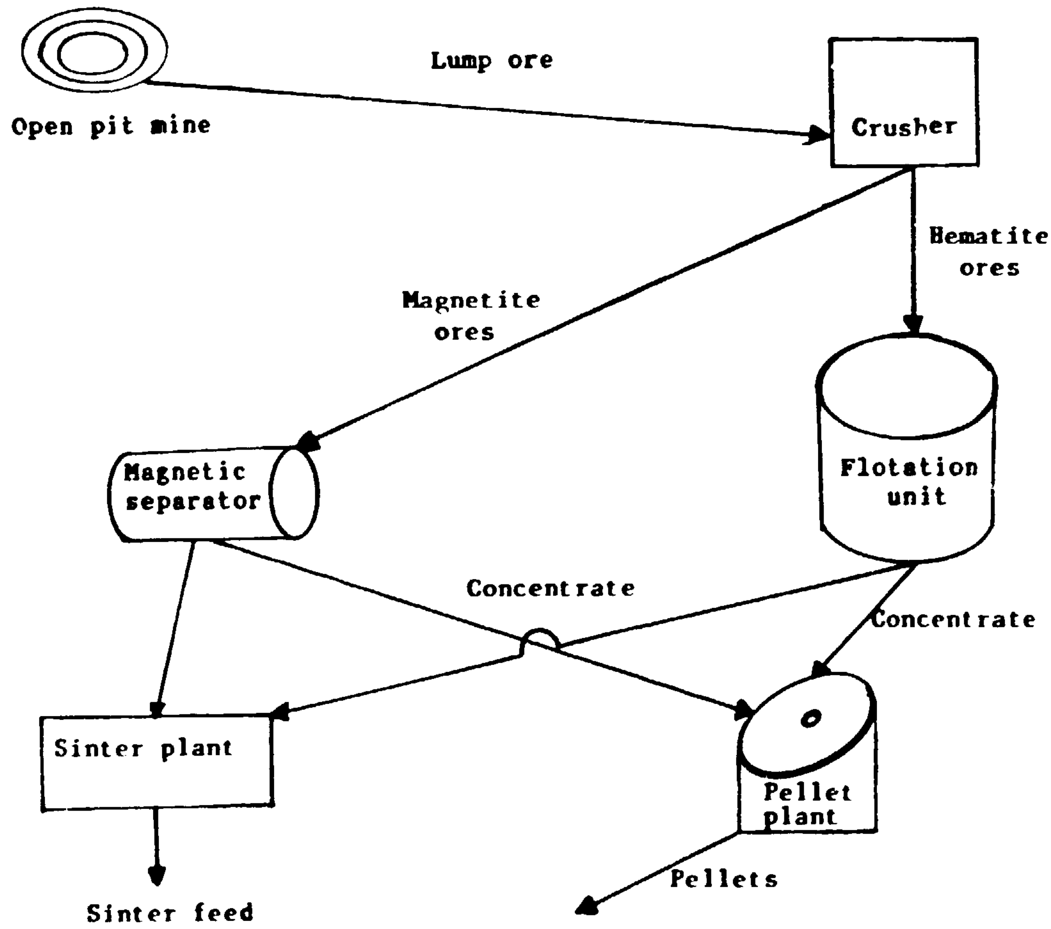
| Commodities | Productive units | Processes |
|---|---|---|
| Iron ore | Sinter plant | Sinter production |
| Coal | Pellet plant | Pellet production |
| Pellets | Coking plant | Coke production |
| Coke | Blast furnace | Molten pig iron production |
| Mineral additives | Electric arc furnance | |
| Molten pig iron | Basic oxygen furnace | Steel production |
| Sponge iron | Direct reduction unit | Continuous casting |
| Water | Continuous casting unit | Rolling of shapes |
| Oxygen | Rolling mills for shapes | Rolling of flat products |
| Electricity | Rolling mills for flat products | |
| Fuel oil | | |
| Natural gas | | |
| Steel | | |
| Billets | | |
| Slabs | | |
| Shapes | | |
| Flat products | | |

Source: World Bank, The Planning of Investment Programmes in the Steel Industry.

Mining and preparation of raw material

5. For economic reasons, only iron ore of at least 45 per cent Fe-content is mined. The ore is crushed and sized and then treated in a concentrator (see Figure A.I.2). Magnetite ores can be concentrated by magnetic means. The ore is passed near large magnetic drums where the ore is separated from impurities. Hematite ores cannot be separated magnetically, they require a more expensive flotation process. Both concentration processes deliver a slurry of rich ores suspended in water which is piped either to a sinter feed plant for the production of sinter feed or to a pellet plant where, after removal of water, the ore is agglomarated into small balls of approximately 7 to 15 mm diameter. These pellets are baked and can be charged to blast furnaces and DRI processes using natural gas or coal as reductant.

Figure A.I.2. Mining and pellet or sinter feed production




Source: World Bank, op.cit.

Blast furnace- Oxygen converter process

6. The BF-BOF option (see Figure A.I.3) involves the reduction of iron ore in the form of lump ore, sinter or pellets in a shaft furnace, with coke (produced from metallurgical coal) as the conventional reductant. In the process, solid ore is converted into liquid pig iron which is subsequently transformed into steel by oxygen injection in a converter. In place of coke, charcoal can be employed as a reductant, and several furnaces based on charcoal are currently in operation in a number of developing countries including Brazil, Argentina, and Malaysia. In fact, some countries in the Eastern and Southern African sub-region (Kenya and Uganda) had recently considered integrated steel projects based on charcoal blast furnaces as a way of overcoming the non-availability of coking coal and utilizing locally available steelmaking resources.

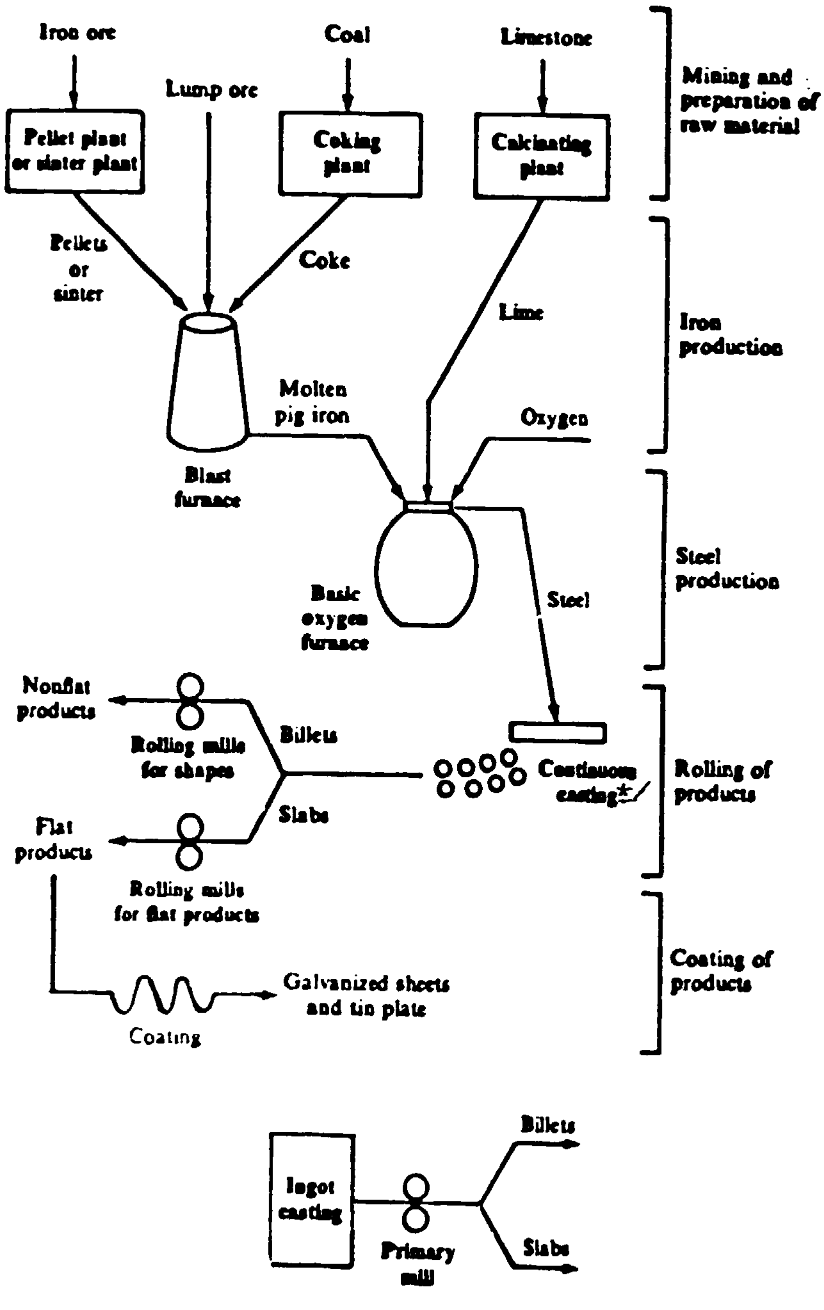
7. In general, however, it is not likely that the BF-BOF option will prove viable for the sub-region. Among the reasons are:

- the economics of modern blast furnace iron-making dictate units of large working hearth volumes, with hot metal production capacities often in excess of 10,000 tonnes per day. In fact, only when a proposed integrated steel project has an annual capacity of at least 2 million tonnes would the BF-BOF option be seriously considered. Thus, given the rather modest steel production potential in the sub-region over the next decade, this approach would hardly appear feasible even in the highest steel consumption alternatives (see Chapter 5).

- the BF-BOF route requires high capital investments and long gestation periods. Because of the extensive ancillary facilities associated with it (e.g. coke ovens, sinter plant, gas recovery and processing, ore blending, and extensive materials handling facilities), initial investment would generally range from $2,000 to $3,000 per tonne of installed annual capacity. The figures for the developing countries would be expected to be even higher, given the necessity of absorbing a disproportionate amount of infrastructural and peripheral amenities burdens.

Figure A.I.3. The making and shaping of steel

Conventional technology: Blast furnace-Oxygen converter process




*/ Process alternative for casting.

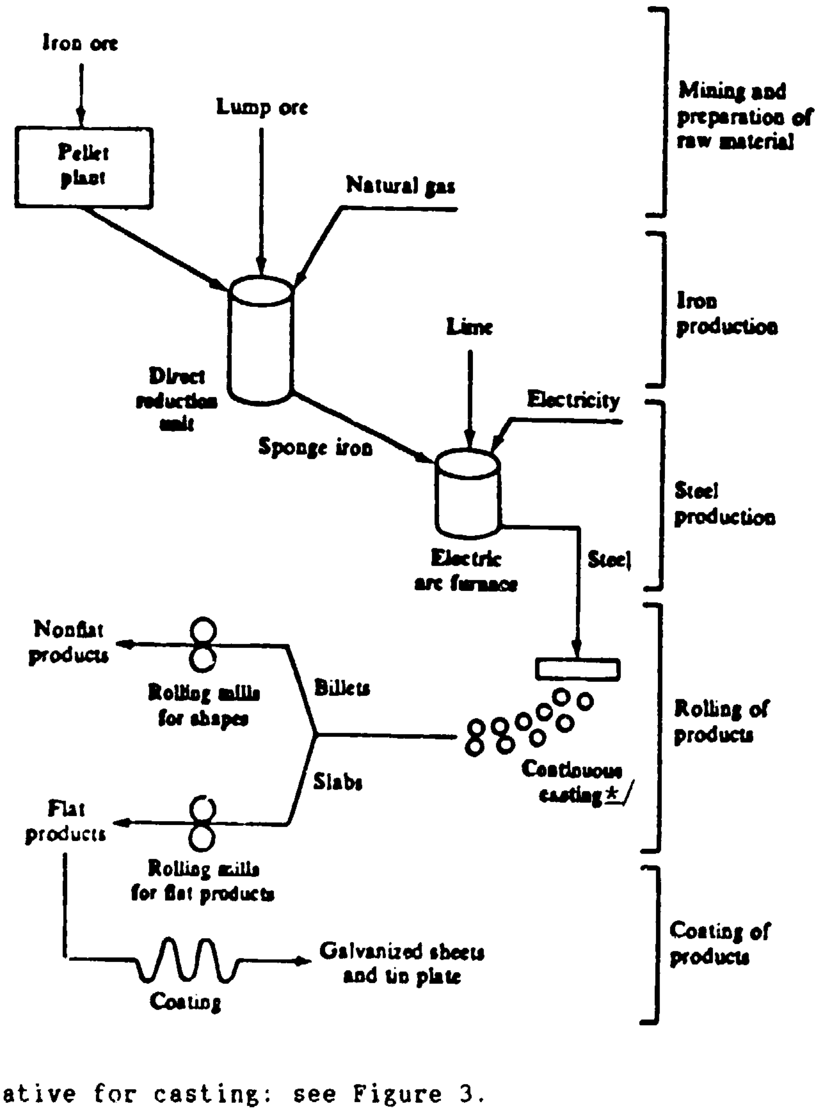
Source: World Bank, op.cit.

- The relative non-availability of metallurgical coal restricts the BF-BOF approach to only those countries with local resources of or ready access to coking coal. In the context of the sub-region, only Zimbabwe, Mozambique and Swaziland can boast of substantial reserves of cokeable coal. All other coal reserves are either bituminous, sub-bituminous, or lignite.

Direct reduced iron - electric arc furnace (DRI-EAF) route

8. In contrast to the BF-BOF approach, the DR-EAF route (see Figure A.I.4) is generally more modest in scale and better suited to the production capacities of the developing countries. Direct reduction units are usually designed and installed in modules (of up to one million tonnes

Figure A.I.4. Direct reduction technology




*/ Process alternative for casting: see Figure 3.

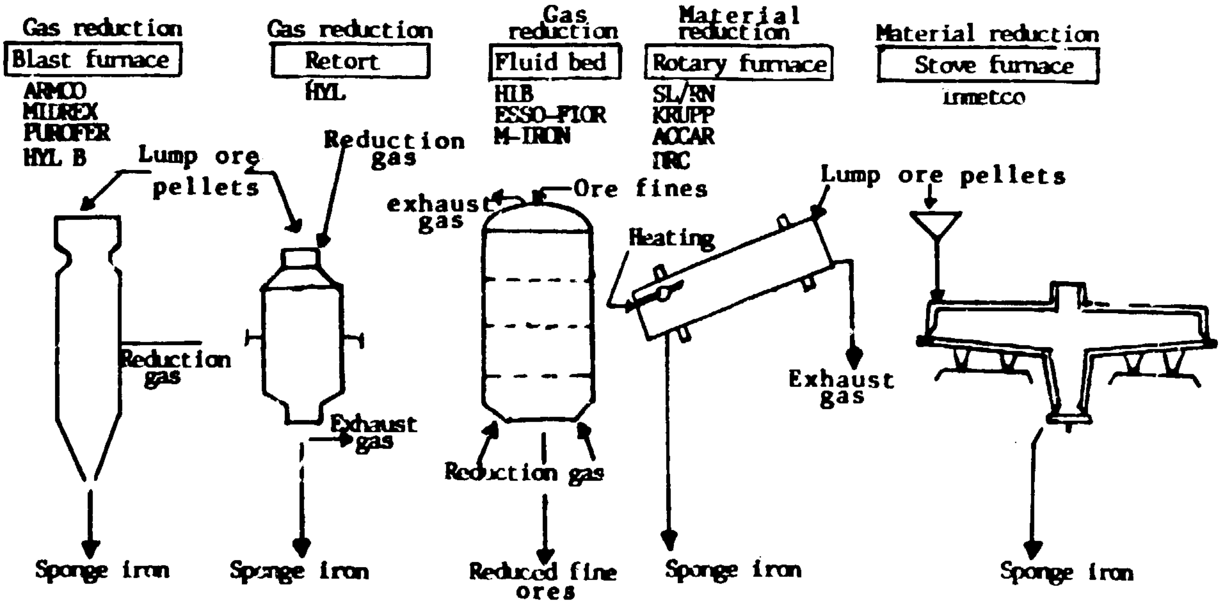
Source: World Bank, op.cit.

per annum capacity). Their capital costs are relatively low and they afford a certain flexibility of operation as well as ready adaptability to local raw materials endowments. Since the commissioning of the first commercial DRI unit in 1957, the world wide installed capacity has grown steadily to a level of about 19 million tonnes per annum in 1984, with the developing countries (particularly oil producers) accounting for a substantial fraction of this capacity, - Venezuela (4.5 million tonnes), Indonesia (2.3 million tonnes), Mexico (2 million tonnes), Nigeria (1.2 million tonnes), and Argentina (0.9 million tonnes).

9. The DRI-EAF option offers a wide choice of sponge iron production processes, with local resource endowments often determining the technology selected in a given situation. For instance, those oil producers that have traditionally flared their associated gas have tended to promote gas-based direct reduction as a means of recovering a wasted asset and exporting energy. And where coal is abundant, it could serve as a sutiable reductant in processes that are solid-fuel-based.

10. Several DRI processes have been developed, with differences in reactor design (fixed-bed, shaft, fluid bed, or rotary kiln), reductant (reformed natural gas, oil, coal, coal gas), feed form (lump ore, pellets, fine ore), and process scheme (continuous versus batch) (see Figure A.I.5). Although new process schemes are being continously devised, only a few have been commercialized and established any performance credibility. As of the end of 1984, about 90 per cent of all installed DRI capacity was gas-based; in fact,

Figure A.I.5. Process options for the production of DRI



two particular processes - the HYL and Midrex - alone accounted for 81 per cent of the total capcity. Their dominance has been accounted for by their superior energy efficiencies and the availability of chea› natural gas in those countries where they have been installed.

11. Among the solid reductant-based schemes the SL/RN process has proved most popular and several facilities are in commercial production around the world. A facility based on the KRUPP-CODIR process is also in industrial operation.

12. For the Eastern and Southern African sub-region, either a gas-based or coal-based process would be conceptually suitable, depending on the relative accessibility to either of these energy resources. However, since most of the iron ore and coal resources of the area have not been evaluated for their compatibility with any of the commercialized DRI processes, a detailed physico-chemical assessment, coupled with pilot scale trials and detailed techno-economic feasibility studies, must precede any decision to implement a project based on indigenous natural resources.

Rolling of products

13. In rolling operations distinction is normally made between rolling of flat products (see Figure A.I.6) and rolling of shapes (see Figure A.1.7). Slabs, blooms or billets are produced before the rolling operations. Material inputs for the rolling of flat products are slabs (usually 20 to 120 cm in cross section and up to 10 meter long) which are either rolled into plates (usually approximately 3 to 20 mm thick and 3 or 6 meter long and wide) as used in ship building or storage tank construction, or into hot rolled sheet. Hot strip mills have usually four or five stands and can be approximately 500 meter long. The sheet, usually less than 3 mm thick, 1 to 1.5 meter wide and 100 meter or more long, is rolled in coils. They can be either used as steel sheet, mainly in the engineering industries, or rolled to cold rolled sheet which after annealing and passing through a temper mill, can be either tinned or galvanized to give tinned or galvanized sheet.

14. Shapes, heavy shapes (e.g. rails) and seamless pipes are rolled from blooms, while light shapes, reinforcing bars and wire rods are made from billets. Blooms are either round or square with a diameter of

Figure A.I.5. Rolling of flat products

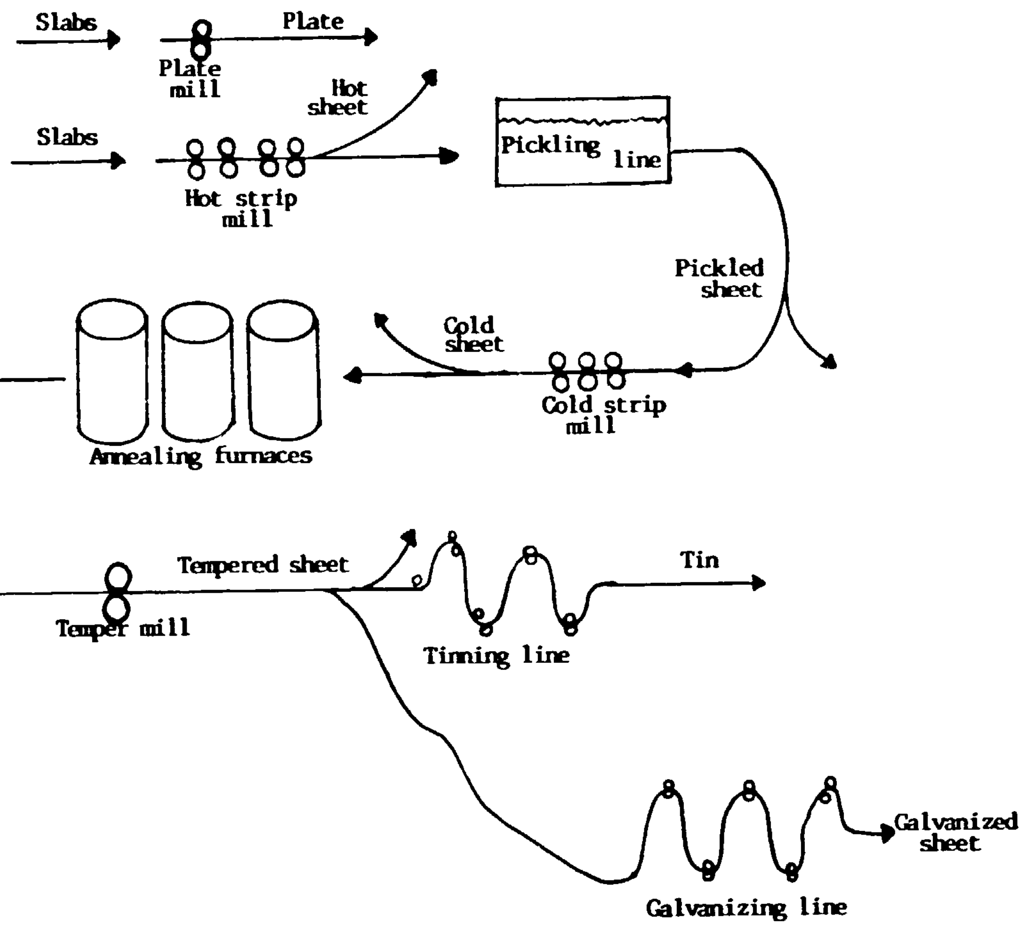
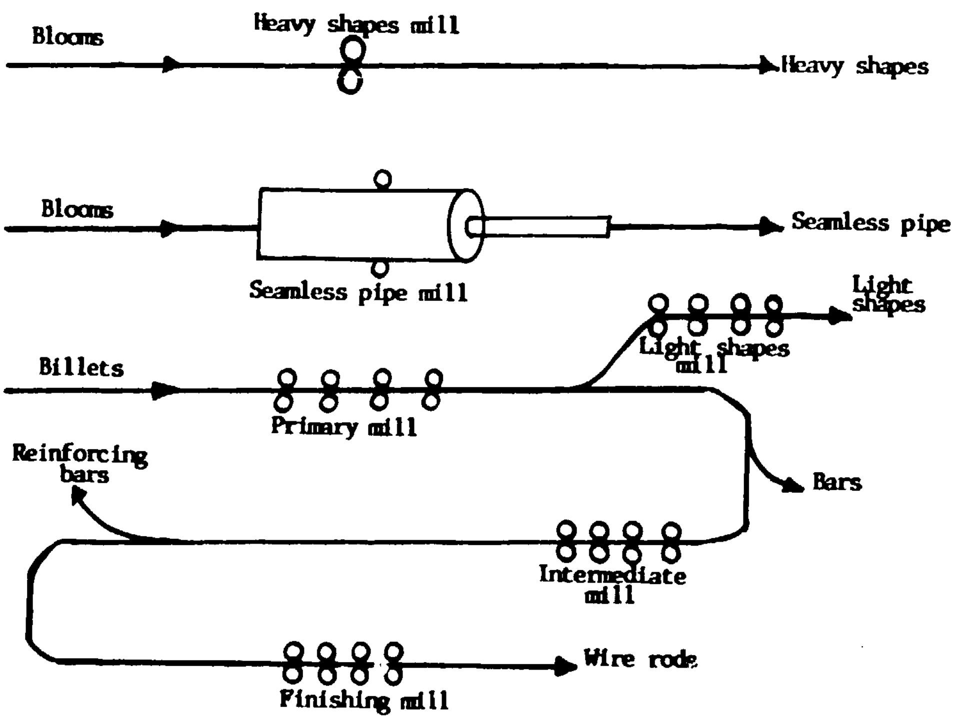



Figure A.I.7. Rolling of shapes



approximately 30 to 60 cm; billets are square in cross section and usually range from 5 to 16 cm on a side. Light section mills are normally quite versatile and allow, through changing of rolls, production of a great variety of products (e.g. strips).

15. The minimum capacity of sheet mills is generally very high. The production process in modern mills is continuous and minimum capacity ranges around one million tonnes of sheet per annum. The highly automated production process is extremely capital intensive.

Technical and process options for the region as regards mini steel plants and rolling mills

(a) Mini steel plants

16. Eight plants in the sub-region fall within the conventional definition of mini steel plants incorporating scrap-based electric are furnace steelmaking coupled to a rolling mill for converting billets or ingots into long products for the construction and engineering industries.

17. When based on local scrap, the mini steel plant represents a higher local resource content than the mere re-rolling of imported billets. The practice in the sub-region has been to employ local scrap to the extent possible (in terms of both quantity and quality) and to make up any deficiencies with imported scrap. Typical of countries with low levels of industrialization, the local scrap supply in virtually all countries in the sub-region is considered insufficient to meet the full-capacity demand of the steel industry, and there are indications that the shortages can only worsen in the future. As such, unless alternative sources of iron input become available, the level of dependence on imported scrap (characterized by wide price fluctuations in response to home demand in the developed countries from which it is imported) is apt to increase.

18. A potentially viable alternative source of iron input is direct reduced (or sponge) iron (DRI). With no current local production of DRI, any demand would have to be met in the short-term through imports. DRI is now commercially marketed in international commerce and has been found to possess certain advantages vis-à-vis scrap, such as:

- ease of transport and handling, as well as its amenability to continuous furnance charging

- a uniform chemical composition and low levels of tramp elements, resulting in higher steel product qualities, and

- a more stable price structure.

19. On the other hand, the open market price per tonne of DRI has traditionally been significantly higher than that of a tonne of good quality scrap. It is expected, however, that as the projected global scrap deficiency materializes in the future, the price gap would narrow substantially, offering an incentive for the increased usage of DRI in electric furnace steelmaking.

20. Even with such a development, there are practical limits to the proportion of DRI that could be charged into an electric furnace. Technically, it is possible to produce heats on the basis of 100 per cent DRI and meltshop practices involving 80 per cent DRI have been developed and commercialized. But operational and furnace productivity considerations may impose a 65 per cent DRI/35 per cent scrap limit in most practices.

(b) Rolling mills

21. As detailed in Annex II, 12 of the 23 basic iron and steel plants in the sub-region are pure rolling mills, with no captive crude steel production capability, although Steel Rolling Mills Ltd, Kikuyu (Kenya), Steel Rolling Mills, Tanga (Tanzania), Lancashire Steel Ltd and TOR Steel Ltd (both in Zimbabwe) are affiliated to companies that supply them with locally produced billets. The other rolling mills traditionally import billets from the most economical sources, usually from outside the sub-region. These re rollers have a combined capacity of 328,000 tons per annum of rolled products.

22. Given the prevailing economic depression affecting the sub-region, with the resultant restrictions in foreign exchange availability for billet importation, most of these re rollers have been forced to operate at levels well below their capacities.

23. To expedite the rehabilitation of these plants while fostering intra regional trade, the Preferential Trade Area (PTA) has devised a three pronged strategy, involving as the first phase, the importation of billets and blooms from ZISCO (Zimbabwe).

24. There are also plants in the sub region that produce flat cold-rolled products on the basis of imported hot-rolled sheets or strips. Such cold-rolled products find applications in the construction (e.g. window sections, door frames), food packaging, and engineering industries. In spite of the relatively low level of industrial and engineering development of the sub-region, such flat products could constitute a substantial portion of total steel demand in the future.

25. As there is currently no producer of primary hot rolled sheet in the sub-region, its importation represents a sizable drainage of foreign exchange and underlines the need to diversify the sub region's steel product mix to include some flat steel production. Any thought of such a project in the past had been thwarted by the large investments required to implement a large economically viable flat products plant. Recent developments, however, have led to the commercialization of mini-mills for flat products (plate and sheet) at annual capacity levels as low as 50,000 tons, and including direct reduction, electric arc furnace melting, continuous slab casting, and reversing plate and hot-strip mills. The promotion of such a project would assist in enhancing sub-regional steel self-sufficiency.

26. Similar gaps in product mix exist with respect to alloy and stainless steels, as well as heavy sections for which there are presently no local producers. Given the sub-region's abundant supply of the alloying minerals, - chrome, nickel, and cobalt ores, there are good prospects for alloy steel plants based on these. And in view of the obvious need to develop the sub-region's transportation and other infrastructures, local sources of heavy structural steels, rails, and beams would be very desirable.

The engineering industry sector

27. Engineering industry is the common expression for all industries belonging within the manufacturing division of ISIC[1/] major division No.3, to the division No. 38, called "Manufacture of Fabricated Metal Products, Machinery and Equipment". This division consists of five major

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1/ International Standard Industrial Classification of all Economic Activities, established by U.N. in 1958 and revised in 1968.

groups which are again subdivided into groups (4 digits) as represented in Table A.I.2. Engineering industries produce capital goods (i.e. goods used to produce other goods or services) and consumer goods. Their main production inputs are steel products which are transformed by machining operations and by assemblying into engineering industry products. Important characteristics of the engineering industries are the high level specialization of single companies, the high degree of inter-industry co-operation in the form of sub-contracting or complementation which is a sign of advanced production, the important role of small and medium sized companies and, in many cases, the low minimum capacity (exceptions are, for example, motor vehicle engines or television sets).

28. The fact that steel products represent the most important production input for engineering industries does, however, not mean that an engineering industry requires a national iron and steel making facility for its growth. There are many examples of countries (e.g. Singapore, Denmark, Swizerland) with a strong and growing engineering industrial sector which have little or no basic iron and steel industry. In fact, experience in industrial development shows that the existence of an iron and steel industry in a developing country can negatively influence the growth of the engineering industry. This is the case when imports of steel products are prohibited yet the local engineering industry needs, for a specific application special types of steel not produced locally. The linkage between iron and steel and engineering industries works rather in reverse: the iron and steel industry needs a strong engineering industry demanding steel products and permitting the increase in volume and product range of steel production. Whenever growth of iron and steel production is envisaged, major attention should be given to promotion and strengthening of the engineering industry, both through incentive schemes (e.g. technical assistance, finance schemes, government purchases geared towards the domestic industry, regional co-operation and complementation) and through marketing efforts of the iron and steel industry (e.g. technical advice to steel users, short delivery lead times, quality control of steel). Customer services play an important role in the iron and steel industry in industrialized countries and extend to holding workshops and to giving construction advice to steel user industries, besides the publication of steel user manuals.

Table A.I.2: ISIC classification of the engineeing industry

| Major group number | Group number | Description |
|---|---|---|
| 381 | | Manufacture of fabricated metal products, except machinery and equipment. |
| | 3811 | Manufacture of cutlery, hand tools and general hardware. |
| | 3812 | Manufacture of furniture and fixtures primarily of metal. |
| | 3813 | Manufacture of structural metal products. |
| | 3819 | Manufacture of fabricated metal products except machinery and equipment not elsewhere classified. |
| 382 | | Manufacture of machinery except electrical. |
| | 3821 | Manufacture of engines and turbines. |
| | 3822 | Manufacture of agricultural machinery and equipment. |
| | 3823 | Manufacture of metal and wood working machinery. |
| | 3824 | Manufacture of special industrial machinery and equipment except metal and wood working machinery. |
| | 3825 | Manufacture of office, computing and accounting machinery. |
| | 3829 | Machinery and equipment except electrical not elsewhere classified. |
| 383 | | Manufacture of electrical machinery, apparatus, appliances and supplies. |
| | 3831 | Manufacture of electrical industrial machinery and apparatus. |
| | 3832 | Manufacture of radio, television and communication equipment and apparatus. |
| | 3833 | Manufacture of electrical appliances and housewares. |
| | 3839 | Manufacture of electrical apparatus and supplies not elsewhere classified. |

../...

Table A.I.2: ISIC classification of the engineeing industry (continued)

| Major group number | Group number | Description |
|---|---|---|
| 384 | | Manufacture of transport equipment. |
| | 3841 | Ship building and repairing. |
| | 3842 | Manufacture of railrod equipment. |
| | 3843 | Manufacture of motor vehicles. |
| | 3844 | Manufacture of motocycles and bicycles. |
| | 3845 | Manufacture of aircraft. |
| | 3849 | Manufacture of transport equipment not elsewhere classified. |
| 385 | | Manufacture of professional and scientific, and measuring and controlling equipment, not elsewhere classified, and of photographic and optical goods. |
| | 3851 | Manufacture of professional and and scientific, and measuring and controlling equipment, not elsewhere classified. |
| | 3852 | Manufacture of photographic and optical goods. |
| | 3853 | Manufacture of watches and clocks. |

29. In the course of industrial development all countries experience a shift in the structure of their manufacturing sector. In the early development stages, the production of non-durable consumer goods is predominant but will lose importance in subsequent stages of industrial development. Table A.I.3 gives an illustrative example of the structural changes of the manufacturing sector of Latin American countries between 1950 and 1977. During this period growth of total industrial production averaged 6.3 per cent per year. Table A.I.3 shows that, while in 1950, production of non-durable consumer goods accounted for almost two-thirds of industrial value added (food and beverages alone accounting for one-third), by 1977 their share had fallen to little more than one-third. The share of engineering industry (ISIC branch 38) had risen from 11 to 25 per cent, the value added of the chemical (other than

petrochemical industry) from 5 to 15 per cent, and basic metals (iron and steel and non- ferrous) from 4 to 9 per cent. Within the engineering branch, the largest increases in relative shares were recorded by the electrical machinery (from 1 to 6 per cent) and transport equipment (2 to 8 per cent) sub sectors. Data are not available tc indicate what proportions of output consisted of consumer durables and capital goods.

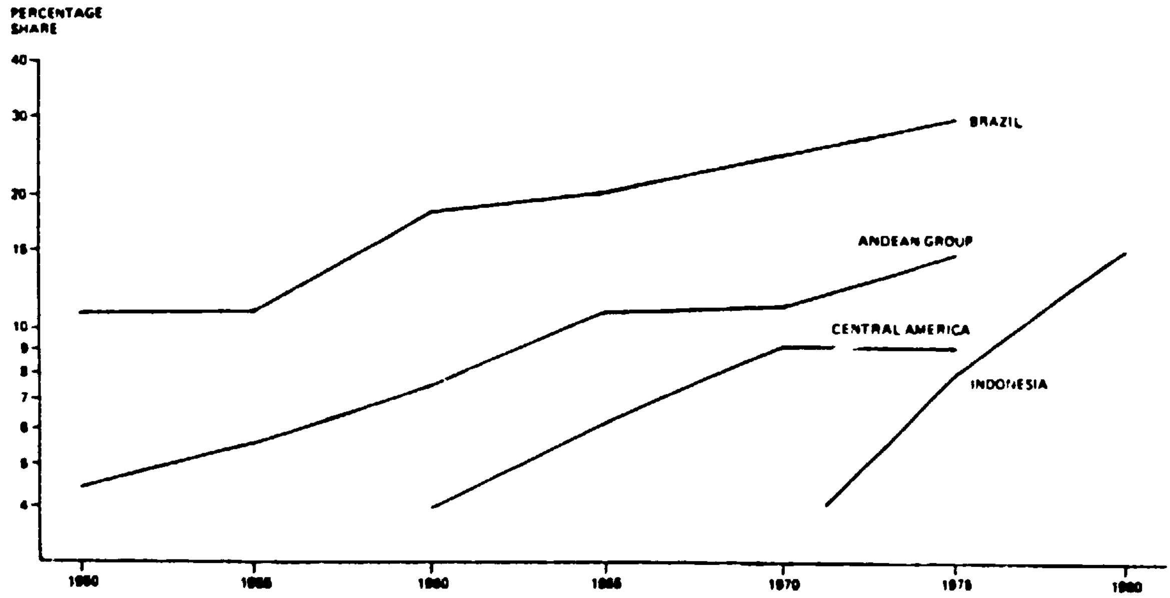
30. Table A.I.4 and Figures A.I.8 and A.I.9 give a further breakdown of the engineering industries of three sub regions, Brazil, the Andean Group countries and Central America. All three groups show a gradual increase in the relative importance of the engineering industry, with Brazil being the most and Central America the least advanced. Whereas in Brazil the share of the engineering industry had already passed 15 per cent by 1960, it did not reach this figure in the Andean Group until 1977; similarly, the share in the Andean Group had passed 10 per cent by 1965, a figure not yet reached in Central America in 1975. Among sub sectors, transport equipment moved ahead of others in Brazil in the 1970s, followed by non electrical machinery (the sub sector containing most capital goods). In the other two sub regions, fabricated metal products still recorded the largest share in 1977.

31. These figures reflect the fact that Brazil's dynamic growth in the engineering industry has relied heavily on development of its automotive sub sector. The Andean Group has also sought to develop automotive production beyond mere assembly of passenger cars but as yet with indifferent results.

32. Latin American governments have all given a high priority to industrial development of one kind or another and have sought to pursue this objective with a variety of industrial policies, including various forms of promotion such as, protection and support activities, including investment in infrastructure, technical education, development finance and, to varying degrees in different countries, also more direct intervention by the state acting as entrepreneur or as buyer of industrial products. Direct state ownership has been important in steel production (accounting for 60 100 per cent in Argentina, Mexico, Brazil, Chile, Venezuela and Peru) and in petroleum refining and petrochemicals in most of these countries. But governments have generally refrained

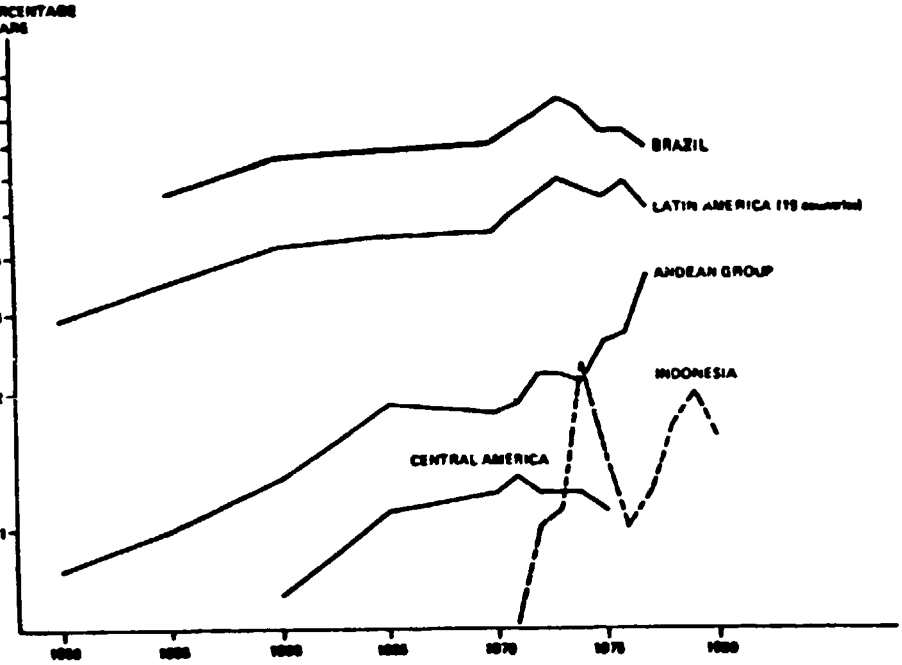
from competing with the private sector in most other branches of manufacturing, except in instances where governments have taken over weak companies to maintain employment. The role of foreign investment by multinationals has been contentious, but most countries have seen the need for their participation in industrial development requiring high technology, large investment and efficient management.

Figure A.I.8: Share of engineering industry (ISIC 38) in total manufacturing, value added, 1950-1980




Source: UNIDO/IS/479/Add.2 (based on Table 2).

Figure A.I.9: Share of non-electrical machinery (ISIC 382) in total manufacturing, value added 1950-1980




Source: UNIDO/IS/479/Add.2 (based on Table 2).

**Table A.I.3: Latin America (15 countries):a/ Structure of the manufacturing industries 1950-1977**
(percentage of value added)

| ISIC | Industry | 1950 b/ | 1955 b/ | 1960 c/ | 1965 | 1970 | 1975 | 1976 d/ | 1977 d/e/ |
|---|---|---|---|---|---|---|---|---|---|
| 311-312, 313-314 | Food, beverage and Tobacco | 31.0 | 28.6 | 26.7 | 24.4 | 23.0 | 20.7 | 19.8 | 18.9 |
| 321 | Textiles | 15.9 | 14.7 | 11.9 | 10.2 | 8.6 | 8.2 | 7.9 | 7.8 |
| 322-324 | Wearing apparel and footwear | 8.1 | 7.1 | 5.5 | 4.5 | 3.6 | 3.5 | 3.2 | 3.0 |
| 323 | Leather | 1.0 | 0.9 | 0.7 | 0.6 | 0.8 | 0.4 | 0.4 | 0.3 |
| 332 | Furniture | 2.2 | 1.9 | 1.7 | 1.5 | 1.3 | 1.3 | 1.3 | 1.5 |
| 342 | Printing and publishing | 4.2 | 4.0 | 3.5 | 3.3 | 3.2 | 2.6 | 2.7 | 2.8 |
| 390 | Other manufactures | 1.0 | 0.9 | 0.9 | 0.9 | 1.1 | 0.9 | 0.9 | 0.9 |
| | Subtotal Group A | 63.4 | 58.1 | 50.9 | 45.5 | 41.8 | 37.6 | 36.2 | 35.1 |
| 331 | Wood and cork products | 2.9 | 2.4 | 2.3 | 2.1 | 1.8 | 1.7 | 1.8 | 2.1 |
| 341 | Paper and paper products | 2.2 | 2.4 | 2.1 | 2.5 | 2.6 | 2.3 | 2.4 | 2.4 |
| 351-352, 356 | Industrial chemicals, other chemicals and plastic products | 5.4 | 7.3 | 8.8 | 10.0 | 11.3 | 12.6 | 13.5 | 14.7 |
| 353-354 | Petroleum refineries and misc. products of petroleum and coal | 4.8 | 5.6 | 6.0 | 6.6 | 6.3 | 5.6 | 5.8 | 4.3 |
| 355 | Rubber products | 1.5 | 1.8 | 1.8 | 1.9 | 2.0 | 2.2 | 2.3 | 2.3 |
| 361-36[illegible], 369 | Manufacture of non-metallic mineral products | 5.3 | 5.6 | 4.9 | 4.6 | 5.1 | 5.4 | 5.4 | 6.1 |
| 371-372 | Iron and steel and non-ferrous metals | 3.6 | 4.6 | 5.7 | 7.0 | 7.3 | 7.6 | 7.4 | 8.[illegible] |
| | Subtotal Group B | 25.7 | 29.7 | 31.7 | 34.6 | 36.4 | 37.4 | 38.6 | 40.4 |
| 381 | Metal products | 4.3 | 4.6 | 4.6 | 5.6 | 5.8 | 5.6 | 5.4 | 5.0 |
| 382 | Non-electrical machinery | 2.9 | 3.5 | 4.2 | 4.4 | 4.5 | 5.4 | 5.8 | 5.1 |
| 383 | Electrical machinery | 0.9 | 1.1 | 3.0 | 3.8 | 4.3 | 4.7 | 5.0 | 5.7 |
| 384 | Transport equipment | 2.4 | 2.6 | 5.1 | 5.5 | 6.7 | 8.7 | 8.3 | 7.9 |
| 385 | Professional equipment | 0.4 | 0.4 | 0.5 | 0.6 | 0.4 | 0.6 | 0.6 | 0.8 |
| | Subtotal Group C | 10.9 | 12.2 | 17.4 | 19.9 | 21.8 | 25.0 | 25.3 | 24.5 |
| | Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: ECLA, based on official statistics.

a/ Argentina, Bolivia, Brazil, Colombia, Costa Rica, Chile, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Paraguay, Peru and Venezuela.

b/ Excluding Bolivia, Chile, Paraguay and member countries of the Central American Common Market (Costa Rice, El Salvador, Guatemala, Honduras and Nicaragua).

c/ Excluding Paraguay.

d/ Excluding member countries of the Central American Common Market.

e/ Excluding Argentina.

Table A.I.4: Share of metal working industry in the manufacturing industry in Latin America and selected sub-regions 1950-1977
(percentage of value added)

| ISIC | Product Group | 1950 | 1955 | 1960 | 1965 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Latin America** | | | | | | | | | | | | | |
| 381 | Fabricated metal products | 4.3 | 4.6 | 4.6 | 5.6 | 5.8 | 5.7 | 5.8 | 5.7 | 5.4 | 5.6 | 5.4 | 5.0 |
| 382 | Non-electrical machinery | 2.9 | 3.5 | 4.2 | 4.4 | 4.5 | 5.0 | 5.4 | 5.9 | 5.6 | 5.4 | 5.8 | 5.1 |
| 383 | Electrical machinery | 0.9 | 1.1 | 3.0 | 3.8 | 4.3 | 4.4 | 4.6 | 4.9 | 4.5 | 4.7 | 5.0 | 5.7 |
| 384 | Transport machinery | 2.4 | 2.6 | 5.1 | 5.5 | 6.7 | 7.2 | 7.5 | 8.2 | 8.9 | 8.7 | 8.3 | 7.9 |
| 385 | Professional equipment | 0.4 | 0.4 | 0.5 | 0.6 | 0.4 | 0.6 | 0.7 | 0.7 | 0.6 | 0.6 | 0.6 | 0.8 |
| | Subtotal | 10.9 | 12.2 | 17.4 | 19.9 | 21.8 | 23.0 | 24.0 | 25.4 | 25.0 | 25.0 | 25.2 | 24.5 |
| **Brazil** | | | | | | | | | | | | | |
| 381 | Fabricated metal products | - | 2.9 | 3.4 | 3.9 | 4.3 | 4.7 | 5.0 | 5.4 | 5.2 | 5.2 | 5.2 | 5.0 |
| 382 | Machinery except electrical | | 5.5 | 6.4 | 6.8 | 7.0 | 7.6 | 8.1 | 8.8 | 8.4 | 7.4 | 7.5 | 6.9 |
| 383 | Electrical machinery | 10.9 | 1.2 | 3.2 | 4.3 | 5.3 | 5.7 | 6.0 | 6.5 | 5.4 | 5.6 | 5.9 | 5.9 |
| 384 | Transport equipment | | 1.2 | 5.2 | 5.1 | 8.0 | 8.9 | 9.6 | 10.3 | 11.7 | 11.5 | 10.9 | 10.4 |
| 385 | Professional equipment | | 0.2 | 0.4 | 0.5 | 0.6 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
| | Subtotal Group C | 10.9 | 11.1 | 18.6 | 20.6 | 25.2 | 27.6 | 29.4 | 31.7 | 31.3 | 30.5 | 30.2 | 28.9 |
| **Andean Group a/** | | | | | | | | | | | | | |
| 381 | Fabricated metal products | 1.2 | 1.6 | 2.8 | 3.5 | 3.7 | 3.8 | 3.8 | 3.8 | 3.6 | 4.4 | 4.1 | 4.8 |
| 382 | Machinery except electrical | 0.8 | 0.9 | 1.3 | 1.9 | 1.8 | 1.9 | 2.2 | 2.2 | 2.1 | 2.6 | 2.7 | 3.6 |
| 383 | Electrical machinery | 1.0 | 1.0 | 1.3 | 2.1 | 2.6 | 2.7 | 2.9 | 2.9 | 3.0 | 3.7 | 3.7 | 4.1 |
| 384 | Transport equipment | 1.4 | 2.0 | 2.0 | 3.3 | 3.0 | 3.1 | 3.3 | 3.5 | 3.2 | 3.9 | 3.6 | 2.8 |
| 385 | Professional equipment | | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.4 | 0.2 | 0.3 |
| | Subtotal | 4.4 | 5.6 | 7.5 | 10.9 | 11.3 | 11.7 | 12.4 | 12.6 | 12.2 | 15.0 | 14.3 | 15.7 |
| **Central America b/** | | | | | | | | | | | | | |
| 381 | Fabricated metal products | | | 1.2 | 3.1 | 4.8 | 4.8 | 4.9 | 5.0 | 5.0 | 4.6 | | |
| 382 | Non-electrical machinery | | | 0.7 | 1.1 | 1.2 | 1.3 | 1.2 | 1.2 | 1.2 | 1.1 | | |
| 383 | Electrical machinery | | | 0.3 | 0.7 | 1.7 | 1.7 | 1.7 | 1.8 | 1.9 | 1.8 | | |
| 384 | Transport equipment | | | 1.8 | 1.5 | 1.6 | 1.7 | 1.6 | 1.5 | 1.6 | 1.7 | | |
| | Subtotal | | | 4.0 | 6.3 | 9.3 | 9.5 | 9.4 | 9.5 | 9.7 | 9.2 | | |

Source: UNIDO: The Capital Goods Industry in Latin America: present situation and prospects (draft dated 15 November 1983 UNIDO/IS)

a/ Bolivia, Colombia, Ecuador, Peru and Venezuela.
b/ Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua.

<u>The situation of the engineering industry sector in the PTA member countries</u>

33. A statistical analysis of the engineering industry sector of the PTA member countries is hampered by the incomplete data base. Hopefully studies presently being carried out will correct this. Table A.I.5 summarizes the available data on the share of the engineering industries in the manufacturing value added (MVA). The highest share of engineering industries in MVA is registered for Mozambique in 1975 which gives an indication of this country's potential in this sector. The three countries with a relatively high share, Kenya, Zambia and Zimbabwe, all experienced a decline in the contribution of engineering industries to MVA from 1973 to 1980 or 1981, respectively. This decline can be explained by reduced investments in the overall economy and additionally, in the size of Zambia, by reduced prices for its mineral exports which limited investments in the mining sector, including replacement of equipment. In a second group of countries the share of engineering industries in MVA is around the per cent range, with Mauritius (12.4 per cent in 1980) and Tanzania (11.5 per cent in 1979) lying above, Malawi (8 per cent in 1980) and Madagascar (7.5 per cent in 1979) lying below this mark. In the third group of countries, the engineering industries are by far less important.

34. If countries for which statistical data are not available (most probably be in the range of of the third group of countries) are included with a share of 5 per cent, the calculation of the combined PTA engineering industry share in total MVA results in approximately 12.5 per cent for all PTA member countries. Even though this general conclusion is affected by the availability and accuracy of data it gives at least an indication of the order of magnitude of the engineering industry sector in the region. This figure furthermore compares well with the data on Latin America (Table A.I.4) placing the PTA region between the Andean group and Central American countries.

35. In most countries, fabricated metal products (ISIC group No. 381) have the highest share. Exceptions are Angola, Kenya and Tanzania where transport equipment (ISIC No. 384) has a higher share and Mauritius which only gives data for ISIC No. 382 to 384. The production of non-electrical machinery (ISIC No. 382) is only significant in Mauritius, Zambia and Zimbabwe. Electrical machinery (ISIC No. 383) already have

significance in several countries, namely, Kenya, Madagascar, Mauritius, Tanzania, Zambia and Zimbabwe. Transport equipment is of importance in all countries except Lesotho, Mauritius, Malawi and Swaziland.

Table A.I.5: Share of the engineering industry sector in manufacturing value added in selected countries and for selected years
(in per cent)

| Country | Years | Total ISIC 38 | ISIC group number 381 | 382 | 383 | 384 | 385 |
|---|---|---|---|---|---|---|---|
| Angola | 1970 | 3.5 | 1.7 | 0.3 | 0.5 | 1.0 | - |
| Botswana | 1975 | 2.7 | 1.9 | - | 0.1 | - | |
| Ethiopia | 1973 | 2.0 | 1.9 | - | 0.1 | - | |
| | 1979 | 2.6 | 2.5 | - | 0.1 | - | |
| Kenya | 1973 | 22.5 | 7.3 | 0.5 | 5.8 | 8.9 | - |
| | 1980 | 18.8 | 7.2 | 0.7 | 5.2 | 5.7 | - |
| Lesotho | 1975 | 0.1 | - | | - | - | - |
| Madagascar | 1973 | 9.8 | 6.2 | - | 2.2 | 1.4 | - |
| | 1979 | 7.5 | 5.0 | - | 1.5 | 1.0 | - |
| Malawi | 1980 | 8.0 | 6.2 | 0.7 | 0.7 | 0.4 | - |
| Mauritius | 1981 | 12.4 | - | 5.1 | 4.1 | 3.2 | - |
| Mozambique | 1975 | 32.5 | 13.7 | 3.3 | 5.4 | 10.1 | - |
| Swaziland | 1980 | 5.2 | 4.5 | 0.2 | 0.5 | - | - |
| Tanzania | 1973 | 11.1 | 2.9 | 0.7 | 2.4 | 5.1 | - |
| | 1979 | 11.5 | 2.8 | 1.0 | 3.1 | 4.6 | - |
| Zambia | 1973 | 30.8 | 14.2 | 5.0 | 6.2 | 5.3 | 0.1 |
| | 1981 | 20.2 | 9.2 | 3.3 | 4.1 | 3.5 | 0.1 |
| Zimbabwe | 1973 | 22.5 | 11.3 | 3.3 | 3.5 | 3.9 | 0.1 |
| | 1980 | 19.1 | 10.5 | 3.1 | 3.6 | 2.9 | 0.1 |

36. Fabricated metal products represent in general the technologically less complex products compared to machinery and transport equipment. Hence the high share of ISIC 381 in most countries and the comparatively lower share of the other product groups indicate that the engineering industries in these countries are still an early stage of development. It can be assumed that future increase in the contribution of engineering

industries will mainly come from strengthening the production capacities of ISIC groups No. 382 to 384, even though ISIC group 381 will also grow albeit at a lower rate (compare figures for Latin America as a whole, 1950 to 1977, Table A.I.4).

37. The future development of the engineering industry sector in the PTA member countries will heavily depend upon whether strategic priority is given to it by both regional and national authorities. Figure A.I.8 gives an example of the influence of development policies on the growth of the engineering industries: Brazil, with incentives especially for the promotion of joint ventures and tax rebates, was able to double the share of engineering industries to manufacturing value added in approximately 15 years (from 1950 to 1965), Latin America as a whole in approximately 20 years (from 1950 to 1979). Indonesia, whose engineering industry was relatively insignificant until 1972, was able to triple its importance in only 8 years (from 1972 to 1980), mainly due to the establishment of a local automotive industry and a general local content regulation to all important products of the engineering industry sector. Here incentives combined with regulatory measures were even more strongly pronounced and more strictly applied than in Latin America. It is noteworthy that both in Brazil and Indonesia, the basic iron and steel industry was in infant stages when the rapid growth of the engineering industries started. Their additional demand for steel products contributed to the strengthening of the steel industry which found developed markets to absorb their additional output. (Some other countries which first developed their basic iron and steel industry and then the user industries have experienced sales difficulties in their early years of operation which negatively affected cash flow and profitability of the steel mills).

38. If PTA member countries decide to give high priority to the development of the engineering industries and to introduce additional incentives and promotional efforts it can be assumed that the share of engineering industries in MVA could be raised considerably in the next 10 to 15 years. However, a thorough analysis of the present stage of development of the engineering industry sector, its constraints and potential and, in relation to the present study, its present and future steel demand seems of urgent importance as a basis for an industrial development strategy

for this sector. Priority should also be given to this sector due to its relatively labour intensive (yet skill-intensive) production operations (annual production output per employee is in the order of US$15,000 to US$20,000 in the engineering industries in East African countries).

Constraints to the development of the engineering industry sector

39. A constraint to the development of appropriate promotional policies for the engineering industry sector lies in the weakness of statistical information. Unclarity as to the industry's present stage of development makes it difficult to acknowledge its importance for the economy by government planning institutions. Only a few countries (e.g. Mauritius, Tanzania and Kenya) pay special attention to the engineering industries in their development plans.

40. The small size of the market in African countries has frequently been quoted as a major constraint to the development of engineering industries. The relatively low level of national income in some countries also contributes to reduce market perspectives. On the other hand, development assistance granted to African countries is often coupled with the obligation to purchase supplies from the donor country which, once again, reduces the market perspectives for local producers. A coherent strategy to increase the participation of local manufacturers in development projects and in government purchases should be developed to overcome these shortcomings.

41. Economies of scale are less important in the engineering industries than in other manufacturing sub-sectors. This is evidenced by the large proportion of small and medium engineering enterprises in industrialized countries co-operating under linkage schemes (sub-contracting, product complementation). These linkage schemes have contributed to high degrees of specialization and productivity in the engineering industries of industrialized countries. However, linkages of this nature are hardly developed in African countries and often encounter fiscal barriers to their strengthening (e.g. ex-factory sales tax instead of value-added tax). The virtual non-existence of sub-contractors and component suppliers in African countries forces the industry into vertical integration. Hence the economies of scale and specialization that would be derived by component producers supplying a number of different firms are negatively affected.

42. The engineering industries are relatively labour-intensive, yet extremely skill-intensive. Most African countries have an abundant labour force but it lacks the qualification required in the engineering industries. While in Africa the ratio of technicians per 10,000 population is only 8.3, it is 23.4 in Asia, 72.2 in Latin America and 142.3 in developed market economies. A priority requirement is therefore the implementation and/or strengthening of manpower development schemes, especially for the engineering industries.

# A N N E X  I I

## Status of the steel industry of Eastern and Southern Africa

1. This annex presents an up-to-date (as of July 1985) characterization of the steel industry of the Eastern and Southern African sub-region.

2. Only those plants that are equipped with steel making facilities (i.e. furnaces) and/or are rollers of cast primary products (billets, ingots, slabs, and blooms) are included in the roster of steel plants. Foundries devoted to production of iron and/or steel castings, cold rolling mills that rely on imported hot-rolled coils, galvanising and/or corrugating plants, and fabricators of wire products (rails, etc.) are excluded.

3. Table A.II.1 lists the 23 steel plants in the sub-region as of the last quarter of 1985, showing their steelmaking units, crude steel production and rolling capacities, product mix, and ownership. In quantitative terms, Kenya has the largest concentration of steelworks (8), seven of which are in the Nairobi area.

4. The sub-region's aggregate (liquid) steelmaking capacity was 1.0191 million tonnes per annum in 1981-83,[1/] of which 83 per cent (or 850,000 tonnes) comes from Zimbabwe Iron and Steel Company's (ZISCO) steelworks at Redcliff. ZISCO is the only integrated steelworks in the sub-region, producing pig iron from two blast furnaces with a combined capacity of 3,000 tonnes per day, and steel from two 55-ton basic oxygen furnaces (BOFs). ZISCO is also the only producer of blooms in the sub-region.

5. All other crude steel producers, except City Engineering Works in Kenya which uses in a 1-ton induction furnace, employ the electric arc furnace route to steelmaking on the basis of scrap, i.e. these are the classical mini-steel mills. The furnace sizes range from 4 tonnes of liquid steel per heat to 20 tonnes per heat. In all but three cases, the molten steel is cast into "pencil ingots" for rolling. The other plants employ the continuous casting technique to generate billets which are particularly desired by producers of wire rod. In fact, Steel Billet Castings Ltd.(in

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1/ Rolmil Kenya and Ethiopia's Asmara plant not included.

Table A.II.1: Steel plants in Eastern and Southern African sub-region

| Country | | Plant and location | Steelmaking units | Crude steel production capacity tonnes/year[a] | Rolling capacity tonnes/year[a] | | Product mix |
|---|---|---|---|---|---|---|---|
| Angola | | Siderurgia Nacional Steelworks, Luanda | One 20-ton EAF | 30,000 | 50,000 | 6-25 mm reinforcing bars and rods; merchant profiles | Government enterprise |
| Ethiopia | i) | Ethiopian Iron and Steel Foundry, Akaki | One 5-ton EAF | 12,000 | 30,000 | Reinforcing bars and wire products | Government enterprise |
| | ii) | Ethiosider Iron and Steel Foundry, Asmara[b] | One (uninstalled) 5-ton EAF | 12,000 (potential) | 34,000 | Reinforcing bars and wire products | Government enterprise |
| Kenya | i) | EMCO Steel Works, Dandora | One 12-ton EAF | 25,000 | 60,000 | 8-40 mm plain rounds, squares, and twisted squares | Private |
| | ii) | Kenya United Steel Company, (KUSCO), Mombasa | Two 4-ton EAFs (one operational) plus (uninstalled) single-strand continuous caster | 26,500 | 30,000 | Reinforcing bars; rounds; squares; twisted squares; and wire products | Private |
| | iii) | Steel Billet Castings Ltd., Dandora | One 12-ton EAF plus 2-strand continuous caster | 25,000 | - | Billets for rerolling | Private |
| | iv) | City Engineering Works Ltd., Dandora | One 1-ton medium frequency induction furnace | 8,600 | 12,000 | Round and flat bars; angles | Private |
| | v) | S[illegible]imil Kenya Ltd., Nairobi | One 7-ton EAF | 15,000 | 13,500 | Reinforcing bars; flats, angles; squares | Private |

a/ Based on 3-shift operation per day        b/ Not in operation as of mid-1985

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**Table A.II.1: Steel plants in Eastern and Southern African sub-region**
(continued)

| Country | | Plant and location | Steelmaking units | Crude steel production capacity tonnes/year | Rolling capacity tonnes/year | Product mix | Ownership |
|---|---|---|---|---|---|---|---|
| Kenya (cont.) | vi) | Morris and Co. Ltd., Nairobi | - | - | 30,000 | Reinforcing bars; angles, channels; squares; flats | Private |
| | vii) | Special Steel Mills Ltd., Ruiru | - | - | 60,000 | 5.5-11.5 mm wire rods; bars; squares; structurals | Private |
| | viii) | Steel Rolling Mills Ltd., Kikuyu | - | - | 72,000 | Flats; angles; squares; reinforcing bars; channels | Private |
| Madagascar | | At Toamasima[c/] | - | - | 6,000 | Reinforcing bars; rods; light sections | Private |
| Mauritius | i) | Debro International Ltd. | - | - | 40,000 | Rebars; light sections | Private |
| | ii) | Iron and Steel Industries Ltd.[d/] | - | - | 15,000 | Round and twisted square bars | Private |
| | iii) | Shipbreaking and Industries Ltd. | - | - | 21,000 | Rebars and flat bars | Private |
| | iv) | R.M. Industries Ltd. | | - | 4,000 | Rebars | Private |

c/ Scheduled for start-up end-1985. d/ Closed in 1983 but due for resuscitation August 1985

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**Table A.II.1: Steel plants in Eastern and Southern African sub-region**
(continued)

| Country | Plant and location | Steelmaking units | Crude steel production capacity tonnes/year | Rolling capacity tonnes/year | Product mix | Ownership |
|---|---|---|---|---|---|---|
| Mozambique | Cia Industrial de Fundicao e Laminagem (CIFEL), Maputo | - | - | 50,000 | 6-50mm reinforcing bars and rods; flats; angles | Government enterprise |
| Tanzania | i) Aluminium Africa (Ltd.), Steelcast Division, Dar-es-Salaam | One 11-ton EAF plus continuous caster | 18,000 | - | Billets for rerolling | 60 per cent Government 40 per cent Private |
| | ii) Steel Rolling Mills Ltd., Tanga | - | - | 30,000 | Plain and deformed bars (10-25 mm); light sections | Government majority (with 4 per cent Danielli) |
| Uganda | East African Steel Company, Jinja | One 10-ton EAF | 24,000 | 30,000 | Reinforcing bar; wire rod; light sections | Government enterprise |
| Zimbabwe | i) ZISCO Ltd., Redcliff | Two blast furnaces; Two 55-ton BOFs; continuous caster for blooms | 850,000 | 600,000 tonnes heavy sections and billets | Billets; blooms; slabs | 86.8 per cent Government Balance - others |
| | | | | 70-110,000 medium sections | Rounds; flats; angles; beams; rails; channels | |

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**Table A.II.1: Steel plants in Eastern and Southern African sub-region**
(continued)

| Country | Plant and location | Steelmaking units | Crude steel production capacity tonnes/year | Rolling capacity tonnes/year | Product mix | Ownership |
|---|---|---|---|---|---|---|
| | | | | 24-48,000 light sections | Flats and angles | |
| Zimbabwe (cont.) | | | | 100-200,000 bar and wire | Rebar and rods (plain and deformed); squares | |
| | ii) Lancashire Steel Ltd., Kwe-Kwe | - | - | 52,000 | Wire rod (5.5-12 mm); 5-8 mm squares | Wholly-owned subsidiary of ZISCO |
| | iii) Tor Steel, Ltd. | - | - | 12,000 | 15-65 mm seamless tubes | Wholly-owned subsidiary of ZISCO |

Kenya) and Aluminium Africa Ltd. (in Tanzania) do not have in-house rolling capability, but rather produce billets for their sister-companies, - Steel Rolling Mills, Ltd., Kikuyu, and Steel Rolling Mills, Ltd., Tanga, respectively.

6. It is to be noted paranthetically that the meltshop of Ethiosider Iron and Steel Foundry, Asmara (Ethiopia) is not presently functioning due to several operational and technical problems. Furthermore, the new 7 ton arc furnace of Rolmil Kenya Ltd. was scheduled to be commissioned in August 1985. The capacity of these two plants are not included in capacity figures for 1981-83 which forms the base period for projections made and which is referred to for the calculation of growth rates up to 1990.

7. The mini mills generally obtain their scrap from local sources. However, progressive depletion of the easily retrievable local scrap sources has forced some steelmakers to import scrap when the necessary import licences could be secured. Other avenues for obtaining scrap are also being investigated. For instance, Angola (with UNIDO assistance) has set up a scrap collection/processing enterprise to ensure a steady supply to Siderurgia Nacional Steelworks, with prospects for eventually exporting the surplus to other countries in the sub-region. Ship-breaking is another attractive supply option which is currently being exploited by Mauritius and (to a lesser extent) Kenya, and which holds promise for such other maritime countries as Mozambique, Tanzania, Madagascar, Somalia, and Djibouti.

8. ZISCO's raw materials (iron ore concentrate and metallurgical coal) come from its captive mines in Zimbabwe. They are converted at the Redcliff steelworks into sinter and coke (capacity of 600,000 tonnes per year) respectively for use in the blast furnaces.

9. The rolling mills that do not have in-house steel melting facilities have generally depended on imported billets from South Africa, India, South Korea, Japan, and the EEC, although recent foreign exchange limitations have compelled most rerollers to increasingly seek local billet suppliers, as well as other sources within the sub-region, e.g. ZISCO. In fact, ZISCO's billet production capacity (in excess of its internal requirements) is more than adequate to supply the present demand of the re-rollers in the sub-region.

10. The rolling capacity, of the sub-region is up to 1,609,500 tonnes per year, although 1,022,000 tonnes of this capacity (63 per cent) is attributable to ZISCO Ltd. and its subsidiaries.

11. Partly due to the present depression of the economies of the various countries of the sub-region, which has been in effect since about 1981/82, all the steel plants are grossly under-utilized. In fact, as of mid-1985, most of the plants were operating at capacity utilization levels of under 30 per cent.

12. The product mix of all the steel mills in the sub-region consists only of "long" finished products - reinforcing bars, (plain, deformed, ribbed, and twisted), rods (for wire and wire products), and light and medium sections (angles, shapes, and channels). There is no local production of hot-rolled "flat" mill products (sheets and strips). Accordingly, producers of cold-rolled products, corrugated and galvanized sheets, and the engineering industries must depend on imported flat products.

13. A little over half of the sub-region's steelworks are totally or majority- government-owned and controlled. These are in Angola, Ethiopia, Mozambique, Tanzania, Uganda and Zimbabwe (where the Government owns 86.8 per cent of the shares in ZISCO). In contrast, all steel enterprises in Kenya, Madagascar and Mauritius are privately-owned and controlled.

14. There are prospects for increased trade in primary and finished steel mill products within the sub-region. In this regard, Zimbabwe's domestic consumption of finished steel products of the types produced locally was in 1981-83 around 200,000 tpy, whereas its production capacity for the same products is 750,000 tpy, creating an export potential of about 550,000 tpy. Thusfar, the export targets for Zimbabwe have been the Far and Middle East. Kenya, the region's other steel exporter markets its products in Uganda, Tanzania, Rwanda and Burundi.

15. A major constraint militating against increased sub-regional trade in steel products are the poor logistics and high costs of transportation between states. The following are illustrative of the specific problems of transportation:

- nine of the countries in the sub-region are land-locked, - Botswana, Burundi, Lesotho, Malawi, Rwanda, Swaziland, Uganda, Zambia, and Zimbabwe, - and must therefore depend on other countries for sea port facilities;

- exclusive of the island states, - Madagascar, Mauritius, Seychelles and Comoros, - there are only eleven commercial seaports to serve the entire sub-region; these are Luanda, Benguela and Mocamedes in Angola, Nacala, Beira and Maputo in Mozambique, Dar-es-Salaam and Tanga in Tanzania, Mombasa in Kenya, Mogadishu in Somalia, and Djibouti. Furthermore, virtually all these ports have limited cargo handlng capacities coupled with inadequate inland evacuation outlets;

- the railway system in the sub-region is largely unintegrated, with non-uniform gauges, and deteriorating tracks. For instance, (i) there was at the time of the missions no direct cross-border rail traffic between Kenya and Uganda (each of which operates its railway system), necessitating trans-shipment of goods moving from Mombasa Nairobi to Kampala; (ii) the Tanzara railway from Dar-es-Salaam to Kapiri Mposhi in Zambia is of a different gauge from the Zambian national rail system, leading to unavoidable trans-shipment at the junction of the two lines; and (iii) the Benguela railway in Angola has been disrupted by the civil war, and rail access from Angola to the other countries in the sub-region is not now possible. Another complication arises from the severe congestion at the port of Luanda as a result of its large general cargo throughput.

16. These constraints result in relatively high inter-state transportation costs. For instance, the cost of transportation of steel from Redcliff to Mombasa (by rail and sea) is about US $45 per tonne, about the same as (or even higher than) the ocean freight from Antwerp to Mombasa. What is more, because of terminal handling and transportation scheduling delays, it is not unusual for shipments from Antwerp to be faster and more reliable.

17. In general, the major process units now in operation in the steelworks are at least ten years old, having been installed in the 1960s and early 1970s. The following is indicative of the ages (and therefore mechanical conditions and relative degrees of obsolescence) of the meltshop and rolling mill equipment in some of the sub region's steelworks:

| | | Year of Installation | |
|---|---|---|---|
| | | Electric Arc Furnace | Rolling Mill |
| Angola | Siderurgia Nacional | 1969 | 1969 |
| Ethiopia | Ethiopian Iron and Steel Foundry | 1951 | 1951 |
| | Ethiosider Iron and Steel Foundry | - | 1961 |
| Kenya | Emco Steel Works Ltd. | 1972 | 1972/73 |
| | KUSCO Ltd. | 1974 & 1980 | 1968 |
| | Steel Billet Castings Ltd. | 1974 | 1974/75 |
| | Rolmil Kenya Ltd. | 1985 | 1979 |
| | Morris & Co. Ltd. | - | 1983 |
| | Special Steel Mills Ltd. | - | 1983 |
| | Steel Rolling Mills Ltd. | - | 1976/1980 |
| Mozambique | CIFEL | - | 1967 |
| Tanzania | Aluminium Africa Ltd. | 1976 | - |
| | Steel Rolling Mills Ltd. | - | 1968/1972 |
| Zimbabwe | ZISCO Ltd. | 1975 and 1961-Blast furnances<br>1970 - Steel plant | 1960-Med. Sec. mill<br>1969-Billet mill<br>1977-Heavy Sec. mill |

18. Total direct employment in the sub-region's steel industry is about 11,100. Senior management and technical personnel would generally constitute 5-8 per cent of the total, and of these, well over half would be expatriates. This underlines the importance of indigenous manpower training and development (particularly in the technical areas) if the long-term self-reliance of the industry is to be guaranteed.

19. The production cost for a tonne of a specific steel product is variable depending on, among other factors, the specific production processes employed, the efficiency (and age) of the process equipment, the capacity utilization, and the costs of such items as raw and consumable materials, energy and labour. These factors vary from one country to the other within the sub-region, and also between plants in the same country. Accordingly, very few generalizations can be made and any figures cited must be regarded as merely indicative.

With these qualifications in mind, it is instructive to compare the delivered price of locally-produced mild steel continuous-cast billets to a steelworks in Nairobi with the costs of similar billets imported from outside the PTA sub-region, and from within the PTA (Zimbabwe). The generally prevailing ex-meltshop (Nairobi) price for locally produced billets as of July 1985 was KSh. 5,300 per tonne (i.e. US $327). On the other hand, imported billets from Zimbabwe could arrive C & F Mombasa at about $229 per tonne. Inclusive of customs tariff (25 per cent) and clearing/inland transport charges (KSh. 500 per tonne), the delivered price (Nairobi) would be about $317 per tonne, - a figure that is roughly identical to the delivered price of billets imported from outside the sub-region.

There are indications that the local production costs of billets in the other countries in the sub-region (except Zimbabwe), are even higher than those for Kenya, making it very tempting for non-PTA countries to "dump" steel at prices that are well below their economic costs, especially during periods of slack demand on their home markets.

Given the plan of the sub-region to become more self-sufficient in steel products, and to preferentially purchase (where necessary) from other member-states within the sub-region, there arises the need for evolving a modality for encouraging such intra-regional trade in preference to extra regional importation. Among the steps that are being taken is the removal of internal tariff barriers on steel products within the framework of PTA which has now put steel products e.g. billets on their 'common list'. Also, preferential issuance of import licences to imports from the sub-region is a possibility. The most important breakthrough so far has been the conclusion of contracts between Zimbabwe, Kenya and Ethiopia regarding purchase of billets by the two latter from ZISCOSTEEL. Improvements in transportation and communications would also go a long way towards stimulating intra regional trade. At the same time, steps must be taken to minimize injury to exporting countries by permitting them to charge equitable prices for their products, even when these are apparently higher than extra regional import prices. In the long run, it is the sub-region's steel industry that would benefit. Furthermore, with these transactions in currencies of the sub-region, the problems now associated with a general scarcity of hard currency would be significantly ameliorated.

20. A number of economic, technical, manpower, infrastructural, and bureaucratic constraints are currently inhibiting the steel industry's full utilization of its installed capacity. Among the most important of these are:

- the depressed world-wide economy which has, in turn, adversely affected the highly dependent economies of the developing countries in general, resulting in enforced idling of capacities and associated production diseconomies;

- a worsening shortage of scrap as a consequence of depressed industrial activities and the absence of well organized systems of scrap collection, processing, and delivery;

- a high dependence on imports for such essential inputs as electrodes, ferroalloys, some refractories, as well as spare parts. This problem has been exacerbated by the foreign exhcange squeeze which is affecting all countries in the sub-region;

- technical and operational problems arising from obsolete equipment, poor plant layout, and inadequate maintenance;

- Unpredictable product quality, often resulting from poor quality control and non-compliance with international product specifications;

- a general shortage of skilled manpower. This is most apparent in respect of technical manpower which is in such short supply that, in most steelworks, well over 75 per cent of the high-level technical experts are expatriates;

- transportation and communication bottlenecks inhibiting intra-country and international trade relations;

- lacklustre product marketing strategies, including the non-availability of strategic warehousing facilities;

- the administrative bureaucracy in the government establishment which can cause unnecessary delays in obtaining necessary approvals and licences;

- retrogressive tariff structures which inadvertently discourage local industry to the advantage of imports. For instance, the customs duty on steel billets could be such as to encourage local re-rolling mills to by-pass local meltshops in favour of billet imports; and

- the imposition of price controls on steel products, thus restricting profit margins and, in the long run, preventing new investments in the industry.

Table A.II.2: Estimated foreign exchange outlay for imports of basic steel products - average 1981-83, million US dollars

| | US$ million |
|---|---|
| Angola | 17.6 |
| Botswana | 7.5 |
| Burundi | 5.7 |
| Comoros | 1.1 |
| Ethiopia | 17.1 |
| Djibouti | 1.6 |
| Kenya | 63.5 |
| Lesotho | 3.6 |
| Madagascar | 11.3 |
| Malawi | 8.4 |
| Mauritius | 8.0 |
| Mozambique | 5.1 |
| Rwanda | 7.6 |
| Seychelles | 0.8 |
| Somalia | 2.7 |
| Swaziland | 3.1 |
| Tanzania | 22.4 |
| Uganda | 2.5 |
| Zambia | 33.4 |
| Zimbabwe | 51.5 |
| Total PTA | 274.5 |
| Total SADCC | 152.6 |

Undersupply from national sources has been covered by imports with a resultant of flow of foreign exchange. Table A.II.2 shows an estimate of average annual foreign exchange costs (not total costs) of the supply of basic steel products to the sub-region. The estimate is based on import quantitites as shown in country tables, Volume II and fob prices Europe of US$270 for bars and rods and US$410 as an average for other items. Only the cost of overseas freight is included (for Botswana, Lesotho, Swaziland a small amount of freight through South Africa paid for in foreign exchange). This estimate therefore represents the very minimum foreign exchange requirement for basic steel.

**Table A.II.3: Additional steelmaking and rolling capacities, 1985-1990**

| Country | Plant and location | Project description | Additional crude steel capacity, tonnes per year | Additional rolling capacity, tonnes/year | Probable commissioning |
|---|---|---|---|---|---|
| Ethiopia | Ethiopian Iron and Steel Foundry, Akaki | Rolling mill modernization and up-grading of capacity to 60,000 tonnes per year | - | 30,000 | 1990 |
| Kenya | i) Eldoret Rolling Mill, Eldoret | Installation of a (previously purchased) rolling mill | - | 12,000 | 1986 |
| | ii) Steel Billet Castings Ltd., Dandora | Installation of a ladle refining unit or a second electric arc furnace | At least 11,000 | - | 1988-90 |
| | iii) Morris and Co. Ltd., Nairobi | Backward integration to produce liquid steel for own consumption | 20,000 | - | 1988-90 |
| Madagascar | Madagascar Rolling Mill, Toamasima | Expansion of rolling capacity to 30,000 tonnes per year | - | 24,000 | Post-1988 |
| Mauritius | Desbro International Ltd. | Installation of arc furnaces plus continuous casters | 50,000 | - | 1988-90 |
| Tanzania | i) Aluminium Africa Ltd., Dar-es-Salaam | Installation of a 15-17 tonne arc furnace and a light sections rolling mill | 25,000 | At least 30,000 | 1986 |
| | ii) Steel Rolling Mills Ltd., Tanga | Reactivation of wire rod mill | - | 18,000 | 1989 |

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## Table A.II.3: Additional steelmaking and rolling capacities, 1985-1990
(continued)

| Country | Plant and location | Project description | Additional crude steel capacity, tonnes per year | Additional rolling capacity, tonnes/year | Probable commissioning |
|---|---|---|---|---|---|
| Uganda | East African Steel Co. Ltd., Jinja | Rehabilitation of arc furnace and installation of 2-strand continuous caster | 2,500 | - | 1988 |
| Zambia | Zambia Steel and Building Supplies Ltd., Lusaka | Installation of a 15-20 tonne electric arc furnace, single-strand continuous caster, and rolling mill for bars and light sections | 27,000 | 43,000 | 1988 |

The total requirement of US$270 million may be compared to total sub-regional import of US$7.7 billion in 1982 or an estimated foreign exchange cost of US$1.7 billion for products representing indirect steel imports - major importers are Kenya, Zimbabwe, Tanzania and Zambia representing over 60 per cent of the total.

1990 Steel supply prospects

21. Table A.II.3 shows the new projects that are expected to contribute to the 1990 steelmaking and rolling capacities. Of particular significance is the entry of Zambia into the roster of steelmakers with the planned implementation of a mini-mill under the auspices of Zambia Steel and Building Supplies Ltd. The plant, which would be located in Lusaka, would be equipped with a 15 to 20-ton electric arc furnace, a single strand continuous caster, and rolling mills for reinforcing bars and light sections. It is planned for commissioning in 1988/89.

22. With these projects on-stream, the additional crude steel production and rolling capacities would be 135,000 tonnes per year and 157,000 tonnes per year respectively, bringing the sub-region's aggregate capacities to 1.166.100 tonnes of crude steel and 1,766,500 tonnes of rolled products per year. Zimbabwe's shares of the totals would decline to 73 per cent and 58 per cent respectively.

23. The additonal capacities would not qualitatively alter the aggregate product mix which would still consist primarily of "long"products. At the time of the mission there was no definite plan to produce flat products in the sub-region.

Long-term (post-1990) proposed projects

24. The long-term development of the sub-region's steel industry has the twin objectives of maximum utilization of indigenous mineral and energy resources, coupled with essential sub-regional self-sufficiency in most steel products. In pursuit of these objectives, six countries have evolved project plans that are currently under consideration for purposes of possible implementation during the decade of the 1990s.

25. Angola: In a 1981 feasibility report, Austromineral had recommended a project that was then thought to have a marginal economic advantage over other options considered, and which, in its first phase, would involve

the development of the Kassala/Kitungo iron ore deposits to provide 2.1 million tonnes per year of super-pellets, initially for the export market. In the second phase, two direct reduced (sponge) iron production modules, with a total capacity of 1.3 million tonnes per year, would be installed at Luanda, based on natural gas. The estimate (1981) of the required capital investment was put at US $567 million.

In view of the high investment requirements and the current economic and political problems in Angola, it is doubtful whether this project can be realistically considered for implementation earlier than 1995.

26. Burundi: A prefeasibility study funded by the African Development Bank has been conducted on the commercial exploitation, for steel production, of the Mukanda vanadium ore deposit which contains a proven reserve of 6.5 million tonnes (0.65 per cent V, 16.3 per cent Fe), with additional probable and possible reserves of 7.3 million and 5 million tonnes respectively. The minerals, which are of the titanomagnetite and ilmenite types, have been beneficiated on a laboratory scale to yield a concentrate with 48-49 per cent Fe and 2-2.5 per cent V.

The proposed steel production scheme involves smelting the concentrate to yield vanadium containing pig iron which would be converted to steel by oxygen blowing, with the vanadium bearing slag subsequently processed to yield ferro-vanadium for export. A steel production capacity of 51,500 tpy is proposed, along with 3,500 tpy ferro-vanadium. The initial investment estimate is $153 million.

A number of issues in respect of the project need, however, to be resolved before it can receive a formal go ahead:

- a detailed geological mapping of the deposit is necessary in order to establish its possible life span;
- hydrocarbon for smelting is proposed to be in the form of charcoal from a planned eucalyptus planatation, rather than peat coke from peat deposits in Northern Burundi. The merits of such a sheme in the face of land scarcities, especially for agriculture, need to be carefully evaluated;
- the smelting practice for the relatively low-Fe concentrate has yet to be worked out;

- the finanical returns of the project as determined by the pre-feasibility study (IRR = 8.8 per cent; pay-back period = 8 years) are thought to be only marginal at best.

For these reasons, if this project is implemented, it is not expected to be earlier than about 1995.

27. Kenya: Austroplan had, in a 1982 study, proposed the stage-wise implementation of a charcoal blast furnace based steel project, with the final phase to be commissioned in 2000. With an ultimate crude steel capacity of 896,000 tonnes per year, the plant would then consume 550,000 tonnes of charcoal and would require the afforestation of 257,000 hectares in the Lamu District. The steelworks would be located at Mihongani, south of Port Reitz in the Mombasa area. The total investment was projected in 1982 to be US $887 million (excluding $231 million investment in afforestation, charcoal production and storage, shipping, and forest roads).

Although the project is still under active government review, there are several major problems that must be resolved before it could be embarked upon:

- the very high capital investment, particularly the foreign exchange component, at a time of a severe foreign earnings squeeze;
- the production and silvicultural management problems associated with a gigantic afforestation project, as well as the agricultural, environmental, and human settlement implications;
- the project's high dependence on imported inputs, especially iron ore;
- issues of manpower availability in the quantities and qualities demanded by such a large project;
- the opportunity costs of implementing this project in preference to other industrial, social and infrastructural projects calling for the government's lean financial resources.

28. Madagascar: There is currently a feasibility study in progress (by Italsider) for the development of a steel project based on th Soalala iron ore deposit and the Sakoa coal deposit. The latter is being investigated by BP Coal Ltd. Although the short-term objective is to develop the iron ore mine for the production of concentrates for the export market, it is hoped that in the medium term, a steelmaking project

would follow. At that stage, the iron ore operations would produce 1.7 million tonnes of pellets or sinter feed for export and 300,000 tonnes for a direct reduced iron-based steelworks. A rotary-kiln reduction process is envisaged. The steelworks, rated at 210,000 tonnes of billets and blooms per year would produce rods, bars, light sections, and flat products (sheets, strips and plates) partly for export.

29. Mozambique: In the spirit of sub-regional industrial co-operation, UNIDO had, in 1983, commissioned a preliminary techno-economic assessment of a sponge iron project based on Angolan iron ore and Mozambican coal. With a capacity of 150,000 tonnes per yar, the sponge plant would export a portion of its output (50,000 tonnes) while the balance would be jointly consumed by steel plants in the two co-operating countries. Among the project location options considered were Mocamedes (in Angola) using Kassinga iron ore and Moatize (Mozambique) coal, and the Tete area of Mozambique on the basis of Moatize coal and Muande iron ore.

In either case, the heavy burden of infrastructural investments and the high land and sea trasportation costs associated with the project are likely to pose problems in its eventual implemention.

30. Tanzania: The centre-piece of Tanzania's steel development plans is the Liganga-Mchuchuma project which was recommended by LURGI in a 1984 study sponsored by UNIDO. The project would involve the development of the Liganga iron ore deposit and the production of pellets which would be employed in an SL/RN direct reduction unit to produce 663,000 tonnes per year of sponge iron, using coal from the Mchuchuma coal fields. A steel plant located at Mahanje would convert the sponge iron into steel by means of the submerged electric arc smelting process (necessitated by the $TiO_2$, $V_2O_5$ and $Cr_2O_3$ contaminants). The steel plant's product mix would be 400,000 tonnes per year of hot rolled strip and 100,000 tonnes per year of heavy plate. The estimated total investment in this phase of the project was US $716 million. In addition, a further investment of US $1,102 million would be required for infrastructures and amenities, including a road from Madaba to Manda, via Ruhuhu, Liganga and Mchuchuma; a rail line from Mlimba through Madaba, Ruhuhu, Liganga, and Mchuchuma to Manda; a coal-fired power plant (300 Mw); and townships at Liganga, Mchuchuma and Ruhuhu.

In the face of the high investments entailed in the Liganga project, the idea had been recently floated for a scaled-down alternative which would serve as a lead-in to the larger project. This would be located at Dar-es Salaam, at the site of the works of the Steelcast Division of Aluminium Africa Ltd., primarily to take advantage of the existing infrastructural facilities. In addition to the on-going expasion (involving the installation of an electric arc furnace), a 60,000 tonne per year sponge iron project would be implemented, based on imported pellets and coal from Songwe colliery, and employing the SL/RN process. The sponge iron excess to the internal requirements (i.e. 19,500 tonnes per year) would be exported. The total investment in the project was preliminarily put at US $26 million.

The project is under detailed review, particularly its foreign exchange savings implications, depending so heavily as it does on imported iron ore.

31. Uganda: An integrated project idea had been formulated, involving the development of the high-quality Muku iron ore deposit in Kigezi district which contains at least 30 million tonnes of proven reserve. A direct reduction project utilising charcoal, - the only deductant potentially available in Uganda, - was formulated, to be coupled with an electric arc furnace steel plant, taking advantage of Uganda's abundant power resources.

It is thought that the project would call for large infrastructural investments since the iron ore is located in a very remote area without adequate rail and road access.

# A N N E X  I I I

## Transport infrastructure and supply costs of steel products

### Transport infrastructure

1. Transport infrastructure deficiencies and their repercussions on timely and cost efficient delivery of goods have been analyzed for several major industrial projects (e.g. fertilizer production). The constraints of the transport sector in the PTA and SADCC member countries can be summarized as follows:
   - inadequate and low standard infrastructure and facilities;
   - inadequate and obsolete equipment;
   - poor, inadequate and occasionally neglected maintenance;
   - lack of standardization;
   - unharmonized and unco-ordinated infrastructure and services;
   - scarcity or lack of spare parts;
   - scarcity of trained and experienced personnel at all levels of construction, management and operations;
   - inadequacy of training institutions;
   - lack of transport planning;
   - absence of harmonized transport/communications policies and legislation at the subregional/regional levels;
   - absence of transport/communications industries in Africa;
   - scarcity of foreign exchange due to low export earnings and tight international lending;
   - inadequate budgetary allocations for maintenance and rehabilitation;
   - general inefficiency in infrastructure/facilities construction and in the management/operations of services; and
   - low transport volume per shipment.

2. These constraints have been identified by governmental and regional institutions, e.g. in the Lagos Plan of Action in 1980, by the PTA Secretariat, by the ECA Conferences of Ministers responsible for transport and communication, and by the Southern Africa Transport and Communica ions Commission (SATCC). Major programmes are at present planned or being implemented by the institutions involved, and special mention should be made of the programmes under the UN Transport and Communication Decade for Africa and the SATCC programmes, as well as PTA

3. activities whose main objectives are to enable the physical integration of the continent through a collective regional effort, with emphasis on improving, harmonizing, co-ordinating and integrating existing and future transport infrastructures and services. According to SATCC planning, this will contribute, by 1990, to solving the numerous probelms listed above and will facilitate economic and social co-operation, intra-African trade and internal collective self-reliance.

4. There might remain, however, constraints resulting from political conflicts and internal disorder which at present negatively influence intra-regional trade or make it even impossible. This is at present the case for rail and/or road connections in Mozambique and Angola. The Benguela rail road system connecting the Angolan port of Lobito, via southern Zaire, with Lusaka and the southeast African railway system (see Figure A.III.1) has not been operational since 1975, but is expected to reopen, political conditions permitting, by 1987. The disruption of rail connections in Mozambique has negatively influenced steel exports by ZISCO Steel, especially through the port of Maputo. Additional to the transport security problem, the congestion at the port of Maputo delayed loading of waiting ships, causing unnecessary increases in transport costs.

5. According to SATCC, measures are under way to improve port handling procedures in all major ports of its member countries.[1/] SATCC assumes that present bottlenecks at ports would be overcome shortly so that no transport constraints would arise in this area. If also solutions to the rail security problems could be found, one can assume that the steel transport problems can be treated on merely economic grounds. Ethiopia encounters similar problems with its port, Massawa on the Red Sea, and the connection to Addis Ababa. The port of Djibouti and the railway connection to the Ethiopian capital, however, have traditionally been the most frequented transport route and is even cheaper than any other connection.

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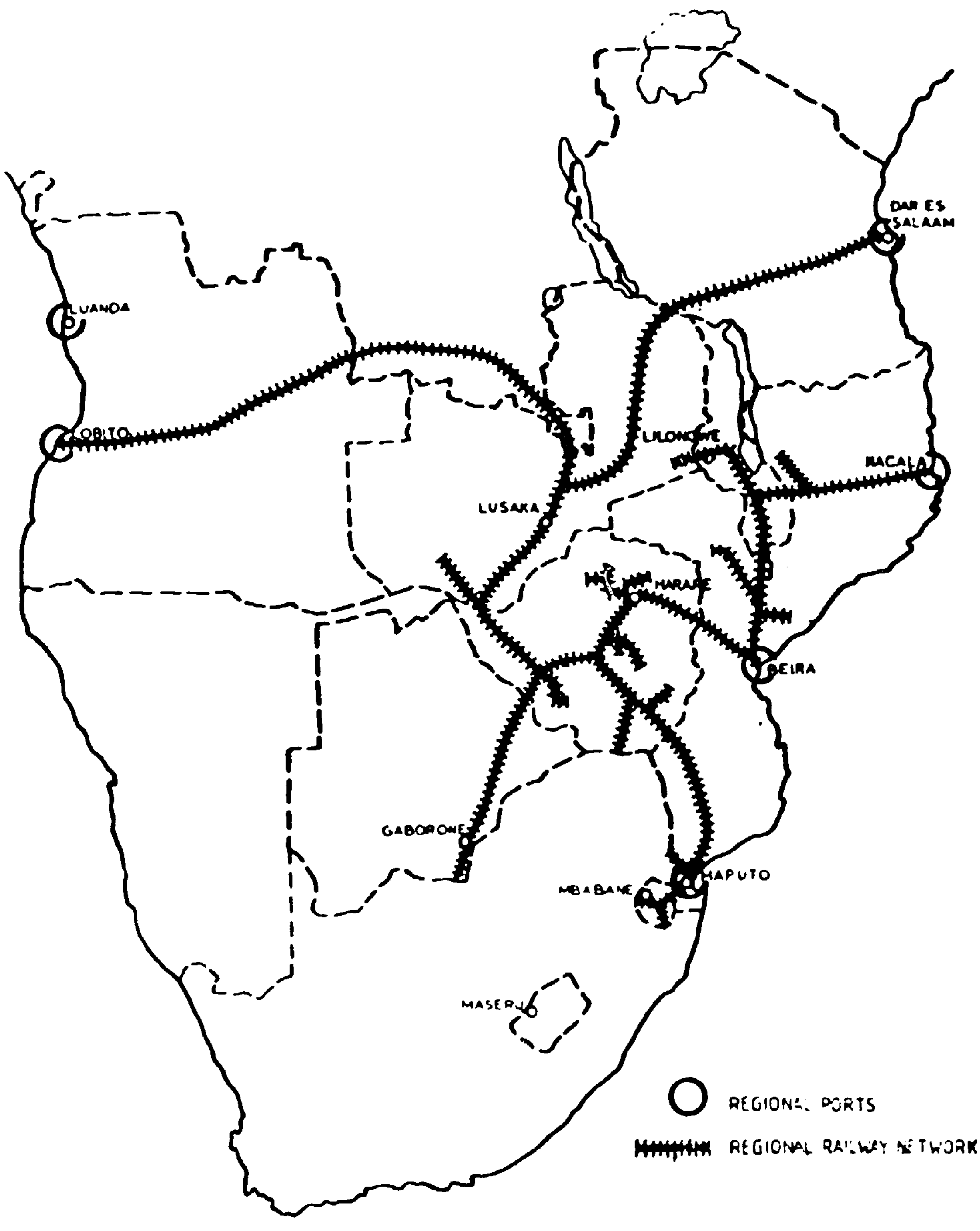
1/ Member countries of SATCC are the SADCC countries Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe.

Figure A.III.1. SADCC regional ports and railway network




Source: SATCC, Docuemnt for the southern African Development Co-ordination Conference in Mbabane, 31 January - 31 February 1985.

6. Infrastructure and cost-wise the countries of the sub-region may be divided into three main groups; island countries, coastal countries and landlocked countries. In the following a brief overview will be given of the transport situation of the various groups. The situation of Zimbabwe as the main steel producer and exporter will finally be dealt with in some detail.

Island countries

7. Island countries of the PTA region are Comoros, Madagascar, Mauritius and Seychelles. Their port facilities are in general adequate for handling their imports and exports. Their major constraint are generally the low frequency of ship calls and the low freight volumes per shipment which raises transport costs. Madagascar and Mauritius have their own shipping lines. The Mauritian shipping line has actively contributed to reducing freight rates, e.g. for the import of corn from US $70 to US $45 per tonne, and for imports of steel billets from Port Elizabeth from US $45 to US $36, that is a reduction of 20 per cent. The shipping line, however, is not inclined at present to call at Mozambiquean ports due to delays experienced at the port.

8. Madagascar traditionally imports steel from France. The major importers are affiliated to French companies, and Madagascar has a special financing scheme for imports from France. The maritime transport costs are 850 FF, which is equivalent to US$91 per tonne. Port charges in Toamasima amount to approximately US$40 per tonne of steel. They are composed as follows:

| | |
|---|---|
| - Handling charges at port: | $ 4.40 per tonne |
| - Equipment utilization at port: | $17.50 per tonne |
| - Port charges: | $18.00 per tonne |
| - Total: | $39.90 per tonne |

9. Rail transport to Antananarivo amounts to $65.50 per tonne, hence giving a total transport cost from France to Antananarivo of $196.40 per tonne of steel. Furthermore, due to lack of foreign exchange, maintenance of the railway had been neglected in recent years. The government currently puts considerable emphasis on the rehabilitation of the railways.

Table A.III.1: Main inter-regional/sub-regional transportation links

| Port | Areas served | Mode of transportation involved |
|---|---|---|
| Massawa | Ethiopia | Rail |
| Mogadishu | Djibouti | Local transport |
| | Ethiopia | Rail |
| Mombasa | Kenya | Rail/road |
| | Uganda | Rail/road (involves transshipment) |
| | (Rwanda) | Road via Uganda |
| | (Burundi) | Road via Uganda and Rwanda |
| Tanga | N. Tanzania | Rail/road |
| Dar-es-Salaam | Tanzania | Rail/road |
| | N. Malawi | Rail and road |
| | Zambia | Rail and rail/road (involves transshipment) |
| | Rwanda | Rail/road (involves transshipment) |
| | Burundi | Rail/ship (involves transshipment) |
| Nacala | N. Mozambique | Rail/road |
| | Malawi | Rail |
| | Zambia | Rail |
| Beira | Central Mozambique | Rail/road |
| | Malawi | Rail |
| | N. Zimbabwe | Rail |
| Maputo | S. Mozambique | Rail/road |
| | Swaziland | Rail |
| | S. Zimbabwe | Rail |
| Luanda | N. Angola | Rail/road |
| Benguela | Central Angola | Rail/road |
| Mocamedes | S. Angola | Rail/road |

10. Total landing costs in Mauritius are approximately $11.20 per tonne of steel, consitsting of:

- landing charges: $8.80 per tonne
- marine services: $9.90 per tonne
- handling, carriages, weighing and bill formalities $1.50 per tonne.

Coastal countries

11. Seven countries in the sub-region have ocean port facilities, one on the Atlantic Ocean, the others on the Indian Ocean or Red Sea. There is a total of twelve major ports in these countries, of which six are also of importance for transshipments to and from landlocked countries in the sub region. Table A.III.1 summarizes the main links of the ports with the landlocked PTA member countries.

12. The port of Mombasa has traditionally served as a transshipment point for Uganda, Rwanda and Burundi. Congestion at the port and difficulties experienced in land transport through Uganda, as well as improvements in port operations in Dar es Salaam, are at present leading to a shift in routing steel imports to Rwanda and Burundi through Tanzania.

13. Port charges at Mombasa, according to information obtained from a steel importer in Rwanda, amount to the following:

- terminal charges: $ 0.70 per tonne
- wharfage and surveillance at dock: $13.70 per tonne
- freight forwarders: $ 9.00 per tonne
- Mombasa transit costs: $ 6.40 per tonne
- Handling and truck loading charges: $10.10 per tonne
- Total: $39.90 per tonne

Together with $77.50 per tonne maritime transport costs from Europe (Auvers, Belgium) this gives a total landing cost (including loading of truck for dispatching) of $117.40 per tonne.

14. A similar cost breakdown for Dar-es-Salaam is not available. The total landing cost at this port amounts to $114.80 per tonne of steel imported from Europe. In both cases the costs at the port of unloading appear very high.

15. Beira and Maputo are more important as export harbours than as import harbours as far as steel is concerned. The port charges for steel exports are $15.60 per tonne of steel compared to $9.00 per tonne at Port Elizabeth. It is expected that planned handling capacities of the ports (see Table A.III.2) would eliminate unfair competition situations at ports.

Landlocked countries

16. The steel transport problems of the northern landlocked countries: Uganda, Rwanda and Burundi, differ from those of the southern ones: Swaziland, Lesotho, Botswana, Zambia and Zimbabwe insofar as the former group are very distant from basic iron and steel production. The southern landlocked countries are in the neighbourhood of ZISCO or, in the case of Lesotho and Swaziland, even closer to South African steel producers. The fact that Botswana, Lesotho and Swaziland form part of the Southern African Customs Union represents a sales barrier to steel products from Zimbabwe.

**Table A.III.2: Traffic demand and port capacity in 1981, 1985, 1990 and 2000**

(million port tonnes)

| | 1981 | | 1985 | | 1990 | | 2000 | |
|---|---|---|---|---|---|---|---|---|
| | Present demand | Present capacity | Estimated damand | Planned capacity | Estimated demand | Planned capacity | Estimated demand | Planned capacity |
| **Maputo/Matola** | | | | | | | | |
| Container (TEU) | 6,100 | 15,000 | 30,000 | 42,000 | 90,000 | 120,000 | 170,000 | 170,000 |
| General cargo[a] | 2.6 | 4.6 | 3.0 | 5.6 | 4.0 | 6.6 | 4.8 | 7.2 |
| Dry bulk | 2.0 | 3.1 | 2.5 | 4.5 | 6.2 | 8.5 | 16.9 | |
| Liquid bulk | 1.8 | 1.9 | 2.2 | 2.4 | 2.5 | 3.6 | 2.5 | 3.6 |
| **Beira** | | | | | | | | |
| Containers (TEU) | 4,450 | 8,000 | 13,600 | 15,000 | 48,000 | 50,000 | 100,000 | 120,000 |
| General cargo RO/RO | 1.1 | 1.6 | 1.8 | 2.0 | 2.6 | 3.0 | 2.9 | 3.5 |
| Dry bulk | 0.2 | 0.4 | 0.7 | 1.2 | 3.2 | 3.5 | 10.5 | 14.0 |
| Liquid bulk | 0.4 | 1.0 | 0.9 | 1.0 | 1.6 | 4.5 | 1.7 | 4.5 |
| **Nacala** | | | | | | | | |
| Containers (TEU) | 14,300 | 18,000 | 20,000 | 36,000 | 36,000 | 50,000 | 60,000 | 67,500 |
| General cargo[b] | 0.7 | 1.3 | 0.8 | 1.9 | 1.1 | 2.3 | 1.6 | 2.8 |
| Dry bulk | | | | | 0.2 | | 0.2 | |
| Liquid bulk | 0.1 | 0.5 | 0.1 | 0.5 | 0.2 | 0.5 | 0.2 | 0.5 |
| **Dar-es-Salaam** | | | | | | | | |
| Containers (TEU) | 19,780 | | 23,000 | 33,000 | 60,000 | 90,000 | 120,000 | |
| General cargo[b] | 1.1 | 1.3 | 2.1 | 3.3 | 2.6 | 8.7 | 3.6 | |
| Dry bulk | 2.1 | | 0.6 | | 0.5 | | 0.5 | |
| Liquid bulk | n.a. | | 0.8 | | 0.9 | | 1.3 | |
| **Lobito** | | | | | | | | |
| Container (TEU) | | | 2,600 | | 19,200 | | 60,000 | |
| General cargo | 0.4 | 1.5 | 0.3 | | 0.4 | | 0.8 | |
| Dry bulk | | 0.4 | | | 0.4 | | 0.5 | |
| Liquid bulk | 0.2 | 0.4 | 0.2 | | 0.3 | | 0.4 | |

a/ General cargo includes the tonnage over container and steel wharfs.

b/ General cargo includes the tonnage in containers.

Source: SATCC, op.cit.

17. Transport of steel products to the southern landlocked countries from Redcliff are, compared to the transport costs to the island and coastal (other than Mozambique) countries acceptable. Table A.III.3 gives transport costs per tonne of steel from Redcliff to various destinations.

18. For Rwanda, road transport costs from Mombasa to Kigali amount to a total of $185.70 per tonne of steel, and combined rail and road transport from Dar-es-Salaam amounts to $122.50. This brings total landing costs of steel for imports from Europe through Mombasa to $302.50 per tonne ($117.40 and $185.70) and for imports from Europe through Dar-es-Salaam to $237.30.

Table A.III.3: Transport costs from Redcliff (ZISCO steel works) to various distinations
(in US $)

| From Redcliff to | Transport costs by rails (US $) | by road (US $) |
|---|---|---|
| Lusaka/Zambia | 31.40 | 48.10 |
| Kabwe/Zambia | 51.80 | |
| Ndola/Zambia | 57.70 | |
| Mpulugu/Zambia | | 106.40 |
| Francistown/Botswana | 9.80 | 38.50 |
| Matsapa/Swaziland | 57.80 | |
| Maseru/Lesotho | 53.50 | |
| Tanzanian railway start/Zambia | 38.90 | 43.60 |
| Malawi Border | 28.90 | |
| Blantyre/Malawi | | 54.50 |
| Lilongwe/Malawi | | 83.30 |

Source: UNIDO team field work.

19. Table A.III.4 gives a cost comparison of steel imports to Bujumbura between imports from Europe (via Dar-es-Salaam, by train to Kigoma and from Kigoma to Bujumbura by lake shipping) and imports from ZISCO steel (by truck to Mpulugu and by ship to Bujumbura). In both cases, the f.o.b. price of steel is $255 per tonne. In the case of purchase from Belgium, the order size was around 300 tonnes of steel; in the case of purchase from ZISCO, it was a trial order of 1 truck load (31.4 tonnes).

Table A.III.4: Comparison of total landing costs for steel supply from Belgium and Zimbabwe to Bujumbura
(in US $ per tonne)

| Cost item | Supply from ZISCO | Anvers (Belgium) |
|---|---|---|
| Road transport Harare - Mpulugu (including all charges) | 132.80 | |
| Lake shipment Mpulugu - Bujumbura | 37.30 | |
| Maritime transport Anvers - Dar-es-Salaam (including port charges) | | 114.80 |
| Loading/unloading of rail wagon and rail transport, Dar-es-Salaam - Kigoma | | 62.30 |
| Lake shipment Kigoma - Bujumbura | | 10.70 |
| Import licence, opening and financing of L/C | 10.20 1/ | 33.20 2/ |
| Insurance (4.5 per cent) | 11.50 | 11.50 |
| Port charges in Bujumbura | 8.20 | 8.20 |
| Customs clearance | 4.90 | 4.90 |
| Customs duty | 35.70 | 35.70 |
| Transport from port to warehouse | 8.20 | 8.20 |
| Total landing costs | 248.80 | 279.50 |

1/ 4 per cent of f.o.b. value

2/ 13 per cent of f.o.b. value due to long lead times

20. The comparison shows that even for only a small order and not including any duty reduction within the framework of PTA, the combined road and Lake Tanganyika ship transport is approximately $31 cheaper than imports from Europe via Dar-es-Salaam, that is approximately 11 per cent. Additional reductions on transport costs should be achievable through:

- economies of scale for bigger orders from ZISCO steel, both on road and on lake transport
- combined rail/road transport from Redcliff to Mpulugu
- general contractual agreement with freight companies covering annual shipments.
- rapid deliveries of steel supplies s[illegible] customers have no need of financing their L/C (potential value: app[illegible]imately 9 per cent of f.o.b. price).

21. It can be expected that the Lake Tanganyika route will, under these conditions, be increasingly used for shipments to Burundi, northeastern Zaire, and possibly Rwanda and Kigoma. The planned extensions of the rail road system leads to the expectation that there will be no transport limitations caused by lack of transport capacity (see Figure A.III.2).

## Zimbabwe

22. The transport costs and port charges for steel from the ZISCO steelworks in Redcliff are shown in Table A.III.5 for Beira, Maputo and Port Elizabeth. As can be seen, total f.o.b. costs are lowest for shipments through Beira but can, for certain types of steel be lower in Port Elizabeth than in Maputo. The insecurity at present existing with shipments through Mozambique unfortunately add another factor militating against the selection of a Mozambican port.

Table A.III.5: Transport and port charges for Zimbabwe steel exports through Southern African ports
(US $ per tonne of steel)

| Transport from Redcliff to: | Transport costs | Port charges | Total f.o.b. costs |
|---|---|---|---|
| Beira | 18.60 - 25.0 a/ | 15.60 | 34.20-40.60 |
| Maputo | 28.20 - 38.10 a/ | 15.60 | 43.80 - 53.70 |
| Port Elizabeth | 38.80 | 9.0 | 47.80 |

Source: ZISCO and MANICA Freight Co. Ltd.

a/ Variations according to type of steel.

From the economic point of view, ZISCO should promote strongly the Beira route for its overseas exports.

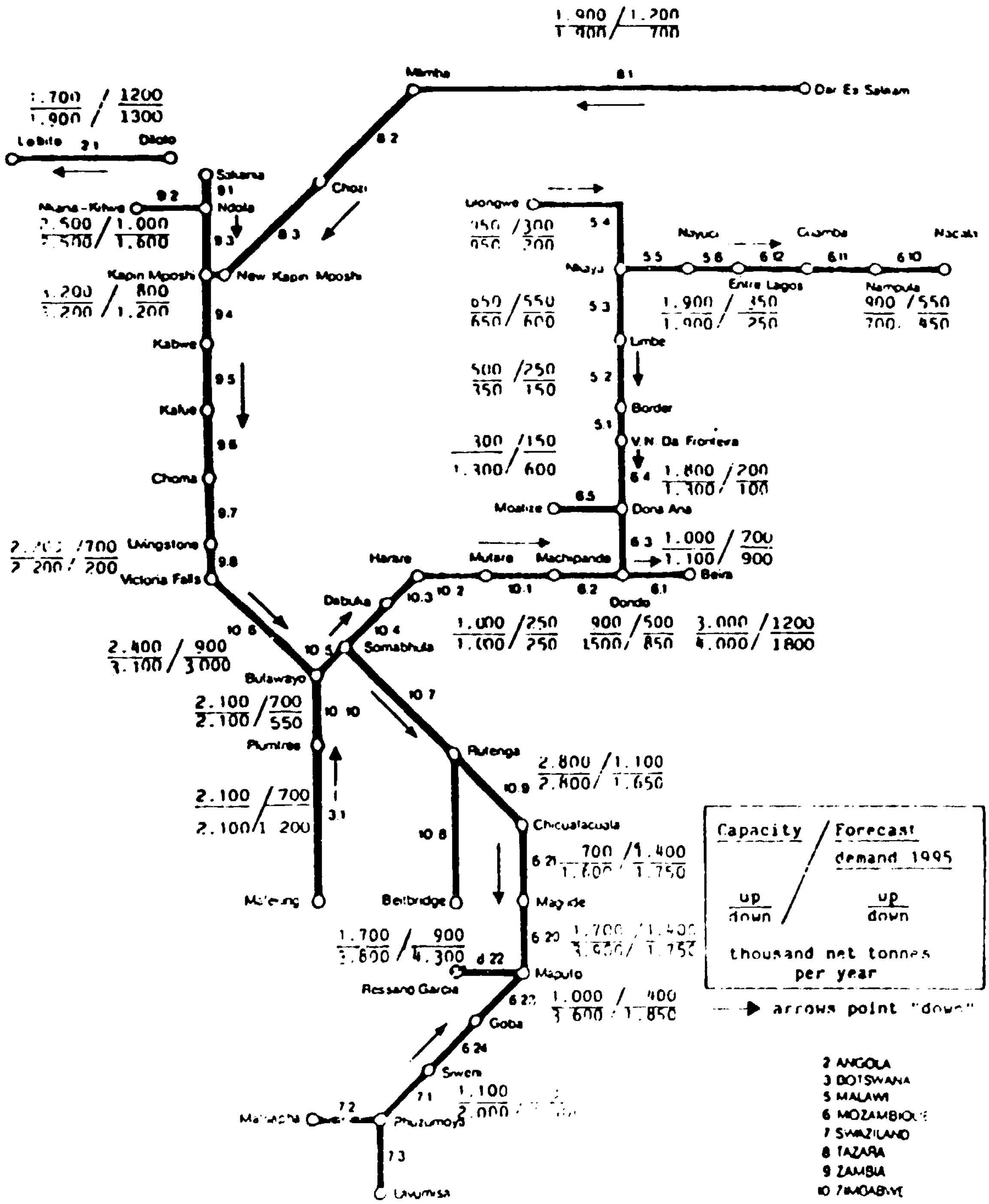
23. Assuming that the ex-factory price of ZISCO steel is in the order of the f.o.b. price for European or South African steel and that the overall transport costs from Redcliff via Beira ($34.20 to 40.60 per tonne) to the port of destination would have to be competitive, one arrives at the following conclusions:

- total transport costs to Mauritius would be too high to compete with South African imports

- the maximum allowable maritime transport costs from Beira to Mombasa or Dar-es-Salaam (maritime transport costs from Europe: $77.50 per tonne) are $36.90 to $43.30 per tonne

Figure A.III.2: Line capacities and demand in 1996

(1000 tonnes)




Source: SATCC, op.cit.

- the maximum allowable maritime transport cost for supplies to Madagascar (maritime transport cost from Europe $91 per tonne of steel) are $50.40 to $56.80 per tonne

- these maximum allowable transport cost could be increased if deliveries are so quick that customers have no need for financing their L/C (maximum additional allowance: 9 per cent of f.o.b. price of steel).

24. At present, transport costs from Maputo to Mombasa stand at $45 per tonne. This is mainly due to low quantities per order imposed by restrictions in foreign exchange allocations in Kenya.

25. As for Madagascar, the transport cost margin should not represent an obstacle to exports. However, the foreign exchange situation of the country and the special financing arrangements with France might pose obstacles to increased exports.

26. The overall situation for ZISCO steel exports to Zambia, Malawi, Burundi, Tanzania, Rwanda and southern and eastern Zaire is seen to be positive as far as the transport and cost situation is concerned.

27. Unlike steel companies in industrialized countries, ZISCO has hardly any warehousing of steel products close to its customers outside of Zimbabwe. It is recommended that the possibility and the usefulness of establishing steel depots which allow a quicker response to customer orders be analyzed. The costs of warehousing generally can be recovered through higher sales prices for immediate deliveries. Establishing at least two depots, one in Beira and one in Zambia for the landlocked countries, and possibly for rail road exports to Tanzania, is recommended.

28. The customer services of ZISCO could be extended in two directions: first, in the area of transport logistics and secondly, in the area of technical customer services.

29. Most importers in the PTA member countries hardly have any substantial negotiating power for their relatively small imports of steel, both in terms of size of order and annual demand. As has been shown, transport costs are a major cost item limiting the competitiveness of steel products compared to other materials and limiting the competitiveness of ZISCO steel products in the region. The market potential, as well as the potential to increase ex works steel prices by ZISCO, would increase

considerably if rapid deliveries and reductions in transport costs could be achieved. ZISCO could probably make substantial gains by increasing its efforts in improving transport logistics coupled with negotiations with major transport enterprises to arrive at global annual or bi-annual transport agreements for the total expected tonnage which would be shipped in several (monthly or bi-monthly) orders. This would also allow the transport companies to improve their planning of transport volume and reduce their operating costs. In the field of maritime transport, negotiations with existing sub-regional shipping lines could give substantial results. For example, Mauritian private and Malgache state owned shipping company, CMN indicated a strong interest for entering into such negotiations. CMN, for example, quoted to the UNIDO mission transport costs of $39.50 per tonne of steel for shipments between Toamasina and the destinations on the coastline between Mombasa and Maputo.

30. Furthermore, ZISCO could strengthen the technical customer assistance service to better compete with those operated by steel companies in industrialized countries. This service should mainly be geared towards the emerging engineering industries in the region which would receive additional impetus for steel product applications, thus increasing the sales potential for ZISCO steel products. It would at the same time lead to an improved feed-back to the production units at ZISCO hence fostering the company's market response.

31. The activities in both areas, i.e. transport logistics and technical customer services, are recommended to be undertaken by ZISCO and co-ordinated with the Minerals Marketing Corporation of Zimbabwe (MMCZ) responsible for the sales of ZISCO steel products in export markets. These activities are however of a technical nature requiring direct contact between ZISCO and customers.

# A N N E X I V

## Iron and steelmaking resources of the subregion

1. This annex presents the iron and steelmaking resource situation in the Southern and Eastern African sub-region. It aims to serve as one of the inputs in any decision regarding the optimal locations of iron and steel projects in the sub-region.

2. The major resources discussed in terms of their availability and technical characteristics are:

- Iron ore
- Coal
- Natural gas
- The slag-forming and refractory minerals such as limestone, dolomite, silica and alumina-bearing minerals, and the alloying minerals such as chrome, maganese, nickel and vanadium ores
- Electricity (particularly hydro-electricity)
- Ferrous scrap

The information and data contained herein were obtained during UNIDO missions to the countries of the sub-region, supplemented by other in-house data in UNIDO, s well as generally available published materials.

### Iron ore

3. Table A.IV.1 shows, for the Eastern and Southern African sub-region, the national distribution of the major known iron ore resources (proven plus estimated). As per the geological reserve size criterion, the following are the most important potential sources:

| | | |
|---|---|---|
| Zimbabwe | - | 3,738 million tonnes |
| Angola | - | 1,030 million tonnes |
| Swaziland | - | 707 million tonnes |
| Madagascar | - | 405 million tonnes |
| Zambia | | 307 million tonnes |
| Mozambique | | 250 million tonnes |

Table A-IV-1: Iron ore resources of the Eastern and Southern African sub-region

| Country | Known deposits | Total estimated size of reserves | Technical characteristics of reserve |
|---|---|---|---|
| Angola | i) Kassinga North deposit | 420 million tons | Haematite; Fe=35.5-40.11%; $SiO_2$=48-42.3%; P=0.039-0.048% |
| | ii) Kassinga South deposit | 400 million tons | Haematite; Fe=39.2-41.95%; $SiO_2$=39.2- 41.6%; P=0.02-0.11% |
| | iii) Dongo deposit | 200 million tons | Haematite/martite/magnetite |
| | iv) Kassala/Kitungo deposits | 200 million tons | Quartzitic magnetite/haematite; Fe=32.3-35.3%; $SiO_2$=40.3-44.1% |
| Ethiopia | Several small deposits in Northern, Western, and South-western Ethiopia | Total of about 12.5 million tons | Low-grade ores not yet accurately characterized. |
| Madagascar | i) Soalala deposit | 385 million tons | Quartzite (with haematite/magnetite ratio of 2:1; Fe(total)=39.1%; $SiO_2$=42.9% |
| | ii) Ambatovy-Analamay deposit | About 20 million tons | Fe=50%; $SiO_2$=9.75%; S=0.23%; $Al_2O_3$=7.2%; $P_2O_5$=0.10% |
| Mozambique | Tete-Honde-Nampula deposits | Over 250 million tons | Fe = 30-60 per cent; Banded ironstones and injection-type igneous ores, very low in phosphorus and sulphur |
| Kenya | Small deposits at Mrima, Bukura, McCalder Mine, and Uyoma | About 42 million tons | Very low-grade ores (goethite; pyrites; and titaniferrous magnetite |
| Somalia | Bur and Kisimaio areas | 170 million and 10 tons respectively | Very low-grade haematite/magnetite in the Bur area ( 38% Fe) and titaniferrous magnetite around Kisimaos |



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Table A-IV-1: Iron ore resources of the Eastern and Southern African sub-region (continued)

| Country | Known deposits | Total estimated size of reserves | Technical characteristics of reserve |
|---|---|---|---|
| Swaziland | i) Northwestern Swaziland (Ngwenya Mine, Nottingham Peak, Iron Hill, Jaspilite, etc.) | At least 62 million tons high-grade haematite (64.56% Fe) plus about 230 million tons of lower-grade ore | Low-grade ore analysis: Fe=34.57%; $SiO_2$=42.86%; $Al_2O_3$=1.93% |
| | ii) Southwestern Swaziland (Maloma, Gege, Mkhondo, etc.) | Up to 415 million tons of low-grade magnetite-bearing ores | Fe=35.31%; $SiO_2$=44%; $Al_2O_3$=1.26% |
| Uganda | Muku, Sukulu and Kilembe deposits | About 30 million tons (Muku); 40 million tons (Sukulu); 1 million tons (Kilembe) | High-grade haematite (68% Fe) at Muku, magnetite at Sukulu (grading 62% Fe, 1.1% $SiO_2$, 2.6%P), and pyrite (from dumps) at Kilembe |
| Tanzania | i) Liganga deposit | 78 million tons at 48 per cent Fe | Titaniferrous magnetite, with chrome and vanadium contaminants; $TiO_2$=13%, $V_2O_5$=0.7%, Fe=50%; $SiO_2$=1.3% |
| | ii) Chunya deposit | 40 million tons | Fe=48.4%, $TiO_2$=12.8%; $V_2OS$=0.67% |
| Zambia | Nambula, Pamba, Sanje, Namantombwa, and Changwe deposits | 307 million tons | Haematite at Nambula and Sanje (Fe=57-67%); haematite/magnetite at Pamba and Namantombwa (44-60% Fe); and magnetite at Changwe (62% Fe) |
| Zimbabwe | The Beacon Tor and Kwe Kwe areas | 3,738 million tons | Secondary high-grade concentrations of haematite and limonite, with average ore grade of 45-65% Fe and about 5% $SiO_2$ |

4. Whereas it is important to know the absolute quantities of the above resources, any decision as to their exploitation for purposes of iron and steel production would be predicated on such considerations as the proportions that are economically extractable, the technical characteristics of each ore deposit (including the presence or otherwise of deleterious contaminants), and the physico chemical performance of the ore under pilot or commercial- scale operating conditions.

Coal

5. The importance of coal in commercial iron and steel production derives from its triple role as an ore reductant, process energy source, and alloying element (carbon donor). However, the well established blast furnace ironmaking process makes more stringent quality demands on coal, requiring only the metallurgical-grade (or coking) coals which are relatively less abundant world-wide. The newer (and perhaps more relevant to the Eastern and Southern African sub-region) direct reduction processes based on coal are capable of utilizing bituminous and sub bituminous coals which occur in greater quantitites in the sub region.

6. Table A.IV.2 shows the distribution of the known coal resources of the sub-region. The largest occurrences are in Zimbabwe with an endowment of up to 27.6 billion tonnes of which at least 2.5 billion tonnes are proven and recoverable, Botswana (15.2 billion tonnes), Mozambique (8 billion tonnes), Tanzania (up to 1.5 billion tonnes), Swaziland (977 million tonnes), and Malawi (810 million tonnes).

7. About 90 per cent of these resources occur in the form of bituminous and sub-bituminous coals, generally unsuitable for direct conversion into coke of the quality consumed in blast furnace ironmaking. In fact, only Zimbabwe and Mozambique are endowed with sizable reserves of metallurgical coal, - as much as 2.5 billion and 3 billion tonnes respectively. At least 345 million tonnes of low volatile cokable anthracite is also known to occur in Swaziland.

8. While the decision as to the eventual use of any coal reserve for iron and steelmaking must depend on detailed geological, mining, physico- chemical, and pilot scale performance considerations, it can be preliminarily stated that each of the following countries of the sub-region: Zimbabwe, Botswana, Mozambique, Tanzania, Swaziland, and Malawi, has adequate reserves to supply, for the long term, the requirements of a coal-based iron and steel project.

Table A-IV-2: Coal resources of the Eastern and Southern African sub-region

| Country | Known deposits | Total estimated size of reserves | Technical characteristics of reserve |
|---|---|---|---|
| Botswana | i) Morupule coal field<br>ii) Southwest Moijabana<br>iii) Mmamabula<br>iv) Letlhakeng coal field<br>v) Dutlwe coal field | 6.5 billion tons<br>1.3 billion tons<br>3.0 billion tons<br>2.4 billion tons<br>2.0 billion tons | High-ash medium-volatile bituminous steam coal. Typical run-of-mine analysis: Ash=25%; Volatiles=30%; Fixed carbon=39-53%; sulphur=1-1.5% |
| Madagascar | Sakoa coal field | At least 84 million tons recoverable in ore seam | Fixed carbon = 50%; Volatiles = 26.0%: Ash = 17.0%; Sulphur = 0.6%; Calorific value-6,500-6,900 Kcals/Kg |
| Malawi | i) Nyika-Chiweka Basin<br>ii) North Karonga Basin<br>iii) Chikwawa Basin<br>iv) Rukuru Basin | 130 million tons<br>400 million tons<br>15 million tons<br>265 million tons | Sub-bituminous and bituminous steam coals, with 15-30% ash and 1.4-2.4% sulphur |
| Swaziland | i) Lower zone | 345 million tons proved, plus 500 million tons probable reserves | Moderate to good quality low-volatile to anthracite (cokable) coal, washable to 11% ash, 75% fixed carbon, 0.5% sulphur |
| | ii) Upper zone (Both zones in Eastern Swaziland) | 82 million tons proved, plus 50 million tons probable reserves | Inferior anthracite, washable to 21.7% ash, 69.8% fixed carbon, 1.54% sulphur |
| Mozambique | i) Moatize basin | Up to 2 billion tons | Contains up to 70 million tons coking coal; ash content = 22.3%; fixed carbon=58.3%; sulphur=0.92%; calorific value=11,880 Btu/lb. |
| | ii) Mucanha-Vusi basin | 3 billion tons | Cokeable coal with 80-90% fixed carbon; 0.78-1.58% sulphur; 8.40-15.61% ash. |
| | iii) Minjova area | Up to 3 billion tons | |



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Table A-IV-2: Coal resources of the Eastern and Southern African sub-region
(continued)

| Country | Known deposits | Total estimated size of reserves | Technical characteristics of reserve |
| --- | --- | --- | --- |
| Tanzania | Mchuchuma reserves | Proven reserves of 324 million tons (total reserves of 1.5 billion tons) | Steam coal; 20.8% ash; 25% volatiles; 54.2% fixed carbon; 0.48% sulphur |
| Zambia | Maamba reserves | 90 million tons (proved plus speculative) | Steam coal; 16-20% ash; 1.2-2.0% sulphur |
| Zimbabwe | i) Hwange reserves | 1,380 million tons | 390 million tons of reserve is coking quality |
| | ii) Lubimbi coal field | 21,473 million tons | Contains 2,108 million tons of coking coal |
| | iii) Iusulu reserves | 3,000 million tons | - |
| | iv) Other reserves | 2.100 million tons | Contains 37 million tons of coking coal |

Natural gas

9. Natural gas is an alternative hydrocarbon reductant for iron ore, particularly in terms of direct reduction processes. Although virtually all the countries of Eastern and Southern Africa have, at one time or the other, issued gas exploration and exploitation concessions to the multinational energy firms, only three countries, - Angola, Mozambique, and Tanzania, - have been shown to be endowed with commercially exploitable natural gas resources.

10. Angola's resources come from off-shore fields in Northern Angola both in the associated and non-associated forms, and the recoverable reserves occur as follows:

| | Associated | Non-associated |
|---|---|---|
| | (in million cu. m.) | |
| Proved-developed reserves | 1,330 | 0 |
| Proved-undeveloped reserves | 230 | 1,130 |
| Probable/possible undeveloped reserves | 5,890 | 54,930 |
| | 7,450 | 54,930 |

Total recoverable reserves amount to 62,380 million cubic metres, of which 88 per cent is non-associated.

11. In Mozambique, considerable exploration has been carried out on the Pande field in the Govuro District of Inhambane Province, about 30 km inland from the coast. The confirmed reserves in this field amount to 60 billion cubic metres.

12. In Tanzania, confirmed gas deposits occur off-shore in Songo Songo island, about 240 km south of Dar-es Salaam. The proven reserves are estimated to be about 41 billion cubic metres, and are considered adequate to justify the implementation of a proposed 1,350 metric tonnes per day ammonia-urea fertilizer project, for which 17 billion cubic metres has been earmarked. Tanzania Petroleum Development Corporation (TPDC) owns and operates the field and plans to offer the gas at agreed prices to the KILAMCO fertilizer project.

13. Mention should also be made of the methane accumulation in the bottom strata of Lake Kivu on the Rwanda-Zaire border. Unfortunately, the early exploitation of this reserve, which may hold a great potential for the industrial development of Rwanda, is beclouded by technical problems pertaining to the optimal extraction rate and technique which would not jeopardize the environment. There are also problems of reaching an agreement with Zaire on the best exploitation and marketing strategies for large scale methane production.

Other mineral resources

14. In addition to iron ore, coal, and natural gas, the other mineral resources consumed in iron and steelmaking are the slag formers, - limestone ($CaCO_3$), dolomite ($CaCO_3.MgCo_3$), fluorspar ($CaF_2$), and refractory clays containing silica and or alumina, - and the alloying minerals such as nickel, vanadium, chromium, cobalt,and manganese ores. The slag-formers are generally available in vast quantities and are, in fact, extensively exploited in most of the countries of Eastern and Southern Africa. As for the alloying minerals, large deposits of chrome ore occur in Zimbabwe, which alone accounts for more than 85 per cent of the world's reserves of high chrome ores. Zambia's cobalt reserves have been estimated to be about 350,000 tonnes, and significant reserves of nickel ore occur in Burundi (1.5 million tonnes), Zimbabwe (1.6 million tonnes), Botswana (600,000 tonnes) and Madagascar (330,000 tonnes).

Current and near-term exploitation of resources

15. Angola: Whereas Angola had been a significant iron ore producer and exporter until the mid 1970s (exports amounting to 6 million tonnes in 1974), production ceased in 1975, and efforts are now being made to reactivate and rehabilitate the Kassinga mine before the end of 1985, with a view to achieving an export target of 1.5 million tonnes per year of iron concentrate. It is planned that, coincident with the resumption of production, the rail line to Mocamedes would be re-opened.

Also, plans are being made to exploit the Kassala Kitungo deposit in Province Cuanza Norte. A three phase development programme has been mapped out (although without specific time horizons involving: 1) start up of mine exploitation to produce 69-70 per cent Fe super concentrate which would be slurry pumped to a 2.1 million tonnes per year pelletizing plant in Luanda; 2) installation of two direct reduced (sponge) iron units at Luanda, with a total capacity of 1.3 million tonnes per year, mainly for the export market; the options for a reductant would be between heavy fuel oil from the refinery at Luanda and natural gas piped to Luanda. The proposed plant site is near deep water and could provide a berth for up to 150,000 dwt vessels; 3) increasing the national steelmaking capacity to 150,000 tonnes per year on the basis of sponge iron and scrap.

16. Angola's natural gas resources are largely unexploited. As such, any gas-dependent project proposed for Angola must consider the cost implications of a gas gathering network from the gas fields to the project site.

17. Botswana: The Morupule reserve is currently the only source of coal in Botswana. The colliery, near Palapye, is owned and operated by Morupule Colliery (Pty) Ltd., a 93 per cent-subsidiary of Anglo-American Corporation. It has a production capacity of 480,000 tonnes per year, and supplies coal to the Botswana Power Company, and also to BCL Ltd., a copper-nickel producer. It is planned to eventually increase the colliery's output capacity to 600,000 tonnes per year.

The other reserve that has attracted attention recently is the Kgaswe deposit. For its development, the Government of Botswana and Shell Coal Botswana Ltd. have recently signed a joint venture agreement, with the aim of producing, for the export market, up to 10 million tonnes of coal per year. However, a recent feasibility study has raised doubts as to the economics of international marketing of Botswanan coal. The cost of transportation to a deep-water port at Walvis Bay (Namibia), via a proposed 1,200 km Trans-Kalahari railway, would place the coal at a severe competitive disadvantage on the world market vis-a-vis coal from such other sources as Colombia.

18. Madagascar: A feasibility study is currently in progress in connection with the development of the Soalala iron ore deposits in northwestern Madagascar, about 80 km inland from the sea. But laboratory tests have already shown that the ores could be readily concentrated by gravimetric and magnetic techniques to produce a good sinter feed of 64 per cent Fe for export. The on-going study, however, is focused on the relative

viabilities of ore concentration projects rated at 2 million and 1 million tonnes per year respectively. Some consideration is also being given to an integrated project that would, in addition to sinter feed, also produce pellets for a sponge iron plant, and incorporate direct reduction, steelmaking and steel rolling aspects.

Concurrent with the iron ore project, there are also plans to develop the Sakoa high-quality coal deposit located in southwestern Madagascar. One development scenario calls for the coal to be land-and-sea-transported (about 800 km maritime distance) to the port site of the Soalala project on Baie de Bally.

19. Malawi: There are no current plans to develop and exploit the Mindale iron ore deposit north of Blantyre. However, consideration is being given to small-scale mining of the coal deposits at Livingstonia for household and industrial use. As for the Chikawawa deposit, exploratory mapping (with French assistance) is expected to commence in late 1985. This deposit has the advantage of being as near as 20 km to a rail link, coupled with close proximity to the Blantyre industrial centre.

20. Mozambique: Beneficiation tests on iron ore samples taken from the Tete Honde Nampula deposits have yielded positive results, although the economic viability of any exploitation project would still have to be established by a formal feasibility study. Furthermore, an integral aspect of that study would relate to provision of now lacking but essential infrastructures and also to transportation logistics.

As for coal, there is only one active mine at Moatize in Tete province. It has a production capacity of 800,000 tonnes (run-of-mine) per year, although the 1981 output was 535,000 tonnes. Because of severe transportation problems which have adversely affected coal evacuation for export, the Moatize mine has recently stopped production. Nevertheless, active plans have been drawn up for a two-phased export oriented project based on Moatize coal, with an ultimate production capacity target of 6 million tonnes per year. The necessary study and financing arrangements for the 3 million tonnes/year first phase have been completed, and prospective partners for the second phase, involving an additional 3 million tonnes per year, have reportedly been identified. The project would involve not only mine development but also substantial investment in transportation infrastructures, including the rehabilitation of the Tete Beira railway and the installation of appropriate coal handling facilities at the port of Beira.

The Pande gas field which was discovered by a consortium of Gulf Oil Corporation and AMOCO in the 1960s was abandoned in 1971. However, the Mozambican government has recently revived its interest in developing the field and, to this end, a feasibility study has been commissioned for a large ammonia based fertilizer project. Other project ideas include a direct-reduction based steel plant, and a gas gathering and pipeline system to supply the power generation, household, and industrial gas demands of the Maputo area.

21. Swaziland: Production of iron ore ended in 1979. However, recent interest has been centred on developing some of the high-grade reserves such as Ngwenya. Experimental testing on the low-grade resources (eg. Mhlatane and Gege) indicates that some of the ores could be economically beneficiated to yield 65-68 per cent Fe concentrates.

Coal production in 1984 was estimated to be about 200,000 tonnes, all of which came from the lower-zone deposits of Eastern Swaziland. Plans have been drawn up to increase coal output, and a technical assistance agreement has been signed with the International Co-operation Agency of Japan, with a view to raising production by 500,000 tonnes per year for 25 years.

22. Tanzania: The current annual production of coal is relatively small (not more than 20,000 tonnes per year), and is confined to the Songwe Kiwira coal fields. Future development of Tanzania's coal resources is tied to the concurrent development of the Liganga iron ore deposits and the implementation of an integrated iron and steel project at Ruhuhu. As conceived, (following a feasibility study by LURGI), the project, estimated to cost $US1,807.4 million (1982), would include:

. Development of the Liganga iron ore mine to produce 1.56 million tonnes per year of ore.

. Ore beneficiation plant rated at 900,000 tonnes per year of concentrate

. A pelletization plant with a capacity of 900,000 tonnes per year.

. Development of the Mchuchuma coal mine to produce 2.4 million tonnes per year run of mine coal.

. A coal washery rated at 545,000 tonnes per year.

. An SL/RN direct reduction plant to produce 663,000 tonnes per year of sponge iron.

. Submerged arc furnace smelting to eleminate oxides of vanadium, titanium and chromium, followed by ladle refining to produce 554,000 tonnes per year of liquid steel which would be cast into slabs and/or blooms and rolled into sheets, strips and plates.

. Infrastructural facilities such as a 160-km road from Madaba through Ruhuhu, Liganga, and Mchuchuma, to Manda; a 320-km rail link between Mlimba and Manda via Madaba, Ruhuhu, Liganga and Mchuchuma; a 300 Mw coal-fired thermal power station; and townships at Liganga, Mchuchuma and Ruhuhu.

It had been proposed to site the DRI and steel complex at Ruhuhu. Although the initial capacity is put at 500,000 tonnes per year of steel products, commencing in 1990, the ultimate capacity rating is 1 million tonnes, expected to be achieved after 2000.

Concerning natural gas, definite plans have been made for implementation of the Kilwa ammonia-urea fertilizer project which, barring financing obstacles, could come on-stream by 1987. There is no present intention to utilize Tanzania natural gas for sponge iron production.

23. Zambia: Although Zambia's iron ore reserves in the northwestern and central provinces may be as much as 307 million tonnes (Table A.IV.1), there are no present plans to utilize them, although the Guideline for ... the Fourth National Development Plan suggests the setting up of an indigenous resource based iron and steel industry during the Plan period. It is more likely, however, that the financial resources available would be devoted to a more modest scrap-based mini-steel mill.

Maamba Collieries Ltd. is the main coal producer with an output of about 490,000 tonnes in 1984. Although the proven and estimated reserves are put at up to 90 million tonnes, it is believed that the remaining recoverable reserve is in the region of 20 to 30 million tonnes. Furthermore, the collieries are not thought to have been operating economically over the last few years, in part because of the increasing stripping ratios now encountered, as well as problems associated with obtaining spare parts for machinery and equipment. There are plans afoot to rehabilitate the collieries, towards which the African Development Bank is to contribute US $26 million. The World Bank has also extended a loan of US $2.4 million for the procurement of spares.

24. Zimbabwe: Zimbabwe is endowed with large supplies of both iron ore and metallurgical coal. The present coal requirements of ZISCO Ltd. at Redcliff come by rail from the Hwange collieries in northwestern Zimbabwe. Its iron ore demand is met from company-owned facilities at Ripple Creek, and in Buchwa, 200 km to the south. Because Ripple Creek ore is of the friable limonitic variety, it is necessary to blend it with Buchwa ore, in the ratio of 25 per cent Buchwa:75 per cent Ripple Creek, prior to sintering in order to produce a good blast furnace feed.

ZISCO Ltd. is planning a comprehensive rehabilitation programme which would, in part, involve its ore supply operations. Specifically, it is planned to stop mining operations at Buchwa for a period of eight years in order to permit reclamation of 3.5 million tonnes of accummulated ore fines. Ripple Creek will, in the meantime, continue its mining and ore processing operations at the rate of 105,000 tonnes per month.

Electricity resources

25. Angola: Angola is endowed with extensive hydro-electric resources, estimated to be over 11,000 Mw. However, as of 1980, the total installed electric generating capacity was only 523 Mw, of which 368 Mw was hydro-based. It can be seen therefore that a great potential exists for tapping Angola's power generation resources in support of future industrial development.

26. Botswana: As of 1981, Botswana's total installed electricity generation capacity was 79 Mw, with 60 Mw derived from the coal-fired plant at Selebi-Pitwe and 19 Mw from the coal-and-oil-fired plant at Gaborone. Botswana Power Corporation is responsible for generating and distributing electricity and (as of 1982), plans were afoot to build a 60 Mw or 90 Mw coal-fired station at Morupule. This was scheduled for a 1986 commissioning.

27. Madagascar: Madagascar possesses some hydroelectric potentials that need to be developed to serve any major development project. Total resources are estimated to be about 73,000 Mw. For the proposed iron and steel complex at Soalala, two sites have been identified at Ambodiroka and Mahavola respectively.

28. Mozambique: The Zambezi River and its tributaries alone have a potential for over 12,000 Mw of hydro-electricity. At present, the total installed capacity in Mozambique is 2,275 Mw, of which 2,175 Mw (96 per cent) is hydro, with the Cahora Bassa station accounting for 2,075 Mw. Until 1984, in fact, Mozambique was an exporter of electricity to South Africa; however, recent disablement of the transmission line has cut off this valuable source of foreign exchange earnings.

29. Swaziland: Swaziland imports up to 70 per cent of its electricity demand from South Africa. Its internal generating capacity is only 20 Mw, although plans (whose implementation has been delayed due to escalating costs) had been drawn up for construction of a hydro station.

30. Tanzania: Tanzania has considerable hydro-electricity resources on the order of about 18,995 Mw, with partially-exploited Rufiji River accounting for about 2,100 Mw. Current installed capacity is 369 Mw, of which about 280 Mw is hydro-based. The future orientation is towards increased exploitation of hydro-resources and, to this end, the Mtera hydro scheme is now under construction, financed by the World Bank and the Kuwait Fund, among others. However, for the purpose of the proposed Ruhuhu steel complex, a 300 Mw coal-fired station is planned in an effort to make maximum use of indigenous coal resources.

31. Zambia: A net exporter of electricity since 1974, Zambia is considered self-sufficient. Generation and distribution are under the control of the Zambia Electricity Supply Corporation whose main hydro-stations are at Kafue Gorge, Kariba North Bank, and Victoria Falls. During the next plan period, it is proposed to expand rural electrification, extend the national transmission and distribution network, and embark on feasibility studies for new hydro-schemes. Potential hydro-electric resources are estimated at about 4,600 Mw.

32. Zimbabwe: By the end of 1986, Zimbabwe's installed generating capacity will be 2,145 Mw, consisting of the 1,266 Mw Kariba hydro complex (operated by the Central African Power Corporation which is jointly owned by Zimbabwe and Zambia), the Electricity Supply Commission's thermal stations at Hwange (480 Mw), Munyati (113 Mw), Zvishavane (27.5 Mw), and Mutare (16.5 Mw), and the Municipal Electricity Departments of Harare (128 Mw) and Bulawayo (114 Mw).

Additional vast hydro-resources are yet to be tapped, amounting to at least 4,566 Mw, including 2,500 Mw at Mupata Gorge, Devil's Gorge, Batoka, and Kariba South.

Ferrous scrap

33. Although scrap is not a "natural" resource per se, its importance derives from the fact that it is an important source of iron units, substituting for sponge iron and vice versa. In fact, the growth of the electric furnace process for steelmaking was dictated, in part, by the ready availability of ferrous scrap from industrial manufacturing processes, obsolescent equipment and appliances, and from other steelmaking and fabrication operations. Moreover, the need for process flexibility requires the availability of scrap in addition to sponge iron in arc furnace operations.

34. An accurate scrap inventory of the Eastern and Southern African sub-region has not yet been carried out, although there is a general concensus among steel producers that scrap supply deficiencies are already a fact of life, with no relief in sight. In fact, only in Angola has a scrap planning study been conducted, with the assistance of UNIDO.

In this case, a company, - SUCANOR, - has been established to collect, classify and press both ferrous and non-ferrous scrap for use by local industries. SUCANOR commenced operations in February 1985, and by May was producing ferrous scrap at the rate of 1,000 tonnes per month. Total production in 1985 is projected to be 6,000 tonnes, rising to 10-12,000 tonnes in 1986, 20,000 tonnes in 1987, and 25,000 tonnes per year from 1988-94. After 1995, an annual production of 50,000 tonnes per year is envisaged.

35. Mention should also be made of the ship-breaking activities carried out in Mauritius for the purpose of generating scrap for the export market. In spite of constraints imposed by available berthing and processing facilities, annual scrap production is now running at about 4,000 tonnes. It is planned to increase capacity substantially with a view to attaining 100,000 tonnes per year in the not too distant future.

36. Concerning the sub-region's scrap generation capability, it is to be noted that the rate is determined, in part, by the economic health of the sub-region (or a particular country) in general, and of the engineering

and metalworking sub-sector in particular. Accordingly, insofar as the engineering industries are under-developed in the sub-region, coupled with the fact that the economies of the various countries have been depressed since about 1982, it stands to reason that the aggreagte scrap generation rate has remained low.

In the absence of objective studies of the scrap sources in the various countries of the sub-region, the following are indicative and educated guesstimates of the annual scrap generation rates for some of the countries in the sub-region, exclusive of "home" scrap generated and consumed by operating steel plants:

| | | | |
|---|---|---|---|
| Angola | - | 6,000 tonnes | (1985 target) |
| Botswana | - | 1,500 tonnes | |
| Burundi | - | 1,000 tonnes | |
| Ethiopia | - | 5,000 tonnes | |
| Kenya | - | 25,000 tonnes | |
| Lesotho | - | 700 tonnes | |
| Madagascar | - | 1,500 tonnes | |
| Malawi | - | 750 tonnes | |
| Mauritius | - | 4,000 tonnes | |
| Mozambique | - | 3,000 tcnnes | |
| Rwanda | - | 1,000 tonnes | |
| Somalia | - | 2,500 tonnes | |
| Swaziland | - | 2,500 tonnes | |
| Tanzania | - | 10,000 tonnes | |
| Uganda | - | 3,500 tonnes | |
| Zambia | - | 10,000 tonnes | |
| Zimbabwe | - | 50,000 tonnes | (Est.) |
| | Total | 127,950 tonnes | |

# A N N E X V

## Indirect steel consumption

### Introduction

1. Indirect steel consumption refers to the the consumption of steel contained in final composite products as distinct from consumption of the basic steel products dealt with in this study. Clearly, there is an input/output relationship between the two forms of consumption; Basic steel products are needed to produce products involving indirect consumption of steel.

2. One major factor increasing the demand for basic steel in the sub-region is the replacement of imported products containing steel by local production. The process whereby this takes place is a complex one, involving prominently the growth and development of the engineering sector, for which detailed data from the region is scarce.

3. This annex represents an attempt to shed some light on the process by focussing on the import and export of engineering sector products. Finally the estimate of steel contained in a selected range of imported products is commented upon.

### Imports of engineering industry goods

4. Table A.V.1 contains the imports of engineering industry products to those PTA member countries for which data were available. The latest year for which data existed is indicated. The figures represent the imports to the countries as classified under SITC categories 69 (metal manufactures NES) and 7 (machinery and transport equipment). From the table it can be seen that engineering industry products constitute a significant proportion of total imports ranging from 22.2 per cent (Mauritius) to 40 per cent (Zambia). The relatively low figure for Mauritius can be explained by the fact that it also has to import the major portion of its food requirements, while the high proportion of Zambia finds its explanation in this country's capital goods and spare parts requirements for the mining industry.

5. Further details on the composition of imports of engineering industry products are given in tables A.V.2 (value) and A.V.3 (percentage breakdown). Comparability of the figures is, however, limited due to the fact that the individual countries use for their import statistics non-comparable formats, namely revision 1 (breakdown into 4 categoreis) and revision 2 (breakdown into 9 categories) of SITC. Accordingly, only countries with the same format can be compared directly.

Table A.V.1: Total imports and imports of engineering industry products to PTA member countries 1/

(thousand US $)

| Country | Latest year for which data were available | Imports of engineering industry products | Total imports | Share of engineering industry products in total imports (percentage) |
|---|---|---|---|---|
| Burundi | 1980 | 46,806 | 167,224 | 28.0 |
| Ethiopia | 1980 | 227,008 | 721,367 | 31.5 |
| Kenya | 1979 | 948,554 | 2,390,095 | 39.7 |
| Madagascar | 1980 | 783,926 | 2,589,939 | 30.3 |
| Malawi | 1980 | 264,907 | 676,477 | 39.2 |
| Mauritius | 1977 | 110,507 | 498,372 | 22.2 |
| Rwanda | 1977 | 35,746 | 113,953 | 31.4 |
| Tanzania | 1980 | 467,833 | 1,211,386 | 38.6 |
| Zambia | 1978 | 251,396 | 628,311 | 40.0 |
| Zimbabwe | 1979 | 234,459 | 939,819 | 25.0 |

Source: 1981 Yearbook of International Trade Statistics, United Nations, 1983.

1/ Selected countries according to availability of data.

6. In the case of countries using revision 1 of SITC the most important category is non-electrical machinery (No. 71) with the exception of Burundi and Rwanda where metal manufactures NES (No. 69) and transport equipment (No. 73), respectively, has a higher share. The shares of category No. 71 lie in the 40 to 50 per cent range except for Burundi (28 per cent) and Rwanda (20 per cent). Transport equipment follows in second place (except in the cases of Burundi, Mauritius and Rwanda) with shares around the 30 per cent range (Rwanada: 40 per cent; Mauritius: 15 per cent). Electrical machinery (No.72) generally is in third place.

7. As to countries using revision 2 of SITC which allows a more detailed breakdown the most important item is road vehicles (No. 78) in most cases (exception: Madagascar where it is second placed). Of importance are also No. 72, machines for special industry; No. 69, metal manufactures

## Table A.V.2: Breakdown of capital goods imports by country (thousand US dollars)

| Country | Year | Total import of capital goods | SITC 69 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Burundi+ | (1980) | 46,806 | 13,420 | 12,911 | 7,791 | 12,684 | | | | | | |
| Ethiopia* | (1980) | 227,908 | 25,738 | 7,452 | 65,546 | 2,954 | 14,969 | 2,327 | 8,551 | 18,377 | 73,568 | 3,527 |
| Kenya+ | (1980) | 783,926 | 58,573 | 333,785 | 110,140 | 281,439 | | | | | | |
| Madagascar* | (1980) | 264,907 | 35,901 | 14,760 | 63,516 | 3,880 | 37,524 | 3,560 | 11,520 | 22,083 | 56,624 | 15,540 |
| Malawi* | (1980) | 167,987 | 19,701 | 7,618 | 18,228 | 1,022 | 17,881 | 1,471 | 11,242 | 26,761 | 44,081 | 19,984 |
| Rwanda+ | (1977) | 35,746 | 8,960 | 6,983 | 5,838 | 13,964 | | | | | | |
| Uganda+ | (1976) | 50,249 | 7,927 | 20,208 | 8,398 | 13,671 | | | | | | |
| Tanzania+ | (1980) | 467,833 | 38,552 | 224,267 | 64,642 | 140,372 | | | | | | |
| Zambia+ | (1978) | 251,396 | 25,590 | 105,997 | 49,465 | 70,345 | | | | | | |
| Zimbabwe+ | (1979) | 234,459 | 17,265 | 110,126 | 43,959 | 63,011 | | | | | | |

Key to SITC categories

SITC (Rev 2)

* 69 - Metal manufactures NES
70 - Power generating equipment
72 - Machines for special industry
73 - Metalworking machinery
74 - General industrial machinery NES
75 - Office machines ADP equipment
76 - Telecommunications, sound equipment
77 - Electrical machinery NES etc.
78 - Road vehicles
79 - Other transport equipment

SITC (Rev 1)

+ 69 - Metal manufactures NES
71 - Machinery non-electric
72 - Electrical machinery
73 - Transport equipment

Source: 1981 Yearbook of International Trade Statistics (UN 1983).

Table A.V.3: Breakdown of capital goods imports by country
(per cent)

| | | SITC | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Country | Year | 69 % | 71 % | 72 % | 73 % | 74 % | 75 % | 76 % | 77 % | 78 % | 79 % |
| Burundi+ | (1980) | 28.7 | 27.6 | 16.6 | 27.1 | | | | | | |
| Ethiopia* | (1980) | 11.3 | 3.28 | 28.9 | 1.3 | 6.59 | 1.02 | 3.76 | 8.09 | 32.4 | 1.55 |
| Kenya+ | (1980) | 7.47 | 42.6 | 14.0 | 35.9 | | | | | | |
| Madagascar* | (1980) | 13.5 | 5.51 | 23.9 | 1.46 | 14.2 | 1.34 | 4.35 | 8.34 | 20.9 | 5.87 |
| Malawi* | (1980) | 11.7 | 4.53 | 10.8 | 0.6 | 10.6 | 0.87 | 6.69 | 15.9 | 26.2 | 11.9 |
| Mauritius+ | (1978) | 15.6 | 44.9 | 24.9 | 14.5 | | | | | | |
| Rwanda+ | (1977) | 25.1 | 19.5 | 16.3 | 39.1 | | | | | | |
| Tanzania+ | (1980) | 8.24 | 47.9 | 13.8 | 30.0 | | | | | | |
| Zambia+ | (1978) | 10.2 | 42.2 | 19.7 | 27.9 | | | | | | |
| Zimbabwe+ | (1979) | 7.36 | 46.9 | 18.7 | 26.9 | | | | | | |

Key to SITC categories

SITC (Rev 2)

* 69 - Metal manufactures NES
70 - Power generating equipment
72 - Machines for special industry
73 - Metalworking machinery
74 - General industrial machinery NES
75 - Office machines ADP equipment
76 - Telecommunications, sound equipment
77 - Electrical machinery NES etc.
78 - Road vehicles
79 - Other transport equipment

SITC (Rev 1)

\+ 69 - Metal manufactures NES
71 - Machinery non-electric
72 - Electrical machinery
73 - Transport equipment

Source: 1981 Yearbook of International Trade Statistics (UN 1983).

NES; No. 74, general industrial machinery NES; No. 27, electrical machinery; and No. 73, metal-working machinery. Of little important are power generating equipment (No. 7), office machines (No. 75), telecommunication equipment (No. 76) and transport equipment (No. 78) with the exception of Malawi.

8. A major item of imports of engineering industry products are spare parts and components. It is estimated that the annual demand of spare parts and components of the PTA member countries is at least in the order of magnitude of US $1 billion based on an overall annual demand of sub-Saharan African countries of US $5 billion. The lack of availability of these items due to foreign exchange constraints has been identified as a major cause of reduced capacity utilization in many PTA member countries. An improved availability of spare parts through their local/regional production and the reduction of foreign exchange requirements for purchases outside the region as well as the fact that parts and components generally can be produced in relatively small lot sizes should enhance their production within the region. Furthermore, the entry of small and medium scale industries within the region into the field of engineering industries would receive additional scope.

Exports of engineering industry goods

9. Most of the imports of engineering industry products goes into domestic consumption as exports of these products are marginal, as shown in tables A.V.4 (total exports and engineering industry product exports), A.V.5 (value of engineering industry product by SITC category industry product exports) and A.V.6 (percentage breakdown of engineering industry product exports by SITC category). Exports of engineering industry products achieved in no country a level above 0.1 per cent (except Zimbabwe with 0.3 per cent) of imports of the same goods in any of the countries considered (those countries mentioned in tables A.V.1, A.V.2 and A.V.3 but not mentioned in tables A.V.4, A.V.5 and A.V.6 did not have exports. Furthermore, the statistics give no indication whether exports consisted of locally manufactured or transit or re-exported goods. The highest share of engineering industry product exports of total exports registers Zimbabwe with 4.0 per cent, followed by Kenya (3.8 per cent), Malawi (3.6 per cent) and Mauritius (3.4 per cent). These insignificant export figures reflect the lack of comparative advantage of African countries in the production of engineering industry products and the low degree of specialization of the engineering industries.

10. Exports of Kenya consisted mainly of transport equipment (40 per cent) followed by metal manufactures (25 per cent), non-electric machinery (23 per cent) and electric machinery (12 per cent). Mauritius exports mainly electrical machinery (88 per cent), Malawi - machines for special industry (41 per cent and road vehicles (35 per cent), Madagascar - transport equipment (88 per cent). Zimbabwe shows, like Kenya, relatively diversified exports of engineering industry products with a share of metal manufactures of 37 per cent, electrical machinery (25 per cent) non-electrical machinery (23 per cent) and transport equipment (14 per cent).

Table A.V.4: Total exports and engineering industry product exports of selected PTA member countries
(in thousand US $)

| Country | Latest year for which data were available | exports of engineering industry products | Total exports | Share of engineering industry products in total exports |
|---|---|---|---|---|
| Kenya | 1980 | 52,805 | 1,389,000 | 3.8 |
| Madagascar | 1980 | 8,608 | 386,517 | 2.2 |
| Malawi | 1980 | 10,256 | 285,148 | 3.6 |
| Mauritius | 1978 | 110,507 | 325,759 | 3.4 |
| Rwanda | 1977 | 210 | 91,665 | 0.2 |
| Tanzania | 1980 | 4,128 | 527,666 | 0.8 |
| Zambia | 1978 | 2,510 | 869,217 | 0.3 |
| Zimbabwe | 1979 | 45,483 | 1,128,835 | 4.0 |

Source: 1981 Yearbook of International Trade Statistics.

11. Many questions, however, remain to be answered regarding the export data recorded in these tables. In particular, more research is needed in order to establish the reasons behind capital goods exports where these are relatively substantial. In many cases presumably foreign capital and foreign technology have provided the basis for production and trade in capital goods, but even here it would be desirable to examine the extent of indigenous capabilities. Similarly, it would be of great interest to identify any locally-owned firms that are imitating, modifying and adapting foreign machinery for local markets and for exports, as has occurred in other developing countries. Furthermore, it is important to analyse the impact of government trade and incentive policies on the activties of the local capital goods sector. Such information would facilitate a more enlightening interpretation of the trade data that has been summarized here.

Table A.V.5: Breakdown of capital goods exports, by SITC category, by country
(thousand US $)

| Country | Latest Year | Total export of capital goods | 69 | Division 7 | 71 | 72 | 73 | 74 | 76 | 78 | 79 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Kenya+ | (1980) | 52,805 | 13,128 | 39,677 | 12,254 | 6,143 | 21,279 | | | | |
| Madagascar* | (1980) | 8,606 | | 8,606 | | | | | | | 7,570 |
| Malawi* | (1980) | 10,256 | | 10,256 | 79 | 4,174 | | 860 | | 3,589 | 825 |
| Mauritius+ | (1978) | 11,209 | | 11,209 | 1,009 | 9,843 | | | | | |
| Rwanda+ | (1977) | 210 | | 210 | | | 210 | | | | |
| Tanzania+ | (1980) | 4,128 | 1,207 | 2,921 | | 2,698 | | | | | |
| Zambia+ | (1978) | 2,510 | | 2,510 | | | | | | | |
| Zimbabwe+ | (1979) | 45,483 | 16,788 | 28,695 | 10,589 | 11,539 | 6,376 | | | | |

Key to SITC categories

SITC (Rev 2)

* 69 - Metal manufactures NES
7 - Machines and transport equipment
70 - Power generating equipment
72 - Machines for special industry
73 - Metalworking machinery
74 - General industrial machinery NES
75 - Office machines ADP equipment
76 - Telecommunications, sound equipment
77 - Electrical machinery NES etc.
78 - Road vehicles
79 - Other transport equipment

SITC (Rev 1)

\+ 69 - Metal manufactures NES
7 - Machines and transport equipment
71 - Machinery non-electric
72 - Electrical machinery
73 - Transport equipment

Source: 1981 Yearbook of International Trade Statistics (UN 1983).

Table A.V.6: Breakdown of capital goods exports, by SITC category, by country
(per cent)

| Country | Latest Year | Total capital goods exports: 69 | Total capital goods exports: Division 7 | 71 | 72 | 73 | 74 | 76 | 78 | 79 |
|---|---|---|---|---|---|---|---|---|---|---|
| Kenya+ | (1980) | 24.86 | 75.14 | 23.21 | 11.63 | 40.29 | | | | |
| Madagascar* | (1980) | | 100.00 | | | | | | | 87.94 |
| Malawi* | (1980) | | 100.00 | 0.77 | 40.69 | | 8.39 | | 34.99 | 8.04 |
| Mauritius+ | (1978) | | 100.00 | 9.00 | 87.81 | | | | | |
| Rwanda+ | (1977) | | 100.00 | | | 100.00 | | | | |
| Tazania+ | (1980) | 29.24 | 70.76 | | 65.36 | | | | | |
| Zambia+ | (1978) | | 100.00 | | | | | | | |
| Zimbabwe+ | (1979) | 36.91 | 63.09 | 23.28 | 25.37 | 14.02 | | | | |

Key to SITC categories

SITC (Rev 2)

* 69 - Metal manufactures NES
7 - Machines and transport equipment
70 - Power generating equipment
72 - Machines for special industry
73 - Metalworking machinery
74 - General industrial machinery NES
75 - Office machines ADP equipment
76 - Telecommunications, sound equipment
77 - Electrical machinery NES etc.
78 - Road vehicles
79 - Other transport equipment

SITC (Rev 1)

\+ 69 - Metal manufactures NES
7 - Machines and transport equipment
71 - Machinery non-electric
72 - Electrical machinery
73 - Transport equipment

Source: 1981 Yearbook of International Trade Statistics (UN 1983).

12. The engineering industry products have different contents of steel. The European Economic Commission has established coversion figures allowing to determine the quantity and value of steel content of different SITC product groups (see Annex VI). The accuracy of figures is such that it permits overall economic and industrial planning as well as the determination of the importance of certain process routes (e.g. milling of flat products) in the pre feasibility stage. The overall accuracy of this calculatory process, however, depends also on the quality of trade statistics. In the case of many PTA member countries these statistics are insufficiently detailed or incomplete.

13. To arrive at figures on indirect steel imports to the PTA member countries the available import statistics were compared with and partly amended by export statistics of major supply countries of engineering industry products. A range of products were chosen by the criterion that it would be within reach for most of the countries to produce them locally over the next decade. The results of this statistical analysis and subsequent application of the conversion factor for steel content of the various product groups are presented by country in Volume II of this study (tables 5) and tables 4.8 and 4.9 in Chapter 4, Volume I.

14. The annual steel imports did decline from approximately 540,000 tonnes in 1981 to approximately 450,000 tonnes in 1983, apparently as a result of poor overall economic performance of the countries of the region and serious constraints on foreign exchange. Countries with the sharpest decline in indirect steel imports were Angola, Kenya and Tanzania, while some countries increased their indirect steel imports in these 3 years (e.g. Ethiopia, Burundi, Rwanda, Somalia). Over the three years 1981-83, the sub-region imported an average annual 490,000 tonnes of steel worth US$1.7 billion. The SADCC countries' average indirect steel imports amounted to approximately 270,000 tonnes per annum valued of approximately US$1 billion.

15. The most important single product group for indirect steel imports were road vehicles with a share of 52 per cent (i.e. approximately 260,000 tonnes per year in average), metal structures are in second place with 18 per cent (approximately 86,000 tonnes per annum), followed by agricultural machinery with 6 per cent (approximately 28,000 tonnes per

annum), tanks, vessels, bicycles with 4 per cent (approximately 22.000, 20,000 and 17,000 tonnes per annum respectively). These groups also represent the major portion of potential for import substitution through local or regional production. The accelerated import replacement case (see Annex VI and Chapter 5) assumes that approximately 300,000 tonnes steel contained in these imports can be replaced by local production by 1995.

16. As regards the share of countries in indirect steel imports (Table 4.8) it is noteworthy that Angola has the highest share (12 per cent), followed by Ehtiopia (11 per cent), Kenya and Somalia (10 per cent), Kenya (9 per cent), Mozambique (8 per cent), Zimbabwe (7 per cent), Tanzania and Zambia (6 per cent). It is noteworthy that the two most important countries for indirect steeel imports, Angola and Ethiopia, have a very small own engineering industry basis (cf. Table 4 of Annex I) contributing 3.5 or 2.0 per cent, respectively, to their manufacturing value added. Kenya, Zimbabwe and Zambia have on the other hand, a comparatively well advanced engineering industry sector. The fact that Kenya and Zimbabwe also export engineering industry products (see Table 6) permits the conclusion that these 2 countries come among the PTA member countries the closest to the engineering industry pattern of industrialized countries which is characterized by high imports and exports, besides production, of these goods.

## ANNEX VI

### METHODOLOGY AND ASSUMPTIONS

Demand model

1. Steel consumption forecasting models have normally attempted to relate total crude steel consumption to general economic aggregates such as Gross Domestic Product (GDP). Although such models appear to provide a satisfactory statistical relationship, their prediction value has been poor: their apparently statisfactory performance during the 1960s, when both explained and explanatory variable were growing constantly, now appears to have been somewhat fortitous.

2. For the present study, it was seen as important to develop consumption projections by product group in order for market projections to be relevant to specific projects for re-rolling or finishing plants in various parts of the sub-region. Aggregation of the individual products was finally carried out to provide projections of crude steel requirements, billet requirements and the derived demand for ferrous inputs. The core of the projection methodology however deals with consumption of the individual products (listed e.g. in Table 5.2, Chapter 5). They are generally referred to in the study as "products", "rolled products" or "basic products".

3. Experience and observation suggest that GDP, and GDP per capita are not sufficiently specific explanatory variables to provide useful projections of steel consumption; As measures of total economic activity, these aggregates change in response to factors whose relevance to steel consumption may be peripheral. It was therefore decided to include as an additional explanatory variable, an aggregate which was more directly related to the consumption of specific types of steel; gross capital formation (GCF), for heavy angles, heavy plate, rail track and rail materials; value added in building and construction (ISIC 5) for bars and rods, and value added in the manufacturing sector (ISIC 3) for light angles, light plate, tinned and coated plate, hoop and strip, wire and tubes. This variable is generally referred to as "special explanatory variable".

4. As time series long enough to support such a methodology were not available it was decided to use a cross sectional linear regression analysis. The analysis assumed a link between the explained variable;

apparent steel consumption (ASC)[1/] and the explanatory variables according to the formula ASC = a + b GDP + c GDP per capita + dx, where x is GCF, ISIC 5, or ISIC 3 depending on the steel item analyzed. To arrive at consumption forecasts, the estimated coefficients a, b, c and d were applied to the alternative forecasts for the explanatory variables (explained below).

5. The underlying idea for the methodology chosen is that the steel consumption of the various sectors will grow and change in response to changes in explanatory variables. Initially, at low development levels, the consumption may be heavily concentrated around reinforcement bars, etc. As the proportion of reinforced concrete structures grows, the fabrication of reinforcing mesh, and structural components in general, will increase. Local assembly of machinery and transport equipment will provide the opportunity for the local metalworking sector to provide components as original equipment, not merely for repair and maintenance.

6. At a certain level, as the metal using industries become more mature, steel intensity will begin to decline. Simple metalworking will be joined by the production of more sophisticated components with higher value added and thus lower steel intensity; eventually the domestic production of electric and electronic components for machinery and transport equipment will further depress the relationship between steel used and value added.

7. The cross sectional analysis chosen assumes that to a particular combination of explanatory variables belongs one and only one level and structure of steel consumption. In other words if, e.g. Malawi by 1995 had grown and developed to have exactly the same combination of explanatory variables as Zimbabwe had in 1981-83, its steel consumption in 1995 would be exactly equal to that of Zimbabwe in 1981-83. The justification for this is that structural differences decrease with economic growth and increasing industrialisation; As the industrial

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1/ Defined as domestic production + imports - exports. The difference between ASC and "real" consumption is movement in stocks. As steel is relatively easy to stock and as large purchases (imports) carry advantages in terms of discounts and transport costs, considerable movements in stocks and hence in ASC may occur in a single year. This is compensated for in the analysis by using three year averages.

sector grows, economic structures usually become more uniform, the initial diverse emphasis on primary products tends to be obscured by a growing interindustry demand which is normally more similar from country to country. It is clear however, that two countries with equal levels of GDP, population and manufacturing value added may be quite different in economic structure and therefore have different levels and composition of steel consumption. A straightforward application of the projection method above would give an instantaneous change in demand and its composition from the initial one to a "standard" one given the projected levels of explanatory variables. Technically this is reflected in "residuals" or differences between actual steel consumption and the one that can be calculated from the projection equation above, using initial values of explanatory variables. The fact that changes do not take place instantaneously and that countries may over substantial time have consumption structures deviating from a "standard" one have both been catered for in the projections. Firstly, the use of a special regression technique[1/] allowed for lasting differences in steel consumption structure for countries showing a substantial deviation from standard patterns at the outset. Secondly, for other countries, the residuals referred to above are assumed to be absorbed into the forecast over time, illustrating a gradual adjustment to "standard" consumption patterns.[2/]

8. It is hoped that this type of steel intensity model, linking individual steel products to specific user sectors, however crude, should provide a more sensitive predictive mechanism than the more general models, which are normally employed.

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1/ An identifying "dummy variable" was used for the countries Zimbabwe (with an exceptionally well developed economy), Comoros, Djibouti, Seychelles, Swaziland (very small countries with special structure or level of steel consumption), Ethiopia and Tanzania (large countries with special consumption structure).

2/ It was assumed that residuals were phased out asymptotically by the formulae:

$y_t = R1.17^{1-t}$ where yt is the remaining residual in year t, R is the residual initally, t is number of years since base period (year 1 = 1982). The coefficient 1.17 is chosen by the criteria that the remaining residual should be eliminated (under 1 per cent of the initial) after 30 years. This would give approximately 33 per cent of the residual remaining in 1990 and approximately 15 per cent in 1995.

<u>The quality of regression results</u>

9. A standard measure for the extent to which the choice of explanatory variables and functional forms are supported by actual data is the multiple correlation coefficient or $R^2$. A reasonable common sense explanation of $R^2$ is that it expresses the per cent of variation in the dependent variable (ASC) which may be explained by the explanatory variables (e.g. 1.00 = 100 per cent and 0.50 = 50 per cent). Table A.VI.1 lists the $R^2$s by product.

<u>Table A.VI.1: Multiple correlations by product</u>

| | $R^2$ |
|---|---|
| Bars and rods | 0.84 |
| Angles, shapes, heavy + medium | 0.99 |
| Angles, shapes, light | 0.98 |
| Plates, heavy + medium | 0.84 |
| Plates, light | 0.88 |
| Tinned and coated plate | 0.89 |
| Hoop and strip | 0.97 |
| Rails and track material | 0.88 |
| Wire | 0.92 |
| Tubes | 0.23 |
| Weighted average 1/ | 0.85 |

10. Overall, multiple correlation was high. With the exception of tube consumption which is notoriously hard to predict, the regression equations estimated explain 84 per cent to 99 per cent of the variation in steel consumption. As an illustration of overall explanation a weighted coefficient of 0.85 was arrived at by using the per cent distribution of steel products for the whole sub-region as weights. The reliability of the individual estimated coefficients may be gauged in terms of the probability of non-zero values for the estimates. An

<u>Table A.VI.2: Estimated coefficients with 95 per cent probability of non-zero values</u>

| | Coefficient |
|---|---|
| Bars and rods | b |
| Angles, shapes, heavy | b |
| Angles, shapes, light/medium | b, d |
| Plates, heavy and medium | d |
| Plates, light | d |
| Tin and coated plate | d |
| Hoop and strip | - |
| Rails and track material | - |
| Wire | d |
| Tubes | - |

1/ Weights equal to the percentage distribution of consumption in 1981-83 (see Table 5.2, Vol. I).

arbitrary but fairly conventional method is to say that estimates are accepted if the probability for a non-zero value exceeds 95 per cent. The use of this criterion (see Table A.VI.2) gives an impression which at first sight appears to deviate from the uniformly high $R^2$s as only one of two variables in each equation seem to meet this criterion.

11. This lack of significance for individual coefficients, together with relatively high $R^2$s however means that although it is difficult to point out the separate effect on ASC of one single explanatory variable, the group of variables taken together quite successfully explains the variation in apparent steel consumption between countries. As this study aims at projecting ASC and not the influence of individual explanatory variables, the weakness of individual coefficient is therefore less crucial.

Alternative growth forecasts of explanatory variables

12. Considerable attention was paid to the development of forecasts for the explanatory variables GCF, ISIC 5 and ISIC 3, GDP and population. For population, projections by ECA were used. For the other variables the following overall framework was used:

13. A major constraint to economic growth in most of the countries of the sub-region in the short and medium term lies in the balance of payments. The PTA and SADCC are composed of countries at a stage of development where restrictions on import of capital goods and industrial inputs will have a direct negative effect on growth. Although alleviation of import dependence ranks highly among the economic objectives of the countries in the sub-region, balance of payments constraints are likely to affect the rate of economic growth all through the projection period.

14. The model framework used in the analysis takes the balance of payment constraint into consideration by calculating each individual country's capacity to import and by linking the increase in import capacity to real GDP growth. The starting point for macro projections were the most recent government view on economic growth prospects that was obtainable by country missions. In the absence of official plans or forecasts, predictions from other sources (mainly the World Bank) and mission

assessments were used. If the balance of payments projections indicated an import capacity far below or above the forecasted GDP growth, adjustments in the macro variables were made.

15. Prices of main export commodities, the economic situation in main donor countries and the state of international financial markets will have a strong effect on the balance of payments of the countries in the sub-region. This relation between external and domestic development was used to form three alternative sets of macro projections. The base case builds on World Bank commodity price forecasts[1/] and the macro-economic assumptions which that forecast is based on.

The main assumptions for the 1985-95 period are:

- A real terms GDP growth of 3.3 per cent per annum in industrialized countries and 5.1 per cent per annum for developing countries;
- The relatively high growth rate would tend to reduce protectionism and lead to higher import by industrialized countries from the developing world;
- A concommittant increase in the developing countries abilities to repay their external debts;
- Towards the end of the decade, petroleum prices would again start increasing slowly;
- The rate of population growth in developing countries would decrease only slightly.

16. Over the last decade, two non-economic factors have had a dramatic effect on economic growth in most of the countries of the PTA sub-region: drought conditions and political and military unrest. The latter has in particular been a problem for the SADCC countries, all of which have suffered from South African destabilization measures.

17. For the coming decade the base case assumes some improvement in the situation, both with regard to drought and unrest. It was not, however, considered realistic to assume a complete end to unrest early in the coming decade. Although the drought period seems to have come to an end in most countries of the region, it is hardly likely that favourable climatic conditions will prevail in all countries throughout the decade.

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1/ World Bank Report No. 814/84: Price Prospects for Major Primary Commodities, Sept. 1984. A list of price assumptions used may be found in Table A.V.4 at the back of this Annex.

18. The high growth case differs from the base case in two ways: Firstly, the development of terms of trade for the countries in the sub-region is assumed to be more favourable than in the base case. Commodity export prices in current terms are assumed 10 per cent higher in 1990 and 20 per cent higher in 1995, whereas the increase in prices of manufactured goods imported into developing countries are kept at roughly the same level as in the base case. Also, the high growth case assumes that higher growth rates in the industrialized countries leads to an increased flow of ODA to African countries.

19. In the low growth case it is attempted against the same external economic background as in the base case, to illustrate the continuation and deepening of political and military unrest in the sub-region, unfavourable climatic conditions, leading to a virtual stagnation of economic growth in the sub- region and for some countries resulting in a decline in per capita GDP.

Additional information on macro-economic assumptions by country can be found under the country sections of Volume II.

Production forecasts

20. The all important determinant for the future development of basic steel production in the region is government policy. In particular, what priority do the various governments attach to increasing steel production and what are the financial and human resources made available to expand production by solving the economic and technical problems of the sector?

21. The importance of policy factors in determining future production means that standard economic projection techniques are difficult to use. The method applied was to assess policies, plans and their implementation to arrive at the two key factors; capacity utilization of existing equipment and installation and utilization of new capacity.

22. On capacity utilization of existing equipment largely a normative approach was used; the overall rolling capacity figures in Table A.II.1 were taken as a starting point. For 1990 a 70 per cent capacity utilization was assumed on the grounds that increase in utilization is a major aim of all governments and that it technically ought to be possible

to reach this level. The distribution between products was assumed to be determined by local demand. Only Zimbabwe and Kenya were assumed to produce other items than bars and light/medium angles. In the case of under supply, it was assumed that the demand for bars and rods would be covered as far as possible and that the demand for angles would be covered by imports. In the case of over supply, some net exports was assumed for each of the two items. For 1995, a 80-90 per cent capacity utilization was assumed.

23. Missions to the various countries took stock of existing plans for capacity expansion (as at mid-85). The results appear in Table A.II.3. The assumed capacity utilizations depend on the starting year as compared to the projection year. High capacity utilization is only assumed to be reached 1-2 years after commissioning of new plant.

24. The gaps emerging between demand projections and the constrained of sub-regional supply of basic steel products were taken as indicators of the need to expand sub-regional production and trade of products as well as crude steel, a main objective being sub-regional self-sufficiency.

Indirect imports

25. As markets and industrial capabilities expand, a structural change in national steel demand is likely to take place. Countries will tend to start local production of the steel-based products formerly imported, in turn giving rise to greater demand for basic steel products. This effect is included in our cross sectional analysis to the extent that such inter-country differences in structure were present in our base period data.

26. To illustrate the point that such structural change is dependent on policies, an alternative projection was prepared, assuming that the initial (1981-83) indirect imports of certain goods would be built down by 30 per cent in 1990 and another 30 per cent in 1995. (See Table 2 in Vol. II). The resulting additional basic steel demand was assumed to be distributed on products according to the key given on page v, Vol. II.

27. Initial indirect imports were estimated using data from UN trade files. Missing country data were filled in by using data from trade partners. As only value figures existed for most countries, quantitites in terms of

total import weight was estimated by using import unit values from countries where trade data permitted the calculation of such values. Finally, crude steel content was estimated by using the following coefficients developed by the ECA.

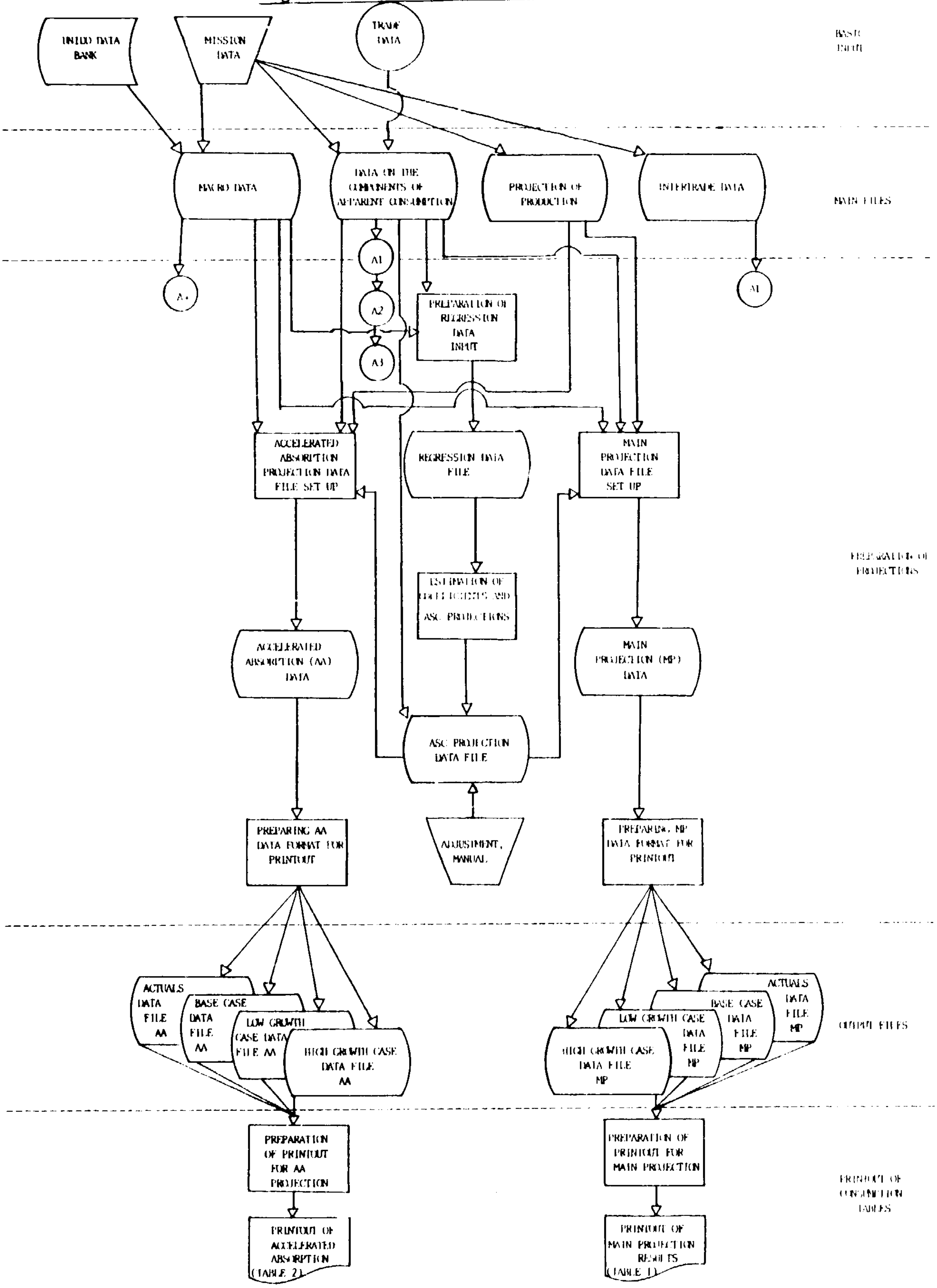
Table A.VI.3: Indirect imports to crude steel conversion coefficients

| SITC code | SITC description | Crude steel requirements per tonne of products |
|---|---|---|
| 691 | Metal structures | 1.48 |
| 692 | Tanks, vessels, etc. | 1.59 |
| 693 | Wire products | 1.33 |
| 694 | Nails, nuts, bolts | 1.41 |
| 695 | Hand tools | 1.69 |
| 696 | Cutlery | 1.40 |
| 697 | Domestic utensils | 1.08 |
| 712 | Agricultural machinery, tractors | 1.23 |
| 725 | Domestic electrical equipment | 1.00 |
| 731 | Rail, locomotives, etc. | 1.00 |
| 732 | Road vehicles | 1.40 |
| 733 | Bicycles, etc. | 1.20 |
| 812 | Heating, sanitary | 1.50 |
| 821 | Furniture | 1.50 |

Computational framework

28. When dealing with 20 individual countries and a considerable amount of data for each, attention to data management problems and standardized data handling methods are required. Therefore, data storage and calculations were done on a mainframe computer. The main data files, providing the starting point of analysis, contain about 7,000 data entries originating partly from existing data systems and partly from data collected during missions. Figures A.VI.1 and A.VI.2 illustrate the most important steps involved in arriving at projection results and displaying detailed results and inputs. Input data are displayed in great detail so that it will be possible to check the correctness of input and the plausibility of macro projections. Projection results in direct printout tables are usually given to the nearest tonne. This is however not meant to indicate a corresponding level of accuracy. Analysis and conclusions are "rounded off" to take account of this spurious accuracy. A programming package called Statistical Analysis System (SAS) has been used throughout.

Figure A.VI.1: Main programme sequence




N.B: A1 etc. refers to auxiliary programme sequence, see following pages.

**Figure A.VI.2: Auxiliary programme sequence**

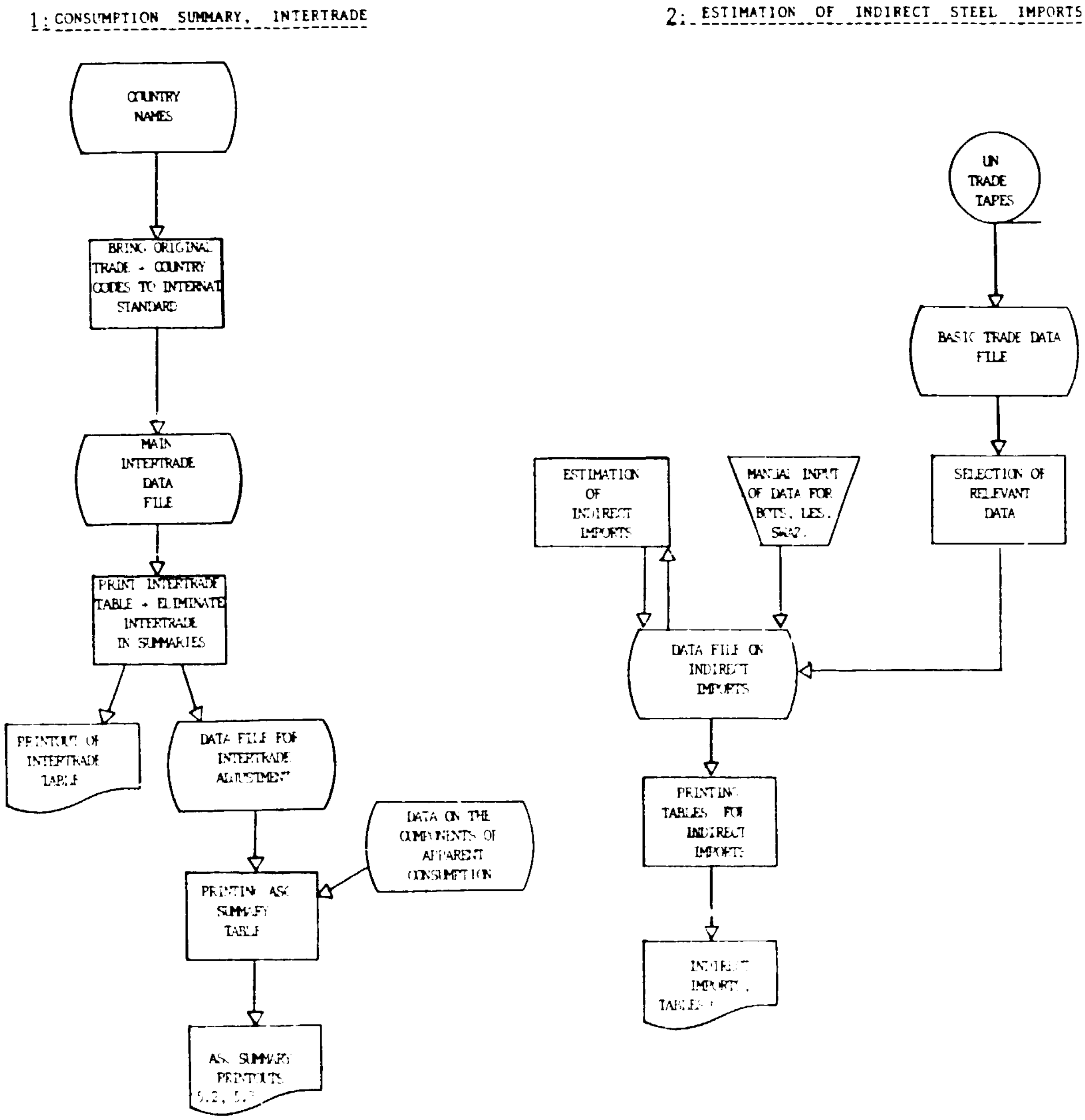
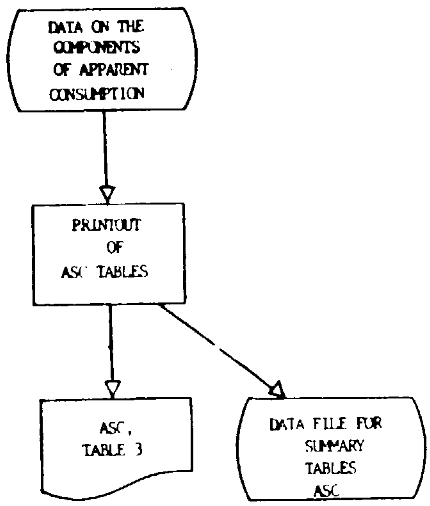
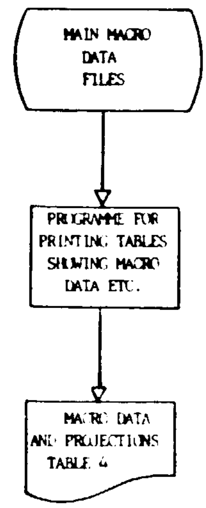


**Figure A.VI.2: (continued)**

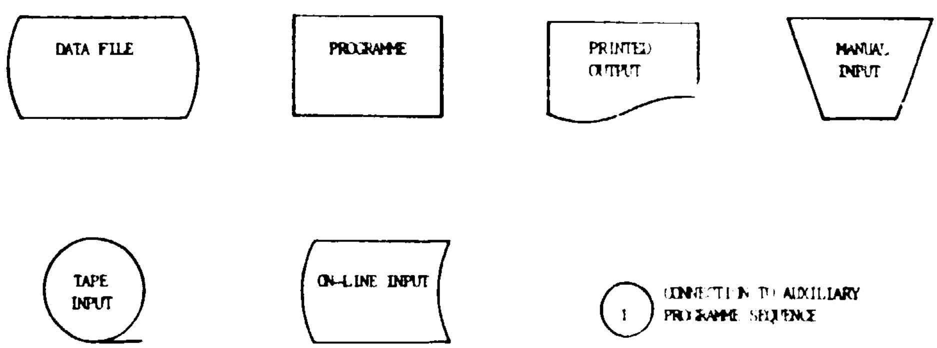
3: APPARENT CONSUMPTION TABLES




4: TABLES ON MACRO DATA AND PROJECTIONS




LEGEND:



29. The system is set up in such a way that it is easy to adjust inputs, to update and to change various assumptions. If it is considered desirable and feasible in terms of hardware compatibility, the whole system could be transferred to the PTA/SADCC secretariats. It would then constitute a framework for continuous monitoring and ad hoc analysis of the state of the iron and steel sector in the sub-region. Particularly, it would lend itself to the analysis of various national plans and policies in a sub-regional perspective.

Factors affecting the reliability of projections

30. The outcome of any projection will be affected by the choice of method, the statistical basis, assumptions made with regard to explanatory variables, and pure statistical uncertainty.

31. Firstly, the choice of method have been restricted by data availability and by the fact that 20 countries were involved. A careful sector by sector, product by product assessment could not be undertaken. As the consumption of steel in the relatively small economies of the sub-region tends to fluctuate rapidly in response to steel requirements for major development projects, a method taking the requirements of such projects into account would be preferred if the objective was to forecast steel consumption accurately country by country in the short term. This study, however, is occupied with longer term structural changes in the sector and although developed on a country by country basis, the main occupation is with sub-regional demand and its satisfaction.

32. The cross section analysis employed was to some extent dictated by availability of data. The method could be used because there was, in the sub-region, a sufficiently great variation between countries with respect to the variables involved. It is often held that demand projections based on cross section data better reflect structural changes in demand and thus are preferable in long term analysis.

33. Secondly, the statistical basis is affected by the time period for which data were available. 1981 to 1983 is by no means an ideal period, the economies of several countries being severely depressed. However, relatively normal economic circumstances did prevail in some countries of the sub-region (Botswana, Malawi, to a certain extent Zimbabwe). This

would make the underestimation of steel consumption in relation to explanatory variable less severe than would otherwise be the case. If it did occur, this underestimation would give rather low predictions for a period where explanatory variables rose rapidly. As such a rapid rise is not forecast, the downward bias of the projection would be limited.

34. Thirdly, whether the projected levels of <u>explanatory variables</u> will in fact occur, is a separate question. At the time when the general overall assumptions had to be made (late 1985), the present slump in oil prices was not foreseen. A continuation of a depressed oil market would substantially benefit net oil importers which constitute all countries in the sub-region except for Angola. How this would affect steel consumption over our projection period depends mainly on the sectoral pattern of growth and for what period the oil market remains depressed.

35. Experience indicates that a considerable improvement in the external balance will quickly be reflected as an improvement in the balance of government budgets. Plans for major building and construction projects (improvement of physical infrastructure etc.) having been shelved for lack of finance, can be revived and frequently leads to a boom in the construction industry. This would boost the consumption of several steel items but in particular, bars, rods and angles.

36. At present most comments on the oil markets go in the direction that the current extremely low price levels will not last in the longer run. Accepting this argument and given the experience outlined in para 35 above, one may expect a tendency to underestimation of the consumption of bars, rods and angles in the projection for 1990.

37. Fourthly, <u>statistical</u> measures of the reliability of estimated coefficients have been discussed above. Similar remarks apply to the projections based on the coefficients. The use of standard statistical techniques to measure reliability of estimates is made difficult by a certain degree of correlation between explanatory variables, technically referred to as multicollinearity.

## Table A.VI.4: Commodity prices and projections in current dollars[a]

| Commodity | ACTUALS 1981 | ACTUALS 1982 | ACTUALS 1983 | PROJECTIONS 1990 A | PROJECTIONS 1990 B-C | PROJECTIONS 1995 A | PROJECTIONS 1995 B-C |
|---|---|---|---|---|---|---|---|
| **ENERGY** | | | | | | | |
| Petroleum | 34.3 | 33.2 | 29.1 | 53.6 | 48.7 | 95.6 | 79.7 |
| Coal | 57 | 52 | 45 | 77.0 | 70 | 120.0 | 100 |
| **FOOD** | | | | | | | |
| Coffee | 282 | 309 | 290 | 528 | 480 | 826 | 689 |
| Cocoa | 208 | 174 | 212 | 306 | 279 | 517 | 431 |
| Tea | 202 | 193 | 233 | 390 | 355 | 618 | 515 |
| Sugar | 374 | 186 | 187 | 570 | 519 | 835 | 696 |
| Beef | 248 | 239 | 244 | 446 | 406 | 678 | 565 |
| Bananas | 401 | 374 | 429 | 535 | 487 | 728 | 607 |
| Oranges | 405 | 385 | 373 | 699 | 583 | 908 | 757 |
| Rice | 483 | 293 | 277 | 616 | 560 | 867 | 723 |
| Wheat | 196 | 167 | 170 | 277 | 252 | 394 | 329 |
| Maize | 131 | 109 | 136 | 205 | 187 | 298 | 249 |
| Grain sorghum | 126 | 109 | 129 | 198 | 180 | 286 | 239 |
| **FATS AND OILS** | | | | | | | |
| Palm oil | 571 | 445 | 501 | 998 | 908 | 1,417 | 1,181 |
| Coconut oil | 570 | 464 | 730 | 1,147 | 1,043 | 1,624 | 1,354 |
| Groundnut oil | 1,043 | 585 | 711 | 1,243 | 1,130 | 1,774 | 1,479 |
| Soyabean oil | 507 | 447 | 527 | 1,025 | 932 | 1,470 | 1,225 |
| Soyabeans | 288 | 245 | 282 | 468 | 426 | 678 | 565 |
| Copra | 379 | 314 | 496 | 743 | 676 | 1,053 | 878 |
| Palm kernels | 317 | 270 | 362 | 558 | 508 | 792 | 660 |
| Groundnut meal | 238 | 189 | 200 | 332 | 302 | 482 | 402 |
| Soyabean meal | 253 | 219 | 238 | 388 | 353 | 561 | 468 |
| **NON-FOOD** | | | | | | | |
| Cotton | 185 | 160 | 185 | 313 | 285 | 463 | 386 |
| Jute | 279 | 285 | 300 | 484 | 440 | 715 | 596 |
| Rubber | 125 | 100 | 124 | 249 | 227 | 378 | 315 |
| Tobacco | 2,350 | 2,410 | 2,242 | 3,960 | 3,600 | 5,724 | 4,770 |
| **TIMBER** | | | | | | | |
| Logs (Lauan) | 145 | 145 | 133 | 264 | 240 | 396 | 330 |
| Logs (Sapelli) | 213 | 176 | 161 | 326 | 297 | 490 | 409 |
| Sawnwood | 314 | 302 | 304 | 526 | 479 | 794 | 627 |
| **METALS AND MINERALS** | | | | | | | |
| Copper | 1,742 | 1,480 | 1,592 | 2,862 | 2,602 | 4,550 | 3,792 |
| Tin | 1,416 | 1,283 | 1,299 | 2,145 | 1,950 | 3,180 | 2,650 |
| Nickel[b] | 7,560 | 7,055 | 7,055 | 9,918 | 9,017 | 14,768 | 12,307 |
| Nickel[c] | 6,736 | 5,132 | 4,802 | 8,587 | 7,802 | 13,620 | 11,350 |
| Aluminium[d] | 1,676 | 1,676 | 1,712 | 2,946 | 2,679 | 4,477 | 3,731 |
| Aluminium[e] | 1,338 | 1,061 | 1,495 | 2,701 | 2,456 | 4,316 | 3,597 |
| Lead | 727 | 546 | 425 | 962 | 875 | 1,449 | 1,208 |
| Zinc | 846 | 745 | 764 | 1,621 | 1,474 | 2,385 | 1,988 |
| Iron ore | 24.3 | 25.9 | 23.8 | 39.9 | 36.3 | 58.3 | 48.6 |
| Bauxite | 40.0 | 36.0 | 34.7 | | 55.2 | 93.2 | 77.7 |
| Magenese ore | 168 | 164 | 152 | 60.7 | 229 | 368 | 307 |
| **FERTILIZERS** | | | | | | | |
| Phosphate rock | 50 | 42 | 37 | 81 | 74 | 118 | 99 |
| Urea | 216 | 159 | 135 | 454 | 413 | 688 | 574 |
| TSP | 161 | 138 | 135 | 309 | 281 | 450 | 375 |
| DAP | 195 | 183 | 184 | 526 | 479 | 778 | 649 |
| Potassium Chloride[f] | 112 | 82 | 75 | 181 | 165 | 265 | 221 |
| *Manufacturing unit value (MUV) index, 1983 = 100* | 104.9 | 103.1 | 100.0 | 165.0 | 165.0 | 220.8 | 220.8 |

Source: World Bank, Economic Analysis and Projections Department, Commodity Studies and Projections Division: "A" projections are arrived at using 10 per cent higher price in 1990 and 20 per cent in 1995 except in the case of Manufacturing unit value index.

a/ Computed from unrounded data. b/ Canadian producer price

c/ Merchant market price (dealer price as published by Metals Week)

d/ US Producers' list price.

e/ Transactions price: US shipment to Europe (Representative of free market prices)

f/ Also known as Muriate of Potash

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INDUSTRIAL DEVELOPMENT ORGANIZATION

# A SURVEY OF THE IRON AND STEEL SECTOR IN PTA AND SADCC COUNTRIES*

VOL. II: COUNTRY DATA AND PROJECTIONS

Prepared by the

**Regional and Country Studies Branch**

**Studies and Research Division**

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## TABLE OF CONTENTS

## Explanation of concepts and tables

Each country section in this volume contains: a map of the country, a short note on macro economic projections and the result of the projection exercise and tables 1 to 5. The purpose of this note is to explain the layout of the tables and the concepts used. It should be read in conjunction with Annex VI of Volume I. Some difference between data presented in tables 1, 2 and 3 are explained at the end of the note.

### Table 1: Main projection

The table is divided into four main sections: A - D

Section A: "Macro variables data and base case projections", shows a summary of data (averages 1981- 1983) and projections for the development of three macro variables from 1981-83 to 1990 and from 1990 to 1995. For example, for Angola the average GDP over 1981-1983 was US $2,706 million at 1975 prices. In the base case, this was assumed to increase to US $3.000 million in 1990 and US $3,650 million in 1995. The population average for 1981-83 was 7.5 million, expected to increase to 9.2 million in 1990 and to 10.6 million in 1995. GDP per capita was US $361 (at 1975 prices) as average for 1981-83, expected to decline to US $326 in 1990 and increase to US $344 in 1995.

The columns headed "Growth rates pct. p.a." gives per annum compound rates of growth for all macro variables in the two periods, 1981-83 to 1990 and 1990 to 1995. For the first period (with the heading "to 1990"), 1982 is taken as the starting year in percentage calculation. Using the example of Angola, the increase in GDP from US $2,706 million in 1982 to US $3,000 million in 1990 is calculated by $\sqrt[8]{3,000/2,706} = 1.01298$ 1.3 per cent per annum.

Section B shows the "Base case projections 1990-1995". For the product groups included in the survey, this section gives apparent consumption (CONS), production (PROD), imports (IMP) and exports (EXP) in the period 1981-83 and main base case projections for the years 1990 and 1995. In the example of Angola apparent consumption of bars and rods (including wire rods) was 9,068 tonnes (metric) as an average for 1981-1983. Consumption is, under the base case, projected to increase to 16,657 tonnes in 1990 and 23,241 tonnes in 1995. The projection columns (1990, 1995) do not include exports, instead a "net import" column (equal to import minus export) is given. This column is the residual of independent projections of apparent consumption and production. A negative number under "net import"indicates an export potential.

The four rightmost columns give annual compound growth rates. The first two columns give growth rates for the consumption of individual steel items. The two next columns give growth rates of the special explanatory variable used in the demand projection for the product on that line. (See paragraph 3, Annex VI in Volume I). Again, using the table for Angola as an example, the consumption of bars and rods (including wire rods) is projected to increase 7.9 per cent per annum, from 1990 to 1995. (For all percentage calculations over the first period 1982, being the middle point of 1981-83, is taken as the starting year). The special explanatory variable, which in the case of this item was value added in the building and construction sector is projected to grow by 3.0 per cent per annum in the first period and by 4.1 per cent per annum from 1990 to 1995.

The two last lines in section B are entitled "Crude equivalent steel" and "Billet equivalent". To arrive at the former, the need for crude steel (ingot) in order to produce the quantity given to each individual steel item in the column above was calculated. The following conversion coefficients, developed by the ECE were used:

| Item name | SITC | Tonnes of crude steel required to produce one tonne of the item |
|---|---|---|
| Bars and rods | 6730 | 1,271 |
| Angles, shapes, heavy and medium | 6734 | 1,271 |
| Angles and shapes, light | 6735 | 1,271 |
| Plates, heavy and medium | 6740 | 1,420 |
| Plates, light | 6743 | 1,359 |
| Tinned and coated plate | 6749 | 1,359 |
| Hoop and strip | 6750 | 1,228 |
| Rails and railtrack materials | 6760 | 1,300 |
| Wire | 6770 | 1,319 |
| Tubes | 6780 | 1,470 |

Billet equivalent was calculated by using a conversion factor of 1.172 between billets and crude steel.

Using the Angola tables as an example, the calculated 1981-1983 crude steel production equivalent of 2825 is arrived at by taking production of bars and rods in that column and multiplying by the relevant coefficient. 2223 x 1,271 = 2825. Similarly the crude requirement for local production in 1990 is (17000 x 1,271) + (2000 x 1,271) = 24149. The corresponding Billet equivalents are arrived at by dividing the crude tonnages by 1.172. For 1981-83, 2825 x 1.172 = 2411 for 1990, 24149 x 1.17: = 20605.

Because of projected changes in the composition of consumption, growth rates of "Totals" which is the simple adding up of individual items and "Crude" or "Billets" equivalents come out slightly different. In the case of Angola, growth rates of the equivalents are slightly lower because of the relatively high proportion in total consumption and rapid growth of items 6730, 6734, 6735 which require relatively less crude steel (billets) per tonne of product.

It should be noted that "equivalents" are calculated for illustrative purposes only. The actual demands for billets and crude steel are constrained by rolling capacity and billet making capacity and are dealt with in Chapter 5 of Volume I.

Section C gives summary results of the projections based on higher growth of GDP and the "special" variable. The line of "Crude equivalents" is based on the same concept and arrived at in the same way as the similar line under Section B.

The other lines in this section give the macro assumptions used under this alternative in terms of annual compound growth rates which may be compared to the base case growth rates given under "Growth rates pct.p.c." under section A and the "Per cent growth in macro variables under section D.

For section D: "Low growth case projections 1990 and 1995" the layout and concepts used are exactly the same as for section C.

Table 2: Projection with accelerated replacement of indirect steel imports

The tables and concepts in this table are largely the same as for Table 1 explained above. The difference lies in the assumption made about the extent to which the countries manage to produce locally (downstream) products with an iron and steel content which were imported in the base period. In the projections given in Table 1, the method applied implicitly assumes that the gradual replacement of indirect import takes place as indicated by the experience represented in the sample of countries. To examplify: the result of the regression analysis will take account of the replacement of indirect imports which data indicate, would result if a country grew from an initial size and structure resembling Lesotho's to one more like Zimbabwe's.

The "accelerated replacement case" is meant to illustrate a development with special measures taken to promote the local production of presently imported products containing steel. A crude assumption has been made: in 1990 an additional 30 per cent of the indirect imports (of the products listed in Table 4.10, Volume I) is assumed to materialize as direct steel consumption and in 1995 another 30 per cent. By 1995 then, it is assumed that 60 per cent of what was imported in 1981-83 of these steel-containing products will be produced locally. Again, using Angola as an example, the 1981-83 average indirect imports was 59,111 tonnes. Thirty per cent of this, or 17,733 tonnes is the difference between the 1990 total consumption under "accelerated replacement" (Table 2) and the 1990 total without "accelerated replacement" (Table 1).

The total additional demand for steel products resulting from accelerated replacement is broken down by product according to the following key, derived from the composition of consumption projected in 1990.

| SITC item | Per cent of total additional direct consumption |
|---|---|
| 6730 | 26.6 |
| 6734 | 6.6 |
| 6735 | 10.7 |
| 6740 | 6.5 |
| 6743 | 19.1 |
| 6749 | 16.2 |
| 6750 | 1.8 |
| 6760 | 2.6 |
| 6770 | 5.6 |
| 6780 | 4.3 |
| Total | 100.0 |

In Angola, e.g., bars and rods consumption was projected at 16657 at 1990. The difference between this and the counterpart figure under "accelerated development" 21374 is 4717 which is 26.6 per cent of the total of 17733 as calculated above.

Table 3 is divided in two sections. The upper section entitled A) "Components of apparent steel consumption by product (tonnes)" gives the complete base data used for the calculation of apparent consumption averages (the column APP CONS, AV 81-83). In Angola, e.g., the imñorts of Bars and rods (SITC 6732) in 1981 was 2,199 tonnes; in 1982, 2,515 tonnes and in 1983, 7,909 tonnes and the average for the period (2,199 + 7,909)/3 = 4,208.

The average imports of Bars and rods together with the 1981-83 average for production make up average apparent steel consumption (ASC) (4,208 + 2,223 = 6,431). Exports of which Angola had none would have been deducted from the total.

Section B entitled "Demand/Supply balances for rolled products and ferrous metals" gives in sub-section A the calculation of ASC for each of the years 1981, 1982 and 1983 and the average for the three years. Note that the fourth line of that sub-section gives net imports (imports - exports).

In sub-section B, an attempt is made to look at a more complete picture of the origin of ferrous materials (metallics) consumed in the country by year and as an average for 1981-1983. The common denominator is crude steel weight. The conversion factors listed under the explanation of Table 2 above were applied to basic product tonnages. Using the example of Angola 1981, the table should be interpreted as follows:

The total crude equivalent of ferrous materials consumption for the year 1981 was 168,334 tonnes of which 166,031 was net imported and 2,302 came from local sources. (In all other cases than Zimbabwe raw materials from local sources would be scrap). Net import can be further broken down into ferrous materials for smelting (874). Net imports of billets (9), Net imports of rolled products (65292) and Indirect imports (99856). Supplies from "local sources" is calculated as the total of products rolled from billets, re calculated to crude equivalents minus imported materials for smelting and minus imported billets. This figure may be compared with estimated annual local scrap generation (sub-section C) to give an impression of how much of the locally generated scrap is used. A negative figure for "C" may be due to imports of scrap or billets which were not used for steelmaking or may be the result of inaccuracies in conversion coefficients, trade data or production data. Supply from local sources greatly exceeding estimated scrap generation may be due to similar statistical deficiencies and/or to the rundown of stocks of scrap.

Table 4 contains "Macro data and projections" used in the steel demand forecasting exercise. The table has three sections: the first (GDP and population) section contains national accounts aggregates and population.

The middle section of the table gives balance of payment figures, mostly in current national currency terms (exchange rates as in 1983). Balance of payments projections are used as a check on the reasonableness of the national accounts projections in the upper part of the table. A key variable is the capacity to imports. This is calculated as exports + other current items + net inflows of official development assistance + long term capital inflows - accumulation of reserves (the latter includes errors and omissions).

Lesotho and Swaziland which have currencies circulating parallel with the South African Rand and being backed by that currency do not have a balance of payments problem in the traditional sense and the projections for these countries have therefore been dropped.

The lower section of the table gives annual compound growth rates for GDP and population for 1982, 1983 and for the base case projections between the base period and 1990, and between 1990 and 1995.

Table 5: Estimated indirect steel imports, 1981-1983 and averages

This table contains estimates of values and quantities of the most important indirect steel imports where there could be a relatively high degree of replacement by local production over the next decade. Values reflect total cif import values for the product groups included, not only the value of steel content. Quantities (tonnes) reflect the estimated content of crude steel, not the total weight of imports. For Angola, e.g., the import of metal structures in 1981 had a total value of about US$36.3 million, (current prices) and the calculated crude steel content was 21,234 tonnes. The average import of metal structures for the three years 1981-1983 had a value of US $26.1 million and a crude steel content of 16,057 tonnes constituting 27 per cent of total indirect steel imports to Angola over the period.

Estimates were based on UN trade data giving values of imports. The import value of several countries which had not reported their trade for one or more of the years in question were estimated by using the reported export figures for countries which had reported.

To arrive at total import tonnages, overall import unit values for each product group was estimated by using import statistics from those countries of the sub-region which had reported values and quantities. Total import weights calculated by applying these unit values were converted to crude steel content by using coefficients developed from a similar exercise by the ECA. For the countries Botswana, Lesotho and Swaziland, whose trade is reported together with that of South Africa in international statistics, it was impossible to use the method described above. Independent estimates have, therefore, been made. It was not possible however to break the total estimate down by product group. Totals for these countries are therefore shown under road vehicles, leading to a certain over- estimation of that item in subregional tables.

A note on differences between data in tables 1, 2 and 3

1. **Differences in classification**

Differences in classification of steel items between the various sources of statistics (trade data and production data) and between countries made it necessary to add up certain items for the purpose of projections where a uniform classification was needed. The following aggregations were made:

| From | | To | |
|---|---|---|---|
| Original item | SITC | Aggregate item | SITC |
| Wire rods | 6731 | Bars and rods | 6730 |
| Bars and rods | 6732 | | |
| Plates, Heavy | 6741 | Plates Heavy and Medium | 6740 |
| Plates, Medium | 6742 | | |
| Tinplate | 6747 | Tin and Coated plate | 6749 |
| Other coated plate | 6748 | | |
| Rails | 6761 | Rails and materials | 6750 |
| Other railway tracks | 6762 | | |
| Seamless tube | 6782 | Tubes | 6780 |
| Welded tubes | 6783 | | |

Note that the SITC codes in the right-hand column above do not tally with the standard SITC classification. For completeness and to allow checking by individual countries, the base data is nevertheless presented in the most disaggregated way in the tables of "Apparent steel consumption".

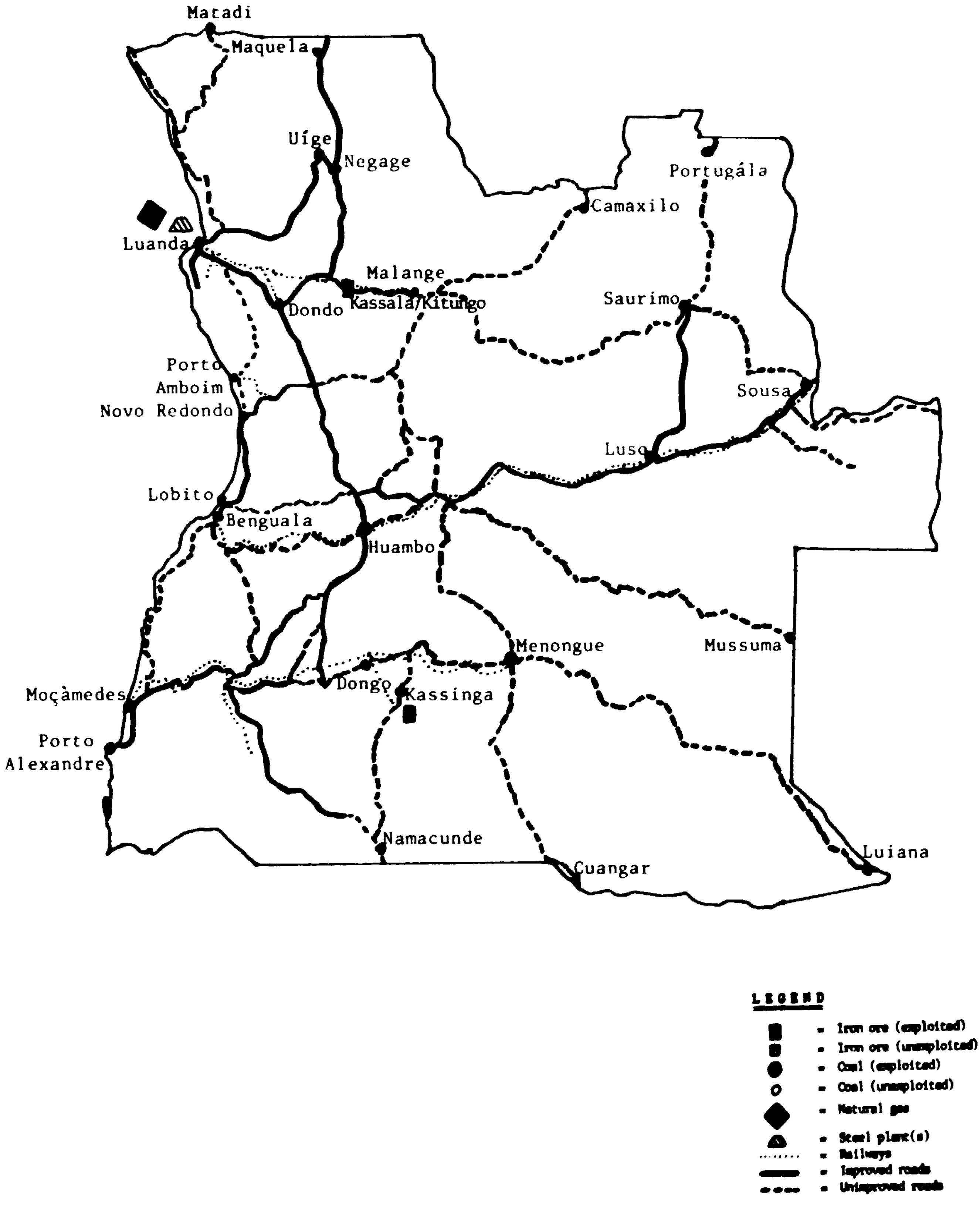
2. Adjustment for double counting in totals

Some of the products included in the study can be produced from other (also included) products. Light, coated and tinned plate may be produced from heavier plate, welded tubes from plate and wire from wire rod. If both inputs (e.g. wire rod), either produced in the country or imported, and final products (e.g. wire) are included in the total for the production columns, double counting will result. As it was considered important to show production totals which in terms of steel weight did not exaggerate total apparent consumption, but at the same time produce a correct apparent consumption figure by item, the following approach was taken: Production of light plate in the sub-region is negligible and therefore presents no problem; all items consumed are imported. Production of wire and welded tubes were excluded from totals of the production columns, but included for the calculation of apparent consumption of these items (the right hand column). In Table 3, the individual items in the columns for "production" and for "apparent consumption" will therefore not always add up to the totals shown. As it was found that the effect of such double counting was small with regard to total production and consumption, similar adjustments were not made in the tables showing projection results.

# A N G O L A

Page

# ANGOLA


Matadi
Maquela
Uíge
Negage
Luanda
Portugála
Camaxilo
Malange
Dondo
Kassala/Kitungo
Saurimo
Porto
Amboim
Novo Redondo
Sousa
Luso
Lobito
Benguala
Huambo
Menongue
Mussuma
Moçâmedes
Dongo
Kassinga
Porto
Alexandre
Namacunde
Cuangar
Luiana
LEGEND
- Iron ore (exploited)
- Iron ore (unexploited)
- Coal (exploited)
- Coal (unexploited)
- Natural gas
- Steel plant(s)
- Railways
- Improved roads
- Unimproved roads

**ANGOLA**

Macro economic projections for Angola are extremely difficult to make. The basic statistics are hard to obtain, there are major uncertainties regarding the price of oil, which constitutes 80-90 per cent of the country's exports, and military action going on in the country may have damaging effects on production.

Considering an annual 2.7 per cent fall in GDP from 1980 to 1983 and the decline in oil prices taking place early 1968 tne GDP growth forecast at 1.3 per cent must be said to be optimistic. It is based on a healthy growth in the manufacturing sector. The faster growth in GDP of 4 per cent from 1990 to 1995 will require an improvement in oil prices.

The forecast for steel consumption growth shows an annual increase somewhat in excess of GDP for both periods, with generally higher increases for those types of steel most heavily used for manufacturing/engineering purposes. The decline in consumption of tubes and pipes is caused by the high recorded importation in 1981-1983 of piping for the oil industry. It is assumed that consumption reverts to a more normal level in the following years. The decline in hoop and strip consumption is due to a comparatively high initial (1981-83) level which will normalize over the years.

ANGOLA TABLE 1, MAIN PROJECTION

## A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 2706 | 7.5 | 361 | 3000 | 9.2 | 326 | 3650 | 10.6 | 344 | 1.3 | 4.0 | 2.6 | 2.9 | -1.3 | 1.1 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. CONSUMPTION | | EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 9068 | 2223 | 6844 | 0 | 16657 | 17000 | -343 | 23241 | 24000 | -759 | 7.9 | 6.9 | 3.0 | 4.1 |
| ANGLES SHP. H | 6734 | 307 | . | 307 | . | 911 | 0 | 911 | 1262 | 0 | 1262 | 14.6 | 6.7 | 2.1 | 3.2 |
| ANGLES SHP.,L | 6735 | 1301 | 0 | 1301 | . | 1998 | 2000 | -2 | 3109 | 3500 | -391 | 5.5 | 9.2 | 5.4 | 6.2 |
| PLATES, H.+ M | 6740 | 3354 | 0 | 3354 | 0 | 3564 | 0 | 3564 | 4098 | 0 | 4098 | 0.8 | 2.8 | 2.1 | 3.2 |
| PLATES, LIGHT | 6743 | 3137 | 0 | 3137 | . | 5429 | 0 | 5429 | 8698 | 0 | 8698 | 7.1 | 9.9 | 5.4 | 6.2 |
| TIN.& COAT.PL | 6749 | 1335 | 0 | 1335 | 0 | 3794 | 0 | 3794 | 6392 | 0 | 6392 | 13.9 | 11.0 | 5.4 | 6.2 |
| HOOP AND STRP | 6750 | 1641 | 0 | 1641 | 0 | 998 | 0 | 998 | 925 | 0 | 925 | -6.0 | -1.5 | 5.4 | 6.2 |
| RAILS+ MATER. | 6760 | 836 | 0 | 836 | . | 1378 | 0 | 1378 | 1795 | 0 | 1795 | 6.4 | 5.4 | 2.1 | 3.2 |
| WIRE | 6770 | 393 | 0 | 393 | . | 1690 | 0 | 1690 | 2856 | 0 | 2856 | 20.0 | 11.1 | 5.4 | 6.2 |
| TUBES | 6780 | 19628 | 0 | 19628 | 0 | 10325 | 0 | 10325 | 8277 | 0 | 8277 | -7.7 | -4.3 | 5.4 | 6.2 |
| TOTALS | | 41000 | 2223 | 38777 | 0 | 46743 | 19000 | 27743 | 60653 | 27500 | 33153 | 1.7 | 5.3 | | |
| CRUDE EQUIVALENT | | 56883 | 2825 | 54056 | 0 | 62887 | 24149 | 38738 | 80825 | 34952 | 45872 | 1.3 | 5.1 | | |
| BILLET EQUVIVALENT | | 48535 | 2411 | 46123 | 0 | 53658 | 20605 | 33053 | 68963 | 29823 | 39140 | 1.3 | 5.1 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 56883 | 2825 | 54056 | 0 | 71603 | 24149 | 47454 | 100686 | 34952 | 65734 | 2.9 | 7.1 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.7 | 2.6 | 0.1 |
| 1990 TO 1995 | 5.1 | 2.9 | 2.2 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 56883 | 2825 | 54056 | 0 | 52109 | 24149 | 27960 | 56844 | 34952 | 21892 | -1.1 | 1.8 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | -0.5 | 2.6 | -3.0 |
| 1990 TO 1995 | 2.2 | 2.9 | -0.6 |

ANGOLA TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 2706 | 7.5 | 361 | 3000 | 9.2 | 326 | 3650 | 10.6 | 344 | 1.3 | 4.0 | 2.6 | 2.9 | -1.3 | 1.1 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT_NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 9068 | 2223 | 6844 | 0 | 21374 | 17000 | 4374 | 32675 | 24000 | 8675 | 11.3 | 8.9 | 3.0 | 4.1 |
| ANGLES SHP. H | 6734 | 307 | . | 307 | . | 2081 | 0 | 2081 | 3603 | 0 | 3603 | 27.0 | 11.6 | 2.1 | 3.2 |
| ANGLES SHP..L | 6735 | 1301 | 0 | 1301 | . | 3895 | 2000 | 1895 | 6904 | 3500 | 3404 | 14.7 | 12.1 | 5.4 | 6.2 |
| PLATES, H.+ M | 6740 | 3354 | 0 | 3354 | 0 | 4717 | 0 | 4717 | 6403 | 0 | 6403 | 4.4 | 6.3 | 2.1 | 3.2 |
| PLATES, LIGHT | 6743 | 3137 | 0 | 3137 | . | 8816 | 0 | 8816 | 15472 | 0 | 15472 | 13.8 | 11.9 | 5.4 | 6.2 |
| TIN.& COAT.PL | 6749 | 1335 | 0 | 1335 | 0 | 6667 | 0 | 6667 | 12137 | 0 | 12137 | 22.3 | 12.7 | 5.4 | 6.2 |
| HOOP AND STRP | 6750 | 1641 | 0 | 1641 | 0 | 1317 | 0 | 1317 | 1563 | 0 | 1563 | -2.7 | 3.5 | 5.4 | 6.2 |
| RAILS+ MATER. | 6760 | 836 | 0 | 836 | . | 1839 | 0 | 1839 | 2717 | 0 | 2717 | 10.4 | 8.1 | 2.1 | 3.2 |
| WIRE | 6770 | 393 | 0 | 393 | . | 2683 | 0 | 2683 | 4842 | 0 | 4842 | 27.1 | 12.5 | 5.4 | 6.2 |
| TUBES | 6780 | 19628 | 0 | 19628 | 0 | 11087 | 0 | 11087 | 9802 | 0 | 9802 | -6.9 | -2.4 | 5.4 | 6.2 |
| TOTALS | | 41000 | 2223 | 38777 | 0 | 64476 | 19000 | 45476 | 96119 | 27500 | 68619 | 5.8 | 8.3 | | |
| CRUDE EQUIVALENT | | 56883 | 2825 | 54056 | 0 | 86346 | 24149 | 62197 | 127744 | 34952 | 92792 | 5.4 | 8.1 | | |
| BILLET EQUVIVALENT | | 48535 | 2411 | 46123 | 0 | 73674 | 20605 | 53069 | 108996 | 29823 | 79174 | 5.4 | 8.1 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 56883 | 2825 | 54056 | 0 | 95064 | 24149 | 70915 | 147607 | 34952 | 112654 | 6.6 | 9.2 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.7 | 2.6 | 0.1 |
| 1990 TO 1995 | 5.1 | 2.9 | 2.2 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 56883 | 2825 | 54056 | 0 | 75570 | 24149 | 51421 | 103763 | 34952 | 68811 | 3.6 | 6.5 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | -0.5 | 2.6 | -3.0 |
| 1990 TO 1995 | 2.2 | 2.9 | 0.6 |

ANGOLA TABLE 3

## A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | 3170 | 2042 | 2698 | 2637 | | | | | | | | | 2637 |
| BARS AND RODS | 6732 | 2199 | 2515 | 7909 | 4208 | 2670 | 1670 | 2330 | 2223 | | | | | 6431 |
| ANGLES SHP.HM | 6734 | 200 | 200 | 520 | 307 | | | | | | | | | 307 |
| ANGLES SHP..L | 6735 | 982 | 800 | 2122 | 1301 | | | | | | | | | 1301 |
| PLATES, HEAVY | 6741 | 4645 | 558 | 2735 | 2646 | | | | | | | | | 2646 |
| PLATES, MED. | 6742 | 119 | 749 | 1255 | 708 | | | | | | | | | 708 |
| PLATES, LIGHT | 6743 | 1359 | 278 | 7773 | 3137 | | | | | | | | | 3137 |
| TINPLATE | 6747 | 19 | | 218 | 79 | | | | | | | | | 79 |
| OTHER COAT.P | 6748 | 939 | 2210 | 620 | 1256 | | | | | | | | | 1256 |
| HOOP AND STRP | 6750 | 2221 | 1954 | 748 | 1641 | | | | | | | | | 1641 |
| RAILS | 6761 | 4 | 1622 | 8 | 545 | | | | | | | | | 545 |
| OTHER RL TRCK | 6762 | 453 | 57 | 365 | 292 | | | | | | | | | 292 |
| WIRE | 6770 | 361 | 592 | 227 | 393 | | | | | | | | | 393 |
| SEAMLESS TUBE | 6782 | 27869 | 17327 | 5514 | 16903 | | | | | | | | | 16903 |
| WELDED TUBES | 6783 | 1556 | 2814 | 3805 | 2725 | | | | | | | | | 2725 |
| TOTALS | | 46096 | 33718 | 36517 | 38777 | 2670 | 1670 | 2330 | 2223 | 0 | 0 | 0 | 0 | 41000 |

## B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 48766 | 35388 | 38847 | 41000 |
| OF WHICH: | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 46096 | 33718 | 36517 | 38777 |
| LOCAL PRODUCTION | 2670 | 1670 | 2330 | 2223 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 168334 | 101432 | 91265 | 120344 |
| SUPPLIED FROM: | | | | |
| 1 NET IMPORTS | 166031 | 101869 | 89968 | 119290 |
| OF WHICH: | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 874 | 1697 | 1465 | 1345 |
| NET IMPORTS OF BILLETS ETC | 9 | 733 | 18 | 253 |
| NET IMPORTS OF ROLLED PRODUCTS | 65292 | 47270 | 49609 | 54057 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 99856 | 52169 | 38876 | 63634 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 2302 | -437 | 1297 | 1054 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 6000 | 6000 | 6000 | 6000 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

ANGOLA TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| **GDP, AND POPULATION** | | | | | | | | | |
| POPULATION (MILL) | 7.3 | 7.5 | 7.7 | 9.2 | 9.2 | 9.2 | 10.6 | 10.6 | 10.6 |
| GDP PER CAPITA US$ (1975) | 385.0 | 357.5 | 342.2 | 364.1 | 326.1 | 282.6 | 405.7 | 344.3 | 273.6 |
| GDP MILL US$ (1975) | 2801.9 | 2681.3 | 2634.6 | 3350.0 | 3000.0 | 2600.0 | 4300.0 | 3650.0 | 2900.0 |
| GROSS CAP FORM MILL US$ (1975) | 260.8 | 243.6 | 232.7 | 330.0 | 290.0 | 270.0 | 420.0 | 340.0 | 300.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 76.5 | 69.0 | 67.8 | 100.0 | 90.0 | 80.0 | 130.0 | 110.0 | 90.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 111.7 | 113.5 | 112.1 | 190.0 | 170.0 | 140.0 | 280.0 | 230.0 | 160.0 |
| **BALANCE OF PAYMENTS BILLION KZ.** | | | | | | | | | |
| EXPORTS | 38.1 | 32.3 | 31.6 | 66.1 | 59.7 | 56.1 | 131.8 | 110.2 | 94.4 |
| OTHER CURRENT ITEMS | -12.7 | -6.6 | -3.9 | -4.0 | -4.0 | -4.0 | -5.0 | -5.0 | -5.0 |
| ODA, NET INFLOWS | 1.8 | 1.8 | 1.7 | 4.0 | 3.0 | 3.0 | 5.0 | 4.0 | 4.0 |
| LONG TERM CAPITAL,NET | 6.8 | 2.0 | 0.9 | 2.0 | 1.0 | 1.0 | 4.0 | 4.0 | 4.0 |
| RESERVES ERRORS AND OMISSIONS | 11.4 | 4.2 | -0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| IMPORTS, IMPORT CAPACITY | 54.4 | 33.7 | 29.7 | 64.1 | 59.7 | 56.1 | 135.8 | 113.2 | 97.4 |
| **GROWTH RATES PER CENT P.A.** | 1981-82 | 1982-83 | | | 1981-1983 TO BASE 1990 | | | BASE 1990-1995 | |
| POPULATION | 2.5 | 2.5 | | | 2.6 | | | 2.8 | |
| GDP. CONSTANT US$ (1975) | -4.3 | -1.4 | | | 1.9 | | | 4.0 | |

TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

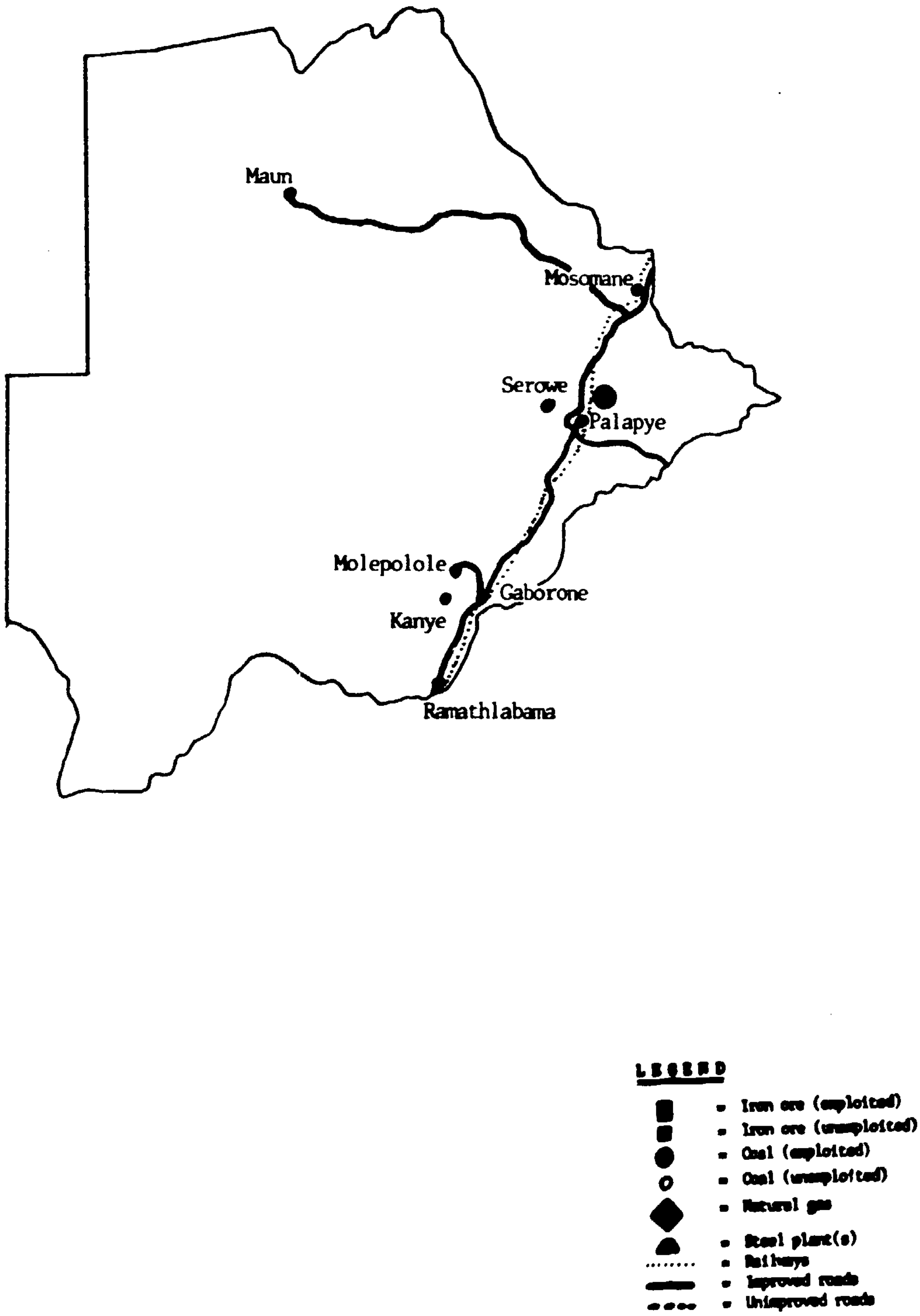
COUNTRY ANGOLA

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| SITC | | | | | | | | | |
| MET. STRUCTURES | 36313 | 21234 | 23804 | 12650 | 18132 | 14287 | 26083 | 16057 | 27 |
| TANKS, VESSELS, ETC | 7825 | 6455 | 3016 | 1636 | 3113 | 2057 | 4651 | 3383 | 6 |
| WIRE PRODUCTS | 3040 | 2077 | 1847 | 1398 | 938 | 806 | 1942 | 1427 | 2 |
| NAILS, NUTS,BOLTS | 1732 | 1022 | 1520 | 545 | 932 | 228 | 1395 | 598 | 1 |
| HAND TOOLS | 18614 | 2098 | 5359 | 753 | 5081 | 526 | 9685 | 1126 | 2 |
| CUTLERY | 2250 | 189 | 679 | 36 | 1298 | 67 | 1409 | 97 | 0 |
| DOM. UTENSILS | 4113 | 1194 | 721 | 115 | 1385 | 262 | 2073 | 524 | 1 |
| AGR.MACH.,TRACTORS | 18765 | 5543 | 11191 | 2396 | 4343 | 582 | 11433 | 2840 | 5 |
| DOM. EL. EQUIPMENT | 6730 | 1539 | 933 | 151 | 462 | 72 | 2708 | 587 | 1 |
| RAIL. LOCOS ETC. | 4280 | 2732 | 11934 | 3434 | 7502 | 2704 | 7939 | 2957 | 5 |
| ROAD VEHICLES | 178823 | 37605 | 93331 | 22382 | 57524 | 11940 | 109893 | 23976 | 41 |
| BICYCLES ETC. | 12582 | 4649 | 3955 | 1119 | 3952 | 1418 | 6830 | 2395 | 4 |
| HEATING, SANITARY | 6156 | 1344 | 1678 | 369 | 2178 | 444 | 3337 | 719 | 1 |
| FURNITURE | 18088 | 4988 | 4307 | 1063 | 4023 | 1224 | 8806 | 2425 | 4 |
| TOTAL | 319311 | 92668 | 164275 | 48047 | 110963 | 36617 | 198183 | 59111 | 100 |

# BOTSWANA

Page

# BOTSWANA


Maun
Mosomane
Serowe
Palapye
Molepolole
Gaborone
Kanye
Ramathlabama
LEGEND
Iron ore (exploited)
Iron ore (unexploited)
Coal (exploited)
Coal (unexploited)
Natural gas
Steel plant(s)
Railways
Improved roads
Unimproved roads

BOTSWANA

Botswana is a very small economy. The major sectors mining, and cattle farming are very large in relation to the rest of the economy. Therefore changes in investment and production in these sectors will have a major effect on the total economy and lead to apparent dramatic chang s in growth rates.

Economic projects are based on the Sixth National Development Plan (NDP6) 1985-1991. The projection rate of 4.8 per cent annually for the period 1985-91, together with the strong increases registered over 1983 and 1984 (15-20 per cent) gives the overall of 6.8 used in the base case. The fall of the population growth rate from the rather high rate of 4.2 per cent per annum to a more normal level of 3.4 per cent per 1990-1995 is as projected by the ECA.

After a rather high level of mining based investment and construction activities in the base period, NDP6 envisages a period where the manufacturing sector becomes increasingly important as a growth factor. This is reflected in steel forecasts by declines in plate demand in the period to 1990 and then increase as the manufacturing sector grows much faster than GDP.

Under the high growth scenario, steel consumption could grow by 4.8 and 7.6 in the periods up to 1990 and 1990-1995 respectively. Under low growth, consumption may actually decline up to 1990 and only increase by 1 per cent to 1995.

BOTSWANA TABLE 1. MAIN PROJECTION

## A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 709 | 0.8 | 844 | 1200 | 1.2 | 1026 | 1400 | 1.4 | 1014 | 6.8 | 3.1 | 4.2 | 3.4 | 2.5 | -0.2 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 2743 | . | 2743 | . | 8122 | 0 | 8122 | 9856 | 0 | 9856 | 14.5 | 3.9 | -0.6 | 4.6 |
| ANGLES SHP. H | 6734 | 633 | . | 633 | . | 1182 | 0 | 1182 | 1341 | 0 | 1341 | 8.1 | 2.6 | -0.7 | 1.6 |
| ANGLES SHP.,L | 6735 | 2644 | . | 2644 | . | 3576 | 0 | 3576 | 4281 | 0 | 4281 | 3.8 | 3.7 | 6.1 | 4.6 |
| PLATES, H.+ M | 6740 | 2967 | . | 2967 | . | 2571 | 0 | 2571 | 3094 | 0 | 3094 | -1.8 | 3.8 | -0.7 | 1.6 |
| PLATES, LIGHT | 6743 | 3217 | . | 3217 | . | 916 | 0 | 916 | 2051 | 0 | 2051 | -15 | 17.5 | 6.1 | 4.6 |
| TIN.& COAT.PL | 6749 | 2788 | . | 2788 | . | 911 | 0 | 911 | 1870 | 0 | 1870 | -13 | 15.5 | 6.1 | 4.6 |
| HOOP AND STRP | 6750 | 152 | . | 152 | . | 507 | 0 | 507 | 600 | 0 | 600 | 16.3 | 3.4 | 6.1 | 4.6 |
| RAILS+ MATER. | 6760 | 861 | . | 861 | . | 944 | 0 | 944 | 967 | 0 | 967 | 1.2 | 0.5 | -0.7 | 1.6 |
| WIRE | 6770 | 259 | . | 259 | . | 380 | 0 | 380 | 480 | 0 | 480 | 4.9 | 4.8 | 6.1 | 4.6 |
| TUBES | 6780 | 2492 | . | 2492 | . | 4498 | 0 | 4498 | 4706 | 0 | 4706 | 7.7 | 0.9 | 6.1 | 4.6 |
| TOTALS | | 18755 | . | 18755 | . | 23608 | 0 | 23608 | 29246 | 0 | 29246 | 2.9 | 4.4 | | |
| CRUDE EQUIVALENT | | 25336 | . | 25336 | . | 31467 | 0 | 31467 | 38939 | 0 | 38939 | 2.7 | 4.4 | | |
| BILLET EQUIVALENT | | 21618 | . | 21618 | . | 26849 | 0 | 26849 | 33225 | 0 | 33225 | 2.7 | 4.4 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 25336 | . | 25336 | . | 36858 | 0 | 36858 | 53237 | 0 | 53237 | 4.8 | 7.6 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 7.9 | 4.2 | 3.5 |
| 1990 TO 1995 | 4.2 | 3.4 | 0.9 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUIV. TONNE | 25336 | . | 25336 | . | 24609 | 0 | 24609 | 25892 | 0 | 25892 | -0.4 | 1.0 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.4 | 4.2 | 0.2 |
| 1990 TO 1995 | 1.0 | 3.4 | -2.3 |

BOTSWANA TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 709 | 0.8 | 844 | 1200 | 1.2 | 1026 | 1400 | 1.4 | 1014 | 6.8 | 3.1 | 4.2 | 3.4 | 2.5 | -0.2 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. CONSUMPTION | | EXPL. VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 2743 | . | 2743 | . | 10041 | 0 | 10041 | 13694 | 0 | 13694 | 17.6 | 6.4 | -0.6 | 4.6 |
| ANGLES SHP. H | 6734 | 633 | . | 633 | . | 1658 | 0 | 1658 | 2293 | 0 | 2293 | 12.8 | 6.7 | -0.7 | 1.6 |
| ANGLES SHP..L | 6735 | 2644 | . | 2644 | . | 4348 | 0 | 4348 | 5825 | 0 | 5825 | 6.4 | 6.0 | 6.1 | 4.6 |
| PLATES, H.+ M | 6740 | 2967 | . | 2967 | . | 3040 | 0 | 3040 | 4032 | 0 | 4032 | 0.3 | 5.8 | -0.7 | 1.6 |
| PLATES, LIGHT | 6743 | 3217 | . | 3217 | . | 2294 | 0 | 2294 | 4807 | 0 | 4807 | -4.1 | 15.9 | 6.1 | 4.6 |
| TIN.& COAT.PL | 6749 | 2788 | . | 2788 | . | 2080 | 0 | 2080 | 4207 | 0 | 4207 | -3.6 | 15.1 | 6.1 | 4.6 |
| HOOP AND STRP | 6750 | 152 | . | 152 | . | 637 | 0 | 637 | 860 | 0 | 860 | 19.6 | 6.2 | 6.1 | 4.6 |
| RAILS+ MATER. | 6760 | 861 | . | 861 | . | 1132 | 0 | 1132 | 1342 | 0 | 1342 | 3.5 | 3.5 | -0.7 | 1.6 |
| WIRE | 6770 | 259 | . | 259 | . | 784 | 0 | 784 | 1288 | 0 | 1288 | 14.8 | 10.4 | 6.1 | 4.6 |
| TUBES | 6780 | 2492 | . | 2492 | . | 4808 | 0 | 4808 | 5327 | 0 | 5327 | 8.6 | 2.1 | 6.1 | 4.6 |
| TOTALS | | 18755 | . | 18755 | . | 30823 | 0 | 30823 | 43676 | 0 | 43676 | 6.4 | 7.2 | | |
| CRUDE EQUIVALENT | | 25336 | . | 25336 | . | 41012 | 0 | 41012 | 58029 | 0 | 58029 | 6.2 | 7.2 | | |
| BILLET EQUVIVALENT | | 21618 | . | 21618 | . | 34994 | 0 | 34994 | 49512 | 0 | 49512 | 6.2 | 7.2 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 25336 | . | 25336 | . | 46402 | 0 | 46402 | 72327 | 0 | 72327 | 7.9 | 9.3 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 7.9 | 4.2 | 3.5 |
| 1990 TO 1995 | 4.2 | 3.4 | 0.9 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 25336 | . | 25336 | . | 34154 | 0 | 34154 | 44982 | 0 | 44982 | 3.8 | 5.7 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.4 | 4.2 | 0.2 |
| 1990 TO 1995 | 1.0 | 3.4 | -2.3 |

BOTSWANA TABLE 3

## A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | | | | | | | | | | | | | 0 |
| BARS AND RODS | 6732 | 3136 | 2639 | 2455 | 2743 | | | | | | | | | 2743 |
| ANGLES SHP.HM | 6734 | 800 | 500 | 600 | 633 | | | | | | | | | 633 |
| ANGLES SHP..L | 6735 | 3356 | 2056 | 2519 | 2644 | | | | | | | | | 2644 |
| PLATES, HEAVY | 6741 | 3600 | 2800 | 2500 | 2967 | | | | | | | | | 2967 |
| PLATES, MED. | 6742 | | | | | | | | | | | | | 0 |
| PLATES, LIGHT | 6743 | 3890 | 3070 | 2690 | 3217 | | | | | | | | | 3217 |
| TINPLATE | 6747 | 1940 | 1530 | 1350 | 1607 | | | | | | | | | 1607 |
| OTHER COAT.P | 6748 | 1431 | 1131 | 982 | 1181 | | | | | | | | | 1181 |
| HOOP AND STRP | 6750 | 118 | 211 | 127 | 152 | | | | | | | | | 152 |
| RAILS | 6761 | 1490 | 489 | 603 | 861 | | | | | | | | | 861 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | 244 | 353 | 180 | 259 | | | | | | | | | 259 |
| SEAMLESS TUBE | 6782 | 3428 | 2096 | 1952 | 2492 | | | | | | | | | 2492 |
| WELDED TUBES | 6783 | | | | | | | | | | | | | 0 |
| TOTALS | | 23433 | 16875 | 15958 | 18755 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18755 |



## B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 23433 | 16875 | 15958 | 18755 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 23433 | 16875 | 15958 | 18755 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 57889 | 54885 | 47200 | 53325 |
| SUPPLIED FROM; | | | | |
| 1 NET IMPORTS | 57889 | 54885 | 47200 | 53325 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 0 | 0 | 0 | 0 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 31691 | 22809 | 21506 | 25335 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 26198 | 32076 | 25693 | 27989 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 0 | 0 | 0 | 0 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 1500 | 1500 | 1500 | 1500 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

BOTSWANA TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| GDP, AND POPULATION | | | | | | | | | |
| POPULATION (MILL) | 0.8 | 0.8 | 0.9 | 1.2 | 1.2 | 1.2 | 1.4 | 1.4 | 1.4 |
| GDP PER CAPITA US$ (1975) | 739.0 | 866.3 | 905.6 | 1083.3 | 1000.0 | 833.3 | 1142.9 | 1000.0 | 780.0 |
| GDP MILL US$ (1975) | 617.5 | 693.0 | 815.0 | 1300.0 | 1200.0 | 1000.0 | 1600.0 | 1400.0 | 1050.0 |
| GROSS CAP FORM MILL US$ (1975) | 300.7 | 249.2 | 210.0 | 250.0 | 240.0 | 220.0 | 280.0 | 260.0 | 220.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 24.4 | 21.5 | 17.8 | 25.0 | 20.0 | 20.0 | 30.0 | 25.0 | 20.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 73.1 | 77.4 | 75.4 | 140.0 | 120.0 | 100.0 | 200.0 | 150.0 | 110.0 |
| BALANCE OF PAYMENTS MILLION BP | | | | | | | | | |
| EXPORTS | 360.0 | 620.0 | 774.7 | 1980.0 | 1860.0 | 1290.0 | 3350.0 | 3150.0 | 1540.0 |
| OTHER CURRENT ITEMS | -9.3 | -75.5 | -151.4 | -400.0 | -380.0 | -350.0 | -640.0 | -600.0 | -550.0 |
| ODA, NET INFLOWS | 151.5 | 144.1 | 162.3 | 270.0 | 250.0 | 250.0 | 380.0 | 330.0 | 330 0 |
| LONG TERM CAPITAL,NET | 110.9 | 45.6 | 71.7 | 120.0 | 100.0 | 80.0 | 170.0 | 140.0 | 100.0 |
| RESERVES ERRORS AND OMISSIONS | 7.5 | -46.9 | -104.7 | -100.0 | -100.0 | -100.0 | -150.0 | -150.0 | -150.0 |
| IMPORTS, IMPORT CAPACITY | 620.6 | 687.3 | 752.6 | 1970.0 | 1730.0 | 1170.0 | 3110.0 | 2870.0 | 1270.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 4.5 | 4.5 | 4.2 | 3.4 |
| GDP, CONSTANT US$ (1975) | 12.3 | 17.6 | 5.7 | 3.1 |

TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

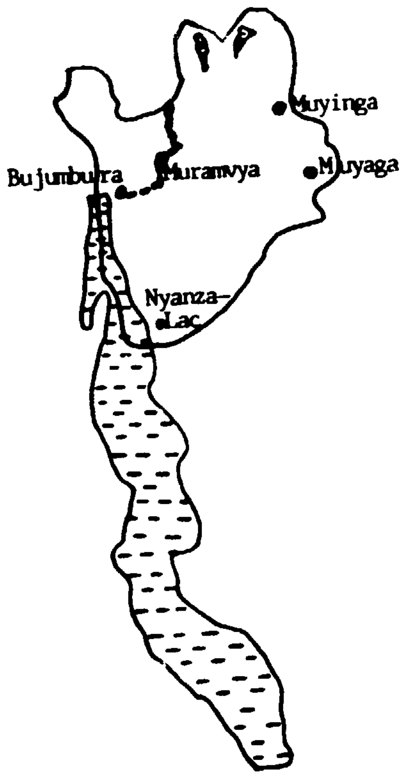
COUNTRY BOTSWANA

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| SITC | | | | | | | | | |
| ROAD VEHICLES | 108712 | 20546 | 119760 | 28293 | 120000 | 22680 | 116157 | 23840 | 100 |
| TOTAL | 108712 | 20546 | 119760 | 28293 | 120000 | 22680 | 116157 | 23840 | 100 |

**BURUNDI**

Page

**BURUNDI**




**LEGEND**

- = Iron ore (exploited)
- = Iron ore (unexploited)
- = Coal (exploited)
- = Coal (unexploited)
- = Natural gas
- = Steel plant(s)
- = Railways
- = Improved roads
- = Unimproved roads

**BURUNDI**

Economic projections for Burundi are based on information from Burundi authorities. The low (2.1 per cent) rate of growth up to 1990 is mainly a result of the GDP decline registered from 1983 to 1984. The 1985-1990 GDP growth rates are projected at over 4 per cent. From 1990 to 1995 GDP is expected to increase at about the rate of population increase.

Projections assume a rapid development of the manufacturing sector and investment, leading to a growth in steel consumption which is considerably higher than the growth of GDP. The high rates of increase in the consumption of plate in steel demand projections is based on the assumption that the presently very low plate consumption will increase to "normal" (compared to other countries) levels. The high average consumption levels reached by 1995 depends partly on the realization of two major projects related to the iron and steel industry.

- development of the Buhinda nickle deposit
- development of the Mukanda ferrousradium deposit.

The low growth projections where GDP per capita falls still give rapidly increasing steel consumption, again caused by the assumption of relatively high investment level and a structural change with emphasis on the modern sectors of the economy. The effect on steel consumption by assuming both overall high growth and structural change is illustrated in the high growth scenario with average consumption growth of over 10 per cent up to 1995.

BURUNDI TABLE 1, MAIN PROJECTION

## A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 560 | 4.5 | 124 | 660 | 5.7 | 116 | 760 | 6.6 | 115 | 2.1 | 2.9 | 2.9 | 3.0 | -0.8 | -0.1 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| PRODUCT NAME | SITC | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | NET IMPORT | 1995 CONS | PROD | NET IMPORT | GROWTH RATES PA. CONSUMPTION TO 1990 | 1990-1995 | EXPL.VARIABLE TO 1990 | 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BARS AND RODS | 6730 | 2219 | . | 2219 | 0 | 1402 | 0 | 1402 | 1915 | 0 | 1915 | -5.6 | 6.4 | 3.3 | 4.9 |
| ANGLES SHP. H | 6734 | 153 | . | 153 | 0 | 295 | 0 | 295 | 419 | 0 | 419 | 8.6 | 7.3 | 3.8 | 5.7 |
| ANGLES SHP.,L | 6735 | 619 | 0 | 619 | . | 2253 | 0 | 2253 | 3430 | 0 | 3430 | 17.5 | 8.8 | 6.9 | 5.6 |
| PLATES, H.+ M | 6740 | 166 | 0 | 166 | . | 1341 | 0 | 1341 | 2538 | 0 | 2538 | 29.8 | 13.6 | 3.8 | 5.7 |
| PLATES, LIGHT | 6743 | 576 | 0 | 576 | . | 4753 | 0 | 4753 | 7669 | 0 | 7669 | 30.2 | 10.0 | 6.9 | 5.6 |
| TIN.& COAT.PL | 6749 | 3742 | 0 | 3742 | 0 | 5641 | 0 | 5641 | 7625 | 0 | 7625 | 5.3 | 6.2 | 6.9 | 5.6 |
| HOOP AND STRP | 6750 | 423 | 0 | 423 | . | 322 | 0 | 322 | 330 | 0 | 330 | -3.4 | 0.5 | 6.9 | 5.6 |
| RAILS+ MATER. | 6760 | 0 | 0 | 0 | . | 314 | 0 | 314 | 403 | 0 | 403 | . | 5.1 | 3.8 | 5.7 |
| WIRE | 6770 | 178 | 0 | 178 | 0 | 1227 | 0 | 1227 | 1974 | 0 | 1974 | 27.3 | 10.0 | 6.9 | 5.6 |
| TUBES | 6780 | 1157 | 0 | 1157 | . | 1187 | 0 | 1187 | 1200 | 0 | 1200 | 0.3 | 0.2 | 6.9 | 5.6 |
| TOTALS | | 9233 | 0 | 9233 | 0 | 18733 | 0 | 18733 | 27502 | 0 | 27502 | 9.2 | 8.0 | | |
| CRUDE EQUIVALENT | | 12360 | 0 | 12360 | 0 | 25217 | 0 | 25217 | 37011 | 0 | 37011 | 9.3 | 8.0 | | |
| BILLET EQUVIVALENT | | 10546 | 0 | 10546 | 0 | 21516 | 0 | 21516 | 31580 | 0 | 31580 | 9.3 | 8.0 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD-1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNES | 12360 | 0 | 12360 | 0 | 29480 | 0 | 29480 | 45813 | 0 | 45813 | 11.5 | 9.2 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.8 | 2.9 | -0.1 |
| 1990 TO 1995 | 5.2 | 3.0 | 2.1 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD - 1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUVIV. TONNE | 12360 | 0 | 12360 | 0 | 19393 | 0 | 19393 | 25953 | 0 | 25953 | 5.8 | 6.0 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 0.7 | 2.9 | -2.2 |
| 1990 TO 1995 | 1.0 | 3.0 | -1.9 |

BURUNDI TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 560 | 4.5 | 124 | 660 | 5.7 | 116 | 760 | 6.6 | 115 | 2.1 | 2.9 | 2.9 | 3.0 | -0.8 | -0.1 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 2219 | . | 2219 | 0 | 2165 | 0 | 2165 | 3443 | 0 | 3443 | -0.3 | 9.7 | 3.3 | 4.9 |
| ANGLES SHP. H | 6734 | 153 | . | 153 | 0 | 485 | 0 | 485 | 798 | 0 | 798 | 15.5 | 10.5 | 3.8 | 5.7 |
| ANGLES SHP.,L | 6735 | 619 | 0 | 619 | . | 2560 | 0 | 2560 | 4044 | 0 | 4044 | 19.4 | 9.6 | 6.9 | 5.6 |
| PLATES, H.+ M | 6740 | 166 | 0 | 166 | . | 1528 | 0 | 1528 | 2911 | 0 | 2911 | 32.0 | 13.8 | 3.8 | 5.7 |
| PLATES, LIGHT | 6743 | 576 | 0 | 576 | . | 5301 | 0 | 5301 | 8766 | 0 | 8766 | 32.0 | 10.6 | 6.9 | 5.6 |
| TIN.& COAT.PL | 6749 | 3742 | 0 | 3742 | 0 | 6106 | 0 | 6106 | 8555 | 0 | 8555 | 6.3 | 7.0 | 6.9 | 5.6 |
| HOOP AND STRP | 6750 | 423 | 0 | 423 | . | 373 | 0 | 373 | 433 | 0 | 433 | -1.6 | 3.0 | 6.9 | 5.6 |
| RAILS+ MATER. | 6760 | 0 | 0 | 0 | . | 388 | 0 | 388 | 552 | 0 | 552 | . | 7.3 | 3.8 | 5.7 |
| WIRE | 6770 | 178 | 0 | 178 | 0 | 1388 | 0 | 1388 | 2295 | 0 | 2295 | 29.3 | 10.6 | 6.9 | 5.6 |
| TUBES | 6780 | 1157 | 0 | 1157 | . | 1310 | 0 | 1310 | 1447 | 0 | 1447 | 1.6 | 2.0 | 6.9 | 5.6 |
| TOTALS | | 9233 | 0 | 9233 | 0 | 21604 | 0 | 21604 | 33245 | 0 | 33245 | 11.2 | 9.0 | | |
| CRUDE EQUIVALENT | | 12360 | 0 | 12360 | 0 | 29013 | 0 | 29013 | 44607 | 0 | 44607 | 11.3 | 9.0 | | |
| BILLET EQUVIVALENT | | 10546 | 0 | 10546 | 0 | 24755 | 0 | 24755 | 38060 | 0 | 38060 | 11.3 | 9.0 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 12360 | 0 | 12360 | 0 | 33275 | 0 | 33275 | 53411 | 0 | 53411 | 13.2 | 9.9 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.8 | 2.9 | -0.1 |
| 1990 TO 1995 | 5.2 | 3.0 | 2.1 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 12360 | 0 | 12360 | 0 | 23191 | 0 | 23191 | 33549 | 0 | 33549 | 8.2 | 7.7 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 0.7 | 2.9 | -2.2 |
| 1990 TO 1995 | 1.0 | 3.0 | 1.9 |

BURUNDI TABLE 3

## A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | 14 | 1 | | 5 | | | | | | | | | 5 |
| BARS AND RODS | 6732 | 1839 | 2102 | 2700 | 2214 | | | | | | | | | 2214 |
| ANGLES SHP HM | 6734 | 100 | 180 | 180 | 153 | | | | | | | | | 153 |
| ANGLES SHP. L | 6735 | 428 | 770 | 660 | 619 | | | | | | | | | 619 |
| PLATES, HEAVY | 6741 | 113 | 147 | 83 | 114 | | | | | | | | | 114 |
| PLATES, MED. | 6742 | 26 | 86 | 44 | 52 | | | | | | | | | 52 |
| PLATES, LIGHT | 6743 | 398 | 765 | 564 | 576 | | | | | | | | | 576 |
| TINPLATE | 6747 | 77 | 82 | | 53 | | | | | | | | | 53 |
| OTHER COAT.P | 6748 | 716 | 4500 | 5850 | 3689 | | | | | | | | | 3689 |
| HOOP AND STRP | 6750 | 114 | 487 | 668 | 423 | | | | | | | | | 423 |
| RAILS | 6761 | | | | | | | | | | | | | 0 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | 266 | 198 | 70 | 178 | | | | | | | | | 178 |
| SEAMLESS TUBE | 6782 | 850 | 1712 | 910 | 1157 | | | | | | | | | 1157 |
| WELDED TUBES | 6783 | | | | | | | | | | | | | 0 |
| TOTALS | | 4941 | 11030 | 11729 | 9233 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9233 |

## B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 4941 | 11030 | 11729 | 9233 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 4941 | 11030 | 11729 | 9233 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) TOTAL | 12781 | 27887 | 25769 | 22146 |
| SUPPLIED FROM: | | | | |
| 1 NET IMPORTS | 12781 | 27887 | 25769 | 22146 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 0 | 0 | 0 | 0 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 6583 | 14854 | 15647 | 12361 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 6199 | 13034 | 10122 | 9785 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 0 | 0 | 0 | 0 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 1000 | 1000 | 1000 | 1000 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

BURUNDI TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| GDP, AND POPULATION | | | | | | | | | |
| POPULATION (MILL) | 4.4 | 4.5 | 4.7 | 5.7 | 5.7 | 5.7 | 6.6 | 6.6 | 6.6 |
| GDP PER CAPITA US$ (1975) | 131.0 | 121.0 | 119.0 | 122.8 | 115.8 | 103.5 | 136.4 | 115.2 | 93.9 |
| GDP MILL US$ (1975) | 575.2 | 544.9 | 559.4 | 700.0 | 660.0 | 590.0 | 900.0 | 760.0 | 620.0 |
| GROSS CAP FORM MILL US$ (1975) | 84.9 | 94.2 | 131.8 | 160.0 | 140.0 | 130.0 | 210.0 | 185.0 | 140.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 32.3 | 34.2 | 34.8 | 46.6 | 43.8 | 38.4 | 62.4 | 56.2 | 40.4 |
| MANUFACTURING V.A. MILL US$ (1975) | 66.4 | 67.0 | 69.2 | 128.7 | 116.4 | 97.4 | 180.5 | 152.3 | 122.3 |
| BALANCE OF PAYMENTS MILLION US$ | | | | | | | | | |
| EXPORTS | 74.9 | 87.8 | 83.2 | 200.0 | 175.0 | 150.0 | 260.0 | 216.4 | 170.0 |
| OTHER CURRENT ITEMS | 18.9 | 0.2 | -31.8 | -80.0 | -85.7 | -80.0 | -70.0 | -69.9 | -70.0 |
| ODA, NET INFLOWS | 57.3 | 88.8 | 155.4 | 180.0 | 173.8 | 170.0 | 250.0 | 219.2 | 180.0 |
| LONG TERM CAPITAL,NET | 1.2 | 1.5 | 7.1 | 6.0 | 4.0 | 2.0 | 7.0 | 7.0 | 7.0 |
| RESERVES ERRORS AND OMISSIONS | 8.9 | 35.9 | -24.2 | -40.0 | -42.3 | -40.0 | -90.0 | -93.2 | -85.0 |
| IMPORTS, IMPORT CAPACITY | 161.2 | 214.2 | 189.7 | 266.0 | 225.0 | 202.0 | 357.0 | 279.5 | 202.0 |

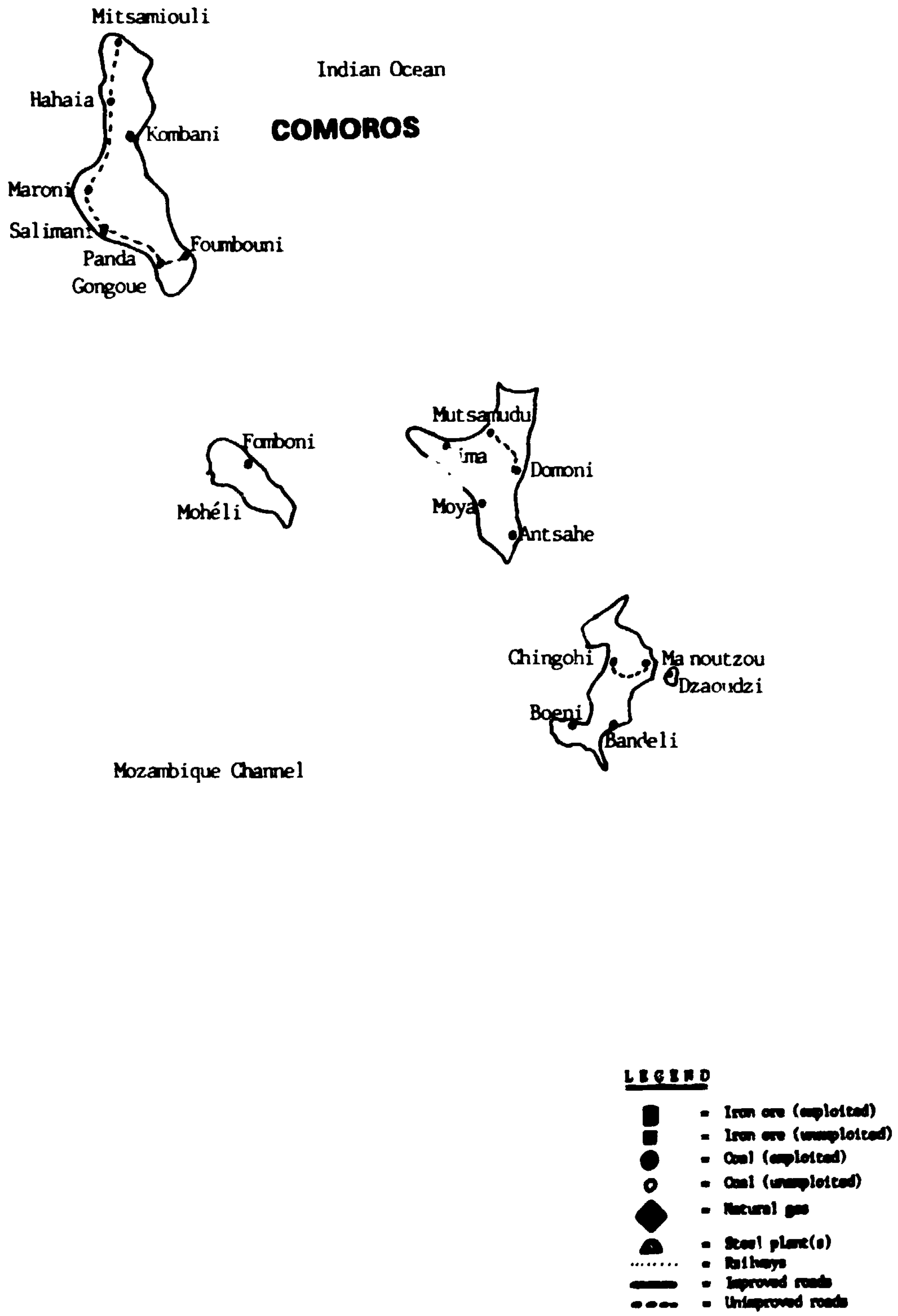
| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 2.3 | 4.4 | 2.8 | 3.0 |
| GDP. CONSTANT US$ (1975) | -5.3 | 2.7 | 2.4 | 2.9 |

TABLE 5: ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY BURUNDI

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | AVERAGE VALUE | AVERAGE TONNES | AVERAGE TONNES IN PCT OF TOTAL |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | | | |
| SITC | | | | | | | | | |
| MET. STRUCTURES | 954 | 801 | 3377 | 3545 | 3437 | 3518 | 2589 | 2621 | 27 |
| TANKS, VESSELS, ETC | 281 | 93 | 111 | 134 | 502 | 728 | 298 | 318 | 3 |
| WIRE PRODUCTS | 272 | 249 | 350 | 388 | 141 | 178 | 254 | 272 | 3 |
| NAILS, NUTS,BOLTS | 236 | 170 | 346 | 254 | 124 | 75 | 235 | 166 | 2 |
| HAND TOOLS | 990 | 189 | 1023 | 221 | 1216 | 438 | 1076 | 283 | 3 |
| CUTLERY | 31 | 2 | 58 | 0 | 57 | 6 | 49 | 3 | 0 |
| DOM. UTENSILS | 202 | 29 | 169 | 29 | 120 | 17 | 164 | 25 | 0 |
| AGR.MACH.,TRACTORS | 1041 | 202 | 1222 | 260 | 2222 | 148 | 1495 | 203 | 2 |
| DOM. EL. EQUIPMENT | 470 | 101 | 515 | 90 | 497 | 96 | 494 | 96 | 1 |
| RAIL. LOCOS ETC. | 14 | 23 | 8 | 19 | 43 | 31 | 22 | 24 | 0 |
| ROAD VEHICLES | 17687 | 3511 | 24013 | 6510 | 16147 | 3651 | 19282 | 4557 | 48 |
| BICYCLES ETC. | 718 | 318 | 1854 | 827 | 550 | 203 | 1041 | 449 | 5 |
| HEATING, SANITARY | 561 | 251 | 638 | 292 | 632 | 333 | 610 | 292 | 3 |
| FURNITURE | 607 | 107 | 1265 | 347 | 663 | 327 | 845 | 260 | 3 |
| TOTAL | 24064 | 6046 | 34949 | 2916 | 6351 | 9749 | 28455 | 9570 | 100 |

**COMOROS**


Mitsamiouli
Indian Ocean
Hahaia
Kombani
COMOROS
Maroni
Salimani
Foumbouni
Panda
Gongoue
Fomboni
Mohéli
Mutsamudu
Domoni
Moya
Antsahe
Chingohi
Boeni
Bandeli
Mozambique Channel
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

COMOROS

Comoros is a mini-economy where individual development projects may have dramatic effects on the overall situation. Without detailed information on such projects, steel demand is very hard to forecast.

The economic proejctions up to 1990 are based on a GDP growth rate of 46 per cent which the World Bank in the beginning of the 80s considered feasible. The availability of concessionary foreign assistance would be of major importance. In the period after 1990, GDP growth is assumed to come down to 3.4 per cent per annum as prospects of rise in export prices of vanilla and cloves and increased flows of development assistance are very modest. Major reasons for this are the assumptions of a relatively strong growth in agriculture (especially food for local consumption), limitations in finance for infrastructural projects and very limited scope for industrial development whereas it increases more rapidly in most other countries. Steel consumption in Comoros is projected to increase at about the same rate as GDP.

COMOROS TABLE 1, MAIN PROJECTION

A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 77 | 0.4 | 188 | 110 | 0.5 | 234 | 130 | 0.5 | 255 | 4.6 | 3.4 | 1.7 | 1.6 | 2.8 | 1.7 |

B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. CONSUMPTION | | GROWTH RATES PA. EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 550 | . | 550 | 0 | 1075 | 0 | 1075 | 1347 | 0 | 1347 | 8.7 | 4.6 | 2.8 | 1.9 |
| ANGLES SHP. H | 6734 | 45 | . | 45 | . | 99 | 0 | 99 | 125 | 0 | 125 | 10.4 | 4.8 | 2.8 | 2.3 |
| ANGLES SHP.,L | 6735 | 182 | 0 | 182 | . | 259 | 0 | 259 | 308 | 0 | 308 | 4.5 | 3.5 | 2.8 | 3.7 |
| PLATES, H.+ M | 6740 | 76 | 0 | 76 | . | 144 | 0 | 144 | 187 | 0 | 187 | 8.3 | 5.4 | 2.8 | 2.3 |
| PLATES, LIGHT | 6743 | 44 | 0 | 44 | 0 | 47 | 0 | 47 | 49 | 0 | 49 | 0.8 | 0.8 | 2.8 | 3.7 |
| TIN.& COAT.PL | 6749 | 1383 | 0 | 1383 | 0 | 1582 | 0 | 1582 | 1787 | 0 | 1787 | 1.7 | 2.5 | 2.8 | 3.7 |
| HOOP AND STRP | 6750 | 2 | 0 | 2 | . | 21 | 0 | 21 | 31 | 0 | 31 | 34.2 | 8.1 | 2.8 | 3.7 |
| RAILS+ MATER. | 6760 | 0 | 0 | 0 | . | 0 | 0 | 0 | 0 | 0 | 0 | . | . | 2.8 | 2.3 |
| WIRE | 6770 | 17 | 0 | 17 | . | 25 | 0 | 25 | 32 | 0 | 32 | 4.9 | 5.1 | 2.8 | 3.7 |
| TUBES | 6780 | 155 | 0 | 155 | . | 339 | 0 | 339 | 422 | 0 | 422 | 10.3 | 4.5 | 2.8 | 3.7 |
| TOTALS | | 2454 | 0 | 2454 | 0 | 3591 | 0 | 3591 | 4289 | 0 | 4289 | 4.9 | 3.6 | | |
| CRUDE EQUIVALENT | | 3288 | 0 | 3288 | 0 | 4797 | 0 | 4797 | 5724 | 0 | 5724 | 4.8 | 3.6 | | |
| BILLET EQUVIVALENT | | 2805 | 0 | 2805 | 0 | 4093 | 0 | 4093 | 4884 | 0 | 4884 | 4.8 | 3.6 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 3288 | 0 | 3288 | 0 | 4371 | 0 | 4371 | 5355 | 0 | 5355 | 3.6 | 4.1 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 5.7 | 1.7 | 3.9 |
| 1990 TO 1995 | 3.9 | 1.6 | 2.2 |

D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 3288 | 0 | 3288 | 0 | 3522 | 0 | 3522 | 3723 | 0 | 3723 | 0.9 | 1.1 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.0 | 1.7 | 0.2 |
| 1990 TO 1995 | 2.1 | 1.6 | 0.5 |

COMOROS TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 77 | 0.4 | 188 | 110 | 0.5 | 234 | 130 | 0.5 | 255 | 4.6 | 3.4 | 1.7 | 1.6 | 2.8 | 1.7 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| PRODUCT NAME | SITC | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | NET IMPORT | 1995 CONS | PROD | NET IMPORT | GROWTH RATES P.A. CONSUMPTION TO 1990 | 1990-1995 | EXPL.VARIABLE TO 1990 | 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BARS AND RODS | 6730 | 550 | . | 550 | 0 | 1350 | 0 | 1350 | 1898 | 0 | 1898 | 11.9 | 7.1 | 2.8 | 1.9 |
| ANGLES SHP. H | 6734 | 45 | . | 45 | . | 167 | 0 | 167 | 262 | 0 | 262 | 17.8 | 9.4 | 2.8 | 2.3 |
| ANGLES SHP.,L | 6735 | 182 | 0 | 182 | . | 370 | 0 | 370 | 530 | 0 | 530 | 9.3 | 7.5 | 2.8 | 3.7 |
| PLATES, H.+ M | 6740 | 76 | 0 | 76 | . | 211 | 0 | 211 | 322 | 0 | 322 | 13.6 | 8.8 | 2.8 | 2.3 |
| PLATES, LIGHT | 6743 | 44 | 0 | 44 | 0 | 245 | 0 | 245 | 445 | 0 | 445 | 23.9 | 12.7 | 2.8 | 3.7 |
| TIN.& COAT.PL | 6749 | 1383 | 0 | 1383 | 0 | 1750 | 0 | 1750 | 2123 | 0 | 2123 | 3.0 | 3.9 | 2.8 | 3.7 |
| HOOP AND STRP | 6750 | 2 | 0 | 2 | . | 40 | 0 | 40 | 68 | 0 | 68 | 45.4 | 11.2 | 2.8 | 3.7 |
| RAILS+ MATER. | 6760 | 0 | 0 | 0 | . | 27 | 0 | 27 | 54 | 0 | 54 | . | 14.9 | 2.8 | 2.3 |
| WIRE | 6770 | 17 | 0 | 17 | . | 83 | 0 | 83 | 148 | 0 | 148 | 21.9 | 12.3 | 2.8 | 3.7 |
| TUBES | 6780 | 155 | 0 | 155 | . | 384 | 0 | 384 | 511 | 0 | 511 | 12.0 | 5.9 | 2.8 | 3.7 |
| TOTALS | | 2454 | 0 | 2454 | 0 | 4626 | 0 | 4626 | 6359 | 0 | 6359 | 8.2 | 6.6 | | |
| CRUDE EQUIVALENT | | 3288 | 0 | 3288 | 0 | 6167 | 0 | 6167 | 8466 | 0 | 8466 | 8.2 | 6.5 | | |
| BILLET EQUVIVALENT | | 2805 | 0 | 2805 | 0 | 5262 | 0 | 5262 | 7224 | 0 | 7224 | 8.2 | 6.5 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD-1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNES | 3288 | 0 | 3288 | 0 | 5740 | 0 | 5740 | 8096 | 0 | 8096 | 7.2 | 7.1 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 5.7 | 1.7 | 3.9 |
| 1990 TO 1995 | 3.9 | 1.6 | 2.2 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD - 1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNE | 3288 | 0 | 3288 | 0 | 4890 | 0 | 4890 | 6462 | 0 | 6462 | 5.1 | 5.7 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.0 | 1.7 | 0.2 |
| 1990 TO 1995 | 2.1 | 1.6 | 0.5 |

COMOROS TABLE 3

## A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | 64 | | | 21 | | | | | | | | | 21 |
| BARS AND RODS | 6732 | 754 | 356 | 476 | 529 | | | | | | | | | 529 |
| ANGLES SHP.HM | 6734 | 70 | 40 | 25 | 45 | | | | | | | | | 45 |
| ANGLES SHP..L | 6735 | 276 | 158 | 112 | 182 | | | | | | | | | 182 |
| PLATES. HEAVY | 6741 | 28 | 45 | | 24 | | | | | | | | | 24 |
| PLATES. MED. | 6742 | 118 | 11 | 26 | 52 | | | | | | | | | 52 |
| PLATES. LIGHT | 6743 | 100 | 16 | 15 | 44 | | | | | | | | | 44 |
| TINPLATE | 6747 | 7 | 10 | 13 | 10 | | | | | | | | | 10 |
| OTHER COAT.P | 6748 | 1959 | 570 | 1591 | 1373 | | | | | | | | | 1373 |
| HOOP AND STRP | 6750 | | 1 | 4 | 2 | | | | | | | | | 2 |
| RAILS | 6761 | | | | | | | | | | | | | 0 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | 2 | 7 | 41 | 17 | | | | | | | | | 17 |
| SEAMLESS TUBE | 6782 | 125 | 2 | 83 | 70 | | | | | | | | | 70 |
| WELDED TUBES | 6783 | 113 | 108 | 35 | 85 | | | | | | | | | 85 |
| TOTALS | | 3616 | 1324 | 2421 | 2454 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2454 |

## B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 3616 | 1324 | 2421 | 2454 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 3616 | 1324 | 2421 | 2454 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 8715 | 4409 | 7968 | 7031 |
| SUPPLIED FROM; | | | | |
| 1 NET IMPORTS | 8715 | 4409 | 7968 | 7031 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 0 | 0 | 0 | 0 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 4847 | 1766 | 3249 | 3287 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 3868 | 2643 | 4719 | 3744 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 0 | 0 | 0 | 0 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 0 | 0 | 0 | 0 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

COMOROS TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| GDP, AND POPULATION | | | | | | | | | |
| POPULATION (MILL) | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| GDP PER CAPITA US$ (1975) | 198.0 | 193.3 | 199.8 | . | . | . | . | . | . |
| GDP MILL US$ (1975) | 73.3 | 77.3 | 79.7 | 120.0 | 110.0 | 90.0 | 145.0 | 130.0 | 100.0 |
| GROSS CAP FORM MILL US$ (1975) | 18.9 | 19.2 | 21.4 | 32.0 | 25.0 | 21.0 | 40.0 | 28.0 | 22.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 7.3 | 7.9 | 8.5 | 14.0 | 10.0 | 9.0 | 19.0 | 11.0 | 9.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 3.9 | 4.1 | 4.3 | 6.0 | 5.0 | 4.5 | 8.0 | 6.0 | 5.0 |
| BALANCE OF PAYMENTS MILLION CFR. | | | | | | | | | |
| EXPORTS | 0.0 | 643.4 | 0.0 | 1440.0 | 1380.0 | 1120.0 | 2510.0 | 2300.0 | 1800.0 |
| OTHER CURRENT ITEMS | 0.0 | -853.3 | 0.0 | -1600.0 | -1600.0 | -1600.0 | -2100.0 | -2100.0 | -2100.0 |
| ODA, NET INFLOWS | 0.0 | 1307.6 | 0.0 | 2500.0 | 2250.0 | 2250.0 | 3300.0 | 3000.0 | 3000.0 |
| LONG TERM CAPITAL,NET | 0.0 | 17.3 | 0.0 | 50.0 | 40.0 | 40.0 | 100.0 | 70.0 | 70.0 |
| RESERVES ERRORS AND OMISSIONS | 0.0 | 364.5 | 0.0 | -300.0 | -300.0 | -300.0 | -400.0 | -400.0 | -400.0 |
| IMPORTS, IMPORT CAPACITY | 0.0 | 750.7 | 0.0 | 2090.0 | 1770.0 | 1510.0 | 3410.0 | 2870.0 | 2370.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 1.8 | 1.8 | 1.8 | 1.8 |
| GDP, CONSTANT US$ (1975) | 5.5 | 3.1 | 4.7 | 3.4 |

TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

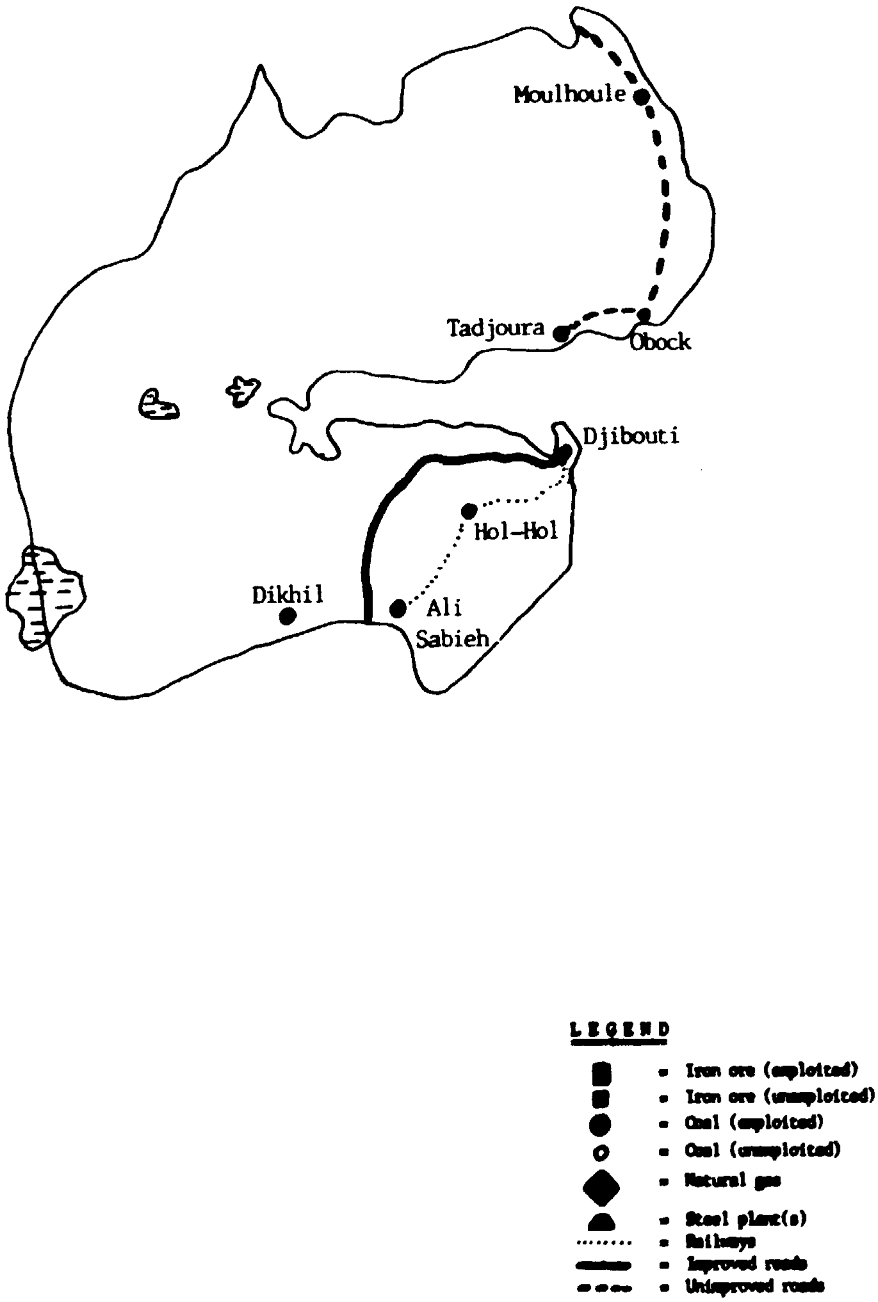
COUNTRY COMOROS

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
| SITC | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| MET. STRUCTURES | 851 | 929 | 529 | 838 | 950 | 1837 | 777 | 1201 | 35 |
| TANKS, VESSELS, ETC | 121 | 37 | 39 | 21 | 84 | 81 | 81 | 46 | 1 |
| WIRE PRODUCTS | 205 | 177 | 53 | 56 | 42 | 34 | 100 | 89 | 3 |
| NAILS, NUTS,BOLTS | 155 | 104 | 142 | 109 | 153 | 144 | 150 | 119 | 3 |
| HAND TOOLS | 287 | 67 | 218 | 67 | 359 | 112 | 288 | 82 | 2 |
| CUTLERY | 74 | 10 | 84 | 15 | 45 | 7 | 68 | 11 | 0 |
| DOM. UTENSILS | 111 | 24 | 143 | 36 | 108 | 25 | 121 | 28 | 1 |
| AGR.MACH.,TRACTORS | 432 | 131 | 158 | 39 | 155 | 35 | 248 | 68 | 2 |
| DOM. EL. EQUIPMENT | 288 | 65 | 228 | 51 | 143 | 35 | 220 | 50 | 1 |
| RAIL. LOCOS ETC. | 2154 | 0 | 21 | 0 | 16 | 6 | 730 | 2 | 0 |
| ROAD VEHICLES | 6578 | 1715 | 3468 | 860 | 5083 | 1527 | 5043 | 1367 | 40 |
| BICYCLES ETC. | 130 | 41 | 61 | 34 | 121 | 88 | 104 | 54 | 2 |
| HEATING, SANITARY | 316 | 134 | 219 | 108 | 330 | 143 | 288 | 128 | 4 |
| FURNITURE | 465 | 171 | 577 | 274 | 791 | 166 | 611 | 204 | 6 |
| TOTAL | 12167 | 3605 | 5940 | 2508 | 8380 | 4240 | 8829 | 3451 | 100 |

# DJIBOUTI

Page

## DJIBOUTI


Moulhoule
Tadjoura
Obock
Djibouti
Hol-Hol
Dikhil
Ali
Sabieh
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

DJIBOUTI

Djibouti is a small economy and "jumps" in economic series caused by individual projects make forecasting difficult. The GDP growth projections are only slightly above the projected growth of population. The levels of increase of overall steel consumption does not deviate much from what is suggested by growth in population and GDP. The apparent dramatic increases in the consumption of plate and rails and other rail line material is mainly a results of the relatively low consumption in the base period 1981-83 and an adjustment, particulary in the period up to 1990 to levels closer to what is normal for the PTA/SADCC group of countries.

DJIBOUTI TABLE 1. MAIN PROJECTION

A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 162 | 0.3 | 523 | 200 | 0.4 | 526 | 230 | 0.4 | 535 | 2.7 | 2.8 | 2.6 | 2.5 | 0.1 | 0.3 |

B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. CONSUMPTION | | GROWTH RATES PA. EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 2163 | . | 2163 | 0 | 2487 | 0 | 2487 | 2766 | 0 | 2766 | 1.8 | 2.1 | 2.8 | 1.9 |
| ANGLES SHP. H | 6734 | 151 | . | 151 | 0 | 178 | 0 | 178 | 200 | 0 | 200 | 2.1 | 2.4 | 2.8 | 2.1 |
| ANGLES SHP..L | 6735 | 25 | 0 | 25 | . | 53 | 0 | 53 | 139 | 0 | 139 | 9.8 | 21.3 | 1.3 | 2.8 |
| PLATES, H.+ M | 6740 | 48 | 0 | 48 | 0 | 260 | 0 | 260 | 359 | 0 | 359 | 23.5 | 6.7 | 2.8 | 2.1 |
| PLATES, LIGHT | 6743 | 18 | 0 | 18 | 0 | 111 | 0 | 111 | 264 | 0 | 264 | 25.5 | 18.9 | 1.3 | 2.8 |
| TIN.& COAT.PL | 6749 | 1291 | 0 | 1291 | 0 | 1349 | 0 | 1349 | 1461 | 0 | 1461 | 0.6 | 1.6 | 1.3 | 2.8 |
| HOOP AND STRP | 6750 | 10 | 0 | 10 | 0 | 17 | 0 | 17 | 25 | 0 | 25 | 6.9 | 8.0 | 1.3 | 2.8 |
| RAILS+ MATER. | 6760 | 7 | 0 | 7 | 0 | 18 | 0 | 18 | 31 | 0 | 31 | 12.5 | 11.5 | 2.8 | 2.1 |
| WIRE | 6770 | 37 | 0 | 37 | 0 | 71 | 0 | 71 | 114 | 0 | 114 | 8.5 | 9.9 | 1.3 | 2.8 |
| TUBES | 6780 | 239 | 0 | 239 | 0 | 288 | 0 | 288 | 322 | 0 | 322 | 2.4 | 2.3 | 1.3 | 2.8 |
| TOTALS | | 3989 | 0 | 3989 | 0 | 4830 | 0 | 4830 | 5680 | 0 | 5680 | 2.4 | 3.3 | | |
| CRUDE EQUIVALENT | | 5241 | 0 | 5241 | 0 | 6369 | 0 | 6369 | 7495 | 0 | 7495 | 2.5 | 3.3 | | |
| BILLET EQUVIVALENT | | 4472 | 0 | 4472 | 0 | 5434 | 0 | 5434 | 6395 | 0 | 6395 | 2.5 | 3.3 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 5241 | 0 | 5241 | 0 | 7782 | 0 | 7782 | 9593 | 0 | 9593 | 5.1 | 4.3 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 3.9 | 2.6 | 1.3 |
| 1990 TO 1995 | 4.2 | 2.5 | 1.6 |

D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 5241 | 0 | 5241 | 0 | 5997 | 0 | 5997 | 6550 | 0 | 6550 | 1.7 | 1.8 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.3 | 2.6 | -1.2 |
| 1990 TO 1995 | 1.1 | 2.5 | -1.4 |

DJIBOUTI TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 162 | 0.3 | 523 | 200 | 0.4 | 526 | 230 | 0.4 | 535 | 2.7 | 2.8 | 2.6 | 2.5 | 0.1 | 0.3 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 2163 | . | 2163 | 0 | 3358 | 0 | 3358 | 4509 | 0 | 4509 | 5.7 | 6.1 | 2.8 | 1.9 |
| ANGLES SHP. H | 6734 | 151 | . | 151 | 0 | 394 | 0 | 394 | 632 | 0 | 632 | 12.7 | 9.9 | 2.8 | 2.1 |
| ANGLES SHP.,L | 6735 | 25 | 0 | 25 | . | 403 | 0 | 403 | 840 | 0 | 840 | 41.6 | 15.8 | 1.3 | 2.8 |
| PLATES, H.+ M | 6740 | 48 | 0 | 48 | 0 | 473 | 0 | 473 | 785 | 0 | 785 | 33.1 | 10.7 | 2.8 | 2.1 |
| PLATES, LIGHT | 6743 | 18 | 0 | 18 | 0 | 736 | 0 | 736 | 1515 | 0 | 1515 | 59.0 | 15.5 | 1.3 | 2.8 |
| TIN.& COAT.PL | 6749 | 1291 | 0 | 1291 | 0 | 1880 | 0 | 1880 | 2522 | 0 | 2522 | 4.8 | 6.1 | 1.3 | 2.8 |
| HOOP AND STRP | 6750 | 10 | 0 | 10 | 0 | 76 | 0 | 76 | 143 | 0 | 143 | 28.9 | 13.5 | 1.3 | 2.8 |
| RAILS+ MATER. | 6760 | 7 | 0 | 7 | 0 | 104 | 0 | 104 | 201 | 0 | 201 | 40.1 | 14.1 | 2.8 | 2.1 |
| WIRE | 6770 | 37 | 0 | 37 | 0 | 254 | 0 | 254 | 481 | 0 | 481 | 27.2 | 13.6 | 1.3 | 2.8 |
| TUBES | 6780 | 239 | 0 | 239 | 0 | 428 | 0 | 428 | 604 | 0 | 604 | 7.6 | 7.1 | 1.3 | 2.8 |
| TOTALS | | 3989 | 0 | 3989 | 0 | 8105 | 0 | 8105 | 12231 | 0 | 12231 | 9.3 | 8.6 | | |
| CRUDE EQUIVALENT | | 5241 | 0 | 5241 | 0 | 10701 | 0 | 10701 | 16162 | 0 | 16162 | 9.3 | 8.6 | | |
| BILLET EQUVIVALENT | | 4472 | 0 | 4472 | 0 | 9130 | 0 | 9130 | 13790 | 0 | 13790 | 9.3 | 8.6 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 5241 | 0 | 5241 | 0 | 12116 | 0 | 12116 | 18258 | 0 | 18258 | 11.0 | 8.5 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 3.9 | 2.6 | 1.3 |
| 1990 TO 1995 | 4.2 | 2.5 | 1.6 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 5241 | 0 | 5241 | 0 | 10330 | 0 | 10330 | 15217 | 0 | 15217 | 8.9 | 8.1 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.3 | 2.6 | -1.2 |
| 1990 TO 1995 | 1.1 | 2.5 | -1.4 |

DJIBOUTI TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | | 122 | | 41 | | | | | | | | | 41 |
| BARS AND RODS | 6732 | 1500 | 2267 | 2600 | 2122 | | | | | | | | | 2122 |
| ANGLES SHP.HM | 6734 | 127 | 150 | 176 | 151 | | | | | | | | | 151 |
| ANGLES SHP..L | 6735 | 48 | 11 | 15 | 25 | | | | | | | | | 25 |
| PLATES, HEAVY | 6741 | 42 | 48 | 34 | 41 | | | | | | | | | 41 |
| PLATES, MED. | 6742 | 4 | 13 | 4 | 7 | | | | | | | | | 7 |
| PLATES, LIGHT | 6743 | 5 | 11 | 38 | 18 | | | | | | | | | 18 |
| TINPLATE | 6747 | 42 | 1235 | 959 | 745 | | | | | | | | | 745 |
| OTHER COAT.P | 6748 | 30 | 905 | 702 | 546 | | | | | | | | | 546 |
| HOOP AND STRP | 6750 | 1 | 23 | 7 | 10 | | | | | | | | | 10 |
| RAILS | 6761 | 7 | 7 | 7 | 7 | | | | | | | | | 7 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | 61 | 36 | 15 | 37 | | | | | | | | | 37 |
| SEAMLESS TUBE | 6782 | 269 | 30 | 40 | 113 | | | | | | | | | 113 |
| WELDED TUBES | 6783 | 128 | 96 | 153 | 126 | | | | | | | | | 126 |
| TOTALS | | 2264 | 4954 | 4750 | 3989 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3989 |

B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 2264 | 4954 | 4750 | 3989 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 2264 | 4954 | 4750 | 3989 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 12007 | 17161 | 19565 | 16244 |
| SUPPLIED FROM; | | | | |
| 1 NET IMPORTS | 12007 | 17161 | 19565 | 16244 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 0 | 0 | 0 | 0 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 2973 | 6521 | 6231 | 5242 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 9034 | 10640 | 13333 | 11002 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 0 | 0 | 0 | 0 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 0 | 0 | 0 | 0 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

DJIBOUTI TABLE 4

## MACRO DATA AND PROJECTIONS

| YE | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| **GI AND POPULATION** | | | | | | | | | |
| .PULATION (MILL) | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| JP PER CAPITA US$ (1975) | 530.7 | 538.7 | 554.7 | 550.0 | 500.0 | 450.0 | 540.0 | 460.0 | 380.0 |
| GDP MILL US$ (1975) | 159.2 | 161.6 | 166.4 | 220.0 | 200.0 | 180.0 | 270.0 | 230.0 | 190.0 |
| GROSS CAP FORM MILL US$ (1975) | 28.7 | 39.2 | 39.5 | 50.0 | 45.0 | 40.0 | 60.0 | 50.0 | 42.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 7.7 | 8.0 | 8.3 | 11.0 | 10.0 | 9.0 | 13.0 | 11.0 | 10.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 18.1 | 17.8 | 18.0 | 25.0 | 20.0 | 19.0 | 30.0 | 23.0 | 20.0 |
| **BALANCE OF PAYMENTS BILLION DF** | | | | | | | | | |
| EXPORTS | 20.8 | 18.0 | 0.0 | 45.0 | 40.0 | 30.0 | 80.0 | 65.0 | 50.0 |
| OTHER CURRENT ITEMS | -1.4 | -5.1 | 0.0 | 7.0 | 5.0 | 5.0 | 12.0 | 9.0 | 9.0 |
| ODA, NET INFLOWS | 18.0 | 16.1 | 0.0 | 33.0 | 28.0 | 28.0 | 46.0 | 37.0 | 37.0 |
| LONG TERM CAPITAL,NET | 1.9 | 6.2 | 0.0 | 15.0 | 12.0 | 12.0 | 22.0 | 19.0 | 19.0 |
| RESERVES ERRORS AND OMISSIONS | -1.5 | 6.1 | 0.0 | | | | | | |
| IMPORTS, IMPORT CAPACITY | 37.8 | 41.4 | 0.0 | 100.0 | 85.0 | 75.0 | 160.0 | 130.0 | 110.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 2.6 | 2.6 | 2.6 | 2.5 |
| GDP. CONSTANT US$ (1975) | 1.2 | 3.0 | 2.5 | 2.5 |

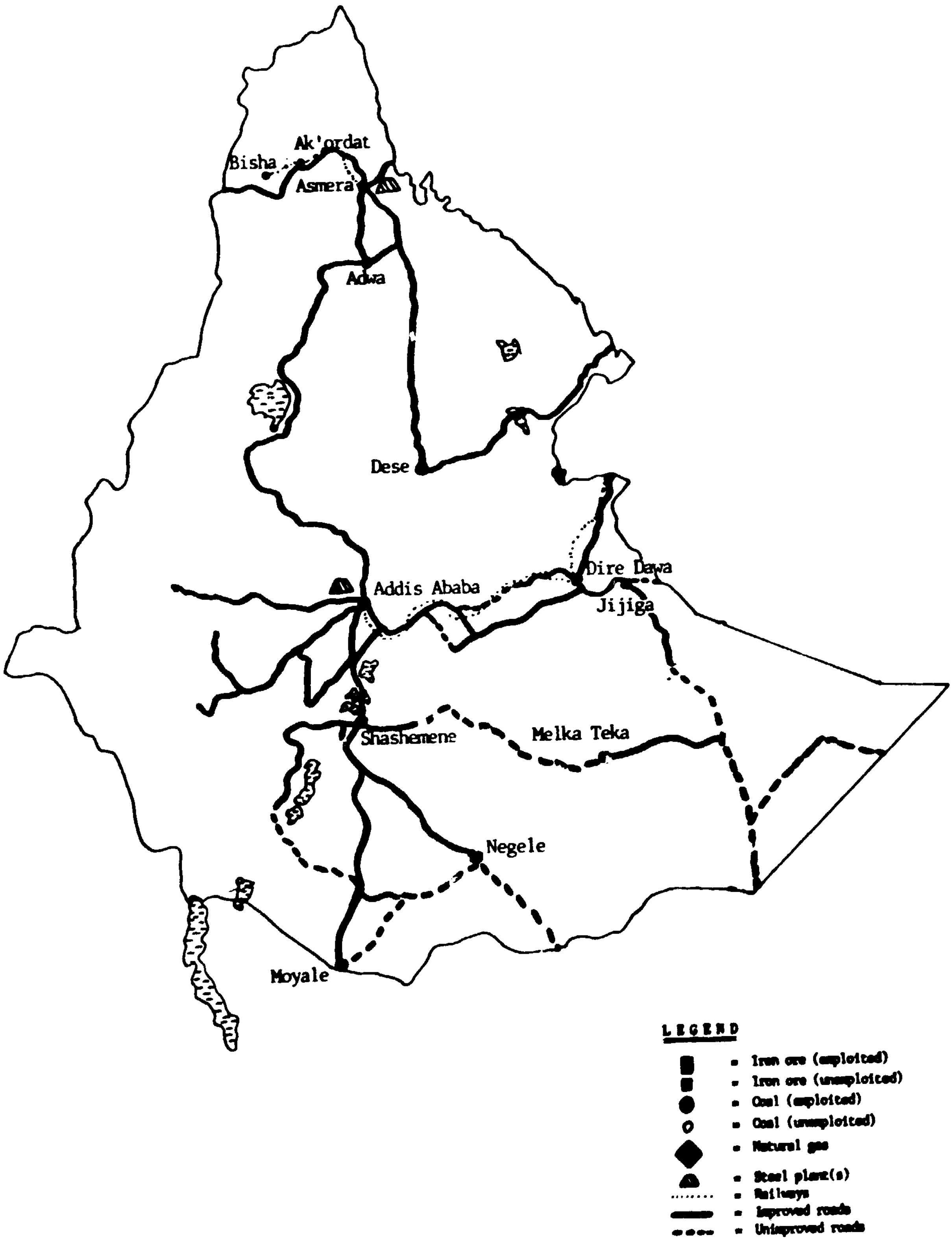
TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY DJIBOUTI

| | EAR 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
|---|---|---|---|---|---|---|---|---|---|
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| SITC | | | | | | | | | |
| MET. STRUCTURES | 2136 | 1725 | 3136 | 2486 | 7419 | 4875 | 4230 | 3029 | 28 |
| TANKS, VESSELS, ETC | 372 | 195 | 296 | 194 | 252 | 216 | 307 | 202 | 2 |
| WIRE PRODUCTS | 414 | 318 | 253 | 301 | 214 | 284 | 294 | 301 | 3 |
| NAILS, NUTS, BOLTS | 164 | 82 | 125 | 145 | 204 | 343 | 164 | 190 | 2 |
| HAND TOOLS | 593 | 164 | 600 | 159 | 1035 | 312 | 743 | 212 | 2 |
| CUTLERY | 157 | 14 | 115 | 5 | 197 | 8 | 156 | 9 | 0 |
| DOM. UTENSILS | 676 | 168 | 449 | 128 | 468 | 145 | 531 | 147 | 1 |
| AGR.MACH., TRACTORS | 184 | 46 | 602 | 203 | 2261 | 237 | 1016 | 162 | 1 |
| DOM. EL. EQUIPMENT | 1051 | 218 | 1097 | 235 | 857 | 243 | 1002 | 232 | 2 |
| RAIL. LOCOS ETC. | 70 | 41 | 64 | 7 | 221 | 96 | 118 | 48 | 0 |
| ROAD VEHICLES | 19791 | 3854 | 21018 | 4338 | 17569 | 4175 | 19459 | 4122 | 38 |
| BICYCLES ETC. | 512 | 148 | 433 | 178 | 470 | 198 | 472 | 175 | 2 |
| HEATING, SANITARY | 1330 | 503 | 809 | 508 | 786 | 354 | 975 | 455 | 4 |
| FURNITURE | 3347 | 1505 | 2946 | 1669 | 2880 | 1734 | 3058 | 1636 | 15 |
| TOTAL | 30797 | 8981 | 31943 | 10556 | 34833 | 13220 | 32524 | 10919 | 100 |

# ETHIOPIA

## ETHIOPIA


Ak'ordat
Bisha
Asmera
Adwa
Dese
Addis Ababa
Dire Dawa
Jijiga
Shashemene
Melka Teka
Negele
Moyale
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

ETHIOPIA

The three alternative macro economic projections for Ethiopia cover a range of possibilities, from those indicated by Government plans to the less optimistic assessment of the World Bank. The base case up to 1990 is near to the more optimistic scenario supplied by the World Bank for the period 1984-89 (Country Economic Memorandum of May 1984). This is based on a less favourable coffee price than the present price levels seem to indicate. For the period 1990-1995 a somewhat more rapid growth is projected.

The overall average growth rates assumed for the manufacturing sector imply a development pattern where those industries which are main consumers of iron and steel gradually increase thin share of GDP. This in addition to the fact that consumption of various products like wire, rails and plate were very depressed in the base period, makes for a development where steel consumption increases more rapidly than GDP and becomes gradually diversified. Whereas bars, rods tin plate and coated plate constituted arround 70 per cent of consumption in 1981-83 the same ites stood for around 60 per cent in 1995.

The high growth scenario indicates steel consumption growth just below 10 per cent annually from 1981-83 to 1995. In case of the low growth scenario it appears that even if GDP per capita declines, structural changes will hold steel consumption growth up to a level not far below that of the base case.

ETHIOPIA TABLE 1, MAIN PROJECTION

A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | PROJECTION 1990 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | PROJECTION 1995 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GROWTH RATES PCT. P.A. GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3779 | 33.3 | 113 | 5080 | 43.2 | 118 | 6200 | 51.2 | 121 | 3.8 | 4.1 | 3.3 | 3.5 | 0.4 | 0.6 |

B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| PRODUCT NAME | SITC | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | NET IMPORT | 1995 CONS | PROD | NET IMPORT | GROWTH RATES PA. CONSUMPTION TO 1990 | CONSUMPTION 1990-1995 | EXPL.VARIABLE TO 1990 | EXPL.VARIABLE 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BARS AND RODS | 6730 | 20710 | 14757 | 5954 | 0 | 31847 | 19000 | 12847 | 41135 | 40000 | 1135 | 5.5 | 5.3 | 4.3 | 3.7 |
| ANGLES SHP. H | 6734 | 547 | . | 547 | . | 1107 | 0 | 1107 | 1527 | 0 | 1527 | 9.2 | 6.6 | 3.5 | 3.1 |
| ANGLES SHP.,L | 6735 | 3521 | 1349 | 2172 | . | 8066 | 1500 | 6566 | 11715 | 10000 | 1715 | 10.9 | 7.7 | 4.4 | 4.4 |
| PLATES, H.+ M | 6740 | 1784 | 0 | 1784 | 0 | 5283 | 0 | 5283 | 7488 | 0 | 7488 | 14.5 | 7.2 | 3.5 | 3.1 |
| PLATES, LIGHT | 6743 | 3567 | 0 | 3567 | . | 7650 | 0 | 7650 | 12500 | 0 | 12500 | 10.0 | 10.3 | 4.4 | 4.4 |
| TIN.& COAT.PL | 6749 | 17722 | 0 | 17722 | . | 27424 | 0 | 27424 | 35261 | 0 | 35261 | 5.6 | 5.2 | 4.4 | 4.4 |
| HOOP AND STRP | 6750 | 1243 | 0 | 1243 | . | 1483 | 0 | 1483 | 1688 | 0 | 1688 | 2.2 | 2.6 | 4.4 | 4.4 |
| RAILS+ MATER. | 6760 | 49 | 0 | 49 | . | 566 | 0 | 566 | 1041 | 0 | 1041 | 35.8 | 13.0 | 3.5 | 3.1 |
| WIRE | 6770 | 1034 | 282 | 752 | . | 4461 | 500 | 3961 | 7260 | 4000 | 3260 | 20.1 | 10.2 | 4.4 | 4.4 |
| TUBES | 6780 | 3241 | 0 | 3241 | . | 3500 | 0 | 3500 | 3590 | 0 | 3590 | 1.0 | 0.5 | 4.4 | 4.4 |
| TOTALS | | 53418 | 16388 | 37030 | 0 | 91387 | 21000 | 70387 | 123205 | 54000 | 69205 | 6.9 | 6.2 | | |
| CRUDE EQUIVALENT | | 70676 | 20843 | 49835 | 0 | 120890 | 26715 | 94175 | 162933 | 68826 | 94107 | 6.9 | 6.2 | | |
| BILLET EQUVIVALENT | | 60304 | 17784 | 42521 | 0 | 103148 | 22794 | 80354 | 139021 | 58725 | 80296 | 6.9 | 6.2 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD-1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNES | 70676 | 20843 | 49835 | 0 | 158275 | 26715 | 131560 | 234677 | 68826 | 165851 | 10.6 | 8.2 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 5.5 | 3.3 | 2.1 |
| 1990 TO 1995 | 6.0 | 3.5 | 2.4 |

D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD - 1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUVIV. TONNE | 70676 | 20843 | 49835 | 0 | 111156 | 26715 | 84441 | 140307 | 68826 | 71481 | 5.8 | 4.8 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.5 | 3.3 | -0.8 |
| 1990 TO 1995 | 2.9 | 3.5 | -0.6 |

ETHIOPIA TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 3779 | 33.3 | 113 | 5080 | 43.2 | 118 | 6200 | 51.2 | 121 | 3.8 | 4.1 | 3.3 | 3.5 | 0.4 | 0.6 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. CONSUMPTION | | EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 20710 | 14757 | 5954 | 0 | 36085 | 19000 | 17085 | 49610 | 40000 | 9610 | 7.2 | 6.6 | 4.3 | 3.7 |
| ANGLES SHP. H | 6734 | 547 | . | 547 | . | 2158 | 0 | 2158 | 3630 | 0 | 3630 | 18.7 | 11.0 | 3.5 | 3.1 |
| ANGLES SHP.,L | 6735 | 3521 | 1349 | 2172 | . | 9771 | 1500 | 8271 | 15124 | 10000 | 5124 | 13.6 | 9.1 | 4.4 | 4.4 |
| PLATES, H.+ M | 6740 | 1784 | 0 | 1784 | 0 | 6319 | 0 | 6319 | 9559 | 0 | 9559 | 17.1 | 8.6 | 3.5 | 3.1 |
| PLATES, LIGHT | 6743 | 3567 | 0 | 3567 | . | 10693 | 0 | 10693 | 18586 | 0 | 18586 | 14.7 | 11.7 | 4.4 | 4.4 |
| TIN.& COAT.PL | 6749 | 17722 | 0 | 17722 | . | 30004 | 0 | 30004 | 40423 | 0 | 40423 | 6.8 | 6.1 | 4.4 | 4.4 |
| HOOP AND STRP | 6750 | 1243 | 0 | 1243 | . | 1770 | 0 | 1770 | 2261 | 0 | 2261 | 4.5 | 5.0 | 4.4 | 4.4 |
| RAILS+ MATER. | 6760 | 49 | 0 | 49 | . | 981 | 0 | 981 | 1870 | 0 | 1370 | 45.4 | 13.8 | 3.5 | 3.1 |
| WIRE | 6770 | 1034 | 282 | 752 | . | 5353 | 500 | 4853 | 9044 | 4000 | 5044 | 22.8 | 11.1 | 4.4 | 4.4 |
| TUBES | 6780 | 3241 | 0 | 3241 | . | 4185 | 0 | 4185 | 4960 | 0 | 4960 | 3.2 | 3.5 | 4.4 | 4.4 |
| TOTALS | | 53418 | 16388 | 37030 | 0 | 107318 | 21000 | 86318 | 155066 | 54000 | 101066 | 9.1 | 7.6 | | |
| CRUDE EQUIVALENT | | 70676 | 20843 | 49835 | 0 | 141967 | 26715 | 115252 | 205085 | 68826 | 136259 | 9.1 | 7.6 | | |
| BILLET EQUVIVALENT | | 60304 | 17784 | 42521 | 0 | 121132 | 22794 | 98338 | 174987 | 58725 | 116262 | 9.1 | 7.6 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA, | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 70676 | 20843 | 49835 | 0 | 179349 | 26715 | 152634 | 276831 | 68826 | 208005 | 12.3 | 9.1 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 5.5 | 3.3 | 2.1 |
| 1990 TO 1995 | 6.0 | 3.5 | 2.4 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA, | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 70676 | 20843 | 49835 | 0 | 132231 | 26715 | 105516 | 182458 | 68826 | 113632 | 8.1 | 6.7 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP CAPITA |
|---|---|---|---|
| AVERAGE 81 83 TO 1990 | 2.5 | 3.3 | 0.8 |
| 1990 TO 1995 | 2.9 | 3.5 | 0.6 |

ETHIOPIA TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | 4789 | 4745 | 7686 | 5740 | | | | | | | | | 5740 |
| BARS AND RODS | 6732 | 87 | 365 | 189 | 214 | 13700 | 14802 | 15768 | 14757 | | | | | 14970 |
| ANGLES SHP.HM | 6734 | 480 | 360 | 800 | 547 | | | | | | | | | 547 |
| ANGLES SHP..L | 6735 | 1897 | 1441 | 3179 | 2172 | 840 | 1307 | 1900 | 1349 | | | | | 3521 |
| PLATES, HEAVY | 6741 | 2160 | 840 | 2351 | 1784 | | | | | | | | | 1784 |
| PLATES, MED. | 6742 | | | | | | | | | | | | | 0 |
| PLATES, LIGHT | 6743 | 4319 | 1678 | 4703 | 3567 | | | | | | | | | 3567 |
| TINPLATE | 6747 | 3332 | 4745 | 13569 | 7215 | | | | | | | | | 7215 |
| OTHER COAT.P | 6748 | 3538 | 10150 | 17833 | 10507 | | | | | | | | | 10507 |
| HOOP AND STRP | 6750 | 661 | 306 | 2761 | 1243 | | | | | | | | | 1243 |
| RAILS | 6761 | 2 | 4 | 141 | 49 | | | | | | | | | 49 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | 704 | 874 | 678 | 752 | 160 | 285 | 402 | 282 | | | | | 1034 |
| SEAMLESS TUBE | 6782 | 1849 | 3508 | 4366 | 3241 | | | | | | | | | 3241 |
| WELDED TUBES | 6783 | | | | | | | | | | | | | 0 |
| TOTALS | | 23818 | 29016 | 58256 | 37030 | 14540 | 16109 | 17668 | 16106 | 0 | 0 | 0 | 0 | 53136 |



B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 38358 | 45125 | 75924 | 53136 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 23818 | 29016 | 58256 | 37030 |
| LOCAL PRODUCTION | 14540 | 16109 | 17668 | 16106 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 102711 | 113169 | 174487 | 130122 |
| SUPPLIED FROM; | | | | |
| 1 NET IMPORTS | 91817 | 109649 | 159923 | 120463 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 824 | 1206 | 1300 | 1110 |
| NET IMPORTS OF BILLETS ETC | 5628 | 14490 | 5213 | 8444 |
| NET IMPORTS OF ROLLED PRODUCTS | 31953 | 39190 | 78358 | 49833 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 53413 | 54762 | 75053 | 61076 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 10893 | 3520 | 14564 | 9659 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 5000 | 5000 | 5000 | 5000 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

ETHIOPIA TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| **GDP, AND POPULATION** | | | | | | | | | |
| POPULATION (MILL) | 32.3 | 33.3 | 34.3 | 43.2 | 43.2 | 43.2 | 51.2 | 51.2 | 51.2 |
| GDP PER CAPITA US$ (1975) | 114.0 | 113.1 | 112.6 | 134.3 | 117.5 | 106.5 | 151.4 | 121.1 | 103.5 |
| GDP MILL US$ (1975) | 3706.4 | 3767.0 | 3863.1 | 5800.0 | 5080.0 | 4600.0 | 7750.0 | 6200.0 | 5300.0 |
| GROSS CAP FORM MILL US$ (1975) | 522.6 | 548.6 | 596.1 | 840.0 | 730.0 | 640.0 | 1000.0 | 850.0 | 670.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 195.0 | 216.7 | 231.1 | 325.0 | 300.0 | 260.0 | 420.0 | 360.0 | 290.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 398.1 | 421.9 | 436.9 | 660.0 | 590.0 | 540.0 | 880.0 | 730.0 | 630.0 |
| **BALANCE OF PAYMENTS MILLION BIRR** | | | | | | | | | |
| EXPORTS | 852.7 | 795.4 | 810.5 | 2450.0 | 2100.0 | 1800.0 | 4980.0 | 3980.0 | 2980.0 |
| OTHER CURRENT ITEMS | 171.2 | 167.2 | 285.6 | 500.0 | 500.0 | 500.0 | 670.0 | 670.0 | 670.0 |
| ODA, NET INFLOWS | 352.5 | 647.9 | 614.9 | 1200.0 | 1000.0 | 1000.0 | 1700.0 | 1300.0 | 1300.0 |
| LONG TERM CAPITAL,NET | . | . | . | 150.0 | 100.0 | 100.0 | 300.0 | 200.0 | 200.0 |
| RESERVES ERRORS AND OMISSIONS | 104.9 | 11.1 | 62.0 | 100.0 | 100.0 | 100.0 | 150.0 | 150.0 | 150.0 |
| IMPORTS, IMPORT CAPACITY | 1481.3 | 1621.7 | 1772.9 | 4400.0 | 3800.0 | 3500.0 | 7800.0 | 6300.0 | 5300.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 3.1 | 3.1 | 3.4 | 3.4 |
| GDP. CONSTANT US$ (1975) | 1.6 | 2.6 | 4.0 | 4.1 |

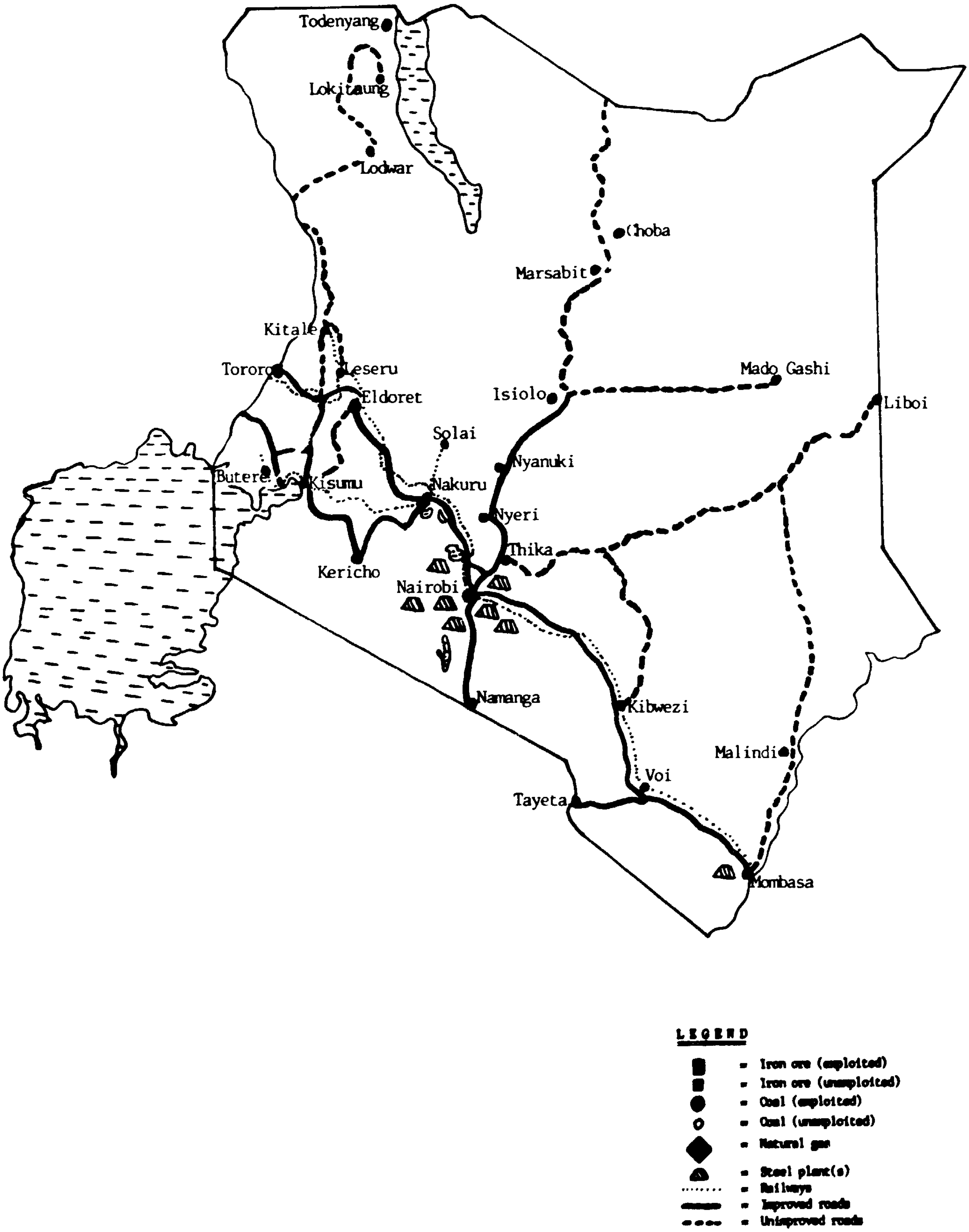
TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY ETHIOPIA

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| SITC | | | | | | | | | |
| MET. STRUCTURES | 2442 | 2803 | 11532 | 13683 | 12244 | 12887 | 8739 | 9791 | 18 |
| TANKS, VESSELS, ETC | 11912 | 10259 | 8904 | 6942 | 11803 | 11686 | 10873 | 9629 | 18 |
| WIRE PRODUCTS | 1477 | 1042 | 1471 | 863 | 3143 | 1087 | 2030 | 997 | 2 |
| NAILS, NUTS,BOLTS | 854 | 272 | 1104 | 353 | 1011 | 570 | 990 | 398 | 1 |
| HAND TOOLS | 3676 | 805 | 3330 | 638 | 3083 | 919 | 3363 | 787 | 1 |
| CUTLERY | 525 | 85 | 610 | 30 | 169 | 12 | 435 | 42 | 0 |
| DOM. UTENSILS | 2006 | 491 | 1499 | 293 | 1723 | 456 | 1743 | 413 | 1 |
| AGR.MACH.,TRACTORS | 12173 | 3090 | 6443 | 1787 | 10225 | 2403 | 9614 | 2427 | 5 |
| DOM. EL. EQUIPMENT | 1261 | 254 | 2710 | 257 | 610 | 120 | 1527 | 210 | 0 |
| RAIL. LOCOS ETC. | 419 | 53 | 1056 | 154 | 5110 | 881 | 2195 | 363 | 1 |
| ROAD VEHICLES | 97704 | 22411 | 84675 | 18838 | 102725 | 26931 | 95035 | 22727 | 43 |
| BICYCLES ETC. | 8817 | 4008 | 6600 | 2414 | 12650 | 6481 | 9356 | 4301 | 8 |
| HEATING, SANITARY | 1585 | 556 | 762 | 328 | 2212 | 1042 | 1520 | 642 | 1 |
| FURNITURE | 295 | 79 | 505 | 226 | 2726 | 817 | 1175 | 374 | 1 |
| TOTAL | 145146 | 46208 | 131201 | 46806 | 169434 | 66292 | 148594 | 53102 | 100 |

# KENYA

# KENYA


Todenyang
Lokitaung
Lodwar
Choba
Marsabit
Kitale
Tororo
Leseru
Eldoret
Mado Gashi
Isiolo
Liboi
Solai
Nyanuki
Butere
Kisumu
Nakuru
Nyeri
Thika
Kericho
Nairobi
Namanga
Kibwezi
Malindi
Voi
Tayeta
Mombasa
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

**KENYA**

Kenyas Development Plan for the period 1983-1988 aimed at a growth rate of GDP at 4.9 per cent per annum. Balance-of-payments constraints which has long troubled the economy and drought were major factors behind the bad outturn for 1984 when GDP increased less than 1 per cent . Despite the brighter outlook for the balance-of-payments in terms of coffee and oil prices, growth is assumed to average only 2.8 per cent per annum up to 1990. The Kenyan debt service ratio is still high and there is a need for structural changes in the economy before neew growth momentum can gather.

The projection for 1990-1995 is more optimistic, assuming less severe debt can balance-of-payments constraints. Investment is supposed to increase relative to GDP. Considerable restructuring efforts giving rise to a rapid growth of the manufacturing sector.

In spite of the need for restructuring, Kenya's economy is further developed than most other PTA countries. This means that the tendency for a decline in steel intensity[1/] long experienced in industrialized economies, should be relatively stronger than in other PTA countries.

This is clearly revealed in the steel demand projections for Kenya; during the period of moderate growth up to 1990 consumption increases by only about one-third of the increase in GDP. A small drop in the consumption of bars and rods up to 1990 is associated with mainly the assumed near stagnation of the building and construction industry in that period.

The more vigorous growth period forecasted from 1990 to 1995 counterbalances the tendency for steel intensity to decline, as the sectors of building and construction, manufacturing and gross capital formation grows at a faster rate than the rest of the economy.

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1/ Measured e.g. as weight of steel per US $ of value added

KENYA TABLE 1. MAIN PROJECTION

## A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 4522 | 17.9 | 252 | 5650 | 25.2 | 224 | 7350 | 31.3 | 235 | 2.8 | 5.4 | 4.3 | 4.4 | -1.5 | 0.9 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 53192 | 33227 | 22511 | 2546 | 45871 | 74000 | -28129 | 54747 | 90000 | -35253 | -1.8 | 3.6 | 0.1 | 5.9 |
| ANGLES SHP. H | 6734 | 2547 | . | 2547 | 0 | 2656 | 2500 | 156 | 3371 | 3500 | -129 | 0.5 | 4.9 | 1.7 | 5.6 |
| ANGLES SHP.,L | 6735 | 16763 | 17528 | 199 | 964 | 21528 | 40000 | -18472 | 29917 | 70000 | -40083 | 3.2 | 6.8 | 3.8 | 6.6 |
| PLATES, H.+ M | 6740 | 17073 | 0 | 17073 | 0 | 18000 | 0 | 18000 | 20411 | 0 | 20411 | 0.7 | 2.5 | 1.7 | 5.6 |
| PLATES, LIGHT | 6743 | 46742 | 0 | 46742 | 0 | 56718 | 0 | 56718 | 77586 | 0 | 77586 | 2.4 | 6.5 | 3.8 | 6.6 |
| TIN.& COAT.PL | 6749 | 37693 | 6000 | 33104 | 1411 | 45938 | 40000 | 5938 | 62796 | 60000 | 2796 | 2.5 | 6.5 | 3.8 | 6.6 |
| HOOP AND STRP | 6750 | 992 | 0 | 992 | 0 | 1218 | 0 | 1218 | 1565 | 0 | 1565 | 2.6 | 5.1 | 3.8 | 6.6 |
| RAILS+ MATER. | 6760 | 2532 | 0 | 2532 | 0 | 2656 | 2500 | 156 | 3211 | 3500 | -289 | 0.6 | 3.9 | 1.7 | 5.6 |
| WIRE | 6770 | 14717 | 7000 | 8557 | 840 | 16193 | 25000 | -8807 | 21495 | 30000 | -8505 | 1.2 | 5.8 | 3.8 | 6.6 |
| TUBES | 6780 | 2145 | 1000 | 1718 | 573 | 2200 | 2000 | 200 | 2500 | 2500 | 0 | 0.3 | 2.6 | 3.8 | 6.6 |
| TOTALS | | 194396 | 64755 | 135975 | 6334 | 212977 | 186000 | 26977 | 277599 | 259500 | 18099 | 1.1 | 5.4 | | |
| CRUDE EQUIVALENT | | 258216 | 83367 | 183178 | 8329 | 283650 | 241596 | 42054 | 369778 | 337143 | 32635 | 1.2 | 5.4 | | |
| BILLET EQUVIVALENT | | 220320 | 71132 | 156295 | 7107 | 242022 | 206140 | 35882 | 315510 | 287664 | 27845 | 1.2 | 5.4 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 258216 | 83367 | 183178 | 8329 | 318754 | 241596 | 77157 | 427671 | 337143 | 90528 | 2.7 | 6.1 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.3 | 4.3 | -0.0 |
| 1990 TO 1995 | 6.5 | 4.4 | 2.0 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 258216 | 83367 | 183178 | 8329 | 261609 | 241596 | 20012 | 331110 | 337143 | -6033 | 0.2 | 4.8 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.0 | 4.3 | -2.2 |
| 1990 TO 1995 | 5.0 | 4.4 | 0.5 |

KENYA TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 4522 | 17.9 | 252 | 5650 | 25.2 | 224 | 7350 | 31.3 | 235 | 2.8 | 5.4 | 4.3 | 4.4 | -1.5 | 0.9 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 53192 | 33227 | 22511 | 2546 | 49557 | 74000 | -24443 | 62119 | 90000 | -27881 | -0.9 | 4.6 | 0.1 | 5.9 |
| ANGLES SHP. H | 6734 | 2547 | . | 2547 | 0 | 3570 | 2500 | 1070 | 5200 | 3500 | 1700 | 4.3 | 7.8 | 1.7 | 5.6 |
| ANGLES SHP.,L | 6735 | 16763 | 17528 | 199 | 964 | 23011 | 40000 | -16989 | 32882 | 70000 | -37118 | 4.0 | 7.4 | 3.8 | 6.6 |
| PLATES, H.+ M | 6740 | 17073 | 0 | 17073 | 0 | 18901 | 0 | 18901 | 22212 | 0 | 22212 | 1.3 | 3.3 | 1.7 | 5.6 |
| PLATES, LIGHT | 6743 | 46742 | 0 | 46742 | 0 | 59364 | 0 | 59364 | 82879 | 0 | 82879 | 3.0 | 6.9 | 3.8 | 6.6 |
| TIN.& COAT.PL | 6749 | 37693 | 6000 | 33104 | 1411 | 48183 | 40000 | 8183 | 67285 | 60000 | 7285 | 3.1 | 6.9 | 3.8 | 6.6 |
| HOOP AND STRP | 6750 | 992 | 0 | 992 | 0 | 1467 | 0 | 1467 | 2064 | 0 | 2064 | 5.0 | 7.1 | 3.8 | 6.6 |
| RAILS+ MATER. | 6760 | 2532 | 0 | 2532 | 0 | 3016 | 2500 | 516 | 3931 | 3500 | 431 | 2.2 | 5.4 | 1.7 | 5.6 |
| WIRE | 6770 | 14717 | 7000 | 8557 | 840 | 16969 | 25000 | -8031 | 23047 | 30000 | -6953 | 1.8 | 6.3 | 3.8 | 6.6 |
| TUBES | 6780 | 2145 | 1000 | 1718 | 573 | 2796 | 2000 | 796 | 3692 | 2500 | 1192 | 3.4 | 5.7 | 3.8 | 6.6 |
| TOTALS | | 194396 | 64755 | 135975 | 6334 | 226834 | 186000 | 40834 | 305312 | 259500 | 45812 | 1.9 | 6.1 | | |
| CRUDE EQUIVALENT | | 258216 | 83367 | 183178 | 8329 | 301982 | 241596 | 60385 | 406441 | 337143 | 69297 | 2.0 | 6.1 | | |
| BILLET EQUVIVALENT | | 220320 | 71132 | 156295 | 7107 | 257663 | 206140 | 51523 | 346791 | 287664 | 59127 | 2.0 | 6.1 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 258216 | 83367 | 183178 | 8329 | 337086 | 241596 | 95490 | 464336 | 337143 | 127192 | 3.4 | 6.6 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.3 | 4.3 | -0.0 |
| 1990 TO 1995 | 6.5 | 4.4 | 2.0 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 258216 | 83367 | 183178 | 8329 | 279943 | 241596 | 38346 | 367774 | 337143 | 30631 | 1.0 | 5.6 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.0 | 4.3 | -2.2 |
| 1990 TO 1995 | 5.0 | 4.4 | 0.5 |

KENYA TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | 21934 | 21785 | 18890 | 20870 | | | | | | | | | 20870 |
| BARS AND RODS | 6732 | 1164 | 2504 | 1256 | 1641 | 31940 | 36495 | 31245 | 33227 | 2432 | 3092 | 2113 | 2546 | 32322 |
| ANGLES SHP.HM | 6734 | 5188 | 1973 | 479 | 2547 | | | | | | | | | 2547 |
| ANGLES SHP..L | 6735 | 322 | 274 | | 199 | 16730 | 19605 | 16250 | 17528 | 891 | 1481 | 520 | 964 | 16763 |
| PLATES, HEAVY | 6741 | 6839 | 9371 | 5414 | 7208 | | | | | | | | | 7208 |
| PLATES, MED. | 6742 | 12455 | 12435 | 4706 | 9865 | | | | | | | | | 9865 |
| PLATES, LIGHT | 6743 | 49523 | 55805 | 34899 | 46742 | | | | | | | | | 46742 |
| TINPLATE | 6747 | 47952 | 23300 | 18974 | 30075 | | | | | | | | | 30075 |
| OTHER COAT.P | 6748 | 3549 | 3069 | 2468 | 3029 | 6000 | 6000 | 6000 | 6000 | 2055 | 1329 | 850 | 1411 | 7617 |
| HOOP AND STRP | 6750 | 757 | 1075 | 1145 | 992 | | | | | | | | | 992 |
| RAILS | 6761 | 470 | 190 | 12 | 224 | | | | | | | | | 224 |
| OTHER RL TRCK | 6762 | 4 | 137 | 6783 | 2308 | | | | | | | | | 2308 |
| WIRE | 6770 | 15978 | 6815 | 2877 | 8557 | 7000 | 7000 | 7000 | 7000 | 508 | 1193 | 819 | 840 | 14717 |
| SEAMLESS TUBE | 6782 | 2145 | 351 | 1704 | 1400 | | | | | | | | | 1400 |
| WELDED TUBES | 6783 | 267 | 321 | 366 | 318 | 1000 | 1000 | 1000 | 1000 | 573 | 759 | 387 | 573 | 745 |
| TOTALS | | 168547 | 139405 | 99973 | 135975 | 54670 | 62100 | 53495 | 56755 | 6459 | 7854 | 4689 | 6334 | 186396 |

B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 216758 | 193651 | 148779 | 186396 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 162088 | 131551 | 95284 | 129641 |
| LOCAL PRODUCTION | 54670 | 62100 | 53495 | 56755 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 344954 | 296021 | 232872 | 291282 |
| SUPPLIED FROM; | | | | |
| 1 NET IMPORTS | 299683 | 248248 | 188553 | 245495 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 724 | 3595 | 1793 | 2037 |
| NET IMPORTS OF BILLETS ETC | 12065 | 15555 | 10546 | 12722 |
| NET IMPORTS OF ROLLED PRODUCTS | 218688 | 177781 | 128079 | 174849 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 68207 | 51318 | 48136 | 55887 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 45271 | 47773 | 44319 | 45787 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 25000 | 25000 | 25000 | 25000 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

KENYA TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| **GDP, AND POPULATION** | | | | | | | | | |
| POPULATION (MILL) | 17.2 | 17.9 | 18.7 | 25.2 | 25.2 | 25.2 | 31.3 | 31.3 | 31.3 |
| GDP PER CAPITA US$ (1975) | 253.0 | 252.1 | 250.7 | 251.9 | 224.2 | 210.3 | 277.9 | 234.8 | 215.7 |
| GDP MILL US$ (1975) | 4364.1 | 4512.5 | 4688.5 | 6350.0 | 5650.0 | 5300.0 | 8700.0 | 7350.0 | 6750.0 |
| GROSS CAP FORM MILL US$ (1975) | 799.4 | 638.8 | 655.6 | 1050.0 | 800.0 | 750.0 | 1450.0 | 1050.0 | 950.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 130.4 | 115.1 | 110.3 | 150.0 | 120.0 | 120.0 | 210.0 | 160.0 | 150.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 582.4 | 583.0 | 609.2 | 900.0 | 800.0 | 750.0 | 1250.0 | 1100.0 | 1000.0 |
| **BALANCE OF PAYMENTS MILLION KL** | | | | | | | | | |
| EXPORTS | 474.8 | 509.9 | 615.8 | 1450.0 | 1350.0 | 1200.0 | 2800.0 | 2350.0 | 2150.0 |
| OTHER CURRENT ITEMS | 125.9 | 128.7 | 144.1 | 250.0 | 200.0 | 150.0 | 350.0 | 300.0 | 250.0 |
| ODA, NET INFLOWS | 141.4 | 98.4 | 137.6 | 300.0 | 250.0 | 250.0 | 400.0 | 350.0 | 350.0 |
| LONG TERM CAPITAL,NET | 87.5 | 79.5 | 73.3 | 150.0 | 100.0 | 100.0 | 200.0 | 150.0 | 150.0 |
| RESERVES ERRORS AND OMISSIONS | 142.2 | 123.9 | -41.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| IMPORTS, IMPORT CAPACITY | 971.8 | 940.3 | 929.1 | 2150.0 | 1900.0 | 1700.0 | 3750.0 | 3150.0 | 2900.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 4.2 | 4.3 | 4.4 | 4.4 |
| GDP, CONSTANT US$ (1975) | 3.4 | 3.9 | 2.7 | 5.5 |

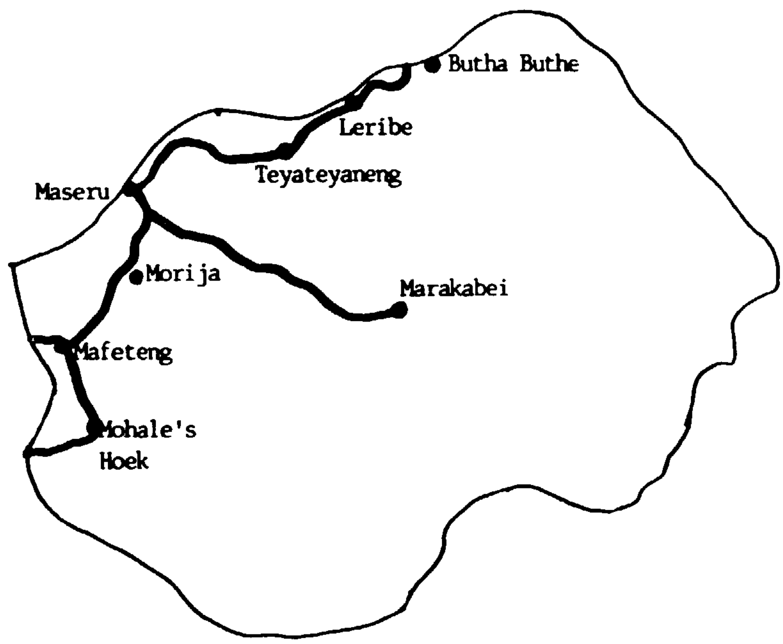
TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

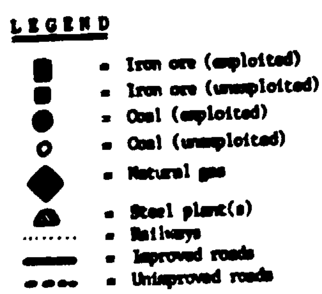
COUNTRY KENYA

| | YEAR | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1981 | | 1982 | | 1983 | | AVERAGE VALUE | AVERAGE TONNES | AVERAGE TONNES IN PCT OF TOTAL |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | | | |
| SITC | | | | | | | | | |
| MET. STRUCTURES | 11328 | 14910 | 7096 | 6501 | 3054 | 2481 | 7159 | 7964 | 17 |
| TANKS, VESSELS, ETC | 1513 | 301 | 852 | 551 | 1257 | 1055 | 1207 | 636 | 1 |
| WIRE PRODUCTS | 7988 | 4537 | 1427 | 1047 | 438 | 255 | 3284 | 1946 | 4 |
| NAILS, NUTS,BOLTS | 3634 | 1545 | 2727 | 1746 | 532 | 342 | 2298 | 1211 | 3 |
| HAND TOOLS | 9686 | 3645 | 7609 | 3065 | 4791 | 3250 | 7362 | 3320 | 7 |
| CUTLERY | 1297 | 63 | 445 | 27 | 356 | 22 | 699 | 37 | 0 |
| DOM. UTENSILS | 2554 | 372 | 1512 | 326 | 851 | 295 | 1639 | 331 | 1 |
| AGR.MACH.,TRACTORS | 25916 | 7022 | 19708 | 5200 | 10657 | 2886 | 18760 | 5036 | 11 |
| DOM. EL. EQUIPMENT | 4347 | 732 | 2825 | 505 | 2949 | 499 | 3374 | 579 | 1 |
| RAIL. LOCOS ETC. | 2277 | 268 | 10734 | 2644 | 8772 | 461 | 7261 | 1124 | 2 |
| ROAD VEHICLES | 126005 | 26775 | 86818 | 18616 | 71021 | 15382 | 94615 | 20258 | 44 |
| BICYCLES ETC. | 5197 | 1988 | 5916 | 2573 | 1557 | 631 | 4223 | 1731 | 4 |
| HEATING, SANITARY | 3919 | 1688 | 3633 | 2007 | 2190 | 1068 | 3247 | 1588 | 3 |
| FURNITURE | 1473 | 341 | 1252 | 536 | 1239 | 409 | 1321 | 429 | 1 |
| TOTAL | 207134 | 64187 | 152554 | 45344 | 109664 | 29036 | 156451 | 46189 | 100 |

## LESOTHO

## LESOTHO


Butha Buthe
Leribe
Teyateyaneng
Maseru
Morija
Marakabei
Mafeteng
Mohale's Hoek


LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

LESOTHO

Lesotho's economy is exceptionally strongly linked with the economy of South Africa. Economic growth in Lesotho therefore will depend crucially on when and how the present severe social and economic problems of South Africa can be solved.

The base case takes what could seem like a pessimistic view of the medium-term with a projected GDP growth rate at 1.6 per cent per annum (i.e. declining GDP per cent). Compared, however, with the experience of the last few years this is still optimistic.

For the longer term, the forecast is still conservative, assuming growth in GDP to be rarely 0.7 per cent per annum over projected population growth. This is based on the view that a very favourable economic situation will hardly materialize. Implementation of a large-scale project like the Highland Water Scheme would improve this situation and also give rise to a vast temporary expansion of steel demand. This is not included in the projections presented.

Steel demand projections for Lesotho by the methodology used for the other countries of the subregion came out with some nonsensical results. Revisions were carried out under the assumption that the present structure of demand would change only slightly but that overall growth of steel demand would tend to be well above that of GDP growth.

LESOTHO TABLE 1, MAIN PROJECTION

## A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 237 | 1.4 | 165 | 270 | 1.8 | 150 | 320 | 2.1 | 155 | 1.6 | 3.5 | 2.8 | 2.7 | -1.2 | 0.7 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| PRODUCT NAME | SITC | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | NET IMPORT | 1995 CONS | PROD | NET IMPORT | GROWTH RATES PA. CONSUMPTION TO 1990 | 1990-1995 | EXPL.VARIABLE TO 1990 | 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BARS AND RODS | 6730 | 989 | . | 989 | . | 1300 | 0 | 1300 | 1800 | 0 | 1800 | 3.5 | 6.7 | 1.9 | 4.6 |
| ANGLES SHP. H | 6734 | 180 | . | 180 | . | 260 | 0 | 260 | 360 | 0 | 360 | 4.7 | 6.7 | 1.2 | 3.4 |
| ANGLES SHP.,L | 6735 | 759 | . | 759 | . | 890 | 0 | 890 | 1150 | 0 | 1150 | 2.0 | 5.3 | 1.8 | 3.7 |
| PLATES, H.+ M | 6740 | 1860 | . | 1860 | . | 2300 | 0 | 2300 | 3100 | 0 | 3100 | 2.7 | 6.2 | 1.2 | 3.4 |
| PLATES, LIGHT | 6743 | 1857 | . | 1857 | . | 2200 | 0 | 2200 | 2700 | 0 | 2700 | 2.1 | 4.2 | 1.8 | 3.7 |
| TIN.& COAT.PL | 6749 | 1608 | . | 1608 | . | 2400 | 0 | 2400 | 3200 | 0 | 3200 | 5.1 | 5.9 | 1.8 | 3.7 |
| HOOP AND STRP | 6750 | 256 | . | 256 | . | 320 | 0 | 320 | 450 | 0 | 450 | 2.8 | 7.1 | 1.8 | 3.7 |
| RAILS+ MATER. | 6760 | 0 | . | 0 | . | 0 | 0 | 0 | 0 | 0 | 0 | . | . | 1.2 | 3.4 |
| WIRE | 6770 | 520 | . | 520 | . | 660 | 0 | 660 | 880 | 0 | 880 | 3.0 | 5.9 | 1.8 | 3.7 |
| TUBES | 6780 | 1468 | . | 1468 | . | 2169 | 0 | 2169 | 2430 | 0 | 2430 | 5.0 | 2.3 | 1.8 | 3.7 |
| TOTALS | | 9497 | . | 9497 | . | 12499 | 0 | 12499 | 16070 | 0 | 16070 | 3.5 | 5.2 | | |
| CRUDE EQUIVALENT | | 12959 | . | 12959 | . | 17083 | 0 | 17083 | 21913 | 0 | 21913 | 3.5 | 5.1 | | |
| BILLET EQUVIVALENT | | 11057 | . | 11057 | . | 14576 | 0 | 14576 | 18697 | 0 | 18697 | 3.5 | 5.1 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD-1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNES | 12959 | . | 12959 | . | 19085 | 0 | 19085 | 27358 | 0 | 27358 | 5.0 | 7.5 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.2 | 2.8 | 1.4 |
| 1990 TO 1995 | 4.9 | 2.7 | 2.1 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD - 1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUVIV. TONNE | 12959 | . | 12959 | . | 12484 | 0 | 12484 | 7160 | 0 | 7160 | -0.5 | -11 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | -0.4 | 2.8 | -3.1 |
| 1990 TO 1995 | 0.9 | 2.7 | -1.8 |

LESOTHO TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990- 1995 | POP TO 1990 | POP 1990- 1995 | GDP/POP TO 1990 | GDP/POP 1990- 1995 |
| 237 | 1.4 | 165 | 270 | 1.8 | 150 | 320 | 2.1 | 155 | 1.6 | 3.5 | 2.8 | 2.7 | -1.2 | 0.7 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. CONSUMPTION | | EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990- 1995 | TO 1990 | 1990- 1995 |
| BARS AND RODS | 6730 | 989 | . | 989 | . | 2950 | 0 | 2950 | 5099 | 0 | 5099 | 14.6 | 11.6 | 1.9 | 4.6 |
| ANGLES SHP. H | 6734 | 180 | . | 180 | . | 669 | 0 | 669 | 1179 | 0 | 1179 | 17.8 | 12.0 | 1.2 | 3.4 |
| ANGLES SHP.,L | 6735 | 759 | . | 759 | . | 1554 | 0 | 1554 | 2477 | 0 | 2477 | 9.4 | 9.8 | 1.8 | 3.7 |
| PLATES, H.+ M | 6740 | 1860 | . | 1860 | . | 2703 | 0 | 2703 | 3906 | 0 | 3906 | 4.8 | 7.6 | 1.2 | 3.4 |
| PLATES, LIGHT | 6743 | 1857 | . | 1857 | . | 3385 | 0 | 3385 | 5069 | 0 | 5069 | 7.8 | 8.4 | 1.8 | 3.7 |
| TIN.& COAT.PL | 6749 | 1608 | . | 1608 | . | 3405 | 0 | 3405 | 5209 | 0 | 5209 | 9.8 | 8.9 | 1.8 | 3.7 |
| HOOP AND STRP | 6750 | 256 | . | 256 | . | 432 | 0 | 432 | 673 | 0 | 673 | 6.8 | 9.3 | 1.8 | 3.7 |
| RAILS+ MATER. | 6760 | 0 | . | 0 | . | 161 | 0 | 161 | 323 | 0 | 323 | . | 14.9 | 1.2 | 3.4 |
| WIRE | 6770 | 520 | . | 520 | . | 1007 | 0 | 1007 | 1575 | 0 | 1575 | 8.6 | 9.4 | 1.8 | 3.7 |
| TUBES | 6780 | 1468 | . | 1468 | . | 2436 | 0 | 2436 | 2963 | 0 | 2963 | 6.5 | 4.0 | 1.8 | 3.7 |
| TOTALS | | 9497 | . | 9497 | . | 18701 | 0 | 18701 | 28473 | 0 | 28473 | 8.8 | 8.8 | | |
| CRUDE EQUIVALENT | | 12959 | . | 12959 | . | 25290 | 0 | 25290 | 38321 | 0 | 38321 | 8.7 | 8.7 | | |
| BILLET EQUVIVALENT | | 11057 | . | 11057 | . | 21578 | 0 | 21578 | 32697 | 0 | 32697 | 8.7 | 8.7 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 12959 | . | 12959 | . | 27287 | 0 | 27287 | 43770 | 0 | 43770 | 9.8 | 9.9 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.2 | 2.8 | 1.4 |
| 1990 TO 1995 | 4.9 | 2.7 | 2.1 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 12959 | . | 12959 | . | 20690 | 0 | 20690 | 23569 | 0 | 23569 | 6.0 | 2.6 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | -0.4 | 2.8 | -3.1 |
| 1990 TO 1995 | 0.9 | 2.7 | -1.8 |

LESOTHO TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | | | | | | | | | | | | | 0 |
| BARS AND RODS | 6732 | 898 | 984 | 1086 | 989 | | | | | | | | | 989 |
| ANGLES SHP.HM | 6734 | 160 | 180 | 200 | 180 | | | | | | | | | 180 |
| ANGLES SHP..L | 6735 | 702 | 733 | 842 | 759 | | | | | | | | | 759 |
| PLATES, HEAVY | 6741 | 1641 | 1915 | 2024 | 1860 | | | | | | | | | 1860 |
| PLATES, MED. | 6742 | | | | | | | | | | | | | 0 |
| PLATES, LIGHT | 6743 | 1640 | 1910 | 2020 | 1857 | | | | | | | | | 1857 |
| TINPLATE | 6747 | 820 | 955 | 1010 | 928 | | | | | | | | | 928 |
| OTHER COAT.P | 6748 | 600 | 700 | 740 | 680 | | | | | | | | | 680 |
| HOOP AND STRP | 6750 | 223 | 265 | 280 | 256 | | | | | | | | | 256 |
| RAILS | 6761 | | | | | | | | | | | | | 0 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | 450 | 530 | 580 | 520 | | | | | | | | | 520 |
| SEAMLESS TUBE | 6782 | 1200 | 1416 | 1787 | 1468 | | | | | | | | | 1468 |
| WELDED TUBES | 6783 | | | | | | | | | | | | | 0 |
| TOTALS | | 8334 | 9588 | 10569 | 9497 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9497 |

B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 8334 | 9588 | 10569 | 9497 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 8334 | 9588 | 10569 | 9497 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 32511 | 33274 | 35109 | 33631 |
| SUPPLIED FROM; | | | | |
| 1 NET IMPORTS | 32511 | 33274 | 35109 | 33631 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 0 | 0 | 0 | 0 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 11357 | 13081 | 14438 | 12959 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 21154 | 20193 | 20671 | 20673 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 0 | 0 | 0 | 0 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 700 | 700 | 700 | 700 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

LESOTHO TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| **GDP, AND POPULATION** | | | | | | | | | |
| POPULATION (MILL) | 1.4 | 1.4 | 1.5 | 1.8 | 1.8 | 1.8 | 2.1 | 2.1 | 2.1 |
| GDP PER CAPITA US$ (1975) | 174.0 | 170.7 | 155.6 | 183.3 | 150.0 | 127.8 | 200.0 | 152.4 | 114.3 |
| GDP MILL US$ (1975) | 239.5 | 239.1 | 233.4 | 330.0 | 270.0 | 230.0 | 420.0 | 320.0 | 240.0 |
| GROSS CAP FORM MILL US$ (1975) | 51.3 | 49.6 | 48.5 | 95.0 | 55.0 | 50.0 | 120.0 | 65.0 | 53.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 23.8 | 23.2 | 24.5 | 48.0 | 28.0 | 25.0 | 60.0 | 35.0 | 26.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 12.2 | 12.4 | 13.0 | 20.0 | 15.0 | 13.0 | 27.0 | 18.0 | 14.0 |
| **BALANCE OF PAYMENTS** | | | | | | | | | |
| EXPORTS | . | . | . | . | . | . | . | . | . |
| OTHER CURRENT ITEMS | . | . | . | . | . | . | . | . | . |
| ODA, NET INFLOWS | . | . | . | . | . | . | . | . | . |
| LONG TERM CAPITAL,NET | . | . | . | . | . | . | . | . | . |
| RESERVES ERRORS AND OMISSIONS | . | . | . | . | . | . | . | . | . |
| IMPORTS, IMPORT CAPACITY | . | . | . | . | . | . | . | . | . |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 2.8 | 2.8 | 2.8 | 2.8 |
| GDP. CONSTANT US$ (1975) | -0.2 | -2.4 | 2.1 | 3.5 |

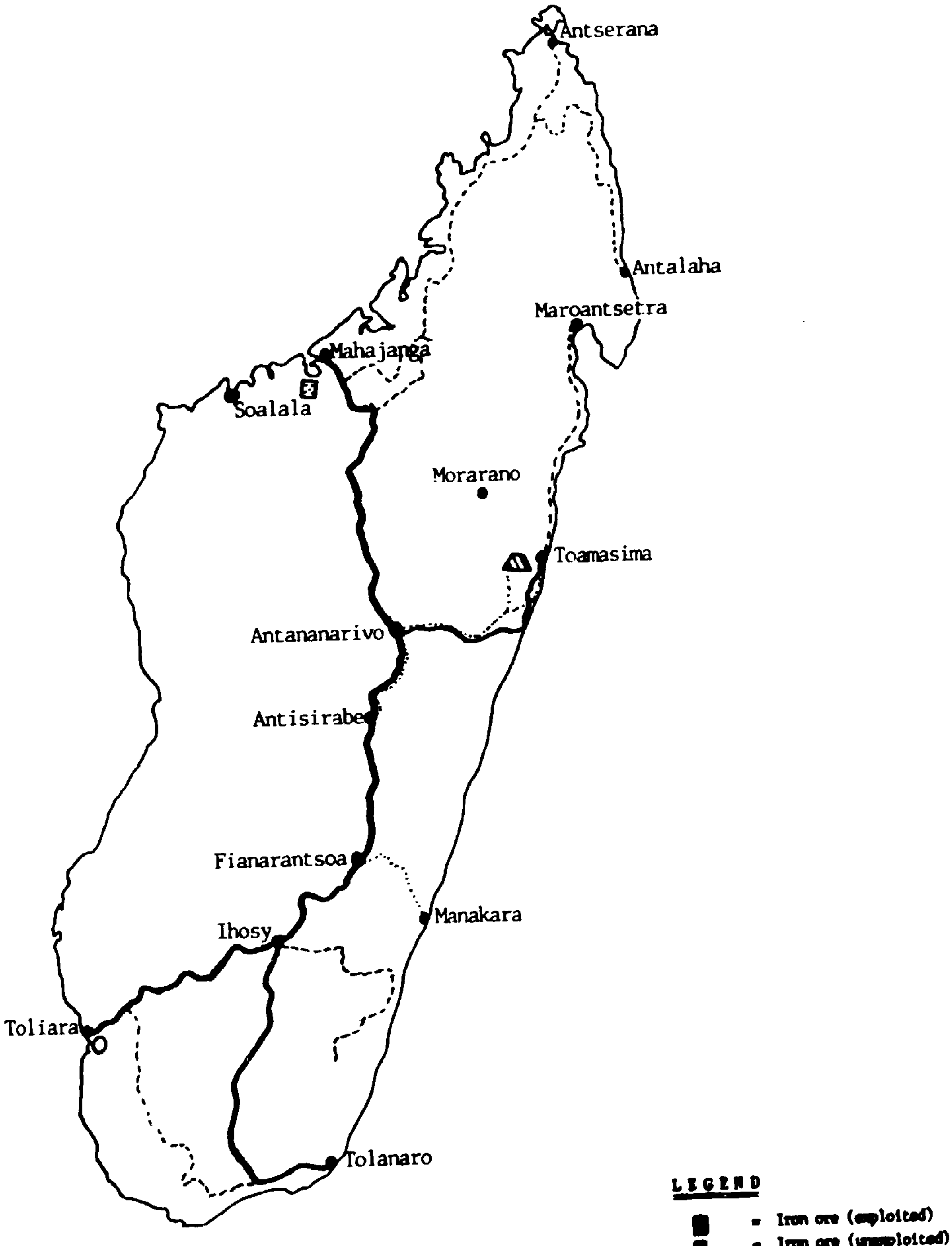
TABLE 5: ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY LESOTHO

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| SITC | | | | | | | | | |
| ROAD VEHICLES | 89534 | 21151 | 106845 | 20193 | 110000 | 20671 | 102126 | 20672 | 100 |
| TOTAL | 89534 | 21151 | 106845 | 20193 | 110000 | 20671 | 102126 | 20672 | 100 |

**MADAGASCAR**

# MADAGASCAR


Antserana
Antalaha
Maroantsetra
Mahajanga
Soalala
Morarano
Toamasima
Antananarivo
Antisirabe
Fianarantsoa
Manakara
Ihosy
Toliara
Tolanaro
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

MADAGASCAR

Considering the sluggish development of GDP during the first half of the 80s, with several years of decline, the assumption of a 2.7 per cent per annual growth up to 1990 may be rather optimistic even though it means a decline in GDP per capita. For the period 1990-1995 a somewhat higher growth rate is projected assuming that policy reforms started in 1983 are successful. The manufacturing sector is assumed to increase its share of GDP in both periods.

The consumption of steel in the base period appears very low, compared with the average for the countries in the subregion. Therefore, in the first projection period there is rapid growth in overall steel consumption compared to the rate of growth of GDP. Whether this will in fact materialize depends to a great extent on the severity of balance-of-payments constraints. With the present favourable developments in oil and coffee prices, development towards a less stringent foreign exchange situation may well take place.

The catch-up effect in overall steel consumption assumed to take place before 1990 is the major reason for the apparent paradox in the period 1990-1995 when the overall rate of increase in steel consumption falls despite an acceleration of growth in GDP. Imports of rail and rail material was relatively high in the base period 1981-83. The registered decline represents a reversion to "normal" levels. The methodology used may understate the speed of such a reversal. Also since the existence and extent of railway networks is not used as an explanatory variable, the consumption levels for this item may easily be overstated in the countries without railways and understated in others.

MADAGASCAR TABLE 1, MAIN PROJECTION

A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 1944 | 9.3 | 210 | 2400 | 11.6 | 207 | 2800 | 13.4 | 209 | 2.7 | 3.1 | 2.8 | 2.9 | -0.2 | 0.2 |

B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 6970 | . | 6970 | 0 | 12545 | 7000 | 5545 | 16215 | 16000 | 215 | 7.6 | 5.3 | 1.7 | 3.4 |
| ANGLES SHP. H | 6734 | 223 | . | 223 | 0 | 638 | 0 | 638 | 842 | 0 | 842 | 14.0 | 5.7 | 1.8 | 2.8 |
| ANGLES SHP.,L | 6735 | 2511 | 0 | 2511 | . | 4127 | 4000 | 127 | 5515 | 5500 | 15 | 6.4 | 6.0 | 3.3 | 4.0 |
| PLATES, H.+ M | 6740 | 1328 | 0 | 1328 | 0 | 1492 | 0 | 1492 | 1895 | 0 | 1895 | 1.5 | 4.9 | 1.8 | 2.8 |
| PLATES, LIGHT | 6743 | 1738 | 0 | 1738 | . | 9170 | 0 | 9170 | 13742 | 0 | 13742 | 23.1 | 8.4 | 3.3 | 4.0 |
| TIN.& COAT.PL | 6749 | 4579 | 0 | 4579 | 0 | 8635 | 0 | 8635 | 11749 | 0 | 11749 | 8.3 | 6.4 | 3.3 | 4.0 |
| HOOP AND STRP | 6750 | 177 | 0 | 177 | . | 458 | 0 | 458 | 586 | 0 | 586 | 12.6 | 5.1 | 3.3 | 4.0 |
| RAILS+ MATER. | 6760 | 3833 | 0 | 3833 | . | 2245 | 0 | 2245 | 1938 | 0 | 1938 | -6.5 | -2.9 | 1.8 | 2.8 |
| WIRE | 6770 | 1888 | 0 | 1888 | 0 | 3152 | 0 | 3152 | 4208 | 4000 | 208 | 6.6 | 5.9 | 3.3 | 4.0 |
| TUBES | 6780 | 1303 | 0 | 1303 | 0 | 2691 | 0 | 2691 | 3032 | 0 | 3032 | 9.5 | 2.4 | 3.3 | 4.0 |
| TOTALS | | 24550 | 0 | 24550 | 0 | 45153 | 11000 | 34153 | 59720 | 25500 | 34220 | 7.9 | 5.8 | | |
| CRUDE EQUIVALENT | | 32410 | 0 | 32410 | 0 | 59911 | 13981 | 45930 | 79269 | 32602 | 46666 | 8.0 | 5.8 | | |
| BILLET EQUVIVALENT | | 27654 | 0 | 27654 | 0 | 51118 | 11929 | 39189 | 67635 | 27818 | 39817 | 8.0 | 5.8 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 32410 | 0 | 32410 | 0 | 68487 | 13981 | 54506 | 96776 | 32602 | 64173 | 9.8 | 7.2 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 3.7 | 2.8 | 0.8 |
| 1990 TO 1995 | 4.9 | 2.9 | 1.9 |

D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 32410 | 0 | 32410 | 0 | 49850 | 13981 | 35869 | 56160 | 32602 | 23557 | 5.5 | 2.4 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.1 | 2.8 | -1.6 |
| 1990 TO 1995 | 0.6 | 2.9 | -2.2 |

MADAGASCAR TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 1944 | 9.3 | 210 | 2400 | 11.6 | 207 | 2800 | 13.4 | 209 | 2.7 | 3.1 | 2.8 | 2.9 | -0.2 | 0.2 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 6970 | . | 6970 | 0 | 13807 | 7000 | 6807 | 18740 | 16000 | 2740 | 8.9 | 6.3 | 1.7 | 3.4 |
| ANGLES SHP. H | 6734 | 223 | . | 223 | 0 | 951 | 0 | 951 | 1468 | 0 | 1468 | 19.9 | 9.1 | 1.8 | 2.8 |
| ANGLES SHP.,L | 6735 | 2511 | 0 | 2511 | . | 4635 | 4000 | 635 | 6531 | 5500 | 1031 | 8.0 | 7.1 | 3.3 | 4.0 |
| PLATES, H.+ M | 6740 | 1328 | 0 | 1328 | 0 | 1800 | 0 | 1800 | 2512 | 0 | 2512 | 3.9 | 6.9 | 1.8 | 2.8 |
| PLATES, LIGHT | 6743 | 1738 | 0 | 1738 | . | 10077 | 0 | 10077 | 15555 | 0 | 15555 | 24.6 | 9.1 | 3.3 | 4.0 |
| TIN.& COAT.PL | 6749 | 4579 | 0 | 4579 | 0 | 9404 | 0 | 9404 | 13286 | 0 | 13286 | 9.4 | 7.2 | 3.3 | 4.0 |
| HOOP AND STRP | 6750 | 177 | 0 | 177 | . | 544 | 0 | 544 | 757 | 0 | 757 | 15.1 | 6.8 | 3.3 | 4.0 |
| RAILS+ MATER. | 6760 | 3833 | 0 | 3833 | . | 2368 | 0 | 2368 | 2184 | 0 | 2184 | -5.8 | -1.6 | 1.8 | 2.8 |
| WIRE | 6770 | 1888 | 0 | 1888 | 0 | 3418 | 0 | 3418 | 4739 | 4000 | 739 | 7.7 | 6.8 | 3.3 | 4.0 |
| TUBES | 6780 | 1303 | 0 | 1303 | 0 | 2895 | 0 | 2895 | 3440 | 0 | 3440 | 10.5 | 3.5 | 3.3 | 4.0 |
| TOTALS | | 24550 | 0 | 24550 | 0 | 49899 | 11000 | 38899 | 69212 | 25500 | 43712 | 9.3 | 6.8 | | |
| CRUDE EQUIVALENT | | 32410 | 0 | 32410 | 0 | 66190 | 13981 | 52209 | 91824 | 32602 | 59221 | 9.3 | 6.8 | | |
| BILLET EQUVIVALENT | | 27654 | 0 | 27654 | 0 | 56476 | 11929 | 44546 | 73348 | 27818 | 50530 | 9.3 | 6.8 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 32410 | 0 | 32410 | 0 | 74766 | 13981 | 60785 | 109334 | 32602 | 76731 | 11.0 | 7.9 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 3.7 | 2.8 | 0.8 |
| 1990 TO 1995 | 4.9 | 2.9 | 1.9 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 32410 | 0 | 32410 | 0 | 56129 | 13981 | 42148 | 68719 | 32602 | 36116 | 7.1 | 4.1 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.1 | 2.8 | -1.6 |
| 1990 TO 1995 | 0.6 | 2.9 | -2.2 |

MADAGASCAR TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | | | | | | | | | | | | | 0 |
| BARS AND RODS | 6732 | 6888 | 6163 | 7859 | 6970 | | | | | | | | | 6970 |
| ANGLES SHP.HM | 6734 | 351 | 95 | 222 | 223 | | | | | | | | | 223 |
| ANGLES SHP..L | 6735 | 3567 | 941 | 3026 | 2511 | | | | | | | | | 2511 |
| PLATES, HEAVY | 6741 | 840 | 573 | 2570 | 1328 | | | | | | | | | 1328 |
| PLATES, MED. | 6742 | | | | | | | | | | | | | 0 |
| PLATES, LIGHT | 6743 | 2123 | 1944 | 1147 | 1738 | | | | | | | | | 1738 |
| TINPLATE | 6747 | 864 | 1001 | 510 | 792 | | | | | | | | | 792 |
| OTHER COAT.P | 6748 | 3568 | 3121 | 4674 | 3788 | | | | | | | | | 3788 |
| HOOP AND STRP | 6750 | 179 | 222 | 129 | 177 | | | | | | | | | 177 |
| RAILS | 6761 | 100 | 1811 | 8034 | 3315 | | | | | | | | | 3315 |
| OTHER RL TRCK | 6762 | 50 | 187 | 1318 | 518 | | | | | | | | | 518 |
| WIRE | 6770 | 1593 | 1607 | 2464 | 1888 | | | | | | | | | 1888 |
| SEAMLESS TUBE | 6782 | 1740 | 929 | 1240 | 1303 | | | | | | | | | 1303 |
| WELDED TUBES | 6783 | | | | | | | | | | | | | 0 |
| TOTALS | | 21863 | 18594 | 33193 | 24550 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24550 |

B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 21863 | 18594 | 33193 | 24550 |
| OF WHICH: | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 21863 | 18594 | 33193 | 24550 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 55769 | 35692 | 59679 | 50380 |
| SUPPLIED FROM: | | | | |
| 1 NET IMPORTS | 55849 | 35796 | 59779 | 50475 |
| OF WHICH: | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 80 | 104 | 100 | 95 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 28909 | 24563 | 43759 | 32410 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 26360 | 11130 | 15920 | 17970 |
| 2 LOCAL SOURCES (INCL. SCRAP) | -80 | -104 | -100 | -95 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 1500 | 1500 | 1500 | 1500 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

MADAGASCAR TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| **GDP, AND POPULATION** | | | | | | | | | |
| POPULATION (MILL) | 9.0 | 9.3 | 9.5 | 11.6 | 11.6 | 11.6 | 13.4 | 13.4 | 13.4 |
| GDP PER CAPITA US$ (1975) | 213.0 | 206.4 | 209.5 | 274.1 | 206.9 | 183.6 | 246.3 | 208.9 | 164.2 |
| GDP MILL US$ (1975) | 1920.7 | 1919.7 | 1990.0 | 2600.0 | 2400.0 | 2130.0 | 3300.0 | 2800.0 | 2200.0 |
| GROSS CAP FORM MILL US$ (1975) | 200.4 | 153.5 | 166.4 | 250.0 | 200.0 | 180.0 | 330.0 | 230.0 | 190.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 55.4 | 44.6 | 44.8 | 70.0 | 55.0 | 50.0 | 90.0 | 65.0 | 53.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 193.0 | 165.8 | 173.9 | 250.0 | 230.0 | 200.0 | 320.0 | 280.0 | 210.0 |
| **BALANCE OF PAYMENTS BILLION MG. FR.** | | | | | | | | | |
| EXPORTS | 85.7 | 108.3 | 133.2 | 280.0 | 240.0 | 220.0 | 470.0 | 380.0 | 230.0 |
| OTHER CURRENT ITEMS | -50.8 | -71.4 | -88.8 | -150.0 | -150.0 | -150.0 | -170.0 | -170.0 | -170.0 |
| ODA, NET INFLOWS | . | . | . | . | . | . | . | . | . |
| LONG TERM CAPITAL,NET | 130.4 | 105.2 | 167.1 | 250.0 | 225.0 | 225.0 | 320.0 | 300.0 | 300.0 |
| RESERVES ERRORS AND OMISSIONS | -17.4 | 6.5 | -9.2 | -30.0 | -30.0 | -30.0 | -50.0 | -50.0 | -50.0 |
| IMPORTS, IMPORT CAPACITY | 147.9 | 148.6 | 202.3 | 350.0 | 285.0 | 265.0 | 570.0 | 460.0 | 310.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 2.8 | 2.8 | 2.9 | 2.9 |
| GDP, CONSTANT US$ (1975) | -0.1 | 3.7 | 2.7 | 3.1 |

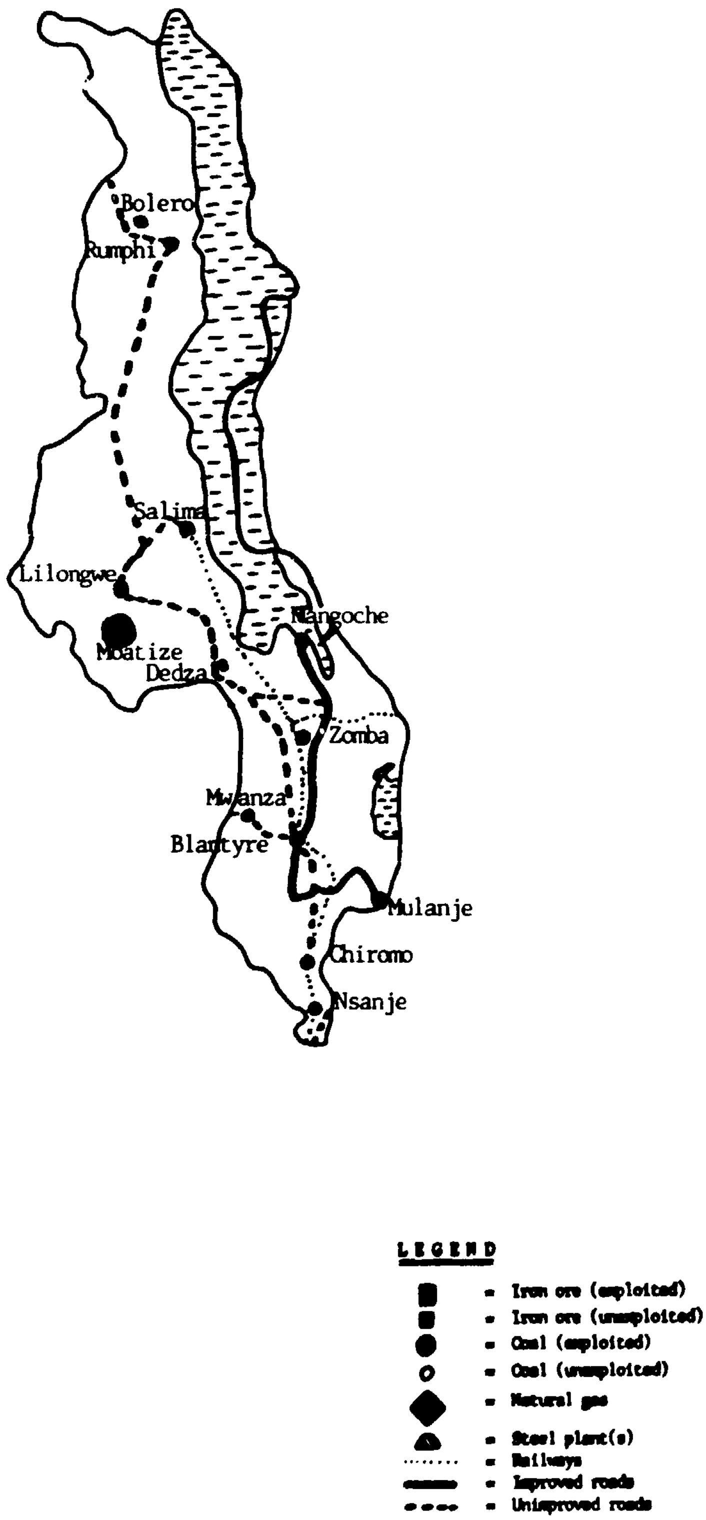
TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY MADAGSCAR

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | AVERAGE VALUE | AVERAGE TONNES | AVERAGE TONNES IN PCT OF TOTAL |
| SITC | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | | | |
| MET. STRUCTURES | 9480 | 8468 | 3902 | 2515 | 1816 | 2866 | 5066 | 4616 | 29 |
| TANKS, VESSELS, ETC | 1561 | 1988 | 416 | 91 | 3100 | 1159 | 1692 | 1079 | 7 |
| WIRE PRODUCTS | 930 | 882 | 443 | 262 | 645 | 661 | 673 | 602 | 4 |
| NAILS, NUTS,BOLTS | 2050 | 16 | 1055 | 630 | 858 | 549 | 1321 | 632 | 4 |
| HAND TOOLS | 3370 | 516 | 1909 | 319 | 2551 | 321 | 2610 | 385 | 2 |
| CUTLERY | 454 | 0 | 22 | 0 | 363 | 24 | 280 | 8 | 0 |
| DOM. UTENSILS | 220 | 119 | 796 | 427 | 388 | 59 | 468 | 202 | 1 |
| AGR.MACH.,TRACTORS | 2516 | 454 | 2736 | 525 | 6267 | 1647 | 3840 | 875 | 6 |
| DOM. EL. EQUIPMENT | 514 | 121 | 415 | 78 | 684 | 136 | 538 | 112 | 1 |
| RAIL. LOCOS ETC. | 4406 | 886 | 6391 | 713 | 1788 | 222 | 4195 | 607 | 4 |
| ROAD VEHICLES | 34095 | 6540 | 22940 | 4698 | 35740 | 5096 | 30925 | 5445 | 34 |
| BICYCLES ETC. | 3784 | 1116 | 1660 | 513 | 2067 | 663 | 2504 | 764 | 5 |
| HEATING, SANITARY | 1202 | 423 | 388 | 163 | 754 | 543 | 781 | 376 | 2 |
| FURNITURE | 375 | 78 | 378 | 90 | 1327 | 185 | 693 | 118 | 1 |
| TOTAL | 64957 | 22307 | 43451 | 11024 | 58348 | 14131 | 55585 | 15821 | 100 |

## MALAWI

# MALAWI


Bolero
Rumphi
Salima
Lilongwe
Moatize
Dedza
Mangoche
Zomba
Mwanza
Blantyre
Mulanje
Chiromo
Nsanje
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

**MALAWI**

The base case projections of GDP and its components up to 1990 are very close to those presented in Economic Report 1985 (Malawi Government). For the period 1990-1995 a similar trend has been continued.

For the period up to 1990 it is, as in the economic report assumed that the small holder agriculture will develop rapidly without substantial investment. This explains the apparent inconsistency between a relatively high overall growth rate and very low rates of growth in investment and building and construction for the first period.

For the period 1990 to 1995 investment and construction growth is slightly higher, reflecting a less stringent balance-of-payments situation. It is also for that period assumed that value added of the manufacturing sector increases faster than GDP, reflecting investment in the sector and an improvement in the transport conditions which now interrupts a steady supply of raw materials.

Development of steel consumption in the first period is for some items characterized by a strong growth from the relatively low levels of the base period. The decline in consumption of tubes and pipe can be ascribed to an initially high consumption which is gradually adjusted. In the 1990-1995 period, growth rates for the various items and more similar, indicating less charge in the structure of consumption.

MALAWI TABLE 1, MAIN PROJECTION

A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 944 | 6.6 | 143 | 1300 | 8.6 | 151 | 1600 | 10.2 | 157 | 4.1 | 4.2 | 3.4 | 3.5 | 0.7 | 0.7 |

B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 3133 | . | 3133 | 0 | 5374 | 0 | 5374 | 7553 | 0 | 7553 | 7.0 | 7.0 | 0.0 | 2.4 |
| ANGLES SHP. H | 6734 | 343 | . | 343 | . | 692 | 0 | 692 | 864 | 0 | 864 | 9.2 | 4.5 | 1.4 | 1.9 |
| ANGLES SHP.,L | 6735 | 1372 | . | 1372 | . | 2889 | 0 | 2889 | 4246 | 0 | 4246 | 9.8 | 8.0 | 4.1 | 5.1 |
| PLATES, H.+ M | 6740 | 1907 | 0 | 1907 | . | 4454 | 0 | 4454 | 5521 | 0 | 5521 | 11.2 | 4.4 | 1.4 | 1.9 |
| PLATES, LIGHT | 6743 | 3814 | 0 | 3814 | 0 | 7144 | 0 | 7144 | 10482 | 0 | 10482 | 8.2 | 8.0 | 4.1 | 5.1 |
| TIN.& COAT.PL | 6749 | 982 | 0 | 982 | 0 | 2105 | 0 | 2105 | 2900 | 0 | 2900 | 10.0 | 6.6 | 4.1 | 5.1 |
| HOOP AND STRP | 6750 | 94 | 0 | 94 | 0 | 299 | 0 | 299 | 396 | 0 | 396 | 15.6 | 5.8 | 4.1 | 5.1 |
| RAILS+ MATER. | 6760 | 444 | 0 | 444 | 0 | 627 | 0 | 627 | 764 | 0 | 764 | 4.4 | 4.0 | 1.4 | 1.9 |
| WIRE | 6770 | 1750 | 0 | 1750 | 0 | 2217 | 0 | 2217 | 3005 | 0 | 3005 | 3.0 | 6.3 | 4.1 | 5.1 |
| TUBES | 6780 | 4575 | 0 | 4575 | . | 2974 | 0 | 2974 | 2406 | 0 | 2406 | -5.2 | -4.2 | 4.1 | 5.1 |
| TOTALS | | 18413 | 0 | 18413 | 0 | 28776 | 0 | 28776 | 38136 | 0 | 38136 | 5.7 | 5.8 | | |
| CRUDE EQUIVALENT | | 25114 | 0 | 25114 | 0 | 38754 | 0 | 38754 | 51101 | 0 | 51101 | 5.6 | 5.7 | | |
| BILLET EQUVIVALENT | | 21428 | 0 | 21428 | 0 | 33067 | 0 | 33067 | 43601 | 0 | 43601 | 5.6 | 5.7 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 25114 | 0 | 25114 | 0 | 52186 | 0 | 52186 | 75631 | 0 | 75631 | 9.6 | 7.7 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 5.0 | 3.4 | 1.6 |
| 1990 TO 1995 | 5.2 | 3.5 | 1.6 |

D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 25114 | 0 | 25114 | 0 | 39455 | 0 | 39455 | 47077 | 0 | 47077 | 5.8 | 3.6 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.9 | 3.4 | -1.4 |
| 1990 TO 1995 | 1.8 | 3.5 | -1.7 |

MALAWI TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 944 | 6.6 | 143 | 1300 | 8.6 | 151 | 1600 | 10.2 | 157 | 4.1 | 4.2 | 3.4 | 3.5 | 0.7 | 0.7 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| PRODUCT NAME | SITC | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | NET IMPORT | 1995 CONS | PROD | NET IMPORT | GROWTH RATES P.A. CONSUMPTION TO 1990 | CONSUMPTION 1990-1995 | EXPL. VARIABLE TO 1990 | EXPL. VARIABLE 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BARS AND RODS | 6730 | 3133 | . | 3133 | 0 | 6095 | 0 | 6095 | 8994 | 0 | 8994 | 8.7 | 8.1 | 0.0 | 2.4 |
| ANGLES SHP. H | 6734 | 343 | . | 343 | . | 871 | 0 | 871 | 1221 | 0 | 1221 | 12.4 | 7.0 | 1.4 | 1.9 |
| ANGLES SHP..L | 6735 | 1372 | . | 1372 | . | 3178 | 0 | 3178 | 4825 | 0 | 4825 | 11.1 | 8.7 | 4.1 | 5.1 |
| PLATES, H.+ M | 6740 | 1907 | 0 | 1907 | . | 4630 | 0 | 4630 | 5873 | 0 | 5873 | 11.7 | 4.9 | 1.4 | 1.9 |
| PLATES, LIGHT | 6743 | 3814 | 0 | 3814 | 0 | 7662 | 0 | 7662 | 11516 | 0 | 11516 | 9.1 | 8.5 | 4.1 | 5.1 |
| TIN.& COAT.PL | 6749 | 982 | 0 | 982 | 0 | 2544 | 0 | 2544 | 3777 | 0 | 3777 | 12.6 | 8.2 | 4.1 | 5.1 |
| HOOP AND STRP | 6750 | 94 | 0 | 94 | 0 | 348 | 0 | 348 | 494 | 0 | 494 | 17.8 | 7.3 | 4.1 | 5.1 |
| RAILS+ MATER. | 6760 | 444 | 0 | 444 | 0 | 697 | 0 | 697 | 905 | 0 | 905 | 5.8 | 5.4 | 1.4 | 1.9 |
| WIRE | 6770 | 1750 | 0 | 1750 | 0 | 2369 | 0 | 2369 | 3309 | 0 | 3309 | 3.9 | 6.9 | 4.1 | 5.1 |
| TUBES | 6780 | 4575 | 0 | 4575 | . | 3091 | 0 | 3091 | 2639 | 0 | 2639 | -4.8 | -3.1 | 4.1 | 5.1 |
| TOTALS | | 18413 | 0 | 18413 | 0 | 31484 | 0 | 31484 | 43552 | 0 | 43552 | 6.9 | 6.7 | | |
| CRUDE EQUIVALENT | | 25114 | 0 | 25114 | 0 | 42340 | 0 | 42340 | 58266 | 0 | 58266 | 6.7 | 6.6 | | |
| BILLET EQUVIVALENT | | 21428 | 0 | 21428 | 0 | 36126 | 0 | 36126 | 49715 | 0 | 49715 | 6.7 | 6.6 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD-1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNES | 25114 | 0 | 25114 | 0 | 55767 | 0 | 55767 | 82796 | 0 | 82796 | 10.5 | 8.2 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 5.0 | 3.4 | 1.6 |
| 1990 TO 1995 | 5.2 | 3.5 | 1.6 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD - 1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUVIV. TONNE | 25114 | 0 | 25114 | 0 | 43033 | 0 | 43033 | 54243 | 0 | 54243 | 7.0 | 4.7 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.9 | 3.4 | -1.4 |
| 1990 TO 1995 | 1.8 | 3.5 | -1.7 |

MALAWI TABLE 3

## A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | 1982 | 1983 | AVER | PRODUCTION 1981 | 1982 | 1983 | AVER | EXPORTS 1981 | 1982 | 1983 | AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | | | | | | | | | | | | | 0 |
| BARS AND RODS | 6732 | 3537 | 3511 | 2351 | 3133 | | | | | | | | | 3133 |
| ANGLES SHP.HM | 6734 | 382 | 386 | 260 | 343 | | | | | | | | | 343 |
| ANGLES SHP..L | 6735 | 1529 | 1547 | 1041 | 1372 | | | | | | | | | 1372 |
| PLATES, HEAVY | 6741 | 1068 | 2578 | 2074 | 1907 | | | | | | | | | 1907 |
| PLATES, MED. | 6742 | | | | | | | | | | | | | 0 |
| PLATES, LIGHT | 6743 | 2137 | 5155 | 4149 | 3814 | | | | | | | | | 3814 |
| TINPLATE | 6747 | 241 | 295 | 475 | 337 | | | | | | | | | 337 |
| OTHER COAT.P | 6748 | 1415 | 393 | 127 | 645 | | | | | | | | | 645 |
| HOOP AND STRP | 6750 | 97 | 99 | 85 | 94 | | | | | | | | | 9, |
| RAILS | 6761 | 650 | 678 | 4 | 444 | | | | | | | | | 444 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | 1740 | 1740 | 1769 | 1750 | | | | | | | | | 1750 |
| SEAMLESS TUBE | 6782 | 5658 | 5733 | 2335 | 4575 | | | | | | | | | 4575 |
| WELDED TUBES | 6783 | | | | | | | | | | | | | 0 |
| TOTALS | | 18454 | 22115 | 14670 | 18413 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18413 |

## B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 18454 | 22115 | 14670 | 18413 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 18454 | 22115 | 14670 | 18413 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 36729 | 40680 | 27209 | 34873 |
| SUPPLIED FROM; | | | | |
| 1 NET IMPORTS | 36729 | 40690 | 27232 | 34884 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 0 | 10 | 23 | 11 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 25172 | 30246 | 19919 | 25112 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 11557 | 10434 | 7291 | 9761 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 0 | -10 | -23 | -11 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 750 | 750 | 750 | 750 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

MALAWI TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| **GDP, AND POPULATION** | | | | | | | | | |
| POPULATION (MILL) | 6.4 | 6.6 | 6.8 | 8.6 | 8.6 | 8.6 | 10.2 | 10.2 | 10.2 |
| GDP PER CAPITA US$ (1975) | 143.0 | 142.1 | 144.1 | 162.8 | 151.6 | 127.9 | 176.5 | 156.9 | 117.6 |
| GDP MILL US$ (1975) | 913.9 | 937.7 | 979.8 | 1400.0 | 1300.0 | 1100.0 | 1800.0 | 1600.0 | 1200.0 |
| GROSS CAP FORM MILL US$ (1975) | 265.2 | 280.0 | 284.2 | 380.0 | 310.0 | 300.0 | 490.0 | 340.0 | 320.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 41.0 | 40.1 | 37.8 | 50.0 | 40.0 | 38.0 | 65.0 | 45.0 | 40.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 114.7 | 112.4 | 120.4 | 180.0 | 160.0 | 150.0 | 240.0 | 205.0 | 170.0 |
| **BALANCE OF PAYMENTS MILLION MK** | | | | | | | | | |
| EXPORTS | 257.5 | 255.5 | 270.6 | 1050.0 | 910.0 | 750.0 | 2300.0 | 1690.0 | 1300.0 |
| OTHER CURRENT ITEMS | -146.3 | -177.8 | -207.2 | -410.0 | -410.0 | -350.0 | -690.0 | -690.0 | -500.0 |
| ODA, NET INFLOWS | 73.3 | 81.7 | 65.8 | 180.0 | 150.0 | 150.0 | 300.0 | 210.0 | 210.0 |
| LONG TERM CAPITAL,NET | 14.1 | -17.9 | -4.7 | 40.0 | 20.0 | 20.0 | 40.0 | 40.0 | 40.0 |
| RESERVES ERRORS AND OMISSIONS | 32.3 | 68.1 | 108.3 | -50.0 | -50.0 | -50.0 | -100.0 | -100.0 | -100.0 |
| IMPORTS, IMPORT CAPACITY | 230.9 | 209.6 | 232.8 | 810.0 | 620.0 | 520.0 | 1850.0 | 1150.0 | 950.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 3.1 | 3.1 | 3.4 | 3.5 |
| GDP. CONSTANT US$ (1975) | 2.6 | 4.5 | 4.1 | 4.2 |

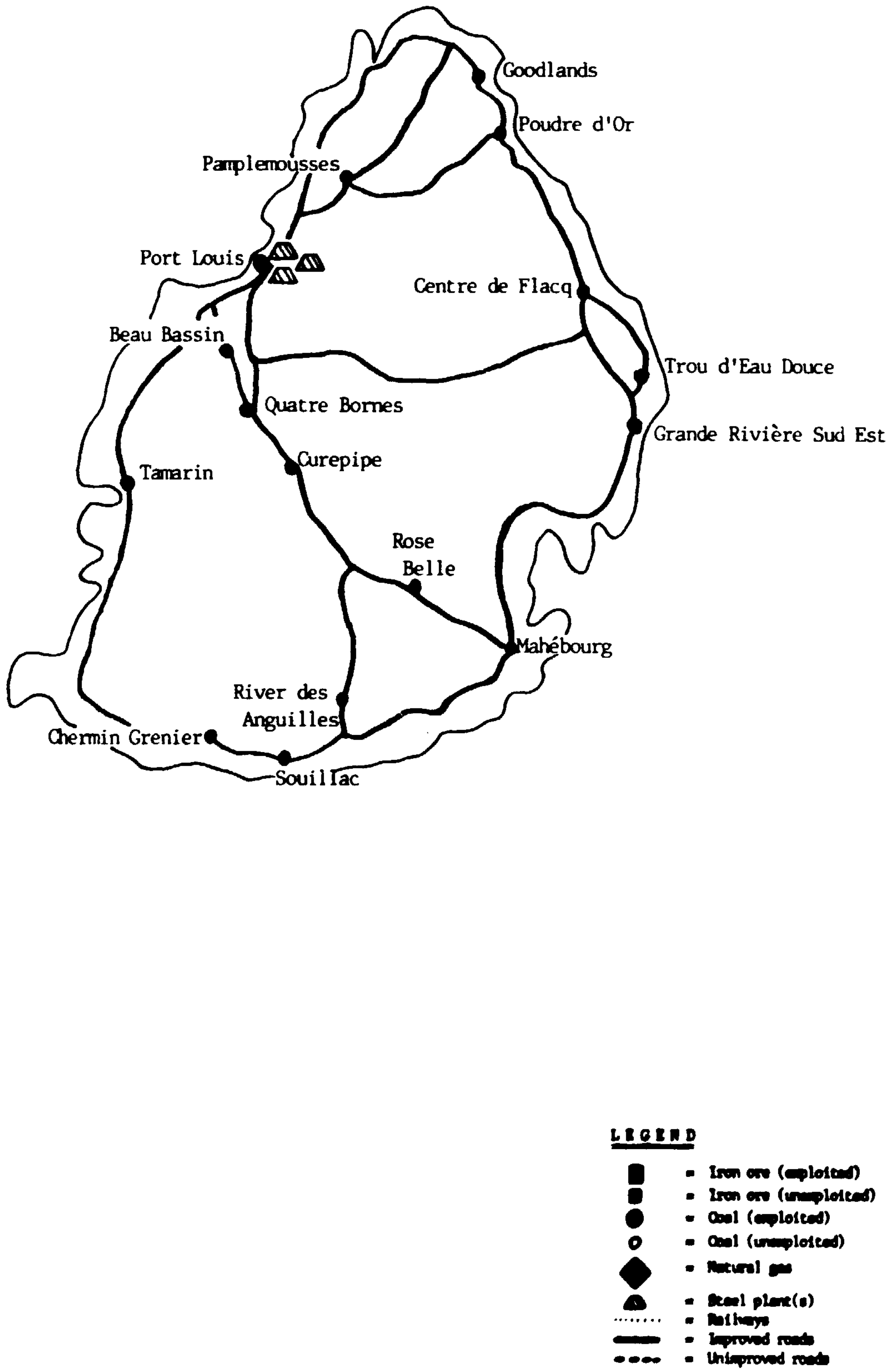
TABLE 5: ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY MALAWI

| SITC | 1981 VALUE | 1981 QUANTITY | 1982 VALUE | 1982 QUANTITY | 1983 VALUE | 1983 QUANTITY | AVERAGE VALUE | AVERAGE TONNES | AVERAGE TONNES IN PCT OF TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| MET. STRUCTURES | 852 | 1715 | 1080 | 2015 | 346 | 460 | 759 | 1397 | 15 |
| TANKS, VESSELS, ETC | 1009 | 625 | 73 | 7 | 39 | 25 | 374 | 219 | 2 |
| WIRE PRODUCTS | 754 | 358 | 250 | 138 | 193 | 143 | 399 | 213 | 2 |
| NAILS, NUTS,BOLTS | 1963 | 886 | 250 | 178 | 136 | 136 | 783 | 400 | 4 |
| HAND TOOLS | 1922 | 400 | 1536 | 490 | 624 | 250 | 1361 | 380 | 4 |
| CUTLERY | 445 | 126 | 428 | 31 | 198 | 21 | 357 | 59 | 1 |
| DOM. UTENSILS | 593 | 82 | 128 | 15 | 48 | 2 | 256 | 33 | 0 |
| AGR.MACH.,TRACTORS | 4220 | 702 | 3295 | 943 | 1101 | 276 | 2872 | 640 | 7 |
| DOM. EL. EQUIPMENT | 1802 | 276 | 406 | 62 | 358 | 61 | 855 | 133 | 1 |
| RAIL. LOCOS ETC. | 1111 | 43 | 628 | 67 | 470 | 72 | 736 | 61 | 1 |
| ROAD VEHICLES | 17859 | 3072 | 23273 | 5342 | 23863 | 4799 | 21665 | 4404 | 49 |
| BICYCLES ETC. | 3768 | 2137 | 670 | 257 | 229 | 88 | 1556 | 827 | 9 |
| HEATING, SANITARY | 1287 | 309 | 465 | 145 | 198 | 71 | 650 | 175 | 2 |
| FURNITURE | 811 | 110 | 401 | 112 | 105 | 31 | 439 | 84 | 1 |
| TOTAL | 38396 | 10841 | 32883 | 9802 | 27908 | 6435 | 33062 | 9026 | 100 |

# MAURITIUS

# MAURITIUS


Goodlands
Poudre d'Or
Pamplemousses
Port Louis
Centre de Flacq
Beau Bassin
Trou d'Eau Douce
Quatre Bornes
Grande Rivière Sud Est
Curepipe
Tamarin
Rose Belle
Mahébourg
River des Anguilles
Chermin Grenier
Souillac
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

MAURITIUS

Mauritius has a very small population, relatively high GDP per capita and a relatively well diversified economy. The economic projections are based on the World Bank projections for the period 1986-1990. These imply an overall rate of growth of 3.8 per cent per annum when actual development from the base period of 1981-83 up to 1985 has been taken into account. A trend of 4.6 per cent per annum which is similar to the one forecasted for the period 1986-90 has been assumed for the period 1990-1995. In both periods the manufacturing sector is assumed to increase its share of GDP providing growth impetus to the overall economy. Investment would increase at roughly the same rate as GDP. Given the low rate of population increase projected, GDP per capita will increase much faster than for the PTA/SADCC subregion as a whole.

The tendency for steel intensity to decline in the countries with relatively developed economies does not hold good generally for Mauritius. The major exception to this is the consumption of bars and rods which actually declines slightly in the first period and increases less than both projected value added of the building and construction industry and overall GDP in the period 1990-1995. Hoop and strip and tubes also register slow growth reative to their explorating variables. All the other items grow relatively fast. The high level and high rate of increase in GDP per capita is indicative of expanding demand. Particularly at Mauritius' high level of GDP per capita there would be a strong demand for consumer durables. Demand for rolled products will, however, be affected only to the extent these durables are produced in Mauritius. The scale of operation needed for efficient production of some durables may cast some doubt on the feasibility of production in a country of 1.2 million people and does therefore indicate the possibility for overestimation.

MAURITIUS TABLE 1. MAIN PROJECTION

## A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 888 | 1.0 | 879 | 1200 | 1.1 | 1043 | 1500 | 1.2 | 1220 | 3.8 | 4.6 | 1.6 | 1.4 | 2.2 | 3.2 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. CONSUMPTION | | GROWTH RATES PA. EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 11084 | 6440 | 4644 | 0 | 11029 | 20000 | -8971 | 13488 | 30000 | -16512 | -0.1 | 4.1 | 3.2 | 5.4 |
| ANGLES SHP. H | 6734 | 739 | . | 739 | 0 | 1267 | 0 | 1267 | 1639 | 0 | 1639 | 7.0 | 5.3 | 4.0 | 4.6 |
| ANGLES SHP.,L | 6735 | 5466 | 2509 | 2957 | . | 9168 | 2000 | 7168 | 12810 | 30000 | -17190 | 6.7 | 6.9 | 5.6 | 6.3 |
| PLATES, H.+ M | 6740 | 1153 | 0 | 1153 | 0 | 2720 | 0 | 2720 | 3970 | 0 | 3970 | 11.3 | 7.9 | 4.0 | 4.6 |
| PLATES, LIGHT | 6743 | 1258 | 0 | 1258 | . | 3200 | 0 | 3200 | 5400 | 0 | 5400 | 12.4 | 11.0 | 5.6 | 6.3 |
| TIN.& COAT.PL | 6749 | 2241 | 0 | 2241 | 0 | 4800 | 0 | 4800 | 7385 | 0 | 7385 | 10.0 | 9.0 | 5.6 | 6.3 |
| HOOP AND STRP | 6750 | 620 | 0 | 620 | 0 | 706 | 0 | 706 | 829 | 0 | 829 | 1.6 | 3.3 | 5.6 | 6.3 |
| RAILS+ MATER. | 6760 | 48 | 0 | 48 | . | 100 | 0 | 100 | 140 | 0 | 140 | 9.6 | 7.0 | 4.0 | 4.6 |
| WIRE | 6770 | 1640 | 0 | 1640 | 0 | 3038 | 10000 | -6962 | 4679 | 12000 | -7321 | 8.0 | 9.0 | 5.6 | 6.3 |
| TUBES | 6780 | 2344 | 0 | 2344 | 0 | 3200 | 0 | 3200 | 3900 | 0 | 3900 | 4.0 | 4.0 | 5.6 | 6.3 |
| TOTALS | | 26594 | 8949 | 17644 | 0 | 39228 | 32000 | 7228 | 54239 | 72000 | -17761 | 5.0 | 6.7 | | |
| CRUDE EQUIVALENT | | 34799 | 11374 | 23425 | 0 | 51723 | 41152 | 10571 | 71625 | 92088 | -20463 | 5.1 | 6.7 | | |
| BILLET EQUVIVALENT | | 29692 | 9705 | 19987 | 0 | 44132 | 35113 | 9020 | 61113 | 78573 | -17460 | 5.1 | 6.7 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 34799 | 11374 | 23425 | 0 | 80339 | 41152 | 39187 | 120481 | 92088 | 28393 | 11.0 | 8.4 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 5.9 | 1.6 | 4.2 |
| 1990 TO 1995 | 5.2 | 1.4 | 3.7 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 34799 | 11374 | 23425 | 0 | 41613 | 41152 | 461 | 51397 | 92088 | -40691 | 2.3 | 4.3 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.5 | 1.6 | -0.1 |
| 1990 TO 1995 | 1.9 | 1.4 | 0.6 |

MAURITIUS TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 888 | 1.0 | 879 | 1200 | 1.1 | 1043 | 1500 | 1.2 | 1220 | 3.8 | 4.6 | 1.6 | 1.4 | 2.2 | 3.2 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 11084 | 6440 | 4644 | 0 | 11738 | 20000 | -8262 | 14907 | 30000 | -15093 | 0.7 | 4.9 | 3.2 | 5.4 |
| ANGLES SHP. H | 6734 | 739 | . | 739 | 0 | 1443 | 0 | 1443 | 1991 | 0 | 1991 | 8.7 | 6.7 | 4.0 | 4.6 |
| ANGLES SHP.,L | 6735 | 5466 | 2509 | 2957 | . | 9453 | 2000 | 7453 | 13381 | 30000 | -16619 | 7.1 | 7.2 | 5.6 | 6.3 |
| PLATES, H.+ M | 6740 | 1153 | 0 | 1153 | 0 | 2893 | 0 | 2893 | 4317 | 0 | 4317 | 12.2 | 8.3 | 4.0 | 4.6 |
| PLATES, LIGHT | 6743 | 1258 | 0 | 1258 | . | 3709 | 0 | 3709 | 6419 | 0 | 6419 | 14.5 | 11.6 | 5.6 | 6.3 |
| TIN.& COAT.PL | 6749 | 2241 | 0 | 2241 | 0 | 5232 | 0 | 5232 | 8249 | 0 | 8249 | 11.2 | 9.5 | 5.6 | 6.3 |
| HOOP AND STRP | 6750 | 620 | 0 | 620 | 0 | 754 | 0 | 754 | 925 | 0 | 925 | 2.5 | 4.2 | 5.6 | 6.3 |
| RAILS+ MATER. | 6760 | 48 | 0 | 48 | . | 169 | 0 | 169 | 279 | 0 | 279 | 17.0 | 10.5 | 4.0 | 4.6 |
| WIRE | 6770 | 1640 | 0 | 1640 | 0 | 3188 | ?000 | -6812 | 4977 | 12000 | -7023 | 8.7 | 9.3 | 5.6 | 6.3 |
| TUBES | 6780 | 2344 | 0 | 2344 | 0 | 3315 | 0 | 3315 | 4129 | 0 | 4129 | 4.4 | 4.5 | 5.6 | 6.3 |
| TOTALS | | 26594 | 8949 | 17644 | 0 | 41895 | 32000 | 9895 | 59573 | 72000 | -12427 | 5.8 | 7.3 | | |
| CRUDE EQUIVALENT | | 34799 | 11374 | 23425 | 0 | 55250 | 41152 | 14098 | 78681 | 92088 | -13407 | 5.9 | 7.3 | | |
| BILLET EQUVIVALENT | | 29692 | 9705 | 19987 | 0 | 47142 | 35113 | 12029 | 67134 | 78573 | -11439 | 5.9 | 7.3 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 34799 | 11374 | 23425 | 0 | 83867 | 41152 | 42715 | 127538 | 92088 | 35450 | 11.6 | 8.7 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 5.9 | 1.6 | 4.2 |
| 1990 TO 1995 | 5.2 | 1.4 | 3.7 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 34799 | 11374 | 23425 | 0 | 45140 | 41152 | 3988 | 58452 | 92088 | -33636 | 3.3 | 5.3 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.5 | 1.6 | -0.1 |
| 1990 TO 1995 | 1.9 | 1.4 | 0.6 |

MAURITIUS TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | 2521 | 1080 | 150 | 1250 | | | | | | | | | 1250 |
| BARS AND RODS | 6732 | 2207 | 5525 | 2449 | 3394 | 6440 | 6185 | 6696 | 6440 | | | | | 9834 |
| ANGLES SHP.HM | 6734 | 609 | 842 | 707 | 739 | | | | | | | | | 739 |
| ANGLES SHP..L | 6735 | 2437 | 3367 | 3068 | 2957 | 2509 | 2714 | 2304 | 2509 | | | | | 5466 |
| PLATES, HEAVY | 6741 | 808 | 789 | 628 | 742 | | | | | | | | | 742 |
| PLATES, MED. | 6742 | 400 | 480 | 355 | 412 | | | | | | | | | 412 |
| PLATES, LIGHT | 6743 | 1211 | 1080 | 1483 | 1258 | | | | | | | | | 1258 |
| TINPLATE | 6747 | 1157 | 1250 | 1376 | 1261 | | | | | | | | | 1261 |
| OTHER COAT.P | 6748 | 1000 | 1168 | 772 | 980 | | | | | | | | | 980 |
| HOOP AND STRP | 6750 | 500 | 612 | 747 | 620 | | | | | | | | | 620 |
| RAILS | 6761 | 50 | 92 | 1 | 48 | | | | | | | | | 48 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | 1700 | 1672 | 1548 | 1640 | | | | | | | | | 1640 |
| SEAMLESS TUBE | 6782 | 1102 | 1447 | 711 | 1087 | | | | | | | | | 1087 |
| WELDED TUBES | 6783 | 990 | 1579 | 1203 | 1257 | | | | | | | | | 1257 |
| TOTALS | | 16692 | 20983 | 15258 | 17644 | 8949 | 8899 | 9000 | 8949 | 0 | 0 | 0 | 0 | 26594 |

B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 25641 | 29882 | 24258 | 26594 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 16692 | 20983 | 15258 | 17644 |
| LOCAL PRODUCTION | 8949 | 8899 | 9000 | 8949 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 44857 | 45164 | 43104 | 44375 |
| SUPPLIED FROM: | | | | |
| 1 NET IMPORTS | 47099 | 40532 | 44320 | 43984 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 42 | 209 | 44 | 98 |
| NET IMPORTS OF BILLETS ETC | 12875 | 5775 | 11909 | 10186 |
| NET IMPORTS OF ROLLED PRODUCTS | 22170 | 27825 | 20282 | 23426 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 12012 | 6723 | 12085 | 10273 |
| 2 LOCAL SOURCES (INCL. SCRAP) | -2242 | 4632 | -1216 | 391 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 4000 | 4000 | 4000 | 4000 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

MAURITIUS TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| GDP, AND POPULATION | | | | | | | | | |
| POPULATION (MILL) | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 | 1.1 | 1.2 | 1.2 | 1.2 |
| GDP PER CAPITA US$ (1975) | 876.0 | 921.3 | 911.3 | 1272.7 | 1090.9 | 909.1 | 1500.0 | 1250.0 | 916.7 |
| GDP MILL US$ (1975) | 855.9 | 902.9 | 905.8 | 1400.0 | 1200.0 | 1000.0 | 1800.0 | 1500.0 | 1100.0 |
| GROSS CAP FORM MILL US$ (1975) | 191.1 | 164.3 | 169.6 | 270.0 | 240.0 | 180.0 | 360.0 | 300.0 | 190.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 39.8 | 38.2 | 38.7 | 60.0 | 50.0 | 40.0 | 80.0 | 65.0 | 45.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 174.9 | 184.1 | 184.3 | 320.0 | 280.0 | 190.0 | 450.0 | 380.0 | 220.0 |
| BALANCE OF PAYMENTS MILLON RS | | | | | | | | | |
| EXPORTS | 2999.0 | 3985.0 | 4346.0 | 11500.0 | 9700.0 | 8000.0 | 19000.0 | 15000.0 | 12000.0 |
| OTHER CURRENT ITEMS | -240.0 | -500.0 | -354.0 | -500.0 | -500.0 | -400.0 | -670.0 | -670.0 | -500.0 |
| ODA, NET INFLOWS | 157.0 | 371.0 | 227.0 | 700.0 | 600.0 | 600.0 | 1000.0 | 800.0 | 800.0 |
| LONG TERM CAPITAL,NET | 406.0 | 524.0 | -218.0 | 1700.0 | 1600.0 | 1600.0 | 2400.0 | 2100.0 | 2100.0 |
| RESERVES ERRORS AND OMISSIONS | 938.0 | -67.0 | 503.0 | -800.0 | -800.0 | 800.0 | -1200.0 | -1200.0 | -1200.0 |
| IMPORTS, IMPORT CAPACITY | 4260.0 | 4313.0 | 4504.0 | 12600.0 | 10600.0 | 9000.0 | 20530.0 | 16030.0 | 13200.0 |

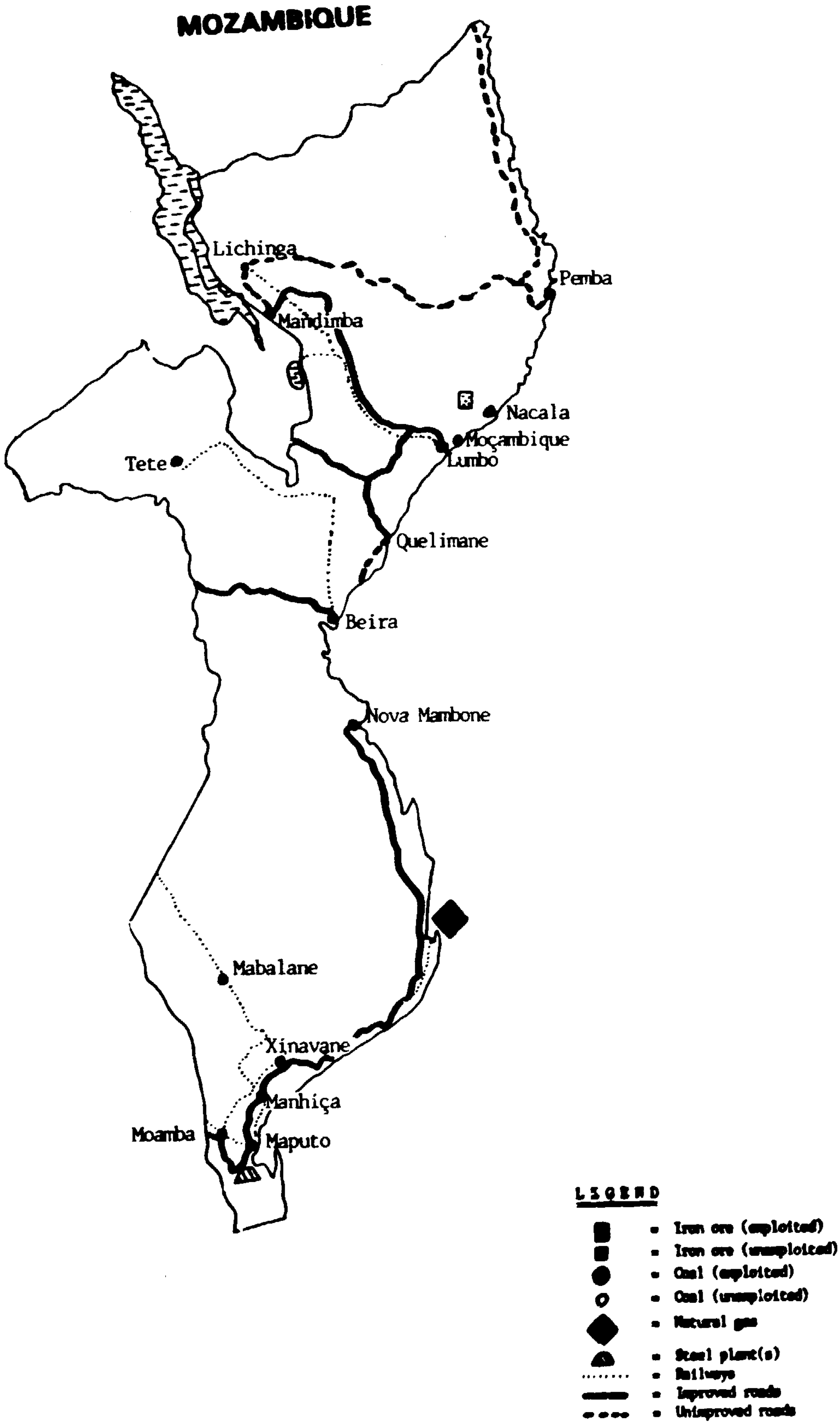
| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 1.4 | 1.4 | 1.6 | 1.4 |
| GDP CONSTANT US$ (1975) | 5.5 | 0.2 | 4.1 | 4.6 |

TABLE 5: ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY MAURITIUS

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| SITC | | | | | | | | | |
| MET. STRUCTURES | 705 | 600 | 405 | 828 | 2465 | 2111 | 1192 | 1180 | 13 |
| TANKS, VESSELS, ETC | 1317 | 245 | 896 | 322 | 852 | 558 | 1022 | 375 | 4 |
| WIRE PRODUCTS | 439 | 331 | 300 | 311 | 376 | 338 | 372 | 327 | 4 |
| NAILS, NUTS,BOLTS | 941 | 451 | 405 | 267 | 417 | 156 | 588 | 291 | 3 |
| HAND TOOLS | 1700 | 244 | 1412 | 295 | 1217 | 248 | 1443 | 262 | 3 |
| CUTLERY | 302 | 28 | 281 | 29 | 345 | 62 | 309 | 40 | 0 |
| DOM. UTENSILS | 1200 | 220 | 935 | 230 | 1551 | 538 | 1229 | 329 | 4 |
| AGR.MACH.,TRACTORS | 1644 | 406 | 1116 | 234 | 821 | 188 | 1194 | 276 | 3 |
| DOM. EL. EQUIPMENT | 1534 | 284 | 1580 | 333 | 2029 | 419 | 1714 | 345 | 4 |
| RAIL. LOCOS ETC. | 6324 | 2421 | 20 | 0 | 29 | 117 | 2124 | 846 | 10 |
| ROAD VEHICLES | 19334 | 5043 | 10861 | 2886 | 11762 | 3852 | 13986 | 3927 | 44 |
| BICYCLES ETC. | 1060 | 265 | 748 | 185 | 747 | 151 | 852 | 200 | 2 |
| HEATING, SANITARY | 1035 | 295 | 543 | 269 | 833 | 437 | 804 | 334 | 4 |
| FURNITURE | 230 | 59 | 266 | 130 | 557 | 282 | 351 | 157 | 2 |
| TOTAL | 37765 | 10892 | 19768 | 6319 | 24001 | 9457 | 27178 | 8889 | 100 |

# MOZAMBIQUE


MOZAMBIQUE
Lichinga
Pemba
Mandimba
Nacala
Moçambique
Lumbo
Tete
Quelimane
Beira
Nova Mambone
Mabalane
Xinavane
Manhiça
Moamba
Maputo
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

MOZAMBIQUE

From 1980 to 1983 Mozambique experienced an annual fall of 6.3 per cent in its GDP. Declines in value added were recorded in all sectors. Particularly rapid declines (of respectively 9.5 per cent and 7.8 per cent per annum) were recorded in agriculture and industries. Natural calamities from which the country has still not recovered and a major internal security problem caused by South African backed armed bands are major reasons for the country's difficulties.

Future economic development is only partly dependent on the world markets for the country's major export commodities. Most of all it depends on the extent to which South Africa continues its support of the armed bands and thereby inflicts severe damage on the economy. As this is dependent on internal developments in South Africa, economic projections are exceedingly difficult to make.

The GDP growth rate of just below 1 per cent for the period up to 1990 reflects an optimistic view, both with regard to internal security and with regard to the balance-of-payments. Exports will have to increase from present levels. Foreign exchange contributions from bilateral and multilateral donors will have to be stepped up. This would, given a better security situation, allow considerable investment for rehabilitation of the economy. Given a successful rehabilitation by the end of the decade the country could look forward to a stronger growth of production. A 3.7 per cent per annum growth is forecasted for the period 1990-1995.

The base period overall steel consumption per capita in Mozambique is very low. There are indications that the years after 1981-83 saw an even lower steel consumption. Therefore the return to more normal levels will in reality appear even more dramatic in terms of percentage growth than indicated in the table. Nevertheless, such an increase is possible and must be expected if the macro scenario sketched out above is realized. The period 1990-1995 would also be influenced by a catching-up effect which will furthermore be fuelled by a more rapid growth in the economy.

The overall low growth case projections does not appear to deviate dramatically from the base case. This is largely because the catching-up effect is so strong that economic growth plays a less important role as a driving force for steel demand. This effect would, however, be limited by foreign exchange availability (for import of both rolled products and raw materials). As the projection model used takes this into account only indirectly, steel consumption increase in the low growth case which assumes a tight balance-of-payments is likely to be overestimated.

MOZAMBIQUE TABLE 1. MAIN PROJECTION

A) MACRO VARIABLES, DATA AND BASE CASE PROJECTION

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 3270 | 11.1 | 295 | 3500 | 13.9 | 252 | 4200 | 15.9 | 264 | 0.9 | 3.7 | 2.9 | 2.7 | -1.9 | 1.0 |

B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 9882 | 9733 | 149 | . | 19974 | 30000 | -10026 | 27965 | 37000 | -9035 | 9.2 | 7.0 | 0.8 | 3.3 |
| ANGLES SHP. H | 6734 | 157 | . | 157 | . | 1024 | 0 | 1024 | 1520 | 0 | 1520 | 26.4 | 8.2 | 2.7 | 4.2 |
| ANGLES SHP.,L | 6735 | 780 | 0 | 780 | . | 2924 | 5000 | -2076 | 4245 | 7000 | -2755 | 18.0 | 7.7 | 1.6 | 3.7 |
| PLATES, H.+ M | 6740 | 1234 | 0 | 1234 | . | 4683 | 0 | 4683 | 6898 | 0 | 6898 | 18.1 | 8.1 | 2.7 | 4.2 |
| PLATES, LIGHT | 6743 | 2469 | 0 | 2469 | . | 8724 | 0 | 8724 | 12781 | 0 | 12781 | 17.1 | 7.9 | 1.6 | 3.7 |
| TIN.& COAT.PL | 6749 | 2235 | 0 | 2235 | . | 6916 | 0 | 6916 | 9838 | 0 | 9838 | 15.2 | 7.3 | 1.6 | 3.7 |
| HOOP AND STRP | 6750 | 638 | 0 | 638 | . | 706 | 0 | 706 | 833 | 0 | 833 | 1.3 | 3.4 | 1.6 | 3.7 |
| RAILS+ MATER. | 6760 | 450 | 0 | 450 | 0 | 1328 | 0 | 1328 | 1840 | 0 | 1840 | 14.5 | 6.7 | 2.7 | 4.2 |
| WIRE | 6770 | 737 | 0 | 737 | . | 2788 | 0 | 2788 | 4109 | 0 | 4109 | 18.1 | 8.1 | 1.6 | 3.7 |
| TUBES | 6780 | 1827 | 0 | 1827 | 0 | 4136 | 0 | 4136 | 5408 | 0 | 5408 | 10.8 | 5.5 | 1.6 | 3.7 |
| TOTALS | | 20410 | 9733 | 10676 | 0 | 53202 | 35000 | 18202 | 75437 | 44000 | 31437 | 12.7 | 7.2 | | |
| CRUDE EQUIVALENT | | 26922 | 12371 | 14552 | 0 | 70660 | 44485 | 26175 | 100190 | 55924 | 44266 | 12.8 | 7.2 | | |
| BILLET EQUVIVALENT | | 22971 | 10555 | 12416 | 0 | 60290 | 37956 | 22334 | 85486 | 47717 | 37769 | 12.8 | 7.2 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 26922 | 12371 | 14552 | 0 | 85299 | 44485 | 40814 | 134917 | 55924 | 78993 | 15.5 | 9.6 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.6 | 2.9 | -0.3 |
| 1990 TO 1995 | 6.2 | 2.7 | 3.4 |

D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. .TONNE | 26922 | 12371 | 14552 | 0 | 59704 | 44485 | 15219 | 83774 | 55924 | 27850 | 10.5 | 7.0 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | -1.1 | 2.9 | -3.8 |
| 1990 TO 1995 | 3.1 | 2.7 | 0.4 |

MOZAMBIQUE TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | PROJECTION 1990 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | PROJECTION 1995 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GROWTH RATES PCT. P.A. GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3270 | 11.1 | 295 | 3500 | 13.9 | 252 | 4200 | 15.9 | 264 | 0.9 | 3.7 | 2.9 | 2.7 | -1.9 | 1.0 |

B) BASE CASE PROJECTIONS 1990 AND 1995. TONNES

| PRODUCT NAME | SITC | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | NET IMPORT | 1995 CONS | PROD | NET IMPORT | GROWTH RATES P.A. CONSUMPTION TO 1990 | CONSUMPTION 1990-1995 | EXPL. VARIABLE TO 1990 | EXPL. VARIABLE 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BARS AND RODS | 6730 | 9882 | 9733 | 149 | . | 23068 | 30000 | -6932 | 34153 | 37000 | -2847 | 11.2 | 8.2 | 0.8 | 3.3 |
| ANGLES SHP. H | 6734 | 157 | . | 157 | . | 1792 | 0 | 1792 | 3056 | 0 | 3056 | 35.6 | 11.3 | 2.7 | 4.2 |
| ANGLES SHP..L | 6735 | 780 | 0 | 780 | . | 4168 | 5000 | -832 | 6735 | 7000 | -265 | 23.3 | 10.1 | 1.6 | 3.7 |
| PLATES, H.+ M | 6740 | 1234 | 0 | 1234 | . | 5439 | 0 | 5439 | 8410 | 0 | 8410 | 20.4 | 9.1 | 2.7 | 4.2 |
| PLATES, LIGHT | 6743 | 2469 | 0 | 2469 | . | 10945 | 0 | 10945 | 17224 | 0 | 17224 | 20.5 | 9.5 | 1.6 | 3.7 |
| TIN.& COAT.PL | 6749 | 2235 | 0 | 2235 | . | 8801 | 0 | 8801 | 13607 | 0 | 13607 | 18.7 | 9.1 | 1.6 | 3.7 |
| HOOP AND STRP | 6750 | 638 | 0 | 638 | . | 916 | 0 | 916 | 1252 | 0 | 1252 | 4.6 | 6.4 | 1.6 | 3.7 |
| RAILS+ MATER. | 6760 | 450 | 0 | 450 | 0 | 1630 | 0 | 1630 | 2445 | 0 | 2445 | 17.5 | 8.4 | 2.7 | 4.2 |
| WIRE | 6770 | 737 | 0 | 737 | . | 3439 | 0 | 3439 | 5412 | 0 | 5412 | 21.2 | 9.5 | 1.6 | 3.7 |
| TUBES | 6780 | 1827 | 0 | 1827 | 0 | 4636 | 0 | 4636 | 6409 | 0 | 6409 | 12.3 | 6.7 | 1.6 | 3.7 |
| TOTALS | | 20410 | 9733 | 10676 | 0 | 64834 | 35000 | 29834 | 98701 | 44000 | 54701 | 15.5 | 8.8 | | |
| CRUDE EQUIVALENT | | 26922 | 12371 | 14552 | 0 | 86048 | 44485 | 41563 | 130970 | 55924 | 75046 | 15.6 | 8.8 | | |
| BILLET EQUVIVALENT | | 22971 | 10555 | 12416 | 0 | 73419 | 37956 | 35463 | 111749 | 47717 | 64032 | 15.6 | 8.8 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD-1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNES | 26922 | 12371 | 14552 | 0 | 100689 | 44485 | 56204 | 165696 | 55924 | 109772 | 17.9 | 10.5 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.6 | 2.9 | -0.3 |
| 1990 TO 1995 | 6.2 | 2.7 | 3.4 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD - 1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUVIV. TONNE | 26922 | 12371 | 14552 | 0 | 75094 | 44485 | 30609 | 114551 | 55924 | 58627 | 13.7 | 8.8 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | -1.1 | 2.9 | -3.8 |
| 1990 TO 1995 | 3.1 | 2.7 | 0.4 |

MOZAMBIQUE TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | | | | | | | | | | | | | 0 |
| BARS AND RODS | 6732 | 230 | 90 | 127 | 149 | 12700 | 8500 | 8000 | 9733 | | | | | 9882 |
| ANGLES SHP.HM | 6734 | 32 | 200 | 240 | 157 | | | | | | | | | 157 |
| ANGLES SHP..L | 6735 | 400 | 980 | 960 | 780 | | | | | | | | | 780 |
| PLATES, HEAVY | 6741 | 1692 | 1415 | 596 | 1234 | | | | | | | | | 1234 |
| PLATES, MED. | 6742 | | | | | | | | | | | | | 0 |
| PLATES, LIGHT | 6743 | 3385 | 2829 | 1192 | 2469 | | | | | | | | | 2469 |
| TINPLATE | 6747 | 5670 | 336 | 523 | 2176 | | | | | | | | | 2176 |
| OTHER COAT.P | 6748 | 129 | | 46 | 58 | | | | | | | | | 58 |
| HOOP AND STRP | 6750 | 292 | 919 | 703 | 638 | | | | | | | | | 638 |
| RAILS | 6761 | 450 | 450 | 450 | 450 | | | | | | | | | 450 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | 1028 | 526 | 657 | 737 | | | | | | | | | 737 |
| SEAMLESS TUBE | 6782 | 2349 | 111 | 3022 | 1827 | | | | | | | | | 1827 |
| WELDED TUBES | 6783 | | | | | | | | | | | | | 0 |
| TOTALS | | 15657 | 7856 | 8516 | 10676 | 12700 | 8500 | 8000 | 9733 | 0 | 0 | 0 | 0 | 20410 |



B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 28357 | 16356 | 16516 | 20410 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 15657 | 7856 | 8516 | 10676 |
| LOCAL PRODUCTION | 12700 | 8500 | 8000 | 9733 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 84531 | 60962 | 55159 | 66884 |
| SUPPLIED FROM; | | | | |
| 1 NET IMPORTS | 102048 | 50851 | 47529 | 66810 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 3 | 29 | 80 | 37 |
| NET IMPORTS OF BILLETS ETC | 32663 | 0 | 1834 | 11499 |
| NET IMPORTS OF ROLLED PRODUCTS | 21478 | 10495 | 11683 | 14552 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 47904 | 40327 | 33932 | 40721 |
| 2 LOCAL SOURCES (INCL. SCRAP) | -17516 | 10111 | 7630 | 75 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 3000 | 3000 | 3000 | 3000 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

MOZAMBIQUE TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| GDP, AND POPULATION | | | | | | | | | |
| POPULATION (MILL) | 10.8 | 11.1 | 11.4 | 13.9 | 13.9 | 13.9 | 15.9 | 15.9 | 15.9 |
| GDP PER CAPITA US$ (1975) | 316.0 | 298.7 | 270.4 | 287.7 | 251.8 | 215.8 | 339.6 | 264.1 | 220.1 |
| GDP MILL US$ (1975) | 3410.7 | 3315.2 | 3083.1 | 4000.0 | 3500.0 | 3000.0 | 5400.0 | 4200.0 | 3500.0 |
| GROSS CAP FORM MILL US$ (1975) | 315.9 | 314.2 | 317.7 | 480.0 | 390.0 | 320.0 | 640.0 | 480.0 | 370.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 165.8 | 159.1 | 154.0 | 200.0 | 170.0 | 150.0 | 260.0 | 200.0 | 170.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 250.6 | 210.5 | 200.0 | 280.0 | 250.0 | 230.0 | 380.0 | 300.0 | 270.0 |
| BALANCE OF PAYMENTS BILLION MT | | | | | | | | | |
| EXPORTS | 9.9 | 8.7 | 5.3 | 15.0 | 11.0 | 9.0 | 30.0 | 20.0 | 14.0 |
| OTHER CURRENT ITEMS | -2.6 | -4.2 | -4.5 | -5.0 | -5.0 | -5.0 | -5.0 | -5.0 | -5.0 |
| ODA, NET INFLOWS | 16.5 | 17.9 | 6.4 | 20.0 | 18.0 | 18.0 | 26.0 | 24.0 | 24.0 |
| LONG TERM CAPITAL,NET | . | . | . | . | . | . | 15.0 | 10.0 | 10.0 |
| RESERVES ERRORS AND OMISSIONS | -0.1 | 3.9 | 14.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| IMPORTS, IMPORT CAPACITY | 23.7 | 26.3 | 21.2 | 35.0 | 29.0 | 27.0 | 71.0 | 54.0 | 48.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 2.9 | 2.9 | 2.9 | 2.7 |
| GDP. CONSTANT US$ (1975) | -2.8 | -7.0 | 1.8 | 3.7 |

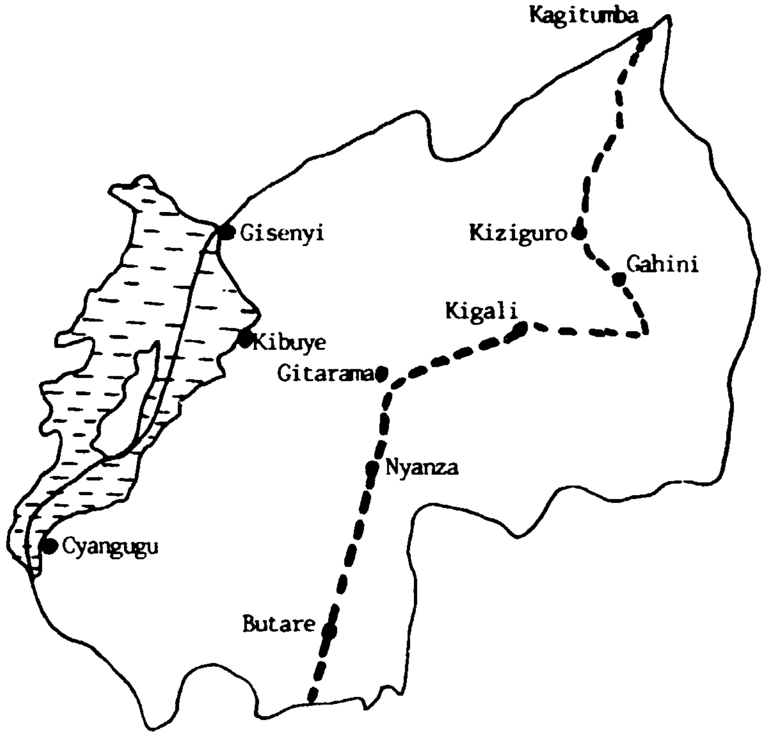
TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY MOZAMBIQUE

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| SITC | | | | | | | | | |
| MET. STRUCTURES | 12197 | 15217 | 17569 | 13617 | 9282 | 9430 | 13016 | 12755 | 33 |
| TANKS, VESSELS, ETC | 426 | 109 | 510 | 397 | 1179 | 1138 | 705 | 548 | 1 |
| WIRE PRODUCTS | 31152 | 16316 | 11223 | 6227 | 3427 | 1306 | 15267 | 7950 | 21 |
| NAILS, NUTS,BOLTS | 1018 | 592 | 1475 | 1274 | 792 | 308 | 1095 | 725 | 2 |
| HAND TOOLS | 2004 | 397 | 6464 | 1043 | 5249 | 925 | 4572 | 788 | 2 |
| CUTLERY | 361 | 52 | 243 | 30 | 470 | 83 | 358 | 55 | 0 |
| DOM. UTENSILS | 101 | 4 | 253 | 20 | 417 | 28 | 257 | 17 | 0 |
| AGR.MACH.,TRACTORS | 10940 | 1956 | 6888 | 1683 | 7919 | 2486 | 8582 | 2042 | 5 |
| DOM. EL. EQUIPMENT | 396 | 45 | 507 | 73 | 714 | 75 | 539 | 64 | 0 |
| RAIL. LOCOS ETC. | 20477 | 795 | 16642 | 1201 | 19473 | 3646 | 18864 | 1881 | 5 |
| ROAD VEHICLES | 37645 | 7172 | 53578 | 11670 | 50875 | 10595 | 47366 | 9812 | 25 |
| BICYCLES ETC. | 1834 | 442 | 2708 | 1057 | 3472 | 3012 | 2671 | 1504 | 4 |
| HEATING, SANITARY | 2423 | 542 | 1314 | 501 | 632 | 167 | 1456 | 403 | 1 |
| FURNITURE | 1090 | 102 | 571 | 154 | 1409 | 435 | 1023 | 230 | 1 |
| TOTAL | 122064 | 43741 | 119945 | 38947 | 105310 | 33634 | 115773 | 38774 | 100 |

## RWANDA

**RWANDA**


Kagitumba
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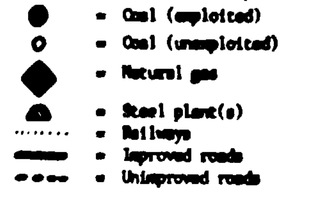
Gahini
Kigali
Kibuye
Gitarama
Nyanza
Cyangugu
Butare


LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

**RWANDA**

During the last ten years Rwanda has experienced a steady GDP growth of above 4 per cent per annum. Government policies as well as favourable weather conditions, terms of trade and capital inflows helped acceleration of growth in the latter half of the 70s. Since 1983, however, a tendency to a slackening pace has occurred mainly due to a more adverse development in external and natural conditions. The projection, based on World Bank assessment, assumes that these factors will negatively influence economic growth up to 1990. The period from 1990 to 1995 will, however, see renewed growth, with the manufacturing sector increasing its share of GDP.

Steel consumption, was less depressed in the base period 1981-83 than in many other PTA countries. The overall rate of consumption increase up to 1990 is therefore only slightly over the GDP growth rate, consumption of heavy and medium plates falling mainly as a result of initially high levels. The faster economic growth and investment projected for the period from 1990 to 1995, implying a rise in GDP per capita will considerably boast consumption of all items. The consumption of plate, where a fall is projected is notoriously hard to forecast and the outturn may change depending on the composition of investment projects.

RWANDA TABLE 1. MAIN PROJECTION

A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 757 | 5.2 | 146 | 980 | 7.0 | 140 | 1200 | 8.3 | 145 | 3.3 | 4.1 | 3.8 | 3.5 | -0.5 | 0.6 |

B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. CONSUMPTION | | EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 2934 | . | 2934 | . | 3652 | 0 | 3652 | 5150 | 0 | 5150 | 2.8 | 7.1 | 4.2 | 3.7 |
| ANGLES SHP. H | 6734 | 255 | . | 255 | . | 380 | 0 | 380 | 486 | 0 | 486 | 5.1 | 5.0 | 3.5 | 4.0 |
| ANGLES SHP.,L | 6735 | 1022 | 0 | 1022 | . | 2475 | 0 | 2475 | 3615 | 0 | 3615 | 11.7 | 7.9 | 3.5 | 4.6 |
| PLATES, H.+ M | 6740 | 2337 | 0 | 2337 | . | 1795 | 0 | 1795 | 2056 | 0 | 2056 | -3.2 | 2.8 | 3.5 | 4.0 |
| PLATES, LIGHT | 6743 | 4572 | 0 | 4572 | . | 6472 | 0 | 6472 | 8871 | 0 | 8871 | 4.4 | 6.5 | 3.5 | 4.6 |
| TIN.& COAT.PL | 6749 | 3879 | 0 | 3879 | . | 5876 | 0 | 5876 | 7924 | 0 | 7924 | 5.3 | 6.2 | 3.5 | 4.6 |
| HOOP AND STRP | 6750 | 66 | 0 | 66 | . | 90 | 0 | 90 | 120 | 0 | 120 | 4.0 | 5.9 | 3.5 | 4.6 |
| RAILS+ MATER. | 6760 | 63 | 0 | 63 | 0 | 65 | 0 | 65 | 67 | 0 | 67 | 0.4 | 0.6 | 3.5 | 4.0 |
| WIRE | 6770 | 860 | 0 | 860 | . | 1620 | 0 | 1620 | 2337 | 0 | 2337 | 8.2 | 7.6 | 3.5 | 4.6 |
| TUBES | 6780 | 2238 | 0 | 2238 | . | 1925 | 0 | 1925 | 1746 | 0 | 1746 | -1.9 | -1.9 | 3.5 | 4.6 |
| TOTALS | | 18225 | 0 | 18225 | 0 | 24348 | 0 | 24348 | 32370 | 0 | 32370 | 3.7 | 5.9 | | |
| CRUDE EQUIVALENT | | 24743 | 0 | 24743 | 0 | 32762 | 0 | 32762 | 43386 | 0 | 43386 | 3.6 | 5.8 | | |
| BILLET EQUVIVALENT | | 21112 | 0 | 21112 | 0 | 27954 | 0 | 27954 | 37018 | 0 | 37018 | 3.6 | 5.8 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 24743 | 0 | 24743 | 0 | 37616 | 0 | 37616 | 52536 | 0 | 52536 | 5.4 | 6.9 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.5 | 3.8 | 0.7 |
| 1990 TO 1995 | 6.1 | 3.5 | 2.5 |

D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 24743 | 0 | 24743 | 0 | 28951 | 0 | 28951 | 34449 | 0 | 34449 | 2.0 | 3.5 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.9 | 3.8 | -1.8 |
| 1990 TO 1995 | 2.2 | 3.5 | -1.2 |

RWANDA TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 757 | 5.2 | 146 | 980 | 7.0 | 140 | 1200 | 8.3 | 145 | 3.3 | 4.1 | 3.8 | 3.5 | -0.5 | 0.6 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| PRODUCT NAME | SITC | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | NET IMPORT | 1995 CONS | PROD | NET IMPORT | GROWTH RATES P.A. CONSUMPTION TO 1990 | CONSUMPTION 1990-95 | EXPL.VARIABLE TO 1990 | EXPL.VARIABLE 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BARS AND RODS | 6730 | 2934 | . | 2934 | . | 4574 | 0 | 4574 | 6994 | 0 | 6994 | 5.7 | 8.9 | 4.2 | 3.7 |
| ANGLES SHP. H | 6734 | 255 | . | 255 | . | 608 | 0 | 608 | 943 | 0 | 943 | 11.5 | 9.2 | 3.5 | 4.0 |
| ANGLES SHP.,L | 6735 | 1022 | 0 | 1022 | . | 2846 | 0 | 2846 | 4357 | 0 | 4357 | 13.7 | 8.9 | 3.5 | 4.6 |
| PLATES, H.+ M | 6740 | 2337 | 0 | 2337 | . | 2020 | 0 | 2020 | 2506 | 0 | 2506 | -1.8 | 4.4 | 3.5 | 4.0 |
| PLATES, LIGHT | 6743 | 4572 | 0 | 4572 | . | 7134 | 0 | 7134 | 10195 | 0 | 10195 | 5.7 | 7.4 | 3.5 | 4.6 |
| TIN.& COAT.PL | 6749 | 3879 | 0 | 3879 | . | 6437 | 0 | 6437 | 9048 | 0 | 9048 | 6.5 | 7.0 | 3.5 | 4.6 |
| HOOP AND STRP | 6750 | 66 | 0 | 66 | . | 152 | 0 | 152 | 245 | 0 | 245 | 11.0 | 10.0 | 3.5 | 4.6 |
| RAILS+ MATER. | 6760 | 63 | 0 | 63 | 0 | 155 | 0 | 155 | 247 | 0 | 247 | 11.9 | 9.8 | 3.5 | 4.0 |
| WIRE | 6770 | 860 | 0 | 860 | . | 1814 | 0 | 1814 | 2725 | 0 | 2725 | 9.8 | 8.5 | 3.5 | 4.6 |
| TUBES | 6780 | 2238 | 0 | 2238 | . | 2074 | 0 | 2074 | 2044 | 0 | 2044 | -0.9 | -0.3 | 3.5 | 4.6 |
| TOTALS | | 18225 | 0 | 18225 | 0 | 27816 | 0 | 27816 | 39305 | 0 | 39305 | 5.4 | 7.2 | | |
| CRUDE EQUIVALENT | | 24743 | 0 | 24743 | 0 | 37345 | 0 | 37345 | 52556 | 0 | 52556 | 5.3 | 7.1 | | |
| BILLET EQUVIVALENT | | 21112 | 0 | 21112 | 0 | 31864 | 0 | 31864 | 44843 | 0 | 44843 | 5.3 | 7.1 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD-1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNES | 24743 | 0 | 24743 | 0 | 42205 | 0 | 42205 | 61709 | 0 | 61709 | 6.9 | 7.9 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.5 | 3.8 | 0.7 |
| 1990 TO 1995 | 6.1 | 3.5 | 2.5 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD - 1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUVIV. TONNE | 24743 | 0 | 24743 | 0 | 33540 | 0 | 33540 | 43624 | 0 | 43624 | 3.9 | 5.4 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.9 | 3.8 | -1.8 |
| 1990 TO 1995 | 2.2 | 3.5 | -1.2 |

RWANDA TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | | | 6 | 2 | | | | | | | | | 2 |
| BARS AND RODS | 6732 | 2537 | 2345 | 3914 | 2932 | | | | | | | | | 2932 |
| ANGLES SHP.HM | 6734 | 277 | 242 | 246 | 255 | | | | | | | | | 255 |
| ANGLES SHP..L | 6735 | 1112 | 968 | 985 | 1022 | | | | | | | | | 1022 |
| PLATES, HEAVY | 6741 | 1239 | 2842 | 2722 | 2268 | | | | | | | | | 2268 |
| PLATES, MED. | 6742 | 32 | 76 | 99 | 69 | | | | | | | | | 69 |
| PLATES, LIGHT | 6743 | 2586 | 5685 | 5445 | 4572 | | | | | | | | | 4572 |
| TINPLATE | 6747 | | | | | | | | | | | | | 0 |
| OTHER COAT.P | 6748 | 4900 | 4849 | 1888 | 3879 | | | | | | | | | 3879 |
| HOOP AND STRP | 6750 | 68 | 63 | 68 | 66 | | | | | | | | | 66 |
| RAILS | 6761 | | 185 | 3 | 63 | | | | | | | | | 63 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | 1122 | 503 | 955 | 860 | | | | | | | | | 860 |
| SEAMLESS TUBE | 6782 | 1938 | 2676 | 2099 | 2238 | | | | | | | | | 2238 |
| WELDED TUBES | 6783 | | | | | | | | | | | | | 0 |
| TOTALS | | 15811 | 20434 | 18430 | 18225 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18225 |

B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 15811 | 20434 | 18430 | 18225 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 15811 | 20434 | 18430 | 18225 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 29866 | 40891 | 38407 | 36388 |
| SUPPLIED FROM; | | | | |
| 1 NET IMPORTS | 29866 | 40891 | 38407 | 36388 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 0 | 0 | 0 | 0 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 21381 | 27893 | 24951 | 24741 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 8486 | 12998 | 13456 | 11647 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 0 | 0 | 0 | 0 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 1000 | 1000 | 1000 | 1000 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

RWANDA TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| GDP, AND POPULATION | | | | | | | | | |
| POPULATION (MILL) | 5.0 | 5.2 | 5.4 | 7.0 | 7.0 | 7.0 | 8.3 | 8.3 | 8.3 |
| GDP PER CAPITA US$ (1975) | 148.0 | 147.5 | 142.1 | 154.3 | 140.0 | 125.7 | 174.7 | 144.6 | 118.1 |
| GDP MILL US$ (1975) | 737.7 | 767.2 | 767.2 | 1080.0 | 980.0 | 880.0 | 1450.0 | 1200.0 | 980.0 |
| GROSS CAP FORM MILL US$ (1975) | 108.1 | 105.0 | 105.0 | 160.0 | 140.0 | 110.0 | 230.0 | 170.0 | 120.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 33.2 | 37.6 | 38.0 | 60.0 | 50.0 | 40.0 | 85.0 | 60.0 | 45.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 99.2 | 109.5 | 110.0 | 150.0 | 140.0 | 130.0 | 190.0 | 175.0 | 150.0 |
| BALANCE OF PAYMENTS BILLION RWF | | | | | | | | | |
| EXPORTS | 10.5 | 10.8 | 0.0 | 23.5 | 21.2 | 19.1 | 41.3 | 34.6 | 32.0 |
| OTHER CURRENT ITEMS | -7.3 | -7.4 | 0.0 | -12.0 | -12.0 | -12.0 | -16.0 | -16.0 | -16.0 |
| ODA, NET INFLOWS | 12.2 | 11.8 | 0.0 | 21.0 | 19.3 | 19.3 | 28.0 | 25.5 | 25.5 |
| LONG TERM CAPITAL,NET | 1.9 | 1.8 | 0.0 | 3.3 | 2.9 | 2.9 | 4.4 | 3.8 | 3.8 |
| RESERVES ERRORS AND OMISSIONS | 2.0 | 3.3 | 0.0 | 4.0 | 4.0 | 4.0 | 5.0 | 5.0 | 5.0 |
| IMPORTS, IMPORT CAPACITY | 19.2 | 20.3 | 0.0 | 39.8 | 35.4 | 33.3 | 62.7 | 52.9 | 50.3 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 3.6 | 3.6 | 3.8 | 3.8 |
| GDP, CONSTANT US$ (1975) | 4.0 | 0.0 | 3.6 | 4.1 |

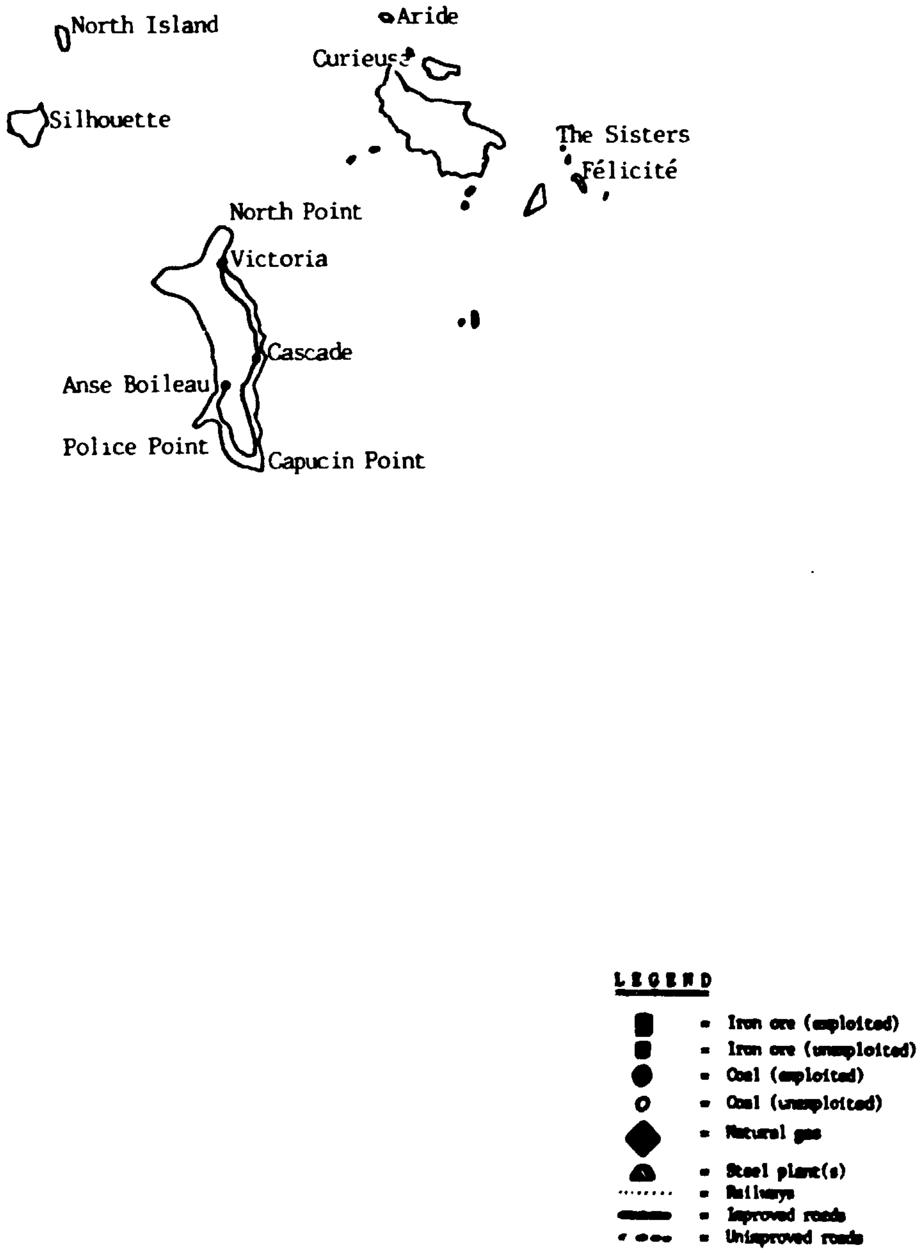
TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY RWANDA

| SITC | 1981 VALUE | 1981 QUANTITY | 1982 VALUE | 1982 QUANTITY | 1983 VALUE | 1983 QUANTITY | AVERAGE VALUE | AVERAGE TONNES | AVERAGE TONNES IN PCT OF TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| MET. STRUCTURES | 2494 | 2656 | 2333 | 2533 | 1137 | 899 | 1988 | 2029 | 18 |
| TANKS, VESSELS, ETC | 280 | 173 | 90 | 60 | 458 | 679 | 276 | 304 | 3 |
| WIRE PRODUCTS | 357 | 272 | 600 | 488 | 377 | 316 | 445 | 359 | 3 |
| NAILS, NUTS,BOLTS | 221 | 154 | 326 | 206 | 157 | 112 | 235 | 157 | 1 |
| HAND TOOLS | 1129 | 345 | 813 | 140 | 1023 | 262 | 988 | 249 | 2 |
| CUTLERY | 156 | 11 | 18 | 0 | 106 | 6 | 93 | 6 | 0 |
| DOM. UTENSILS | 276 | 33 | 415 | 55 | 154 | 21 | 282 | 36 | 0 |
| AGR.MACH.,TRACTORS | 1552 | 291 | 1543 | 302 | 769 | 155 | 1288 | 249 | 2 |
| DOM. EL. EQUIPMENT | 455 | 106 | 506 | 114 | 416 | 71 | 459 | 97 | 1 |
| RAIL. LOCOS ETC. | 97 | 34 | 129 | 42 | 29 | 71 | 85 | 49 | 0 |
| ROAD VEHICLES | 17874 | 3310 | 29383 | 7570 | 31757 | 8693 | 26338 | 6524 | 56 |
| BICYCLES ETC. | 1670 | 610 | 1674 | 751 | 4030 | 1770 | 2458 | 1044 | 9 |
| HEATING, SANITARY | 364 | 120 | 505 | 291 | 532 | 225 | 467 | 212 | 2 |
| FURNITURE | 927 | 246 | 1155 | 339 | 572 | 142 | 885 | 242 | 2 |
| TOTAL | 27852 | 8361 | 39490 | 12891 | 41517 | 13422 | 36286 | 11558 | 100 |

# SEYCHELLES

# SEYCHELLES


North Island
Aride
Curieuse
Silhouette
The Sisters
Félicité
North Point
Victoria
Cascade
Anse Boileau
Police Point
Capucin Point
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

SEYCHELLES

In terms of population, area and GDP Seychelles is the smallest country of the PTA. A demand projection method, which does not specifically take into account major development projects and particular sectoral developments is not quite satisfactory for such a country. Adjustments have therefore been made to model results.

The negative record of overall economic growth for the most recent years is not encouraging. In making projections, account has been taken of the countrys ambitious National Development Plant 1985-89. It is assumed that a strong expansion in the exchange receipts from tourism and fisheries will give room for an expansion of the manufacturing sector up to 1990. In the period after a long term growth rate of 3.7 per cent will give rise to considerable increase in GDP per capita given the relatively low population growth projected for the Seychelles.

Given the relatively high level of GDP per capita, the tiny market, and a very high per capita steel consumption in the base year, overall steel consumption growth has been projected at a level slightly under the rate of growth of GDP. Abnormally high or abnormally low (in relation to overall average) consumption have been assumed to develop towards a more 'normal' level over the two periods. The forecast is not built on detailed assumptions on development projects envisaged and should therefore be considered tentative.

SEYCHELLES    TABLE 1, MAIN PROJECTION

## A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | PROJECTION 1990 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | PROJECTION 1995 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GROWTH RATES PCT. P.A. GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 0.1 | 600 | 75 | 0.1 | 682 | 90 | 0.1 | 750 | 2.8 | 3.7 | 1.2 | 1.8 | 1.6 | 1.9 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| PRODUCT NAME | SITC | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | NET IMPORT | 1995 CONS | PROD | NET IMPORT | GROWTH RATES PA. CONSUMPTION TO 1990 | CONSUMPTION 1990-1995 | EXPL.VARIABLE TO 1990 | EXPL.VARIABLE 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BARS AND RODS | 6730 | 604 | . | 604 | 0 | 730 | 0 | 730 | 980 | 0 | 980 | 2.4 | 6.1 | 2.8 | 3.7 |
| ANGLES SHP. H | 6734 | 37 | . | 37 | . | 50 | 0 | 50 | 60 | 0 | 60 | 3.8 | 3.7 | 2.5 | 3.3 |
| ANGLES SHP.,L | 6735 | 151 | . | 151 | . | 220 | 0 | 220 | 270 | 0 | 270 | 4.8 | 4.2 | 5.2 | 3.1 |
| PLATES, H.+ M | 6740 | 0 | 0 | 0 | . | 5 | 0 | 5 | 6 | 0 | 6 | . | 3.7 | 2.5 | 3.3 |
| PLATES, LIGHT | 6743 | 432 | . | 432 | . | 460 | 0 | 460 | 480 | 0 | 480 | 0.8 | 0.9 | 5.2 | 3.1 |
| TIN.& COAT.PL | 6749 | 377 | 0 | 377 | . | 400 | 0 | 400 | 420 | 0 | 420 | 0.7 | 1.0 | 5.2 | 3.1 |
| HOOP AND STRP | 6750 | 1 | 0 | 1 | . | 30 | 0 | 30 | 54 | 0 | 54 | 53.0 | 12.5 | 5.2 | 3.1 |
| RAILS+ MATER. | 6760 | 0 | 0 | 0 | . | 0 | 0 | 0 | 0 | 0 | 0 | . | . | 2.5 | 3.3 |
| WIRE | 6770 | 5 | 0 | 5 | . | 7 | 0 | 7 | 9 | 0 | 9 | 4.3 | 5.2 | 5.2 | 3.1 |
| TUBES | 6780 | 243 | 0 | 243 | . | 300 | 0 | 300 | 360 | 0 | 360 | 2.7 | 3.7 | 5.2 | 3.1 |
| TOTALS | | 1850 | 0 | 1850 | 0 | 2202 | 0 | 2202 | 2639 | 0 | 2639 | 2.2 | 3.7 | | |
| CRUDE EQUIVALENT | | 2471 | 0 | 2471 | 0 | 2934 | 0 | 2934 | 3504 | 0 | 3504 | 2.2 | 3.6 | | |
| BILLET EQUVIVALENT | | 2108 | 0 | 2108 | 0 | 2503 | 0 | 2503 | 2990 | 0 | 2990 | 2.2 | 3.6 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD-1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNES | 2471 | 0 | 2471 | 0 | 3278 | 0 | 3278 | 3958 | 0 | 3958 | 3.6 | 3.8 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 3.7 | 1.2 | 2.4 |
| 1990 TO 1995 | 4.6 | 1.8 | 2.8 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD - 1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUVIV. TONNE | 2471 | 0 | 2471 | 0 | 2624 | 0 | 2624 | 2929 | 0 | 2929 | 0.8 | 2.2 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.0 | 1.2 | -0.2 |
| 1990 TO 1995 | 1.5 | 1.8 | -0.3 |

SEYCHELLES TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 60 | 0.1 | 600 | 75 | 0.1 | 682 | 90 | 0.1 | 750 | 2.8 | 3.7 | 1.2 | 1.8 | 1.6 | 1.9 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. CONSUMPTION | | EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 604 | . | 604 | 0 | 951 | 0 | 951 | 1423 | 0 | 1423 | 5.8 | 8.4 | 2.8 | 3.7 |
| ANGLES SHP. H | 6734 | 37 | . | 37 | . | 105 | 0 | 105 | 170 | 0 | 170 | 13.9 | 10.1 | 2.5 | 3.3 |
| ANGLES SHP..L | 6735 | 151 | . | 151 | . | 309 | 0 | 309 | 448 | 0 | 448 | 9.4 | 7.7 | 5.2 | 3.1 |
| PLATES, H.+ M | 6740 | 0 | 0 | 0 | . | 59 | 0 | 59 | 114 | 0 | 114 | . | 14.1 | 2.5 | 3.3 |
| PLATES, LIGHT | 6743 | 432 | . | 432 | . | 619 | 0 | 619 | 798 | 0 | 798 | 4.6 | 5.2 | 5.2 | 3.1 |
| TIN.& COAT.PL | 6749 | 377 | 0 | 377 | . | 535 | 0 | 535 | 690 | 0 | 690 | 4.5 | 5.2 | 5.2 | 3.1 |
| HOOP AND STRP | 6750 | 1 | 0 | 1 | . | 45 | 0 | 45 | 84 | 0 | 84 | 60.9 | 13.3 | 5.2 | 3.1 |
| RAILS+ MATER. | 6760 | 0 | 0 | 0 | . | 22 | 0 | 22 | 43 | 0 | 43 | . | 14.3 | 2.5 | 3.3 |
| WIRE | 6770 | 5 | 0 | 5 | . | 54 | 0 | 54 | 102 | 0 | 102 | 34.6 | 13.6 | 5.2 | 3.1 |
| TUBES | 6780 | 243 | 0 | 243 | . | 336 | 0 | 336 | 432 | 0 | 432 | 4.1 | 5.2 | 5.2 | 3.1 |
| TOTALS | | 1850 | 0 | 1850 | 0 | 3034 | 0 | 3034 | 4302 | 0 | 4302 | 6.4 | 7.2 | | |
| CRUDE EQUIVALENT | | 2471 | 0 | 2471 | 0 | 4036 | 0 | 4036 | 5707 | 0 | 5707 | 6.3 | 7.2 | | |
| BILLET EQUVIVALENT | | 2108 | 0 | 2108 | 0 | 3444 | 0 | 3444 | 4869 | 0 | 4869 | 6.3 | 7.2 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 2471 | 0 | 2471 | 0 | 4379 | 0 | 4379 | 6159 | 0 | 6159 | 7.4 | 7.1 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 3.7 | 1.2 | 2.4 |
| 1990 TO 1995 | 4.6 | 1.8 | 2.8 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 2471 | 0 | 2471 | 0 | 3724 | 0 | 3724 | 5130 | 0 | 5130 | 5.3 | 6.6 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.0 | 1.2 | -0.2 |
| 1990 TO 1995 | 1.5 | 1.8 | -0.3 |

SEYCHELLES TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | 316 | 508 | 60 | 295 | | | | | | | | | 295 |
| BARS AND RODS | 6732 | 489 | 111 | 328 | 309 | | | | | | | | | 309 |
| ANGLES SHP.HM | 6734 | 57 | 30 | 25 | 37 | | | | | | | | | 37 |
| ANGLES SHP..L | 6735 | 220 | 122 | 111 | 151 | | | | | | | | | 151 |
| PLATES, HEAVY | 6741 | | | | | | | | | | | | | 0 |
| PLATES, MED. | 6742 | | | | | | | | | | | | | 0 |
| PLATES, LIGHT | 6743 | 515 | 390 | 390 | 432 | | | | | | | | | 432 |
| TINPLATE | 6747 | 260 | 190 | 190 | 213 | | | | | | | | | 213 |
| OTHER COAT.P | 6748 | 190 | 150 | 150 | 163 | | | | | | | | | 163 |
| HOOP AND STRP | 6750 | | 2 | 2 | 1 | | | | | | | | | 1 |
| RAILS | 6761 | | | | | | | | | | | | | 0 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | | 8 | 6 | 5 | | | | | | | | | 5 |
| SEAMLESS TUBE | 6782 | 300 | 250 | 180 | 243 | | | | | | | | | 243 |
| WELDED TUBES | 6783 | | | | | | | | | | | | | 0 |
| TOTALS | | 2347 | 1761 | 1442 | 1850 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1850 |

B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 2347 | 1761 | 1442 | 1850 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 2347 | 1761 | 1442 | 1850 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 6757 | 5854 | 4309 | 5640 |
| SUPPLIED FROM: | | | | |
| 1 NET IMPORTS | 6757 | 5854 | 4309 | 5640 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 0 | 0 | 0 | 0 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 3128 | 2353 | 1933 | 2471 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 3630 | 3502 | 2376 | 3169 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 0 | 0 | 0 | 0 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 0 | 0 | 0 | 0 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

SEYCHELLES TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| **GDP, AND POPULATION** | | | | | | | | | |
| POPULATION (MILL) | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| GDP PER CAPITA US$ (1975) | 941.7 | 920.2 | 948.8 | 1141.2 | 1070.0 | 927.2 | 1305.5 | 1175.0 | 913.8 |
| GDP MILL US$ (1975) | 59.8 | 58.8 | 61.1 | 80.0 | 75.0 | 65.0 | 100.0 | 90.0 | 70.0 |
| GROSS CAP FORM MILL US$ (1975) | 14.5 | 13.8 | 13.8 | 20.0 | 17.0 | 15.0 | 28.0 | 20.0 | 16.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 5.2 | 3.6 | 3.8 | 6.0 | 5.0 | 4.0 | 8.0 | 6.0 | 4.5 |
| MANUFACTURING V.A. MILL US$ (1975) | 4.3 | 4.4 | 4.3 | 6.0 | 5.5 | 5.0 | 8.0 | 7.0 | 6.0 |
| **BALANCE OF PAYMENTS MILLION US$** | | | | | | | | | |
| EXPORTS | 4.6 | 3.9 | 5.1 | 9.2 | 8.3 | 7.8 | 14.3 | 11.9 | 10.5 |
| OTHER CURRENT ITEMS | 40.9 | 27.4 | 29.5 | 65.0 | 55.0 | 50.0 | 110.0 | 90.0 | 75.0 |
| ODA, NET INFLOWS | 19.5 | 32.6 | 24.5 | 40.0 | 35.0 | 30.0 | 55.0 | 45.0 | 40.0 |
| LONG TERM CAPITAL,NET | 1.4 | 3.7 | 4.4 | 7.0 | 6.0 | 6.0 | 9.3 | 8.0 | 8.0 |
| RESERVES ERRORS AND OMISSIONS | 12.8 | 15.4 | 11.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| IMPORTS, IMPORT CAPACITY | 79.2 | 83.0 | 74.5 | 131.2 | 114.3 | 103.0 | 198.6 | 164.9 | 143.5 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 0.6 | 0.5 | 1.4 | 1.8 |
| GDP. CONSTANT US$ (1975) | -1.7 | 3.9 | 1.0 | 1.0 |

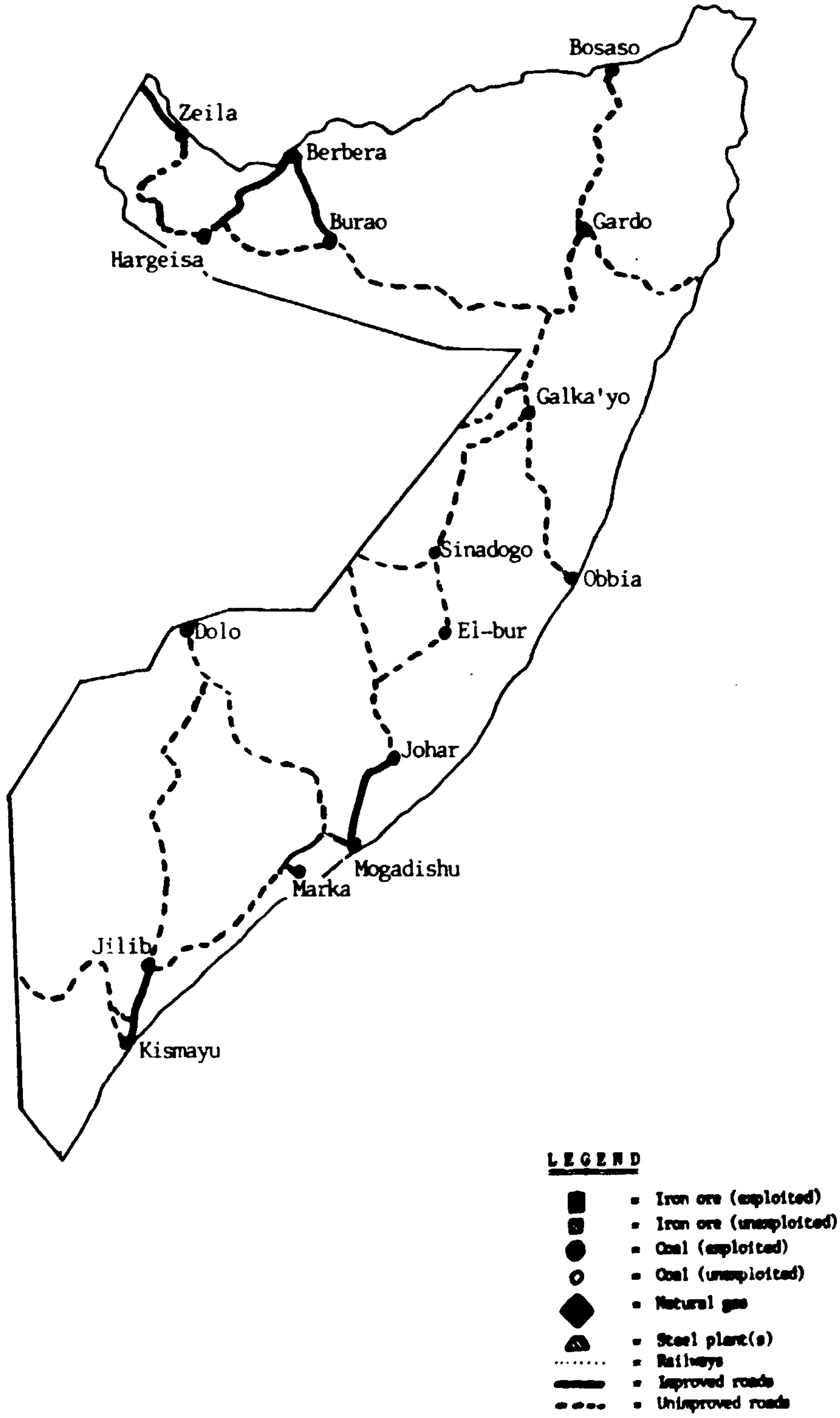
TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY SEYCHELLES

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| SITC | | | | | | | | | |
| MET. STRUCTURES | 798 | 658 | 887 | 1024 | 573 | 409 | 753 | 697 | 25 |
| TANKS, VESSELS, ETC | 372 | 296 | 82 | 18 | 53 | 11 | 169 | 108 | 4 |
| WIRE PRODUCTS | 236 | 242 | 344 | 376 | 116 | 136 | 232 | 251 | 9 |
| NAILS, NUTS,BOLTS | 328 | 47 | 309 | 152 | 250 | 116 | 296 | 105 | 4 |
| HAND TOOLS | 407 | 23 | 658 | 102 | 387 | 107 | 484 | 77 | 3 |
| CUTLERY | 115 | 4 | 125 | 25 | 86 | 8 | 109 | 12 | 0 |
| DOM. UTENSILS | 756 | 134 | 539 | 131 | 428 | 81 | 574 | 115 | 4 |
| AGR.MACH.,TRACTORS | 385 | 139 | 136 | 23 | 187 | 48 | 236 | 70 | 3 |
| DOM. EL. EQUIPMENT | 1801 | 332 | 1239 | 157 | 934 | 228 | 1325 | 239 | 9 |
| RAIL. LOCOS ETC. | . | . | 10 | 1 | . | . | 3 | 0 | 0 |
| ROAD VEHICLES | 3464 | 635 | 3232 | 630 | 2581 | 512 | 3092 | 592 | 21 |
| BICYCLES ETC. | 150 | 114 | 103 | 24 | 103 | 30 | 119 | 56 | 2 |
| HEATING, SANITARY | 722 | 322 | 708 | 173 | 437 | 178 | 622 | 224 | 8 |
| FURNITURE | 669 | 209 | 1166 | 238 | 531 | 225 | 789 | 224 | 8 |
| TOTAL | 10203 | 3155 | 9538 | 3074 | 6666 | 2089 | 8802 | 2773 | 100 |

## SOMALIA

# SOMALIA


Bosaso
Zeila
Berbera
Burao
Gardo
Hargeisa
Galka'yo
Sinadogo
Obbia
Dolo
El-bur
Johar
Mogadishu
Marka
Jilib
Kismayu
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

SOMALIA

Although National Accounts data in Somalia are weak it is clear that a major upswing took place in the economy from 1980-81 from the very depressed levels of the late 70s.

In terms of GDP growth rates, the economic projections cover a range from 5 per cent to under 1 per cent per annum, the former reflecting an optimistic government view and the latter and unfavourable scenerio with reoccurrence of drought, lower aid inflows and worsening balance-of-payments. A middle situation implying a growth rate of just over 2 per cent per annum as been selected as a base case for both projection periods.

The steel demand projection indicate an overall growth well above the GDP growth rate for both periods, reflecting a substantial catch up effect from the exceedingly low levels of consumption per capita which prevailed in the base period 1981-83. Also, most strikingly in the period up to 1990, the structure of consumption changes to from the one recorded in available import statistics to one which is more in line with the average for the subregion.

SOMALIA TABLE 1. MAIN PROJECTION

## A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 603 | 5.0 | 121 | 720 | 6.0 | 120 | 800 | 6.5 | 123 | 2.2 | 2.1 | 2.3 | 1.6 | -0.1 | 0.5 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. CONSUMPTION | | EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 713 | . | 713 | . | 1163 | 0 | 1163 | 1722 | 0 | 1722 | 6.3 | 8.2 | 1.7 | 2.4 |
| ANGLES SHP. H | 6734 | 147 | . | 147 | . | 335 | 0 | 335 | 426 | 0 | 426 | 10.8 | 4.9 | 1.7 | 2.2 |
| ANGLES SHP.,L | 6735 | 567 | 0 | 567 | . | 619 | 0 | 619 | 810 | 0 | 810 | 1.1 | 5.5 | 2.6 | 2.7 |
| PLATES, H.+ M | 6740 | 308 | 0 | 308 | . | 1350 | 0 | 1350 | 1900 | 0 | 1900 | 20.3 | 7.1 | 1.7 | 2.2 |
| PLATES, LIGHT | 6743 | 112 | 0 | 112 | . | 570 | 0 | 570 | 920 | 0 | 920 | 22.6 | 10.0 | 2.6 | 2.7 |
| TIN.& COAT.PL | 6749 | 1323 | 0 | 1323 | . | 1660 | 0 | 1660 | 2101 | 0 | 2101 | 2.9 | 4.8 | 2.6 | 2.7 |
| HOOP AND STRP | 6750 | 323 | 0 | 323 | . | 279 | 0 | 279 | 277 | 0 | 277 | -1.8 | -0.1 | 2.6 | 2.7 |
| RAILS+ MATER. | 6760 | 60 | 0 | 60 | . | 344 | 0 | 344 | 433 | 0 | 433 | 24.4 | 4.7 | 1.7 | 2.2 |
| WIRE | 6770 | 552 | 0 | 552 | . | 650 | 0 | 650 | 730 | 0 | 730 | 2.1 | 2.3 | 2.6 | 2.7 |
| TUBES | 6780 | 1696 | 0 | 1696 | . | 2188 | 0 | 2188 | 2320 | 0 | 2320 | 3.2 | 1.2 | 2.6 | 2.7 |
| TOTALS | | 5800 | 0 | 5800 | . | 9158 | 0 | 9158 | 11638 | 0 | 11638 | 5.9 | 4.9 | | |
| CRUDE EQUIVALENT | | 7897 | 0 | 7897 | . | 12502 | 0 | 12502 | 15839 | 0 | 15839 | 5.9 | 4.8 | | |
| BILLET EQUVIVALENT | | 6738 | 0 | 6738 | . | 10667 | 0 | 10667 | 13515 | 0 | 13515 | 5.9 | 4.8 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 7897 | 0 | 7897 | . | 16410 | 0 | 16410 | 23850 | 0 | 23850 | 9.6 | 7.8 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 3.9 | 2.3 | 1.6 |
| 1990 TO 1995 | 4.0 | 1.6 | 2.4 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 7897 | 0 | 7897 | . | 9015 | 0 | 9015 | 10847 | 0 | 10847 | 1.7 | 3.8 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 0.3 | 2.3 | -1.9 |
| 1990 TO 1995 | 0.9 | 1.6 | -0.7 |

SOMALIA TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 603 | 5.0 | 121 | 720 | 6.0 | 120 | 800 | 6.5 | 123 | 2.2 | 2.1 | 2.3 | 1.6 | -0.1 | 0.5 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 198[illegible] | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 7[illegible]3 | . | 713 | . | 4910 | 0 | 4910 | 9216 | 0 | 9216 | 27.3 | 13.4 | 1.7 | 2.4 |
| ANGLES SHP. H | 6734 | 147 | . | 147 | . | 1265 | 0 | 1265 | 2285 | 0 | 2285 | 30.9 | 12.6 | 1.7 | 2.2 |
| ANGLES SHP.,L | 6735 | 567 | 0 | 567 | . | 2126 | 0 | 2126 | 3824 | 0 | 3824 | 18.0 | 12.5 | 2.6 | 2.7 |
| PLATES, H.+ M | 6740 | 308 | 0 | 308 | . | 2266 | 0 | 2266 | 3731 | 0 | 3731 | 28.3 | 10.5 | 1.7 | 2.2 |
| PLATES, LIGHT | 6743 | 112 | 0 | 112 | . | 3261 | 0 | 3261 | 6301 | 0 | 6301 | 52.4 | 14.1 | 2.6 | 2.7 |
| TIN.& COAT.PL | 6749 | 1323 | 0 | 1323 | . | 3942 | 0 | 3942 | 6665 | 0 | 6665 | 14.6 | 11.1 | 2.6 | 2.7 |
| HOOP AND STRP | 6750 | 323 | 0 | 323 | . | 532 | 0 | 532 | 784 | 0 | 784 | 6.4 | 8.1 | 2.6 | 2.7 |
| RAILS+ MATER. | 6760 | 60 | 0 | 60 | . | 710 | 0 | 710 | 1166 | 0 | 1166 | 36.2 | 10.4 | 1.7 | 2.2 |
| WIRE | 6770 | 552 | 0 | 552 | . | 1439 | 0 | 1439 | 2308 | 0 | 2308 | 12.7 | 9.9 | 2.6 | 2.7 |
| TUBES | 6780 | 1696 | 0 | 1696 | . | 2793 | 0 | 2793 | 3531 | 0 | 3531 | 6.4 | 4.8 | 2.6 | 2.7 |
| TOTALS | | 5800 | 0 | 5800 | . | 23244 | 0 | 23244 | 39811 | 0 | 39811 | 18.9 | 11.4 | | |
| CRUDE EQUIVALENT | | 7897 | 0 | 7897 | . | 31137 | 0 | 31137 | 53110 | 0 | 53110 | 18.7 | 11.3 | | |
| BILLET EQUVIVALENT | | 6738 | 0 | 6738 | . | 26568 | 0 | 26568 | 45316 | 0 | 45316 | 18.7 | 11.3 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 7897 | 0 | 7897 | . | 35048 | 0 | 35048 | 61118 | 0 | 61118 | 20.5 | 11.8 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 3.9 | 2.3 | 1.6 |
| 1990 TO 1995 | 4.0 | 1.6 | 2.4 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 7897 | 0 | 7897 | . | 27650 | 0 | 27650 | 48117 | 0 | 48117 | 17.0 | 11.7 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 0.3 | 2.3 | -1.9 |
| 1990 TO 1995 | 0.9 | 1.6 | -0.7 |

SOMALIA TABLE 3

## A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | 0 |
| WIRE RODS | 6731 | | | | | | | | | | | | | 713 |
| BARS AND RODS | 6732 | 470 | 890 | 780 | 713 | | | | | | | | | 147 |
| ANGLES SHP.HM | 6734 | 100 | 180 | 160 | 147 | | | | | | | | | 567 |
| ANGLES SHP..L | 6735 | 370 | 710 | 620 | 567 | | | | | | | | | |
| PLATES, HEAVY | 6741 | 50 | 95 | 83 | 76 | | | | | | | | | |
| PLATES, MED. | 6742 | 153 | 290 | 254 | 232 | | | | | | | | | |
| PLATES, LIGHT | 6743 | 73 | 140 | 123 | 112 | | | | | | | | | 12 |
| TINPLATE | 6747 | 8 | 15 | 13 | 12 | | | | | | | | | 1311 |
| OTHER COAT.P | 6748 | 863 | 1637 | 1434 | 1311 | | | | | | | | | 323 |
| HOOP AND STRP | 6750 | 212 | 403 | 353 | 323 | | | | | | | | | 60 |
| RAILS | 6761 | 40 | 75 | 65 | 60 | | | | | | | | | 0 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 552 |
| WIRE | 6770 | 363 | 689 | 603 | 552 | | | | | | | | | 891 |
| SEAMLESS TUBE | 6782 | 586 | 1112 | 975 | 891 | | | | | | | | | 805 |
| WELDED TUBES | 6783 | 509 | 965 | 940 | 805 | | | | | | | | | |
| TOTALS | | 3797 | 7201 | 6403 | 5800 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5800 |

## B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 3797 | 7201 | 6403 | 5800 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 3797 | 7201 | 6403 | 5800 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 36671 | 55686 | 72833 | 55063 |
| SUPPLIED FROM; | | | | |
| 1 NET IMPORTS | 36896 | 55692 | 73233 | 55273 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 3 | 6 | 400 | 136 |
| NET IMPORTS OF BILLETS ETC | 222 | 0 | 0 | 74 |
| NET IMPORTS OF ROLLED PRODUCTS | 5167 | 9799 | 8723 | 7896 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 31504 | 45887 | 64109 | 47167 |
| 2 LOCAL SOURCES (INCL. SCRAP) | -225 | -6 | -400 | -210 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 2500 | 2500 | 2500 | 2500 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

SOMALIA TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| GDP, AND POPULATION | | | | | | | | | |
| POPULATION (MILL) | 4.8 | 5.0 | 5.2 | 6.0 | 6.0 | 6.0 | 6.5 | 6.5 | 6.5 |
| GDP PER CAPITA US$ (1975) | 118.0 | 122.2 | 120.1 | 136.6 | 120.0 | 103.3 | 153.0 | 123.0 | 100.0 |
| GDP MILL US$ (1975) | 572.3 | 611.1 | 624.7 | 820.0 | 720.0 | 620.0 | 1000.0 | 800.0 | 650.0 |
| GROSS CAP FORM MILL US$ (1975) | 149.8 | 152.2 | 145.7 | 200.0 | 170.0 | 145.0 | 255.0 | 190.0 | 150.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 33.0 | 34.4 | 36.6 | 50.0 | 40.0 | 35.0 | 65.0 | 45.0 | 38.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 55.3 | 56.8 | 58.4 | 75.0 | 70.0 | 60.0 | 90.0 | 80.0 | 65.0 |
| BALANCE OF PAYMENTS MILLION US$ | | | | | | | | | |
| EXPORTS | 114.0 | 137.0 | 100.0 | 220.0 | 200.0 | 190.0 | 360.0 | 325.0 | 310.0 |
| OTHER CURRENT ITEMS | 63.0 | 20.0 | 23.0 | 40.0 | 35.0 | 35.0 | 55.0 | 45.0 | 45.0 |
| ODA, NET INFLOWS | 229.0 | 280.0 | 248.0 | 430.0 | 410.0 | 410.0 | 570.0 | 540.0 | 540.0 |
| LONG TERM CAPITAL,NET | . | . | . | . | . | . | . | . | . |
| RESERVES ERRORS AND OMISSIONS | 16.0 | 47.0 | 79.0 | 40.0 | 40.0 | 40.0 | 30.0 | 30.0 | 30.0 |
| IMPORTS, IMPORT CAPACITY | 422.0 | 484.0 | 450.0 | 730.0 | 685.0 | 675.0 | 1015.0 | 940.0 | 925.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 3.9 | 3.9 | 2.1 | 1.6 |
| GDP, CONSTANT US$ (1975) | 6.8 | 2.2 | 2.1 | 2.1 |

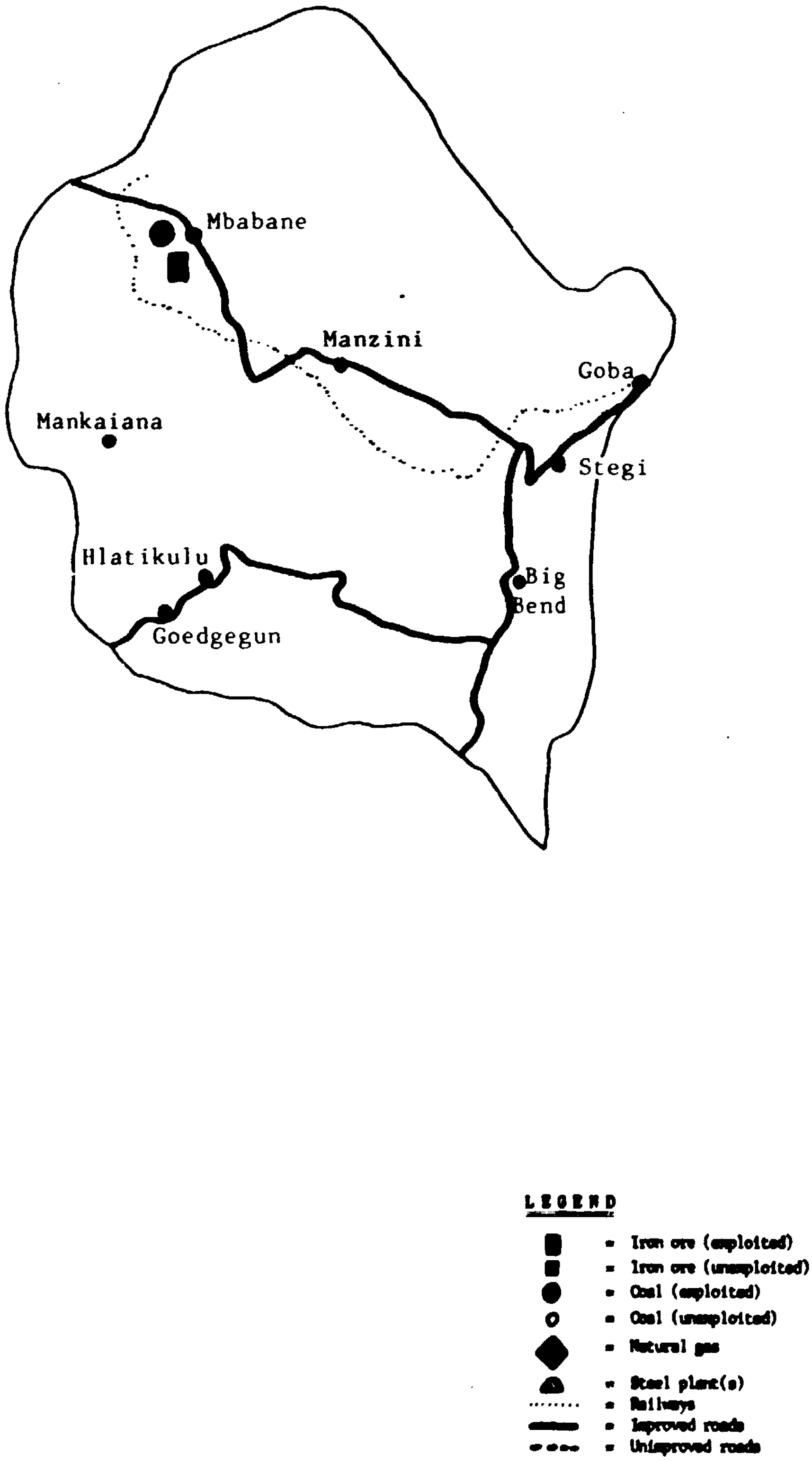
TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 19[illegible] - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY SOMALIA

| | YEAR 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
|---|---|---|---|---|---|---|---|---|---|
| SITC | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| MET. STRUCTURES | 2993 | 2275 | 10994 | 7956 | 14783 | 9017 | 9590 | 6416 | 14 |
| TANKS, VESSELS, ETC | 449 | 227 | 9583 | 3586 | 6424 | 5539 | 5485 | 3117 | 7 |
| WIRE PRODUCTS | 309 | 282 | 1284 | 1008 | 3390 | 4898 | 1661 | 2063 | 4 |
| NAILS, NUTS,BOLTS | 371 | 440 | 1209 | 1373 | 1819 | 2427 | 1133 | 1413 | 3 |
| HAND TOOLS | 2760 | 768 | 3257 | 825 | 4992 | 2010 | 3670 | 1201 | 3 |
| CUTLERY | 130 | 0 | 44 | 5 | 407 | 267 | 194 | 91 | 0 |
| DOM. UTENSILS | 1659 | 303 | 1813 | 426 | 2435 | 654 | 1969 | 461 | 1 |
| AGR.MACH.,TRACTORS | 6829 | 1415 | 5860 | 1424 | 7966 | 2235 | 6885 | 1691 | 4 |
| DOM. EL. EQUIPMENT | 948 | 221 | 1958 | 531 | 2305 | 576 | 1737 | 443 | 1 |
| RAIL. LOCOS ETC. | 5 | 5 | 78 | 122 | 2193 | 1480 | 759 | 536 | 1 |
| ROAD VEHICLES | 113080 | 24190 | 116537 | 22225 | 128011 | 27704 | 119209 | 24706 | 53 |
| BICYCLES ETC. | 739 | 278 | 3361 | 1465 | 3621 | 1536 | 2574 | 1093 | 2 |
| HEATING, SANITARY | 571 | 272 | 1790 | 970 | 3560 | 1533 | 1974 | 925 | 2 |
| FURNITURE | 1624 | 750 | 6604 | 3680 | 9281 | 3965 | 5836 | 2798 | 6 |
| TOTAL | 132467 | 31426 | 164372 | 45596 | 191187 | 63841 | 162675 | 46954 | 100 |

# SWAZILAND

# SWAZILAND


Mbabane
Manzini
Goba
Mankaiana
Stegi
Hlatikulu
Big Bend
Goedgegun
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

SWAZILAND

Swaziland is one of the mini-economies of PTA/SADCC where forecasts are difficult to make, because of the size and structure of the economy but and because of its proximity to and linkages with South Afirca. Economic projections up to 1990 have been based on macro projections in Swaziland's Fourth National Development Plan. Although the countrys consumption of rolled steel products per capita is quite high, the projection methodology chosen, using the very high per capita GDP as an explanatory variable makes for an even higher consumption. Partly, this problem also is related to the structure of steel consumption in Swaziland, where an unusual large number of products are imported from South Africa in their final forms instead of being produced in the country on the basis of rolled products. As this can be expected to continue for some time, the projections produced by the straingt forward application of the model have been scaled down.

SWAZILAND TABLE 1, MAIN PROJECTION

A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 521 | 0.6 | 840 | 620 | 0.8 | 785 | 720 | 0.9 | 774 | 2.2 | 3.0 | 3.1 | 3.3 | -0.9 | -0.3 |

B) BA E CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 112 | . | 112 | . | 548 | 0 | 548 | 1247 | 0 | 1247 | 22.0 | 17.9 | 0.5 | 1.4 |
| ANGLES SHP. H | 6734 | 759 | . | 759 | . | 820 | 0 | 820 | 880 | 0 | 880 | 1.0 | 1.4 | 0.7 | 2.2 |
| ANGLES SHP.,L | 6735 | 3035 | . | 3035 | . | 3985 | 0 | 3985 | 4747 | 0 | 4747 | 3.5 | 3.6 | 2.8 | 2.9 |
| PLATES, H.+ M | 6740 | 57 | . | 57 | . | 120 | 0 | 120 | 150 | 0 | 150 | 9.8 | 4.6 | 0.7 | 2.2 |
| PLATES, LIGHT | 6743 | 118 | . | 118 | . | 245 | 0 | 245 | 320 | 0 | 320 | 9.6 | 5.5 | 2.8 | 2.9 |
| TIN.& COAT.PL | 6749 | 2692 | . | 2692 | . | 3980 | 0 | 3980 | 5280 | 0 | 5280 | 5.0 | 5.8 | 2.8 | 2.9 |
| HOOP AND STRP | 6750 | 212 | . | 212 | . | 221 | 0 | 221 | 241 | 0 | 241 | 0.5 | 1.7 | 2.8 | 2.9 |
| RAILS+ MATER. | 6760 | 40 | . | 40 | . | 72 | 0 | 72 | 103 | 0 | 103 | 7.6 | 7.4 | 0.7 | 2.2 |
| WIRE | 6770 | 259 | . | 259 | . | 450 | 0 | 450 | 680 | 0 | 680 | 7.1 | 8.6 | 2.8 | 2.9 |
| TUBES | 6780 | 141 | . | 141 | . | 210 | 0 | 210 | 270 | 0 | 270 | 5.1 | 5.2 | 2.8 | 2.9 |
| TOTALS | | 7425 | . | 7425 | . | 10650 | 0 | 10650 | 13918 | 0 | 13918 | 4.6 | 5.5 | | |
| CRUDE EQUIVALENT | | 9725 | . | 9725 | . | 13983 | 0 | 13983 | 18284 | 0 | 18284 | 4.6 | 5.5 | | |
| BILLET EQUVIVALENT | | 8298 | . | 8298 | . | 11931 | 0 | 11931 | 15601 | 0 | 15601 | 4.6 | 5.5 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 9725 | . | 9725 | . | 15182 | 0 | 15182 | 21545 | 0 | 21545 | 5.7 | 7.3 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 3.4 | 3.1 | 0.3 |
| 1990 TO 1995 | 4.1 | 3.3 | 0.7 |

D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 9725 | . | 9725 | . | 13413 | 0 | 13413 | 14820 | 0 | 14820 | 4.1 | 2.0 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | -0.0 | 3.1 | -3.0 |
| 1990 TO 1995 | 1.1 | 3.3 | -2.1 |

SWAZILAND TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 521 | 0.6 | 840 | 620 | 0.8 | 785 | 720 | 0.9 | 774 | 2.2 | 3.0 | 3.1 | 3.3 | -0.9 | -0.3 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. CONSUMPTION | | EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 112 | . | 112 | . | 2018 | 0 | 2018 | 4188 | 0 | 4188 | 43.5 | 15.7 | 0.5 | 1.4 |
| ANGLES SHP. H | 6734 | 759 | . | 759 | . | 1185 | 0 | 1185 | 1610 | 0 | 1610 | 5.7 | 6.3 | 0.7 | 2.2 |
| ANGLES SHP.,L | 6735 | 3035 | . | 3035 | . | 4576 | 0 | 4576 | 5930 | 0 | 5930 | 5.3 | 5.3 | 2.8 | 2.9 |
| PLATES, H.+ M | 6740 | 57 | . | 57 | . | 479 | 0 | 479 | 869 | 0 | 869 | 30.5 | 12.7 | 0.7 | 2.2 |
| PLATES, LIGHT | 6743 | 118 | . | 118 | . | 1301 | 0 | 1301 | 2432 | 0 | 2432 | 35.0 | 13.3 | 2.8 | 2.9 |
| TIN.& COAT.PL | 6749 | 2692 | . | 2692 | . | 4875 | 0 | 4875 | 7071 | 0 | 7071 | 7.7 | 7.7 | 2.8 | 2.9 |
| HOOP AND STRP | 6750 | 212 | . | 212 | . | 320 | 0 | 320 | 440 | 0 | 440 | 5.3 | 6.6 | 2.8 | 2.9 |
| RAILS+ MATER. | 6760 | 40 | . | 40 | . | 215 | 0 | 215 | 390 | 0 | 390 | 23.4 | 12.6 | 0.7 | 2.2 |
| WIRE | 6770 | 259 | . | 259 | . | 760 | 0 | 760 | 1299 | 0 | 1299 | 14.4 | 11.3 | 2.8 | 2.9 |
| TUBES | 6780 | 141 | . | 141 | . | 448 | 0 | 448 | 745 | 0 | 745 | 15.5 | 10.7 | 2.8 | 2.9 |
| TOTALS | | 7425 | . | 7425 | . | 16177 | 0 | 16177 | 24973 | 0 | 24973 | 10.2 | 9.1 | | |
| CRUDE EQUIVALENT | | 9725 | . | 9725 | . | 21294 | 0 | 21294 | 32911 | 0 | 32911 | 10.3 | 9.1 | | |
| BILLET EQUVIVALENT | | 8298 | . | 8298 | . | 18169 | 0 | 18169 | 28081 | 0 | 28081 | 10.3 | 9.1 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 9725 | . | 9725 | . | 22496 | 0 | 22496 | 36169 | 0 | 36169 | . 11.1 | 10.0 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 3.4 | 3.1 | 0.3 |
| 1990 TO 1995 | 4.1 | 3.3 | 0.7 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 9725 | . | 9725 | . | 20723 | 0 | 20723 | 29443 | 0 | 29443 | 9.9 | 7.3 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | -0.0 | 3.1 | -3.0 |
| 1990 TO 1995 | 1.1 | 3.3 | -2.1 |

SWAZILAND TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | | | | | | | | | | | | | 0 |
| BARS AND RODS | 6732 | 154 | 155 | 27 | 112 | | | | | | | | | 112 |
| ANGLES SHP.HM | 6734 | 530 | 924 | 822 | 759 | | | | | | | | | 759 |
| ANGLES SHP..L | 6735 | 2120 | 3697 | 3289 | 3035 | | | | | | | | | 3035 |
| PLATES, HEAVY | 6741 | 70 | 20 | 80 | 57 | | | | | | | | | 57 |
| PLATES, MED. | 6742 | | | | | | | | | | | | | 0 |
| PLATES, LIGHT | 6743 | 140 | 54 | 160 | 118 | | | | | | | | | 118 |
| TINPLATE | 6747 | | | | | | | | | | | | | 0 |
| OTHER COAT.P | 6748 | 2596 | 2389 | 3090 | 2692 | | | | | | | | | 2692 |
| HOOP AND STRP | 6750 | 462 | 70 | 105 | 212 | | | | | | | | | 212 |
| RAILS | 6761 | 24 | 27 | 68 | 40 | | | | | | | | | 40 |
| OTHER RL TRCK | 6762 | | | | | | | | | | | | | 0 |
| WIRE | 6770 | 150 | 374 | 253 | 259 | | | | | | | | | 259 |
| SEAMLESS TUBE | 6782 | 100 | 216 | 108 | 141 | | | | | | | | | 141 |
| WELDED TUBES | 6783 | | | | | | | | | | | | | 0 |
| TOTALS | | 6346 | 7926 | 8002 | 7425 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7425 |



B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 6346 | 7926 | 8002 | 7425 |
| OF WHICH: | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 6346 | 7926 | 8002 | 7425 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 29367 | 30729 | 25821 | 28639 |
| SUPPLIED FROM: | | | | |
| 1 NET IMPORTS | 29408 | 30733 | 25872 | 28671 |
| OF WHICH: | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 41 | 4 | 51 | 32 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 8325 | 10351 | 10500 | 9725 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 21043 | 20378 | 15322 | 18914 |
| 2 LOCAL SOURCES (INCL. SCRAP) | -41 | -4 | -51 | -32 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 2500 | 2500 | 2500 | 2500 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

SWAZILAND TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| GDP, AND POPULATION | | | | | | | | | |
| POPULATION (MILL) | 0.6 | 0.6 | 0.6 | 0.8 | 0.8 | 0.8 | 0.9 | 0.9 | 0.9 |
| GDP PER CAPITA US$ (1975) | 894.0 | 888.3 | 846.4 | 887.7 | 809.4 | 678.9 | 921.0 | 789.1 | 610.4 |
| GDP MILL US$ (1975) | 514.1 | 529.4 | 519.7 | 680.0 | 620.0 | 520.0 | 830.0 | 720.0 | 550.0 |
| GROSS CAP FORM MILL US$ (1975) | 169.3 | 161.2 | 151.7 | 180.0 | 170.0 | 120.0 | 200.0 | 190.0 | 130.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 27.5 | 27.7 | 25.7 | 30.0 | 28.0 | 21.0 | 33.0 | 30.0 | 21.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 122.7 | 129.7 | 130.4 | 170.0 | 160.0 | 130.0 | 190.0 | 185.0 | 140.0 |
| BALANCE OF PAYMENTS | | | | | | | | | |
| EXPORTS | . | . | . | . | . | . | . | . | . |
| OTHER CURRENT ITEMS | . | . | . | . | . | . | . | . | . |
| ODA, NET INFLOWS | . | . | . | . | . | . | . | . | . |
| LONG TERM CAPITAL,NET | . | . | . | . | . | . | . | . | . |
| RESERVES ERRORS AND OMISSIONS | . | . | . | . | . | . | . | . | . |
| IMPORTS, IMPORT CAPACITY | . | . | . | . | . | . | . | . | . |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 3.0 | 3.0 | 3.2 | 3.3 |
| GDP, CONSTANT US$ (1975) | 3.0 | -1.8 | 2.6 | 3.0 |

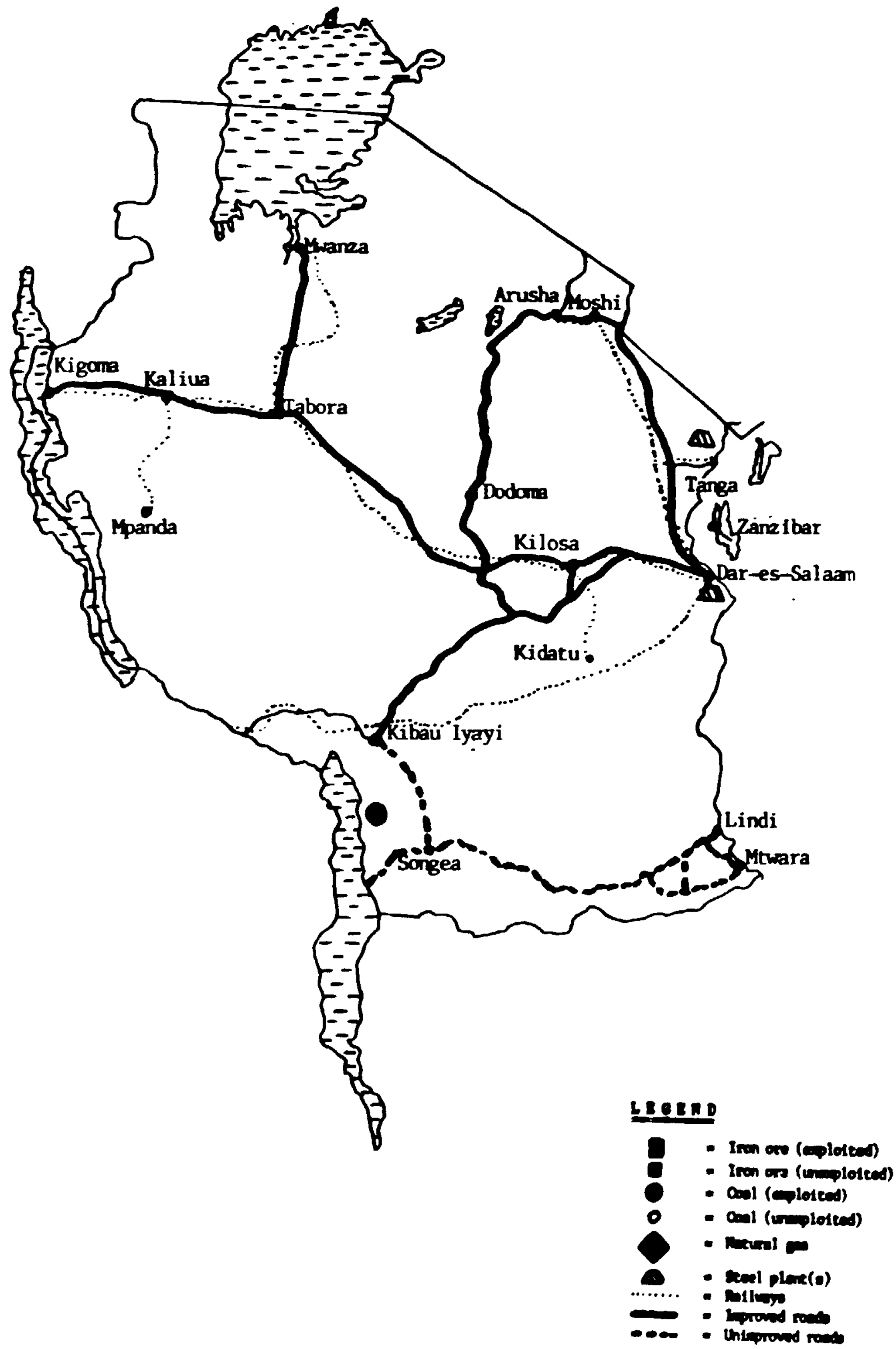
TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY SWAZILAND

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| SITC | | | | | | | | | |
| ROAD VEHICLES | 69836 | 20531 | 67693 | 19671 | 66430 | 15072 | 67986 | 18425 | 100 |
| TOTAL | 69836 | 20531 | 67693 | 19671 | 66430 | 15072 | 67986 | 18425 | 100 |

# TANZANIA

# TANZANIA


Mwanza
Arusha
Moshi
Kigoma
Kaliua
Tabora
Tanga
Dodoma
Mpanda
Zanzibar
Kilosa
Dar-es-Salaam
Kidatu
Kibau Iyayi
Lindi
Mtwara
Songea
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

**TANZANIA**

Tanzania has experienced a decline in GDP during the 80s. Natural disasters, adverse terms of trade and the liberation war in Uganda have been major factors causing the decline.

1984 and 1985 saw a slight improvement in the overall situation but economic recovery was heavily constrained by the lack of foreign exchange for importation of necessary raw materials, spares and capital equipment for agriculture and industry.

Whether an economic upswing will come about given the absence of natural calamities is crucially dependent on terms of trade development and access to foreign exchange by international concessionary borrowing.

Because of the present favourable development in prices of coffee (Tanzania's main export) and decline in prices of oil which counts heavily in the country's overall import bill, a base case implying considerable growth from 1985-1990 has been assumed. Barring, however a dramatic terms of trade change in Tanzania's favour, achievement of the growth rate of 2.5 per cent from the base period 1981-83 up to 1990 would imply substantial external borrowing. The base case for the years 1990-1995 illustrates a situation where GDP grows slightly over the rate of population growth and industry increases its share of GDP based on substantial investment also in the preceeding period. The high growth scenario illustrates the effect of favourable external circumstances as well as successful domestic policies particularly with regard to agriculutre and manufacturing. The low growth case could easily materialize given a less favourable development in terms of trade and very limited access to foreign borrowing.

Overall steel consumption is projected to grow at roughly the same rate as GDP. The relatively rapid growth in consumption of heavy and medium plate is caused by the relatively rapid increase in investment in both priords.

TANZANIA TABLE 1, MAIN PROJECTION

## A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 3032 | 19.2 | 158 | 3700 | 24.9 | 149 | 4400 | 29.1 | 151 | 2.5 | 3.5 | 3.3 | 3.2 | -0.7 | 0.3 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. CONSUMPTION | | EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 28816 | 13804 | 15012 | 0 | 34376 | 30000 | 4376 | 40019 | 40000 | 19 | 2.2 | 3.1 | 3.4 | 3.4 |
| ANGLES SHP. H | 6734 | 908 | . | 908 | . | 1424 | 0 | 1424 | 1843 | 0 | 1843 | 5.8 | 5.3 | 3.9 | 3.6 |
| ANGLES SHP.,L | 6735 | 3847 | 212 | 3635 | . | 3703 | 2000 | 1703 | 4248 | 3000 | 1248 | -0.5 | 2.8 | 1.7 | 4.3 |
| PLATES, H.+ M | 6740 | 3114 | 0 | 3114 | . | 8015 | 0 | 8015 | 11413 | 0 | 11413 | 12.5 | 7.3 | 3.9 | 3.6 |
| PLATES, LIGHT | 6743 | 6228 | 0 | 6228 | 0 | 6930 | 0 | 6930 | 9147 | 0 | 9147 | 1.3 | 5.7 | 1.7 | 4.3 |
| TIN.& COAT.PL | 6749 | 7465 | 0 | 7465 | 0 | 7706 | 0 | 7706 | 9209 | 0 | 9209 | 0.4 | 3.6 | 1.7 | 4.3 |
| HOOP AND STRP | 6750 | 2017 | 0 | 2017 | 0 | 2111 | 0 | 2111 | 2220 | 0 | 2220 | 0.6 | 1.0 | 1.7 | 4.3 |
| RAILS+ MATER. | 6760 | 1251 | 0 | 1251 | . | 1400 | 0 | 1400 | 1622 | 0 | 1622 | 1.4 | 3.0 | 3.9 | 3.6 |
| WIRE | 6770 | 6750 | 0 | 6750 | 0 | 7127 | 0 | 7127 | 7883 | 0 | 7883 | 0.7 | 2.0 | 1.7 | 4.3 |
| TUBES | 6780 | 3701 | 0 | 3701 | 0 | 4670 | 0 | 4670 | 5413 | 0 | 5413 | 2.9 | 3.0 | 1.7 | 4.3 |
| TOTALS | | 64098 | 14016 | 50082 | 0 | 77461 | 32000 | 45461 | 93017 | 43000 | 50017 | 2.4 | 3.7 | | |
| CRUDE EQUIVALENT | | 84146 | 17814 | 66332 | 0 | 102158 | 40672 | 61486 | 122948 | 54653 | 68295 | 2.5 | 3.8 | | |
| BILLET EQUVIVALENT | | 71797 | 15200 | 56597 | 0 | 87165 | 34703 | 52462 | 104904 | 46632 | 58272 | 2.5 | 3.8 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 84146 | 17814 | 66332 | 0 | 112734 | 40672 | 72062 | 143865 | 54653 | 89212 | 3.7 | 5.0 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.0 | 3.3 | 0.7 |
| 1990 TO 1995 | 5.0 | 3.2 | 1.8 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 84146 | 17814 | 66332 | 0 | 90082 | 40672 | 49410 | 99078 | 54653 | 44425 | 0.9 | 1.9 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.0 | 3.3 | -2.2 |
| 1990 TO 1995 | 1.5 | 3.2 | -1.6 |

TANZANIA TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | PROJECTION 1990 GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | PROJECTION 1995 GDP MILL. US$ -75 | POPU- LATION MILL. | GDP PER CAPITA US$ -75 | GROWTH RATES PCT. P.A. GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3032 | 19.2 | 158 | 3700 | 24.9 | 149 | 4400 | 29.1 | 151 | 2.5 | 3.5 | 3.3 | 3.2 | -0.7 | 0.3 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| PRODUC | SITC | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | NET IMPORT | 1995 CONS | PROD | NET IMPORT | GROWTH RATES P.A. CONSUMPTION TO 1990 | CONSUMPTION 1990-1995 | EXPL.VARIABLE TO 1990 | EXPL.VARIABLE 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BARS . RODS | 6730 | 28816 | 13804 | 15012 | 0 | 36862 | 30000 | 6862 | 44991 | 40000 | 4991 | 3.1 | 4.1 | 3.4 | 3.4 |
| ANGLE ,HP. H | 6734 | 908 | . | 908 | . | 2041 | 0 | 2041 | 3077 | 0 | 3077 | 10.7 | 8.6 | 3.9 | 3.6 |
| ANGLE. SHP.,L | 6735 | 3847 | 212 | 3635 | . | 4703 | 2000 | 2703 | 6248 | 3000 | 3248 | 2.5 | 5.8 | 1.7 | 4.3 |
| PLATES, H.+ M | 6740 | 3114 | 0 | 3114 | . | 8622 | 0 | 8622 | 12628 | 0 | 12628 | 13.6 | 7.9 | 3.9 | 3.6 |
| PLATES, LIGHT | 6743 | 6228 | 0 | 6228 | 0 | 8715 | 0 | 8715 | 12717 | 0 | 12717 | 4.3 | 7.9 | 1.7 | 4.3 |
| TIN.& COAT.PL | 6749 | 7465 | 0 | 7465 | 0 | 9220 | 0 | 9220 | 12237 | 0 | 12237 | 2.7 | 5.8 | 1.7 | 4.3 |
| HOOP AND STRP | 6750 | 2017 | 0 | 2017 | 0 | 2279 | 0 | 2279 | 2556 | 0 | 2556 | 1.5 | 2.3 | 1.7 | 4.3 |
| RAILS+ MATER. | 6760 | 1251 | 0 | 1251 | . | 1643 | 0 | 1643 | 2108 | 0 | 2108 | 3.5 | 5.1 | 3.9 | 3.6 |
| WIRE | 6770 | 6750 | 0 | 6750 | 0 | 7650 | 0 | 7650 | 8930 | 0 | 8930 | 1.6 | 3.1 | 1.7 | 4.3 |
| TUBES | 6780 | 3701 | 0 | 3701 | 0 | 5072 | 0 | 5072 | 6216 | 0 | 6216 | 4.0 | 4.2 | 1.7 | 4.3 |
| TOTALS | | 64098 | 14016 | 50082 | 0 | 86807 | 32000 | 54807 | 111709 | 43000 | 68709 | 3.9 | 5.2 | | |
| CRUDE EQUIVALENT | | 84146 | 17814 | 66332 | 0 | 114521 | 40672 | 73849 | 147675 | 54653 | 93022 | 3.9 | 5.2 | | |
| BILLET EQUVIVALENT | | 71797 | 15200 | 56597 | 0 | 97714 | 34703 | 63011 | 126002 | 46632 | 79370 | 3.9 | 5.2 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD-1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNES | 84146 | 17814 | 66332 | 0 | 125099 | 40672 | 84427 | 168594 | 54653 | 113941 | 5.1 | 6.1 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.0 | 3.3 | 0.7 |
| 1990 TO 1995 | 5.0 | 3.2 | 1.8 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD - 1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUVIV. TONNE | 84146 | 17814 | 66332 | 0 | 102446 | 40672 | 61774 | 123807 | 54653 | 69154 | 2.5 | 3.9 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.0 | 3.3 | -2.2 |
| 1990 TO 1995 | 1.5 | 3.2 | 1.6 |

TANZANIA TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | 1982 | 1983 | AVER | PRODUCTION 1981 | 1982 | 1983 | AVER | EXPORTS 1981 | 1982 | 1983 | AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | 638 | 5190 | 3026 | 2951 | | | | | | | | | 2951 |
| BARS AND RODS | 6732 | 11918 | 14117 | 10146 | 12060 | 16000 | 13163 | 12250 | 13804 | | | | | 25865 |
| ANGLES SHP.HM | 6734 | 760 | 690 | 1273 | 908 | | | | | | | | | 908 |
| ANGLES SHP..L | 6735 | 3036 | 2776 | 5094 | 3635 | 273 | 189 | 174 | 212 | | | | | 3847 |
| PLATES, HEAVY | 6741 | 3901 | 3631 | 1809 | 3114 | | | | | | | | | 3114 |
| PLATES, MED. | 6742 | | | | | | | | | | | | | 0 |
| PLATES, LIGHT | 6743 | 7803 | 7263 | 3619 | 6228 | | | | | | | | | 6228 |
| TINPLATE | 6747 | 5663 | 3555 | 2607 | 3942 | | | | | | | | | 3942 |
| OTHER COAT.P | 6748 | 4071 | 4170 | 2330 | 3524 | | | | | | | | | 3524 |
| HOOP AND STRP | 6750 | 1587 | 1776 | 2689 | 2017 | | | | | | | | | 2017 |
| RAILS | 6761 | 220 | 962 | 972 | 718 | | | | | | | | | 718 |
| OTHER RL TRCK | 6762 | 1136 | 360 | 103 | 533 | | | | | | | | | 533 |
| WIRE | 6770 | 14487 | 3874 | 1890 | 6750 | | | | | | | | | 6750 |
| SEAMLESS TUBE | 6782 | 4955 | 66 | 942 | 1988 | | | | | | | | | 1988 |
| WELDED TUBES | 6783 | 1377 | 1764 | 2000 | 1714 | | | | | | | | | 1714 |
| TOTALS | | 61552 | 50194 | 38500 | 50082 | 16273 | 13352 | 12424 | 14016 | 0 | 0 | 0 | 0 | 64098 |



B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 77825 | 63546 | 50924 | 64098 |
| OF WHICH: | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 61552 | 50194 | 38500 | 50082 |
| LOCAL PRODUCTION | 16273 | 13352 | 12424 | 14016 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 164726 | 162749 | 121120 | 149532 |
| SUPPLIED FROM: | | | | |
| 1 NET IMPORTS | 155615 | 149244 | 110790 | 138550 |
| OF WHICH: | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 1262 | 774 | 1364 | 1133 |
| NET IMPORTS OF BILLETS ETC | 9040 | 1649 | 3126 | 4605 |
| NET IMPORTS OF ROLLED PRODUCTS | 82284 | 66169 | 50548 | 66333 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 63030 | 80653 | 55752 | 66478 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 9111 | 13505 | 10331 | 10982 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 10000 | 10000 | 10000 | 10000 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

TANZANIA TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| GDP, AND POPULATION | | | | | | | | | |
| POPULATION (MILL) | 18.6 | 19.2 | 19.9 | 24.9 | 24.9 | 24.9 | 29.1 | 29.1 | 29.1 |
| GDP PER CAPITA US$ (1975) | 162.0 | 158.8 | 152.6 | 166.6 | 148.6 | 132.1 | 182.1 | 151.2 | 122.0 |
| GDP MILL US$ (1975) | 3010.6 | 3049.4 | 3036.1 | 4150.0 | 3700.0 | 3290.0 | 5300.0 | 4400.0 | 3550.0 |
| GROSS CAP FORM MILL US$ (1975) | 604.3 | 608.7 | 484.0 | 835.0 | 770.0 | 610.0 | 1040.0 | 920.0 | 660.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 137.1 | 143.3 | 96.4 | 185.0 | 165.0 | 125.0 | 240.0 | 195.0 | 140.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 174.4 | 143.3 | 130.6 | 190.0 | 170.0 | 160.0 | 250.0 | 210.0 | 180.0 |
| BALANCE OF PAYMENTS MILLION TSHS | | | | | | | | | |
| EXPORTS | 4372.8 | 3767.0 | 3772.0 | 10750.0 | 9750.0 | 9000.0 | 19400.0 | 16400.0 | 14900.0 |
| OTHER CURRENT ITEMS | 781.0 | 597.0 | 548.5 | 1300.0 | 1200.0 | 1200.0 | 2000.0 | 1800.0 | 1800.0 |
| ODA, NET INFLOWS | 3055.6 | 2989.0 | 3253.0 | 6900.0 | 6200.0 | 6200.0 | 10000.0 | 8300.0 | 8300.0 |
| LONG TERM CAPITAL,NET | 1235.9 | 281.0 | 461.0 | 1500.0 | 1300.0 | 1300.0 | 2200.0 | 1700.0 | 1700.0 |
| RESERVES ERRORS AND OMISSIONS | -325.5 | 2605.0 | 1198.0 | 2000.0 | 2000.0 | 2000.0 | 2700.0 | 2700.0 | 2700.0 |
| IMPORTS, IMPORT CAPACITY | 9120.0 | 10239.0 | 9232.0 | 22450.0 | 20450.0 | 19700.0 | 31900.0 | 30900.0 | 29400.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 3.5 | 3.6 | 3.3 | 3.2 |
| GDP, CONSTANT US$ (1975) | 1.3 | -0.4 | 2.9 | 3.5 |

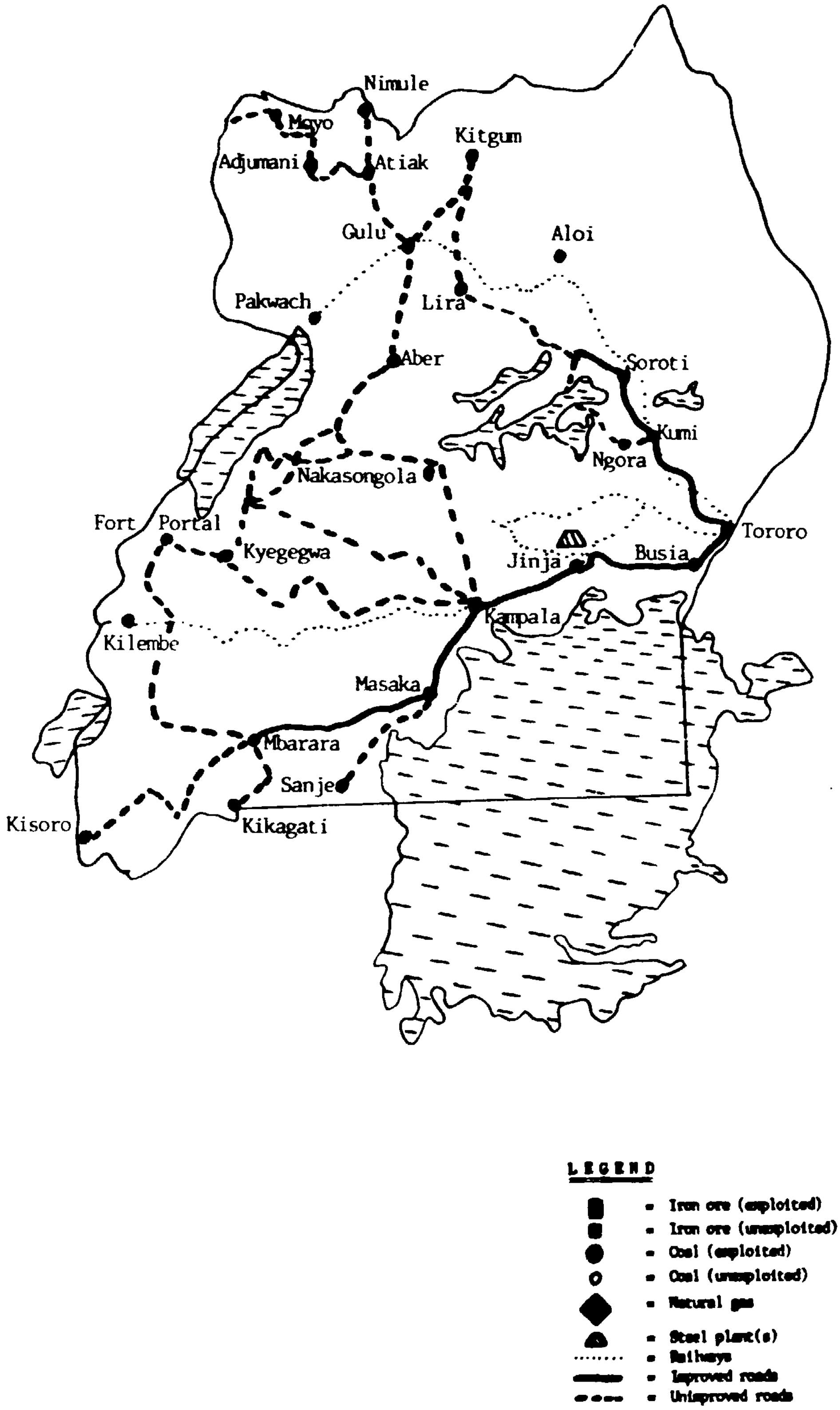
TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY TANZANIA

| | YEAR | | | | | | | | AVERAGE TONNES |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | | | |
| SITC | | | | | | | | | |
| MET. STRUCTURES | 4990 | 4478 | 13450 | 9730 | 7589 | 6005 | 8676 | 6738 | 22 |
| TANKS, VESSELS, ETC | 1825 | 1075 | 1634 | 450 | 648 | 854 | 1369 | 793 | 3 |
| WIRE PRODUCTS | 624 | 425 | 775 | 747 | 1428 | 1665 | 942 | 946 | 3 |
| NAILS, NUTS,BOLTS | 2758 | 2423 | 1213 | 765 | 902 | 685 | 1624 | 1291 | 4 |
| HAND TOOLS | 5183 | 1024 | 6274 | 2014 | 4288 | 854 | 5248 | 1297 | 4 |
| CUTLERY | 239 | 30 | 204 | 20 | 30 | 4 | 158 | 18 | 0 |
| DOM. UTENSILS | 581 | 113 | 556 | 122 | 337 | 101 | 491 | 112 | 0 |
| AGR.MACH.,TRACTORS | 11391 | 2649 | 13592 | 3540 | 4407 | 1260 | 9797 | 2483 | 8 |
| DOM. EL. EQUIPMENT | 1603 | 365 | 1044 | 163 | 829 | 166 | 1159 | 231 | 1 |
| RAIL. LOCOS ETC. | 17773 | 4180 | 4158 | 365 | 14316 | 1268 | 12082 | 1938 | 6 |
| ROAD VEHICLES | 92312 | 16726 | 64086 | 11725 | 49335 | 10510 | 68578 | 12987 | 42 |
| BICYCLES ETC. | 2788 | 1407 | 3398 | 1298 | 1547 | 981 | 2578 | 1229 | 4 |
| HEATING, SANITARY | 1308 | 544 | 1548 | 654 | 1299 | 469 | 1385 | 556 | 2 |
| FURNITURE | 1424 | 484 | 1907 | 555 | 1534 | 566 | 1622 | 535 | 2 |
| TOTAL | 144799 | 35923 | 113839 | 32148 | 88489 | 25388 | 115709 | 31153 | 100 |

# UGANDA

# UGANDA


Nimule
Moyo
Kitgum
Adjumani
Atiak
Gulu
Aloi
Pakwach
Lira
Aber
Soroti
Kumi
Ngora
Nakasongola
Fort Portal
Tororo
Kyegegwa
Jinja
Busia
Kampala
Kilembe
Masaka
Mbarara
Sanje
Kisoro
Kikagati
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

## UGANDA

Because of the situation in Uganda during the time when country missions were undertaken (June 1985), it was impossible to enter the country. The developments after that time has made any assessment of future development highly uncertain. The new government will need time to set overall policies and the resources at governments disposal depends substantially on the positions taken by multilateral and bilateral donors.

As complete import statistics were not available, the steel import figures used are based on information from countries exporting steel to Uganda. Problems of coverage make it likely that consumption in the base period is underestimated. Production figures are based on an informed guess. The base case macro scenario is based on projections by the World Bank. It may well be that the low case, after disruption caused by war and changing governments is a more realistic case than the base case. Because, however, the agricultural back bone of Uganda's economy has performed reatively well in difficult conditions and without heavy investment, the base case which seemed most likely in early 1985 has been retained. The average GDP growth rate from the base period 1981-83 up to 1990 is pushed up because of the good performance of the economy in 1983/1984. The longer term growth rate is expected to be roughly that of population growth since development still will be hampered by the mismanagement and neglect under the Amin regime.

Overall consumption of steel would most likely increase dramatically (nearly 20 per cent per annum) from the depressed (and probably underestimated) level of 1981-83. Growth rates are fairly uniform from 1990-1995 indicating that a relatively "normal" structure of consumption has been reached by 1990.

UGANDA TABLE 1, MAIN PROJECTION

## A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 3618 | 14.1 | 256 | 5000 | 18.7 | 267 | 6000 | 22.4 | 268 | 4.1 | 3.7 | 3.6 | 3.7 | 0.5 | 0.0 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 10631 | 10000 | 631 | 0 | 28552 | 21000 | 7552 | 37979 | 27000 | 10979 | 13.1 | 5.9 | 6.0 | 4.0 |
| ANGLES SHP. H | 6734 | 133 | . | 133 | 0 | 1685 | 0 | 1685 | 2372 | 0 | 2372 | 37.4 | 7.1 | 5.0 | 4.0 |
| ANGLES SHP..L | 6735 | 3 | 0 | 3 | 0 | 1265 | 0 | 1265 | 1813 | 0 | 1813 | 113 | 7.5 | 5.2 | 3.9 |
| PLATES, H.+ M | 6740 | 52 | 0 | 52 | 0 | 8687 | 0 | 8687 | 12717 | 0 | 12717 | 89.6 | 7.9 | 5.0 | 4.0 |
| PLATES, LIGHT | 6743 | 1847 | 0 | 1847 | 0 | 6940 | 0 | 6940 | 9704 | 0 | 9704 | 18.0 | 6.9 | 5.2 | 3.9 |
| TIN.& COAT.PL | 6749 | 533 | 0 | 533 | 0 | 4273 | 0 | 4273 | 6126 | 0 | 6126 | 29.7 | 7.5 | 5.2 | 3.9 |
| HOOP AND STRP | 6750 | 94 | 0 | 94 | . | 720 | 0 | 720 | 983 | 0 | 983 | 29.0 | 6.4 | 5.2 | 3.9 |
| RAILS+ MATER. | 6760 | 205 | 0 | 205 | . | 1775 | 0 | 1775 | 2450 | 0 | 2450 | 31.0 | 6.7 | 5.0 | 4.0 |
| WIRE | 6770 | 1477 | 0 | 1477 | . | 3046 | 0 | 3046 | 4002 | 0 | 4002 | 9.5 | 5.6 | 5.2 | 3.9 |
| TUBES | 6780 | 287 | 0 | 287 | 0 | 6308 | 0 | 6308 | 8716 | 0 | 8716 | 47.1 | 6.7 | 5.2 | 3.9 |
| TOTALS | | 15263 | 10000 | 5263 | 0 | 63251 | 21000 | 42251 | 86862 | 27000 | 59862 | 19.4 | 6.5 | | |
| CRUDE EQUIVALENT | | 19745 | 12710 | 7035 | 0 | 84095 | 26691 | 57404 | 115645 | 34317 | 81328 | 19.9 | 6.6 | | |
| BILLET EQUVIVALENT | | 16847 | 10845 | 6003 | 0 | 71753 | 22774 | 48980 | 98673 | 29261 | 69392 | 19.9 | 6.6 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 19745 | 12710 | 7035 | 0 | 96495 | 26691 | 69804 | 138765 | 34317 | 104448 | 21.9 | 7.5 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 5.8 | 3.6 | 2.2 |
| 1990 TO 1995 | 5.1 | 3.7 | 1.3 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 19745 | 12710 | 7035 | 0 | 65619 | 26691 | 38928 | 80358 | 34317 | 46041 | 16.2 | 4.1 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.6 | 3.6 | -1.9 |
| 1990 TO 1995 | 1.0 | 3.7 | -2.6 |

UGANDA TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | PROJECTION 1990 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | PROJECTION 1995 GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GROWTH RATES PCT. P.A. GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3618 | 14.1 | 256 | 5000 | 18.7 | 267 | 6000 | 22.4 | 268 | 4.1 | 3.7 | 3.6 | 3.7 | 0.5 | 0.0 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| PRODUCT NAME | SITC | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | NET IMPORT | 1995 CONS | PROD | NET IMPORT | GROWTH RATES P.A. CONSUMPTION TO 1990 | CONSUMPTION 1990-1995 | EXPL.VARIABLE TO 1990 | EXPL.VARIABLE 1990-1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BARS AND RODS | 6730 | 10631 | 10000 | 631 | 0 | 29675 | 21000 | 8675 | 40226 | 27000 | 13226 | 13.7 | 6.3 | 6.0 | 4.0 |
| ANGLES SHP. H | 6734 | 133 | . | 133 | 0 | 1964 | 0 | 1964 | 2930 | 0 | 2930 | 40.0 | 8.3 | 5.0 | 4.0 |
| ANGLES SHP.,L | 6735 | 3 | 0 | 3 | 0 | 1716 | 0 | 1716 | 2717 | 0 | 2717 | 121 | 9.6 | 5.2 | 3.9 |
| PLATES, H.+ M | 6740 | 52 | 0 | 52 | 0 | 8962 | 0 | 8962 | 13266 | 0 | 13266 | 90.3 | 8.2 | 5.0 | 4.0 |
| PLATES, LIGHT | 6743 | 1847 | 0 | 1847 | 0 | 7746 | 0 | 7746 | 11317 | 0 | 11317 | 19.6 | 7.9 | 5.2 | 3.9 |
| TIN.& COAT.PL | 6749 | 533 | 0 | 533 | 0 | 4957 | 0 | 4957 | 7494 | 0 | 7494 | 32.1 | 8.6 | 5.2 | 3.9 |
| HOOP AND STRP | 6750 | 94 | 0 | 94 | . | 796 | 0 | 796 | 1135 | 0 | 1135 | 30.6 | 7.4 | 5.2 | 3.9 |
| RAILS+ MATER. | 6760 | 205 | 0 | 205 | . | 1885 | 0 | 1885 | 2669 | 0 | 2669 | 32.0 | 7.2 | 5.0 | 4.0 |
| WIRE | 6770 | 1477 | 0 | 1477 | . | 3283 | 0 | 3283 | 4475 | 0 | 4475 | 10.5 | 6.4 | 5.2 | 3.9 |
| TUBES | 6780 | 287 | 0 | 287 | 0 | 6489 | 0 | 6489 | 9079 | 0 | 9079 | 47.7 | 6.9 | 5.2 | 3.9 |
| TOTALS | | 15263 | 10000 | 5263 | 0 | 67474 | 21000 | 46474 | 95307 | 27000 | 68307 | 20.4 | 7.2 | | |
| CRUDE EQUIVALENT | | 19745 | 12710 | 7035 | 0 | 89681 | 26691 | 62990 | 126819 | 34317 | 92502 | 20.8 | 7.2 | | |
| BILLET EQUVIVALENT | | 16847 | 10845 | 6003 | 0 | 76519 | 22774 | 53745 | 108207 | 29281 | 78926 | 20.8 | 7.2 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD-1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUIV. TONNES | 19745 | 12710 | 7035 | 0 | 102080 | 26691 | 75389 | 149938 | 34317 | 115621 | 22.8 | 8.0 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 5.8 | 3.6 | 2.2 |
| 1990 TO 1995 | 5.1 | 3.7 | 1.3 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 CONS | PROD | IMP | EXP | 1990 CONS | PROD | IMPORT | 1995 CONS | PROD | IMPORT | CONSUMPTION GROWTH RATE PA. BASE PERIOD - 1990 | 1990-95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRUDE EQUVIV. TONNE | 19745 | 12710 | 7035 | 0 | 71205 | 26691 | 44514 | 91531 | 34317 | 57214 | 17.4 | 5.2 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 1.6 | 3.6 | -1.9 |
| 1990 TO 1995 | 1.0 | 3.7 | -2.6 |

UGANDA TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | 2 | 12 | 1 | 5 | | | | | | | | | 5 |
| BARS AND RODS | 6732 | 253 | 1202 | 422 | 626 | 5000 | 10000 | 15000 | 10000 | | | | | 10626 |
| ANGLES SHP.HM | 6734 | 116 | 209 | 75 | 133 | | | | | | | | | 133 |
| ANGLES SHP..L | 6735 | | 6 | 2 | 3 | | | | | | | | | 3 |
| PLATES, HEAVY | 6741 | 18 | 73 | 14 | 35 | | | | | | | | | 35 |
| PLATES, MED. | 6742 | 3 | 41 | 6 | 17 | | | | | | | | | 17 |
| PLATES, LIGHT | 6743 | 3655 | 1812 | 75 | 1847 | | | | | | | | | 1847 |
| TINPLATE | 6747 | | 486 | 19 | 168 | | | | | | | | | 168 |
| OTHER COAT.P | 6748 | 426 | 540 | 129 | 365 | | | | | | | | | 365 |
| HOOP AND STRP | 6750 | 55 | 4 | 224 | 94 | | | | | | | | | 94 |
| RAILS | 6761 | | 250 | | 83 | | | | | | | | | 83 |
| OTHER RL TRCK | 6762 | | 348 | 17 | 122 | | | | | | | | | 122 |
| WIRE | 6770 | 218 | 3167 | 1047 | 1477 | | | | | | | | | 1477 |
| SEAMLESS TUBE | 6782 | 18 | 186 | 12 | 72 | | | | | | | | | 72 |
| WELDED TUBES | 6783 | 158 | 193 | 295 | 215 | | | | | | | | | 215 |
| TOTALS | | 4922 | 8529 | 2338 | 5263 | 5000 | 10000 | 15000 | 10000 | 0 | 0 | 0 | 0 | 15263 |



B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 9922 | 18529 | 17338 | 15263 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 4922 | 8529 | 2338 | 5263 |
| LOCAL PRODUCTION | 5000 | 10000 | 15000 | 10000 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 29352 | 35154 | 40072 | 34859 |
| SUPPLIED FROM: | | | | |
| 1 NET IMPORTS | 23395 | 23295 | 22178 | 22956 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 8 | 71 | 0 | 26 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 6661 | 11352 | 3096 | 7036 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 16726 | 11873 | 19081 | 15893 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 5957 | 11858 | 17894 | 11903 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 3500 | 3500 | 3500 | 3500 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

UGANDA TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| **GDP. AND POPULATION** | | | | | | | | | |
| POPULATION (MILL) | 13.7 | 14.1 | 14.6 | 18.7 | 18.7 | 18.7 | 22.4 | 22.4 | 22.4 |
| GDP PER CAPITA US$ (1975) | 247.0 | 259.0 | 262.2 | 304.8 | 267.4 | 219.3 | 325.9 | 267.9 | 191.9 |
| GDP MILL US$ (1975) | 3373.9 | 3651.2 | 3828.6 | 5700.0 | 5000.0 | 4100.0 | 7300.0 | 6000.0 | 4300.0 |
| GROSS CAP FORM MILL US$ (1975) | 408.2 | 433.5 | 455.6 | 730.0 | 640.0 | 490.0 | 930.0 | 780.0 | 510.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 28.6 | 32.0 | 36.6 | 58.0 | 51.0 | 40.0 | 74.0 | 62.0 | 42.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 144.8 | 165.3 | 170.0 | 260.0 | 240.0 | 210.0 | 330.0 | 290.0 | 230.0 |
| **BALANCE OF PAYMENTS MILLION US$** | | | | | | | | | |
| EXPORTS | 245.5 | 347.1 | 367.6 | 1000.0 | 860.0 | 750.0 | 1700.0 | 1500.0 | 1100.0 |
| OTHER CURRENT ITEMS | -86.7 | -85.5 | -96.9 | -200.0 | -170.0 | -170.0 | -325.0 | -280.0 | -280.0 |
| ODA, NET INFLOWS | 144.2 | 154.4 | 105.4 | 400.0 | 370.0 | 350.0 | 540.0 | 500.0 | 470.0 |
| LONG TERM CAPITAL,NET | . | . | . | . | . | . | . | . | . |
| RESERVES ERRORS AND OMISSIONS | 111.7 | 6.0 | 52.0 | -60.0 | -60.0 | -60.0 | -100.0 | -100.0 | -100.0 |
| IMPORTS, IMPORT CAPACITY | 414.7 | 422.0 | 428.1 | 1260.0 | 1000.0 | 870.0 | 1815.0 | 1620.0 | 1190.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 3.5 | 3.5 | 3.6 | 3.6 |
| GDP. CONSTANT US$ (1975) | 8.2 | 4.9 | 3.9 | 3.7 |

TABLE 5: ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

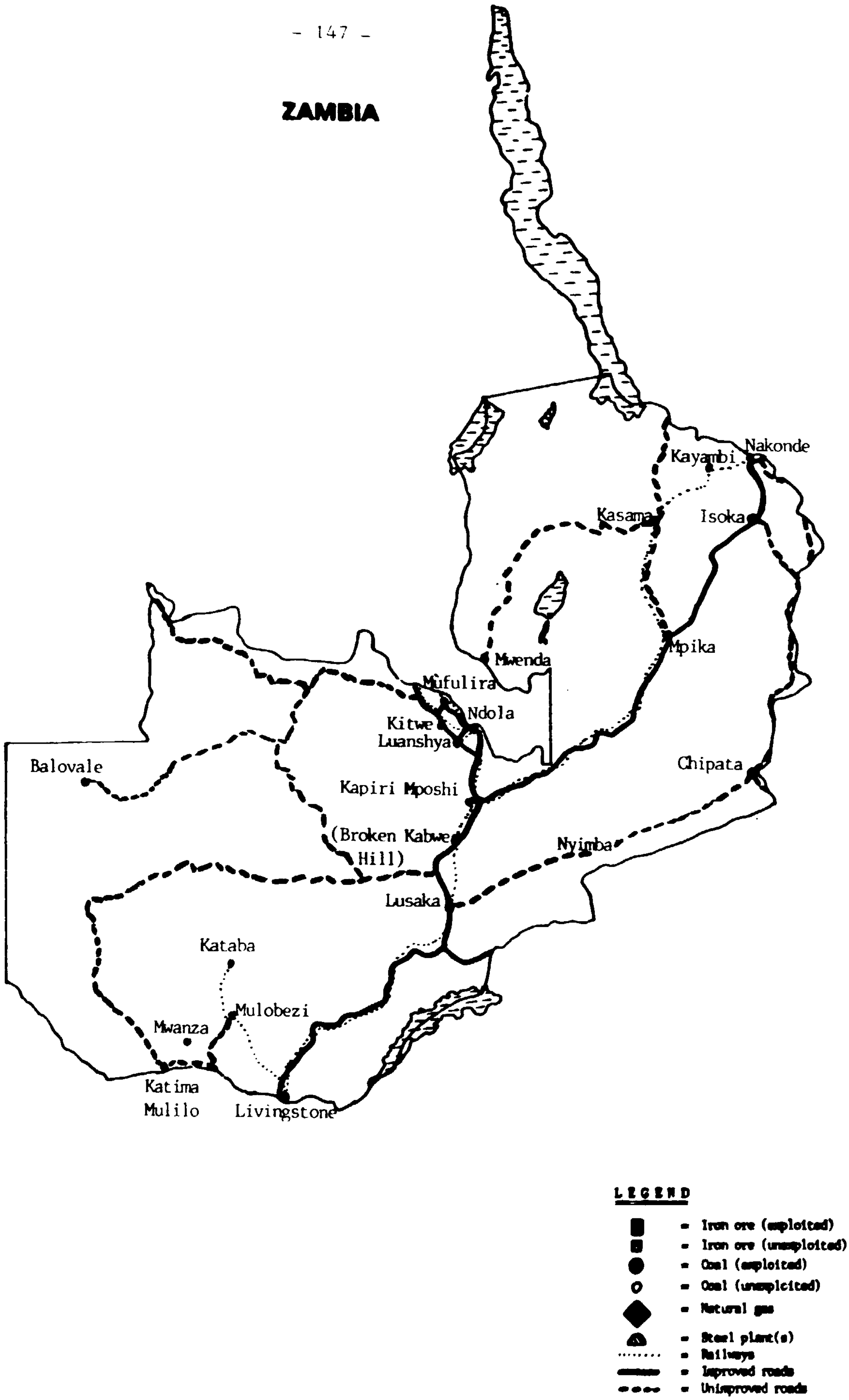
COUNTRY UGANDA

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | | | AVERAGE TONNES |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| SITC | | | | | | | | | |
| MET. STRUCTURES | 3262 | 1536 | 3426 | 1281 | 5543 | 2352 | 4077 | 1723 | 12 |
| TANKS, VESSELS, ETC | 453 | 92 | 267 | 166 | 513 | 658 | 411 | 305 | 2 |
| WIRE PRODUCTS | 511 | 228 | 716 | 1102 | 287 | 292 | 505 | 541 | 4 |
| NAILS, NUTS,BOLTS | 226 | 159 | 356 | 56 | 94 | 127 | 225 | 114 | 1 |
| HAND TOOLS | 4112 | 1355 | 3570 | 1347 | 2645 | 503 | 3442 | 1068 | 8 |
| CUTLERY | 117 | 16 | 242 | 21 | 138 | 29 | 166 | 22 | 0 |
| DOM. UTENSILS | 156 | 17 | 640 | 149 | 184 | 39 | 327 | 68 | 0 |
| AGR.MACH.,TRACTORS | 3828 | 643 | 5438 | 1650 | 6749 | 1758 | 5338 | 1350 | 10 |
| DOM. EL. EQUIPMENT | 170 | 13 | 405 | 59 | 635 | 101 | 403 | 58 | 0 |
| RAIL. LOCOS ETC. | 24300 | 1583 | 10141 | 782 | 726 | 86 | 11722 | 817 | 6 |
| ROAD VEHICLES | 40801 | 9992 | 18888 | 4127 | 26403 | 6602 | 28697 | 6907 | 49 |
| BICYCLES ETC. | 885 | 375 | 3001 | 669 | 2374 | 1174 | 2087 | 739 | 5 |
| HEATING, SANITARY | 363 | 152 | 325 | 17 | 239 | 54 | 309 | 74 | 1 |
| FURNITURE | 1235 | 334 | 1864 | 333 | 470 | 199 | 1190 | 289 | 2 |
| TOTAL | 80419 | 16495 | 49279 | 11759 | 47000 | 13974 | 58899 | 14076 | 100 |

# ZAMBIA

Page

# ZAMBIA


Nakonde
Kayambi
Kasama
Isoka
Mwenda
Mpika
Mufulira
Ndola
Kitwe
Luanshya
Balovale
Chipata
Kapiri Mposhi
(Broken Kabwe
Hill)
Nyimba
Lusaka
Kataba
Mulobezi
Mwanza
Katima
Mulilo
Livingstone
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

## ZAMBIA

Zambia's economy is heavily based on copper mining. From the country's independence up to the mid-70s the economy developed rapidly, in particular the manufacturing sector. Agriculture receoved limited attention. The present situation with economic decline, severe balance-of-payments restriction and industry working at only small functions of all capacity is caused by the weakness in the copper market over the last ten years. The effect of the copper price decline is exacerbated by structural deficiencies in the economy, particularly the poorly developed agricultural sector and an import dependent manufacturing sector.

A considerable time will have to be spent on the economic restructuring process now underway. Balance-of-payments is likely to be extremely tight and substantial foreign borrowing will have to take place to finance necessary capital investment.

The economic projections assume that the years up to 1990 will see considerable investment particularly in agriculture which will, however, take some time to respond in terms of increased production. After 1990 the effect of earlier investment will materialize in production increases resulting in a growth rate near the projected population growth. For the period up to 1990 considerable decline in GDP per capita would be expected.

The high growth case illustrates a quick response by agriculture, resulting in a higher GDP growth particularly in the period up to 1990. The low growth case illustrates a severe shortage of foreign exchange limiting investment during the first period.

Projecting steel demand under the present circumstances in Zambia is difficult. A major uncertainty is related to the fate of the mining industry which is a major source of demand for steel. If severe contractions in the mining sector happens, the projections will have tc be scaled down considerably.

Although in the period up to 1990 projections show a decline in consumptions of some steel products related to mining investment, the overall consumption increases at a rate above that of GDP. This is because of a particularly strong increase in light plates, tin plates, other coated plates and wire. In both periods the structure of consumption changes as a response to the assumed changes in the country's economic structure.

ZAMBIA TABLE 1. MAIN PROJECTION

## A) MACRO VAR[illegible]S, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION [illegible] | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 2301 | 6.2 | 371 | 2500 | 8.2 | 305 | 2970 | 9.8 | 303 | 1.0 | 3.5 | 3.6 | 3.6 | -2.4 | -0.1 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. CONSUMPTION | | EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SI[illegible] | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 15439 | . | 15439 | 0 | 17697 | 17000 | 697 | 21734 | 22000 | -266 | 1.7 | 4.2 | 3.5 | 3.0 |
| ANGLES SHP. H | 6734 | 5709 | . | 5709 | 0 | 2767 | 0 | 2767 | 2115 | 0 | 2115 | -8.7 | -5.2 | 3.9 | 3.1 |
| ANGLES SHP.,L | 6735 | 8563 | 0 | 8563 | . | 11456 | 11500 | -44 | 13694 | 13500 | 194 | 3.7 | 3.6 | 1.8 | 3.0 |
| PLATES. H.+ M | 6740 | 8255 | 0 | 8255 | 0 | 7254 | 0 | 7254 | 7517 | 0 | 7517 | -1.6 | 0.7 | 3.9 | 3.1 |
| PLATES. LIGHT | 6743 | 14841 | 0 | 14841 | 0 | 25322 | 0 | 25322 | 31941 | 0 | 31941 | 6.9 | 4.8 | 1.8 | 3.0 |
| TIN.& COAT.PL | 6749 | 12412 | 0 | 12412 | 0 | 21216 | 0 | 21216 | 26574 | 0 | 26574 | 6.9 | 4.6 | 1.8 | 3.0 |
| HOOP AND STRP | 6750 | 890 | 0 | 890 | . | 764 | 0 | 764 | 811 | 0 | 811 | -1.9 | 1.2 | 1.8 | 3.0 |
| RAILS+ MATER. | 6760 | 3470 | 0 | 3470 | . | 1994 | 0 | 1994 | 1782 | 0 | 1782 | -6.7 | -2.2 | 3.9 | 3.1 |
| WIRE | 6770 | 206 | 0 | 206 | 0 | 5485 | 0 | 5485 | 7970 | 0 | 7970 | 50.7 | 7.8 | 1.8 | 3.0 |
| TUBES | 6780 | 2724 | 0 | 2724 | 0 | 2950 | 0 | 2950 | 3500 | 0 | 3500 | 1.0 | 3.5 | 1.8 | 3.0 |
| TOTALS | | 72509 | 0 | 72509 | 0 | 96904 | 28500 | 68404 | 117639 | 35500 | 82139 | 3.7 | 4.0 | | |
| CRUDE EQUIVALENT | | 96402 | 0 | 96402 | 0 | 129218 | 36223 | 92994 | 156883 | 45120 | 111763 | 3.7 | 4.0 | | |
| BILLET EQUVIVALENT | | 82254 | 0 | 82254 | 0 | 110254 | 30907 | 79346 | 133859 | 38499 | 95360 | 3.7 | 4.0 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 96402 | 0 | 96402 | 0 | 136813 | 36223 | 10059[illegible] | 188145 | 45120 | 143025 | 4.5 | 6.6 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.2 | 3.6 | -1.3 |
| 1990 TO 1995 | 4.0 | 3.6 | 0.3 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 96402 | 0 | 96402 | 0 | 106064 | 36223 | 69840 | 114315 | 45120 | 69195 | 1.2 | 1.5 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | -0.4 | 3.6 | -3.9 |
| 1990 TO 1995 | 0.0 | 3.6 | -3.5 |

ZAMBIA TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 2301 | 6.2 | 371 | 2500 | 8.2 | 305 | 2970 | 9.8 | 303 | 1.0 | 3.5 | 3.6 | 3.6 | -2.4 | -0.1 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | CONSUMPTION | | EXPL.VARIABLE | |
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 15439 | . | 15439 | 0 | 20201 | 17000 | 3201 | 26741 | 22000 | 4741 | 3.4 | 5.8 | 3.5 | 3.0 |
| ANGLES SHP. H | 6734 | 5709 | . | 5709 | 0 | 3388 | 0 | 3388 | 3357 | 0 | 3357 | -6.3 | -0.2 | 3.9 | 3.1 |
| ANGLES SHP.,L | 6735 | 8563 | 0 | 8563 | . | 12463 | 11500 | 963 | 15708 | 13500 | 2208 | 4.8 | 4.7 | 1.8 | 3.0 |
| PLATES, H.+ M | 6740 | 8255 | 0 | 8255 | 0 | 7866 | 0 | 7866 | 8741 | 0 | 8741 | -0.6 | 2.1 | 3.9 | 3.1 |
| PLATES, LIGHT | 6743 | 14841 | 0 | 14841 | 0 | 27120 | 0 | 27120 | 35537 | 0 | 35537 | 7.8 | 5.6 | 1.8 | 3.0 |
| TIN.& COAT.PL | 6749 | 12412 | 0 | 12412 | 0 | 22741 | 0 | 22741 | 29623 | 0 | 29623 | 7.9 | 5.4 | 1.8 | 3.0 |
| HOOP AND STRP | 6750 | 890 | 0 | 890 | . | 933 | 0 | 933 | 1150 | 0 | 1150 | 0.6 | 4.3 | 1.8 | 3.0 |
| RAILS+ MATER. | 6760 | 3470 | 0 | 3470 | . | 2239 | 0 | 2239 | 2272 | 0 | 2272 | -5.3 | 0.3 | 3.9 | 3.1 |
| WIRE | 6770 | 206 | 0 | 206 | 0 | 6012 | 0 | 6012 | 9025 | 0 | 9025 | 52.5 | 8.5 | 1.8 | 3.0 |
| TUBES | 6780 | 2724 | 0 | 2724 | 0 | 3355 | 0 | 3355 | 4309 | 0 | 4309 | 2.6 | 5.1 | 1.8 | 3.0 |
| TOTALS | | 72509 | 0 | 72509 | 0 | 106316 | 28500 | 77816 | 136462 | 35500 | 100962 | 4.9 | 5.1 | | |
| CRUDE EQUIVALENT | | 96402 | 0 | 96402 | 0 | 141671 | 36223 | 105448 | 181788 | 45120 | 136668 | 4.9 | 5.1 | | |
| BILLET EQUVIVALENT | | 82254 | 0 | 82254 | 0 | 120879 | 30907 | 89972 | 155109 | 38499 | 116610 | 4.9 | 5.1 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 96402 | 0 | 96402 | 0 | 149265 | 36223 | 113042 | 213049 | 45120 | 167928 | 5.6 | 7.4 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.2 | 3.6 | -1.3 |
| 1990 TO 1995 | 4.0 | 3.6 | 0.3 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 96402 | 0 | 96402 | 0 | 118516 | 36223 | 82292 | 139219 | 45120 | 94098 | 2.6 | 3.3 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | -0.4 | 3.6 | -3.9 |
| 1990 TO 1995 | 0.0 | 3.6 | -3.5 |

ZAMBIA TABLE 3

## A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | 711 | 619 | 585 | 638 | | | | | | | | | 638 |
| BARS AND RODS | 6732 | 12187 | 18500 | 13715 | 14801 | | | | | | | | | 14801 |
| ANGLES SHP.HM | 6734 | 6962 | 5614 | 4550 | 5709 | | | | | | | | | 5709 |
| ANGLES SHP..L | 6735 | 10443 | 8422 | 6825 | 8563 | | | | | | | | | 8563 |
| PLATES, HEAVY | 6741 | 9743 | 7806 | 7215 | 8255 | | | | | | | | | 8255 |
| PLATES, MED. | 6742 | | | | | | | | | | | | | 0 |
| PLATES, LIGHT | 6743 | 16973 | 13260 | 14290 | 14841 | | | | | | | | | 14841 |
| TINPLATE | 6747 | 15261 | 7316 | 7280 | 9952 | | | | | | | | | 9952 |
| OTHER COAT.P | 6748 | 1791 | 2859 | 2730 | 2460 | | | | | | | | | 2460 |
| HOOP AND STRP | 6750 | 1113 | 452 | 1105 | 890 | | | | | | | | | 890 |
| RAILS | 6761 | 946 | 2974 | 2015 | 1978 | | | | | | | | | 19 |
| OTHER RL TRCK | 6762 | 473 | 2183 | 1820 | 1492 | | | | | | | | | 14 |
| WIRE | 6770 | 155 | 248 | 215 | 206 | | | | | | | | | 206 |
| SEAMLESS TUBE | 6782 | 21 | 15 | 10 | 15 | | | | | | | | | 15 |
| WELDED TUBES | 6783 | 1461 | 3805 | 2860 | 2709 | | | | | | | | | 2709 |
| TOTALS | | 78240 | 74073 | 65215 | 72509 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 72509 |

## B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 78240 | 74073 | 65215 | 72509 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | 78240 | 74073 | 65215 | 72509 |
| LOCAL PRODUCTION | 0 | 0 | 0 | 0 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 143723 | 135907 | 112267 | 130632 |
| SUPPLIED FROM; | | | | |
| 1 NET IMPORTS | 144258 | 137128 | 112320 | 131235 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | 535 | 1221 | 53 | 603 |
| NET IMPORTS OF BILLETS ETC | 0 | 0 | 0 | 0 |
| NET IMPORTS OF ROLLED PRODUCTS | 104185 | 98274 | 86747 | 96402 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 39538 | 37632 | 25520 | 34230 |
| 2 LOCAL SOURCES (INCL. SCRAP) | -535 | -1221 | -53 | -603 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 10000 | 10000 | 10000 | 10000 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

ZAMBIA TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| GDP, AND POPULATION | | | | | | | | | |
| POPULATION (MILL) | 6.0 | 6.2 | 6.4 | 8.2 | 8.2 | 8.2 | 9.8 | 9.8 | 9.8 |
| GDP PER CAPITA US$ (1975) | 394.0 | 369.9 | 351.2 | 332.9 | 304.8 | 279.3 | 338.8 | 281.6 | 226.5 |
| GDP MILL US$ (1975) | 2359.9 | 2293.8 | 2247.9 | 2730.0 | 2500.0 | 2220.0 | 3320.0 | 2970.0 | 2220.0 |
| GROSS CAP FORM MILL US$ (1975) | 340.7 | 260.7 | 197.6 | 390.0 | 360.0 | 170.0 | 450.0 | 420.0 | 180.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 138.1 | 147.1 | 148.1 | 210.0 | 190.0 | 160.0 | 280.0 | 220.0 | 170.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 399.4 | 385.4 | 356.9 | 470.0 | 440.0 | 400.0 | 630.0 | 510.0 | 420.0 |
| BALANCE OF PAYMENTS MILLION ZK | | | | | | | | | |
| EXPORTS | 866.3 | 883.0 | 1150.4 | 2250.0 | 2040.0 | 1870.0 | 3460.0 | 2950.0 | 2690.0 |
| OTHER CURRENT ITEMS | -612.3 | -550.9 | -602.2 | -1150.0 | -1150.0 | -1150.0 | -1800.0 | -1800.0 | -1800.0 |
| ODA, NET INFLOWS | 276.6 | 183.2 | 169.8 | 310.0 | 280.0 | 280.0 | 430.0 | 380.0 | 380.0 |
| LONG TERM CAPITAL,NET | 89.5 | 128.3 | 40.0 | 70.0 | 60.0 | 60.0 | 100.0 | 80.0 | 80.0 |
| RESERVES ERRORS AND OMISSIONS | 306.4 | 288.4 | 137.2 | 170.0 | 140.0 | 140.0 | 250.0 | 200.0 | 200.0 |
| IMPORTS, IMPORT CAPACITY | 926.4 | 932.0 | 895.2 | 1650.0 | 1370.0 | 1200.0 | 2440.0 | 1810.0 | 1550.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 3.3 | 3.2 | 3.6 | 3.6 |
| GDP, CONSTANT US$ (1975) | -2.8 | -2.0 | 1.5 | 2.0 |

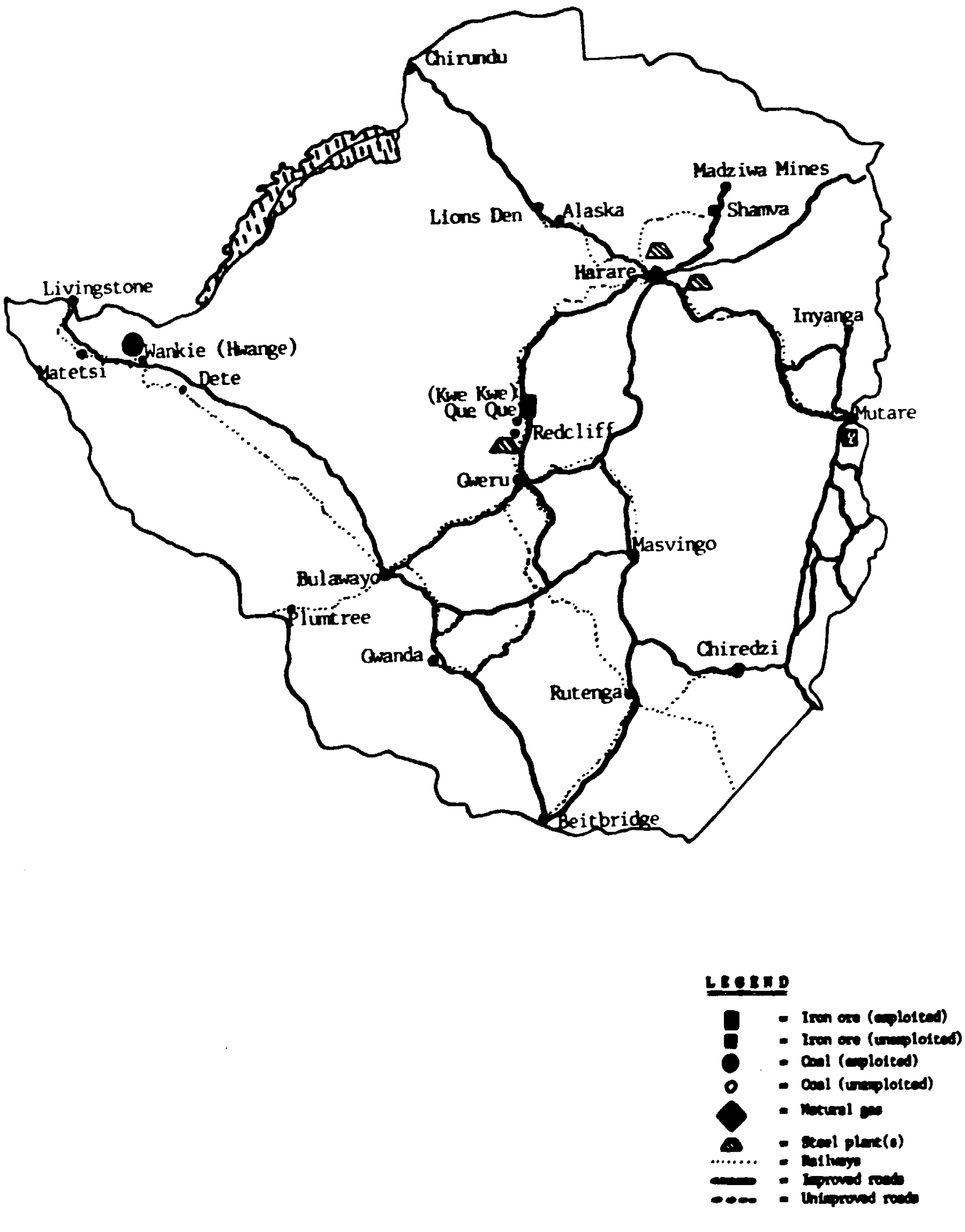
TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY ZAMBIA

| | YEAR | | | | | | | | AVERAGE TONNES |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | | | |
| | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | AVERAGE VALUE | AVERAGE TONNES | IN PCT OF TOTAL |
| SITC | | | | | | | | | |
| MET. STRUCTURES | 13037 | 14136 | 5594 | 3586 | 2120 | 1365 | 6917 | 6362 | 20 |
| TANKS, VESSELS, ETC | 1636 | 747 | 896 | 393 | 628 | 274 | 1053 | 471 | 2 |
| WIRE PRODUCTS | 3458 | 1881 | 814 | 454 | 993 | 1046 | 1755 | 1127 | 4 |
| NAILS, NUTS,BOLTS | 627 | 284 | 541 | 275 | 286 | 103 | 485 | 221 | 1 |
| HAND TOOLS | 5280 | 723 | 4520 | 974 | 2678 | 362 | 4159 | 686 | 2 |
| CUTLERY | 430 | 33 | 497 | 22 | 58 | 0 | 328 | 18 | 0 |
| DOM. UTENSILS | 633 | 37 | 400 | 51 | 78 | 12 | 370 | 33 | 0 |
| AGR.MACH.,TRACTORS | 7631 | 1562 | 18850 | 4848 | 9524 | 2014 | 12002 | 2808 | 9 |
| DOM. EL. EQUIPMENT | 899 | 148 | 1607 | 345 | 561 | 79 | 1022 | 191 | 1 |
| RAIL. LOCOS ETC. | 12270 | 1328 | 2475 | 202 | 10665 | 2700 | 8470 | 1410 | 4 |
| ROAD VEHICLES | 78412 | 14057 | 108356 | 23201 | 63306 | 13695 | 83358 | 16984 | 54 |
| BICYCLES ETC. | 1694 | 567 | 2741 | 785 | 1579 | 557 | 2005 | 636 | 2 |
| HEATING, SANITARY | 1584 | 639 | 1212 | 313 | 331 | 91 | 1042 | 348 | 1 |
| FURNITURE | 580 | 85 | 685 | 91 | 254 | 54 | 506 | 77 | 0 |
| TOTAL | 128171 | 36227 | 149188 | 35540 | 93061 | 22352 | 123473 | 31373 | 100 |

# ZIMBABWE

# ZIMBABWE


Chirundu
Madziwa Mines
Shamva
Lions Den
Alaska
Harare
Livingstone
Wankie (Hwange)
Matetsi
Dete
Inyanga
(Kwe Kwe)
Que Que
Redcliff
Mutare
Gweru
Masvingo
Bulawayo
Plumtree
Gwanda
Chiredzi
Rutenga
Beitbridge
LEGEND
= Iron ore (exploited)
= Iron ore (unexploited)
= Coal (exploited)
= Coal (unexploited)
= Natural gas
= Steel plant(s)
= Railways
= Improved roads
= Unimproved roads

ZIMBABWE

Zimababwe accounts for 30 per cent of steel consumption in PTA and more than half of that in SADCC. Projections for Zimbabwe will therefore have a major effect on projections for the two sub-regions. Unfortunately, the Zimbabwean National Development Plan, covering the years 1986-1991 was not available as an input for the economic projections.

The Zimbabwean economy performed well with a GDP growth of around 5 per cent in 1985. It is likely that the outturn for 1986 will be as good. As a substantial factor behind the good performance were good weather conditions, growth is hardly likely to continue at the same rate. For the period from 1986-1990 a growth rate of 4 per cent per annum was assumed. The 5 per cent projected from the period 1990-1995 is based on the assumption of good export performance and access to external financing in the earlier period, giving room for substantial productive investment. A particularly rapid development of the manufactuirng sector could be expected in this period.

Downside risks relate to the external balance, prices of major export products and scope for manufactured exports particularly to other countries in the subregion. Major uncertainties are, however, represented by the developments in the South African economy and society. Like the other countries bordening Souther Africa, Zimababwe is economically linked to its neighbour albeit with a much stronger independent basis than any of the others.

The low growth scenario would illustrate a situation with considerable turmoil in South Africa as well as less favourable external balance and weather conditions. The high growth case illustrates a very fortunate situation with regard to neighbour relations and trade as well as external balance and successful investment policies. The projections increased in overall steel consumption in Zimbabwe does not deviate much from the rates of GDP growth. This could be seen as the result of two opposite tendencies, Firstly, as illustrated in the case of Kenya, a tendency for steel intensity to decline in a relatively developed economy producing an increasing share of high value added products. Secondly the effect of growth tending to conteract the declining steel intensity particularly by building a demand basis for durable consumber goods.

ZIMBABWE TABLE 1. MAIN PROJECTION

## A) MACRO VARIABLES, DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 4207 | 8.0 | 526 | 5600 | 10.7 | 523 | 7150 | 12.8 | 559 | 3.6 | 5.0 | 3.7 | 3.6 | -0.1 | 1.3 |

## B) BASE CASE PROJECTIONS 1990 AND 1995 ,TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES PA. CONSUMPTION | | EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 64024 | 148872 | 5489 | 90337 | 74941 | 170000 | -95059 | 87234 | 200000 | -112766 | 2.0 | 3.1 | 4.1 | 5.3 |
| ANGLES SHP. H | 6734 | 64756 | 68667 | 6247 | 10158 | 65760 | 75000 | -9240 | 66644 | 80000 | -13356 | 0.2 | 0.3 | 4.5 | 4.2 |
| ANGLES SHP.,L | 6735 | 33397 | 35333 | . | 1937 | 46217 | 55000 | -8783 | 66177 | 80000 | -13823 | 4.1 | 7.4 | 4.0 | 7.0 |
| PLATES, H.+ M | 6740 | 23809 | 0 | 23809 | 0 | 32896 | 0 | 32896 | 39529 | 0 | 39529 | 4.1 | 3.7 | 4.5 | 4.2 |
| PLATES, LIGHT | 6743 | 30932 | 0 | 30932 | 0 | 62524 | 0 | 62524 | 110435 | 0 | 110435 | 9.2 | 12.1 | 4.0 | 7.0 |
| TIN.& COAT.PL | 6749 | 21871 | 0 | 21871 | 0 | 47861 | 0 | 47861 | 87564 | 0 | 87564 | 10.3 | 12.8 | 4.0 | 7.0 |
| HOOP AND STRP | 6750 | 9188 | 0 | 9188 | 0 | 9530 | 0 | 9530 | 9984 | 0 | 9984 | 0.5 | 0.9 | 4.0 | 7.0 |
| RAILS+ MATER. | 6760 | 12048 | 3882 | 9975 | 1809 | 12403 | 7000 | 5403 | 12933 | 8000 | 4933 | 0.4 | 0.8 | 4.5 | 4.2 |
| WIRE | 6770 | 26515 | 28667 | 319 | 2471 | 34749 | 36500 | -1751 | 47052 | 50000 | -2948 | 3.4 | 6.2 | 4.0 | 7.0 |
| TUBES | 6780 | 3844 | 3465 | 1044 | 665 | 5100 | 8400 | -3300 | 6500 | 12000 | -5500 | 3.6 | 5.0 | 4.0 | 7.0 |
| TOTALS | | 290383 | 288886 | 108874 | 107376 | 391980 | 351900 | 40080 | 534051 | 430000 | 104051 | 3.8 | 6.4 | | |
| CRUDE EQUIVALENT | | 379264 | 369352 | 146690 | 136780 | 515456 | 450391 | 64564 | 705592 | 551550 | 154042 | 3.9 | 6.5 | | |
| BILLET EQUVIVALENT | | 323603 | 315146 | 125162 | 116706 | 439808 | 384719 | 55089 | 602039 | 470605 | 131434 | 3.9 | 6.5 | | |

## C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 379264 | 369352 | 146690 | 136780 | 569136 | 450891 | 118244 | 837970 | 551550 | 286420 | 5.2 | 8.0 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.5 | 3.7 | 0.8 |
| 1990 TO 1995 | 6.5 | 3.6 | 2.7 |

## D) LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 379264 | 369352 | 146690 | 136780 | 443999 | 450891 | -6893 | 520205 | 551550 | -31345 | 2.0 | 3.2 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.4 | 3.7 | -1.2 |
| 1990 TO 1995 | 3.0 | 3.6 | -0.7 |

ZIMBABWE     TABLE 2. PROJECTION WITH ACCELLERATED REPLACEMENT OF INDIRECT STEEL IMPORTS

A) MACRO VARIABLES: DATA AND BASE CASE PROJECTIONS

| AVERAGE 1981 - 1983 | | | PROJECTION 1990 | | | PROJECTION 1995 | | | GROWTH RATES PCT. P.A. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP MILL. US$ -75 | POPU-LATION MILL. | GDP PER CAPITA US$ -75 | GDP TO 1990 | GDP 1990-1995 | POP TO 1990 | POP 1990-1995 | GDP/POP TO 1990 | GDP/POP 1990-1995 |
| 4207 | 8.0 | 526 | 5600 | 10.7 | 523 | 7150 | 12.8 | 559 | 3.6 | 5.0 | 3.7 | 3.6 | -0.1 | 1.3 |

B) BASE CASE PROJECTIONS 1990 AND 1995, TONNES

| | | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | GROWTH RATES P.A. CONSUMPTION | | EXPL.VARIABLE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PRODUCT NAME | SITC | CONS | PROD | IMP | EXP | CONS | PROD | NET IMPORT | CONS | PROD | NET IMPORT | TO 1990 | 1990-1995 | TO 1990 | 1990-1995 |
| BARS AND RODS | 6730 | 64024 | 148872 | 5489 | 90337 | 77576 | 170000 | -92424 | 92505 | 200000 | -107495 | 2.4 | 3.6 | 4.1 | 5.3 |
| ANGLES SHP. H | 6734 | 64756 | 68667 | 6247 | 10158 | 66414 | 75000 | -8586 | 67952 | 80000 | -12048 | 0.3 | 0.5 | 4.5 | 4.2 |
| ANGLES SHP.,L | 6735 | 33397 | 35333 | . | 1937 | 47277 | 55000 | -7723 | 68297 | 80000 | -11703 | 4.4 | 7.6 | 4.0 | 7.0 |
| PLATES, H.+ M | 6740 | 23809 | 0 | 23809 | 0 | 33540 | 0 | 33540 | 40817 | 0 | 40817 | 4.4 | 4.0 | 4.5 | 4.2 |
| PLATES, LIGHT | 6743 | 30932 | 0 | 30932 | 0 | 64416 | 0 | 64416 | 114219 | 0 | 114219 | 9.6 | 12.1 | 4.0 | 7.0 |
| TIN.& COAT.PL | 6749 | 21871 | 0 | 21871 | 0 | 49466 | 0 | 49466 | 90773 | 0 | 90773 | 10.7 | 12.9 | 4.0 | 7.0 |
| HCOP AND STRP | 6750 | 9188 | 0 | 9188 | 0 | 9709 | 0 | 9709 | 10341 | 0 | 10341 | 0.7 | 1.3 | 4.0 | 7.0 |
| RAILS+ MATER. | 6760 | 12048 | 3882 | 9975 | 1809 | 12660 | 7000 | 5660 | 13448 | 8000 | 5448 | 0.6 | 1.2 | 4.5 | 4.2 |
| WIRE | 6770 | 26515 | 28667 | 319 | 2471 | 35303 | 36500 | -1197 | 48162 | 50000 | -1838 | 3.6 | 6.4 | 4.0 | 7.0 |
| TUBES | 6780 | 3844 | 3465 | 1044 | 665 | 5526 | 8400 | -2874 | 7352 | 12000 | -4648 | 4.6 | 5.9 | 4.0 | 7.0 |
| TOTALS | | 290383 | 288886 | 108874 | 107376 | 401887 | 351900 | 49987 | 553865 | 430000 | 123865 | 4.1 | 6.6 | | |
| CRUDE EQUIVALENT | | 379264 | 369352 | 146690 | 136780 | 528561 | 450891 | 77670 | 731805 | 551550 | 180255 | 4.2 | 6.7 | | |
| BILLET EQUVIVALENT | | 323603 | 315146 | 125162 | 116706 | 450990 | 384719 | 66271 | 624405 | 470605 | 153801 | 4.2 | 6.7 | | |

C) HIGH-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD-1990 | 1990-95 |
| CRUDE EQUIV. TONNES | 379264 | 369352 | 146690 | 136780 | 582242 | 450891 | 131351 | 864186 | 551550 | 312636 | 5.5 | 8.2 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 4.5 | 3.7 | 0.8 |
| 1990 TO 1995 | 6.5 | 3.6 | 2.7 |

LOW-GROWTH CASE PROJECTIONS 1990 AND 1995

| | AVERAGE 1981 - 1983 | | | | 1990 | | | 1995 | | | CONSUMPTION GROWTH RATE PA. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CONS | PROD | IMP | EXP | CONS | PROD | IMPORT | CONS | PROD | IMPORT | BASE PERIOD - 1990 | 1990-95 |
| CRUDE EQUVIV. TONNE | 379264 | 369352 | 146690 | 136780 | 457104 | 450891 | 6213 | 546420 | 551550 | -5130 | 2.4 | 3.6 |

| PERCENT GROWTH IN MACRO VARIABLES | GDP | POPULATION | GDP/CAPITA |
|---|---|---|---|
| AVERAGE 81-83 TO 1990 | 2.4 | 3.7 | -1.2 |
| 1990 TO 1995 | 3.0 | 3.6 | -0.7 |

ZIMBABWE TABLE 3

A) COMPONENTS OF APPARENT STEEL CONSUMPTION BY PRODUCT (TONNES)

| PRODUCT NAME | SITC | IMPORTS 1981 | IMPORTS 1982 | IMPORTS 1983 | IMPORTS AVER | PRODUCTION 1981 | PRODUCTION 1982 | PRODUCTION 1983 | PRODUCTION AVER | EXPORTS 1981 | EXPORTS 1982 | EXPORTS 1983 | EXPORTS AVER | APP. CONS AV 81-83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIRE RODS | 6731 | | | | | 52000 | 39000 | 35000 | 42000 | 15000 | 5000 | 5000 | 8333 | 33667 |
| BARS AND RODS | 6732 | 6300 | 5917 | 4249 | 5489 | 123617 | 96000 | 101000 | 106872 | 83749 | 72348 | 89915 | 82004 | 30357 |
| ANGLES SHP.HM | 6734 | 7243 | 5302 | 6196 | 6247 | 70000 | 73000 | 63000 | 68667 | 16825 | 9049 | 4600 | 10158 | 64756 |
| ANGLES SHP..L | 6735 | | | | | 34000 | 36000 | 36000 | 35333 | 3277 | 358 | 2175 | 1937 | 33397 |
| PLATES, HEAVY | 6741 | 24296 | 26493 | 20639 | 23809 | | | | | | | | | 23809 |
| PLATES, MED. | 6742 | | | | | | | | | | | | | 0 |
| PLATES, LIGHT | 6743 | 33906 | 40052 | 18837 | 30932 | | | | | | | | | 30932 |
| TINPLATE | 6747 | 10642 | 9674 | 9988 | 10101 | | | | | | | | | 10101 |
| OTHER COAT.P | 6748 | 11813 | 14806 | 8691 | 11770 | | | | | | | | | 11770 |
| HOOP AND STRP | 6750 | 9284 | 6689 | 11591 | 9188 | | | | | | | | | 9188 |
| RAILS | 6761 | 17567 | 10323 | 338 | 9409 | 1077 | 1500 | 768 | 1115 | 577 | 1000 | 268 | 615 | 9909 |
| OTHER RL TRCK | 6762 | 977 | 596 | 123 | 565 | 2500 | 2700 | 3100 | 2767 | 820 | 1593 | 1168 | 1194 | 2138 |
| WIRE | 6770 | 288 | 298 | 372 | 319 | 32000 | 29000 | 25000 | 28667 | 3421 | 1991 | 2000 | 2471 | 26515 |
| SEAMLESS TUBE | 6782 | 1353 | 1226 | 553 | 1044 | 2810 | 3093 | 4492 | 3465 | 210 | 293 | 1492 | 665 | 3844 |
| WELDED TUBES | 6783 | | | | | | | | | | | | | 0 |
| TOTALS | | 123669 | 121376 | 81577 | 108874 | 286004 | 251293 | 243360 | 260219 | 123879 | 91632 | 106618 | 107376 | 261717 |



B) DEMAND / SUPPLY BALANCES FOR ROLLED PRODUCTS AND FERROUS MATERIALS (TONNES)

| | 1981 | 1982 | 1983 | AVERAGE |
|---|---|---|---|---|
| A ROLLED PRODUCTS | | | | |
| APPARENT CONSUMPTION OF ROLLED PRODUCTS | 285794 | 281037 | 218319 | 261717 |
| OF WHICH; | | | | |
| NET IMPORTS OF ROLLED PRODUCTS | -210 | 29744 | -25041 | 1498 |
| LOCAL PRODUCTION | 286004 | 251293 | 243360 | 260219 |
| B FERROUS MATERIALS CONSUMPTION (CRUDE EQUIVALENTS) 1) | | | | |
| TOTAL | 299290 | 290873 | 220349 | 270171 |
| SUPPLIED FROM: | | | | |
| 1 NET IMPORTS | -188978 | -197101 | -288370 | -224816 |
| OF WHICH; | | | | |
| FERROUS MATERIALS FOR SMELTING, INCL SCRAP | -5358 | -1231 | 5349 | -413 |
| NET IMPORTS OF BILLETS ETC | -228490 | -277629 | -304165 | -270095 |
| NET IMPORTS OF ROLLED PRODUCTS | 8488 | 47489 | -26242 | 9912 |
| FINISHED PRODUCTS (INDIRECT IMPORTS) | 36382 | 34270 | 36689 | 35780 |
| 2 LOCAL SOURCES (INCL. SCRAP) | 488269 | 487974 | 508718 | 494987 |
| C ESTIMATED ANNUAL LOCAL SCRAP GENERATION | 50000 | 50000 | 50000 | 50000 |

1) IMPORT, EXPORT AND PRODUCTION FIGURES ARE CONVERTED TO CRUDE STEEL EQUIVALENTS (INGOTS) BY USING COEFFICIENTS DEVELOPED BY THE ECE. "FERROUS MATERIALS FROM LOCAL SOURCES" ARE CALCULATED BY APPLYING THESE COEFFICIENTS TO LOCALLY PRODUCED ROLLED PRODUCTS, ARRIVING AT BILLET EQUVIVALENTS, AND THEN DEDUCTING NET IMPORTS OF BILLETS AND "FERROUS MATERIALS FOR SMELTING". DIFFERENCES BETWEEN THIS AND THE FIGURE GIVEN FOR SCRAP GENERATION MAY BE DUE TO INACCURACIES IN CONVERSION FACTORS, STOCKS OF SCRAP OR DEFICIENCIES IN THE EXTERNAL TRADE STATISTICS USED

ZIMBABWE TABLE 4

## MACRO DATA AND PROJECTIONS

| YEAR | ACTUALS, ESTIMATES 1981 | 1982 | 1983 | PROJECTIONS 1990 HIGH | 1990 BASE | 1990 LOW | 1995 HIGH | 1995 BASE | 1995 LOW |
|---|---|---|---|---|---|---|---|---|---|
| GDP. AND POPULATION | | | | | | | | | |
| POPULATION (MILL) | 7.7 | 8.0 | 8.3 | 10.7 | 10.7 | 10.7 | 12.8 | 12.8 | 12.8 |
| GDP PER CAPITA US$ (1975) | 542.0 | 524.5 | 513.1 | 560.7 | 523.4 | 476.6 | 642.2 | 558.6 | 460.9 |
| GDP MILL US$ (1975) | 4166.7 | 4195.9 | 4258.8 | 6000.0 | 5600.0 | 5100.0 | 8220.0 | 7150.0 | 5900.0 |
| GROSS CAP FORM MILL US$ (1975) | 922.7 | 995.6 | 828.3 | 1450.0 | 1300.0 | 1100.0 | 1950.0 | 1600.0 | 1250.0 |
| BLDG AND CONSTR V.A MILL US$ (1975) | 128.1 | 125.5 | 115.1 | 210.0 | 170.0 | 125.0 | 300.0 | 220.0 | 150.0 |
| MANUFACTURING V.A. MILL US$ (1975) | 1113.4 | 1107.8 | 1075.7 | 1700.0 | 1500.0 | 1300.0 | 2600.0 | 2100.0 | 1550.0 |
| BALANCE OF PAYMENTS MILLION Z$ | | | | | | | | | |
| EXPORTS | 1001.9 | 998.2 | 1174.0 | 2500.0 | 2250.0 | 1900.0 | 4900.0 | 4100.0 | 3050.0 |
| OTHER CURRENT ITEMS | -382.1 | -416.8 | -579.3 | -870.0 | -800.0 | -800.0 | -1150.0 | -1000.0 | -1000.0 |
| ODA, NET INFLOWS | . | . | 124.2 | 250.0 | 200.0 | 200.0 | 350.0 | 300.0 | 300.0 |
| LONG TERM CAPITAL,NET | 62.0 | 281.9 | 222.5 | 300.0 | 250.0 | 250.0 | 450.0 | 350.0 | 350.0 |
| RESERVES ERRORS AND OMISSIONS | 377.6 | 251.0 | 145.2 | . | . | . | . | . | . |
| IMPORTS, IMPORT CAPACITY | 1059.4 | 1114.3 | 1086.8 | 2180.0 | 1900.0 | 1550.0 | 4550.0 | 3750.0 | 2760.0 |

| GROWTH RATES PER CENT P.A. | 1981-82 | 1982-83 | 1981-1983 TO BASE 1990 | BASE 1990-1995 |
|---|---|---|---|---|
| POPULATION | 3.9 | 3.8 | 3.7 | 3.6 |
| GDP. CONSTANT US$ (1975) | 0.7 | 1.5 | 2.3 | 7.1 |

TABLE 5; ESTIMATED INDIRECT STEEL IMPORTS, 1981 - 1983 AND AVERAGES VALUES IN 1000 US $. QUANTITIES IN TONNES.

COUNTRY ZIMBABWE

| | YEAR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1981 | | 1982 | | 1983 | | AVERAGE VALUE | AVERAGE TONNES | AVERAGE TONNES IN PCT OF TOTAL |
| SITC | VALUE | QUANTITY | VALUE | QUANTITY | VALUE | QUANTITY | | | |
| MET. STRUCTURES | 328 | 93 | 4076 | 1813 | 837 | 1629 | 1747 | 1178 | 4 |
| TANKS, VESSELS, ETC | 546 | 460 | 233 | 177 | 433 | 148 | 404 | 262 | 1 |
| WIRE PRODUCTS | 141 | 27 | 902 | 350 | 139 | 27 | 394 | 135 | 0 |
| NAILS, NUTS,BOLTS | 662 | 482 | 687 | 359 | 335 | 113 | 561 | 318 | 1 |
| HAND TOOLS | 3134 | 531 | 3263 | 604 | 1832 | 268 | 2743 | 468 | 1 |
| CUTLERY | 319 | 27 | 223 | 13 | 124 | 9 | 222 | 16 | 0 |
| DOM. UTENSILS | 152 | 15 | 156 | 10 | 107 | 12 | 138 | 12 | 0 |
| AGR.MACH.,TRACTORS | 16590 | 4640 | 17706 | 5081 | 16858 | 4185 | 17051 | 4635 | 14 |
| DOM. EL. EQUIPMENT | 610 | 148 | 741 | 240 | 833 | 196 | 728 | 195 | 1 |
| RAIL. LOCOS ETC. | 2013 | 584 | 14399 | 1405 | 9536 | 1585 | 8649 | 1191 | 4 |
| ROAD VEHICLES | 111143 | 27494 | 101823 | 22359 | 102703 | 22633 | 105223 | 24162 | 73 |
| BICYCLES ETC. | 996 | 277 | 753 | 287 | 1442 | 273 | 1064 | 279 | 1 |
| HEATING, SANITARY | 370 | 130 | 316 | 59 | 214 | 30 | 300 | 73 | 0 |
| FURNITURE | 878 | 133 | 484 | 93 | 440 | 73 | 601 | 100 | 0 |
| TOTAL | 137882 | 35041 | 145762 | 32850 | 135833 | 31181 | 139826 | 33024 | 100 |