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**TOWARDS AN INTEGRATED INDUSTRIAL
DEVELOPMENT PROGRAMME
FOR THE
PTA**

Prepared by the Secretariat of UNIDO
in co-operation with the PTA Secretariat

V.90-86150

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PREFACE

This document is, as its title suggests, intended to assist the Preferential Trade Area for Eastern and Southern African States (PTA) in determining an integrated industrial development programme for the subregion. In March 1989, at the request of the PTA, a Multi-disciplinary Programming Mission was undertaken by UNIDO to the PTA subregion. The present document draws upon the findings of that mission, together with the existing programme of industrial development activity in the PTA, and information available to UNIDO on industry in the member states. Earlier versions of this document were discussed with the PTA Secretariat in November 1989 and July 1990, and the present version incorporates changes and additional material suggested by the PTA.

This paper was prepared by the Regional and Country Studies Branch, in co-operation with Africa Countries Programme. Inputs were also provided by other UNIDO organizational units. Ms. M.A. Cappiello, as UNIDO consultant, assisted in the preparation of an earlier draft of this report. Mr. Kee-Yung Nam, as UNIDO consultant, assisted in the presentation of data in this report.

The document attempts a brief summary of the complex industrial structure to be found in the subregion, and makes proposals for action. Many of these proposals are in the form of project outlines, which have been prepared in response to what are seen as the strategic requirements of integrated industrial development for the future.

Although in some cases countries have been identified to host certain projects because of favourable conditions or endowments, the target beneficiaries are the participating countries of the subregion, including the newly admitted member states of the PTA.

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1. THE PTA PRIORITY INDUSTRIAL SECTORS

1.1 The PTA industrial programme: an introduction

The Preferential Trade Area for Eastern and Southern African States covers, as its name suggests, a range of countries from Ethiopia, Djibouti and Somalia in the north down to Lesotho and Swaziland in the South of the continent.¹ Established by the PTA Treaty of 1982, the organization has laid the foundations for major economic integration and development, especially through important initiatives in the field of trade liberalization, payments mechanisms and infrastructural development and co-ordination.

The manufacturing sector in the region varies from sectors still in the initial stage of development, especially in the smaller and more economically disadvantaged member states, to relatively complex industrial productive systems in some countries which have attained a degree of international competitiveness and hold a share of the economy equal to or greater than that to be encountered in many developed countries.

The diversity is mirrored by that of natural resource endowments, an important determinant of future industrialization possibilities. In some countries agro-based industries offer the best promise for expansion. In others, the exploitation and local processing of mineral resources may be a suitable option. Again, the general socio-economic situation, especially with respect to population pressures, urbanization trends, and the need for rural development, may all compel consideration of strategies involving elements of import substitution, and small- and medium-scale industry promotion, insofar as choices of such strategies have to be made instead of those of export promotion, large-scale industry projects, etc.

These choices are not new ones: they have been traditionally at the heart of the industrial development debate for many years. But they emerge with particular emphasis in the context of regional integration and the development of a PTA industrial strategy. This is because the elaboration of such a strategy has to take account not only of the different national possibilities and priorities, but also of the degree to which these possibilities and priorities can themselves be altered by the progress achieved towards regional economic integration. For instance, industrial possibilities limited by insufficient market size at the national level may be improved by access to the larger markets implied by regional integration. This must however be qualified by the degree to which such market expansion takes place in practice, as well as by the possible interest in such an industrial project on the part of other member countries. The situation is made more complex by the fact that the task of financing large industrial projects is not necessarily any easier, and experience with multinational investment projects in other parts of the world suggest that this approach to financing and management can introduce further complications into what may already be a difficult operation, if caution is not exercised and appropriate safeguards

¹ The member states of the PTA at the time of the mission in 1989 were Burundi, Comoros, Djibouti, Ethiopia, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Rwanda, Somalia, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Other states regarded as potential members were Angola, Botswana, Madagascar, Namibia, Seychelles, Sudan and Zaire.

and mechanisms for the resolution of difficulties not incorporated at the outset.²

The choice of priority sectors for industrial integration must take the above factors into full consideration. A choice is always necessary in any situation of scarcity. It is even more necessary in a regional context, where the resources to be considered for allocation are not only the conventional resources of investible funds and skilled labour but also the human resources, the political capital, as it were, at the regional level. Not all sectors can receive full attention and not all possible projects can be supported at the regional level. The PTA has to concentrate on those priorities which best address the concerns of its member states, and best meet the needs of the people of the region.

The priority sectors for industry adopted by the PTA are metals, engineering, chemicals, agro-industries, building materials, human resources and energy. The last two are not, strictly speaking, industrial sectors, or at least not part of manufacturing activity in statistical terms, although they have, of course, a crucial role to play in any industrial strategy.

Together, these sectors constitute the major, most complex and most dynamic part of an economy. They cover an elaborate system of actual and potential linkages which would allow for a resilient industrial sector for the region, capable of meeting many of the domestic needs and also opening up possibilities for increased exports outside the region, including the developed countries.

Another way of looking at the PTA priorities is to see them as containing elements of a crisis strategy and recovery programme. This is particularly true with respect to the emphasis placed on the agro-food sector (within agro-industries) in response to supply problems, and the emphases also placed on the energy and transport sectors, which constitute essential components of an enabling environment for industrial growth and development. More immediately, improvement in the short term under these headings would give a stimulus to production where industrial capacity is underutilized due to market or power inadequacies.

From such a viewpoint, other elements of the priorities include rehabilitation and restructuring to meet subregional needs. Existing productive capacity has been painfully acquired, but unfavorable macro-economic conditions and other external factors have led in some cases to deterioration of machines, shortages of spare parts and maintenance, lack of appropriate staff, etc. Some plants have become outmoded due to energy inefficiency, or else because their products are not competitively priced compared with those from more modern factories, whether these are within the region or outside it. The three simultaneous upgradings needed, of products, processes and skills, constitute the major tasks of industrialization in the PTA.

For this reason, the PTA has already instituted a wide variety of activities under each sector heading, to address the main tasks of recovery and of laying

² See the Report of the Meeting of high-level experts on the formulation, planning, negotiation, implementation and monitoring of multinational industrial projects in Africa, Vienna, Austria, 25-29 September 1989 UNIDO ID/WG +89/3(SPEC.) 9 October 1989 See also Report of the Meeting of Team of Experts to consider Terms of Reference for Multinational Industrial Enterprises, PTA/LEG/MIE/I/3, August 1989

the basis for sustained growth and development. There has been a particular concentration on exploiting complementarities and on mobilising the region's resources, defining these to include existing industries and institutions, together with skilled people active in the field of industry.

Broadly speaking the industrial activities of the PTA can be classified as new investment, rehabilitation, expansion and diversification, or institutional development.³ New investment would cover the promotional activity in connexion with the establishment of new industrial plants. Sometimes these are existing national projects capable of meeting subregional needs and promoted by the PTA for this reason. Examples include the project for a triple superphosphate plant in Uganda, the production of single superphosphate fertilizer in Burundi, or the establishment of multinational sponge iron plants in Ethiopia, Tanzania, Uganda and Mozambique.⁴ The PTA activity would include promotion through the different pre-investment phases. Rehabilitation would cover the refurbishment or modification of existing capacity, so that existing investments can be rescued from chronic under-utilization of capacity. This has particularly been the case in the metals sector, where the upgrading, rehabilitation and rationalization of national rolling mills has been an important element of PTA industrial activity. Finally, institutional development would cover the very wide range of cases in which the PTA promotes the upgrading of research, training and technology centres to meet sub-regional needs.

This last point may be elaborated on because these initiatives amount to a very large part of PTA promotional activity. The most notable example is the Metallurgical Technology Centre, where what is essentially a start-up center is to be established. Other initiatives involve the up-grading of existing institutions, such as the Ethiopian Leather and Shoe Research Institute which is to be expanded into a PTA Leather Technologies Centre to meet the needs of the PTA as a whole. It is clear that this approach makes best use of the existing institutional resources of the region and amounts to a practical expression of the economic co-operation exemplified by the PTA. It is also particularly appropriate for technologies where the cost of equipment is high and the number of skilled staff available to undertake training and research is limited. The focus has also been on sectors where several PTA countries are strongly represented, such as in metals and in leather, and where success at an international level is increasingly technologically determined.

1.2 National plans and priorities

As noted, the fundamental problem of developing a PTA industrial programme is that of realizing the complementarities in some aspects of individual national structures while at the same time attempting to come to terms with the fact that in some respects the structures are very similar as regards the predominance of certain subsectors.

³These categories describe the activities of the PTA Division of Industry and Energy. Of course, all the other PTA activities in the fields of trade, finance, agriculture, transport and communications have important effects on industrial development also.

⁴PTA: Report of the Thirteenth Meeting of the Council of Ministers PTA/CM/XIII/5, November 1988

Table 1B illustrates this point very strikingly. It gives the subsectoral breakdown of the manufacturing value added (MVA) of each of the PTA countries from the latest estimates available. In all except two cases, Mauritius and Uganda, the subsector Food, Beverages, and Tobacco has the largest share of MVA. From this point of view, the dominance of the traditional agriculture based sector is clearly established. Another mainstay of a developing economy, the textiles, wearing apparel and leather sector, is also strongly represented in almost all countries (apart from Rwanda and Swaziland) : it is at least 10 per cent of MVA in all the other countries⁵ This subsector is usually the second largest. A certain uniformity can be seen also in the relatively large chemical subsector share in total MVA: in the larger countries this is at least 10 per cent of MVA also, and in some countries (such as Ethiopia and Kenya) the share is much higher. In fact, this statistical finding is borne out by the presence of significant productive capacity in many chemicals products, especially refining capabilities, and fertilizers production in a number of PTA states.

Table 1B also, however, show divergences. Thus for Mauritius the textiles, clothing and footwear sector is strikingly important, amounting to almost half of all MVA, and this reflects, among other things, its considerable success in world markets in this field. Metal products, machinery and equipment are especially important for Kenya, Tanzania Zambia and Zimbabwe. Of these, however, only Zimbabwe also has a large activity in basic metals (ISIC 37). Further variations in structures between member states may be noted in the high share of paper and paper products in Swaziland, the high share of non-metallic minerals in Rwanda, and the low share of fabricated metal products, machinery and equipment in Ethiopia.

These first observations are based on a broad classification. Going to a more detailed one will disclose further variations. By contrast, moving to a broader view also discloses uniformities within which variations can still be found. For instance, taking the total of ISIC 31, 32, and 33 gives a total figure which may be called "agro-industries". From the point of view of this total, the countries of the PTA split into two distinct groups: those where the share of agro-industries is over 70 per cent of MVA, and those where it is less than 60 per cent. (Only Swaziland, at 66.1 per cent falls between the two groups). Thus Kenya, Tanzania, Zambia and Zimbabwe may be regarded as having more diversified industrial structures than the other countries of the PTA (For detailed statistics on value added and production in the PTA states, see Annex II, Table 10).

The pattern of some similarities and some divergences is found also in the area of industrial policy emphases in the individual countries. Table 3 attempts to summarize some of the recent emphases, at least in terms of policy statements, adopted by the individual member states of the PTA. The table should however be taken as only a very rough guide, however, since most policy choices cannot be fitted neatly into classifications such as adopted here.⁶

⁵ As is noted in the table, the available data for Uganda did not allow a full breakdown at the two-digit ISIC level.

⁶ Assessment is complicated by the fact that most countries would choose a broad combination of objectives, giving, in practice, different weights to the policies adopted. For example, export promotion and import substitution are less mutually exclusive options than might appear from reading the table. Other countries, not only Zimbabwe, pursue some combination of the two approaches. However, in order to provide an overview, Table 2 presents a simplified view.

Table 1A: The structure of the manufacturing sector in PTA countries:
percentage shares of manufacturing value added - 1987
(Percentage share by ISIC code)

Sub-sector	Food, Beverages & Tobacco	Textiles, Wearing Apparel & Leather	Wood & Wood products (incl. furniture)	Paper & Paper products (incl. Printing & Publishing)	Chemicals, Petroleum, Rubber & Plastics	Non-metallic minerals	Basic metals	Fabricate metal products, Machinery & Equipment	Other
ISIC	31	32	33	34	35	36	37	38	39
BURUNDI	77.5	9.3	0.2	1.2	5.2	3.2	-	3.5	-
COMOROS	-	-	-	-	-	-	-	-	-
DJIBOUTI	-	-	-	-	-	-	-	-	-
ETHIOPIA	52.0	19.0	1.8	4.6	16.4	2.7	1.7	1.9	-
KENYA	40.6	10.4	3.3	6.7	17.0	3.1	1.0	16.1	1.5
LESOTHO	69.3	12.6	2.7	3.5	3.9	1.7	3.9	-	2.2
MALAWI	52.7	15.2	3.9	6.0	12.9	2.3	-	6.8	0.3
MAURITIUS	30.1	49.6	1.1	2.7	4.8	2.0	-	6.5	3.0
MOZAMBIQUE	53.3	12.6	6.8	3.3	10.7	2.3	1.9	6.1	-
RWANDA	65.4	2.4	3.7	2.1	5.1	12.2	-	9.0	-
SOMALIA	62.4	11.5	6.4	2.2	11.6	2.1	-	0.8	3.1
SWAZILAND	58.8	2.2	5.1	12.0	9.6	3.5	-	8.5	0.2
TANZANIA	33.5	19.4	3.1	7.2	15.6	1.3	3.7	16.0	0.5
UGANDA*	20.9	28.7	-	-	-	0.4	-	-	-
ZAMBIA	41.6	15.3	2.3	4.9	9.7	6.6	0.8	18.5	0.3
ZIMBABWE	35.8	13.9	2.5	6	12.4	4.0	8.4	15.6	0.6

* The data available did not permit a further breakdown for ISICs 33-35 and 37-39.
Source: REG Database for Africa, 1989.

Table 1B: The structure of the manufacturing sector in PTA countries:
percentage shares of manufacturing value added - 1987
(MVA in current million US dollars)

Sub-sector	Food, Beverages & Tobacco	Textiles, Wearing Apparel & Leather	Wood & Wood products (incl. furniture)	Paper & Paper products (incl. Printing & Publishing)	Chemicals, Petroleum, Rubber & Plastics	Non-metallic minerals	Basic metals	Fabricate metal products, Machinery & Equipment	Other
ISIC	31	32	33	34	35	36	37	38	39
BURUNDI	84.75	10.05	0.27	1.36	5.73	3.45	-	3.81	-
COMOROS	-	-	-	-	-	-	-	-	-
DJIBOUTI	-	-	-	-	-	-	-	-	-
ETHIOPIA	335.24	122.56	11.93	29.96	105.34	17.33	11.21	12.17	-
KENYA	329.47	84.23	26.19	53.99	137.10	25.34	8.10	130.15	12.47
LESOTHO	28.54	5.20	1.11	1.46	1.61	0.70	1.61	-	0.92
MALAWI	71.21	20.56	5.14	8.05	17.39	3.13	-	9.23	0.37
MAURITIUS	77.52	127.86	2.94	7.07	12.20	5.39	-	16.98	7.85
MOZAMBIQUE	23.74	6.05	3.05	1.47	4.78	1.03	0.86	3.59	-
RWANDA	151.79	5.67	8.56	4.84	11.74	28.41	-	20.93	-
SOMALIA	15.02	2.75	1.53	0.52	2.79	0.50	-	0.19	0.75
SWAZILAND	45.60	1.74	3.96	9.31	7.44	2.69	-	6.59	0.19
TANZANIA	36.03	20.82	3.35	7.69	16.68	1.36	3.96	17.15	0.58
UGANDA*	35.61	48.74	-	-	-	0.65	-	-	-
ZAMBIA	146.49	54.02	8.19	17.30	34.07	23.19	2.90	65.06	1.15
ZIMBABWE	771.61	299.54	54.38	142.65	267.99	85.71	181.54	336.19	13.56

* The data available did not permit a further breakdown for ISICs 33-35 and 37-39.
Source: REG Database for Africa, 1989.

Table 2: Ranking of sub-sectors in total NVA, by country

COUNTRY	ISIC								
	31	32	33	34	35	36	37	38	39
BURUNDI	1	2	7	6	3	5	-	4	-
COMOROS	-	-	-	-	-	-	-	-	-
DJIBOUTI	-	-	-	-	-	-	-	-	-
ETHIOPIA	1	2	7	4	3	5	8	6	-
KENYA	1	4	6	5	2	-	7	3	8
LESOTHO	1	2	5	4	3	7	3	-	6
MALAWI	1	2	6	5	3	7	-	4	8
MAURITIUS	2	1	8	6	4	7	-	3	5
MOZAMBIQUE	1	2	5	6	3	7	8	4	-
RWANDA	1	6	5	7	4	2	-	3	-
SOMALIA	1	3	4	6	2	7	-	8	5
SWAZILAND	1	7	5	2	3	6	-	4	8
TANZANIA	1	2	6	5	4	8	7	3	9
UGANDA	2	1	-	-	-	3	-	-	-
ZAMBIA	1	3	7	6	4	5	8	2	9
ZIMBABWE	1	3	8	6	4	7	5	2	9

Interpretation of the table must also bear in mind that it is a representation of emphases at present or recently adopted. The fact that a subject is not stated as a priority may be that because it is not seen as needing special treatment in view of progress already achieved. With these reservations in mind, the following are the main policy emphases as summarized in Table 3:

Small and medium scale industry: virtually all member states are giving it high priority. In some cases, such as Somalia and Zimbabwe this represents a significant change from previous strategies, which, while they may have included small and medium scale industry, did not give it the central priority in policy it appears now to have attained. The policy choice arises for different reasons: for some countries, such as those mentioned, it represents an attempt to diversify the structure or to promote rural employment and contain urbanization. For other countries, it represents a response to the shortage of capital for large investment projects or a reflection of the small size of the country concerned.

Foreign investment: for almost all member states of the PTA, some priority has been given to foreign investment, i.e. encouragement of direct investment in the country concerned by firms outside the subregion. Usually, in practice, firms outside Africa are meant. The steps actually taken in pursuit of this objective have however varied in practice. Table 4 gives a more detailed

breakdown of the policies applied to foreign investment in the different PTA member states. The table deals with some important variables which will be taken into account by a potential investor. A crucial one is whether foreign majority holdings are allowed, i.e. whether the foreign partner is permitted to hold 51 per cent or more of the equity. In some cases where foreign companies believe strongly in their own management style this can be a decisive factor. The table shows that only a few countries provide a definite yes or no to this question. Other important issues include the repatriation of profits and capital, which is permitted in the majority of countries. Almost all the states offer tax incentives, and several offer grants or other benefits, as well. In general, there is a tendency (not just in PTA countries) to give this issue higher priority than previously, but this means that there is more competition between different countries and regions to attract DFI. The most important determinant of success in attracting foreign investment will be the creation of a suitable "climate" for investment.

Export promotion: At one level, an export promotion strategy does not make a distinction between the type of exports. Whether these are raw materials, processed goods or indeed services, they represent foreign exchange for an economy in which it is usually in short supply. In fact, manufactures exports have a particular role to play in improving the quality and technological level of the domestic sector, in offering a source of foreign exchange more certain than many commodities and in giving also a wider market than might be available locally, thus allowing for new industries for whose output local demand may be insufficient to justify the investment cost. A further consideration is the export market in question: of the PTA countries for which export promotion is a policy priority, Zimbabwe, Kenya and Mauritius are overwhelmingly targeted towards hard currency areas. Lesotho and Swaziland are, due to their geographic position, heavily dependent on certain opportunities in the South African market, and Zambia and Malawi face the problem of a less competitive and diversified industrial base as a platform for the selective expansion of industrial exports.

Rehabilitation: As a strategy, an emphasis on rehabilitation is particularly important because its aim is to ensure that what has been painfully acquired is not allowed to slip away through mismanagement or through unfavourable macroeconomic conditions. Machines can deteriorate beyond repair if not adequately maintained or supplied with the relevant spare parts. Markets, once abandoned, can only be re-entered with great difficulty. Skilled labour forces, once dispersed, cannot easily be brought together again. However, rehabilitation does not amount only to a preservation or a restoration of the status quo. In

⁷As in Table 3, the data is to a considerable degree judgmental, and only for the purpose of making rough comparisons. It is derived from reviewing material published by the member states, as well as other information, including that collected by UNIDO in connexion with the preparation of a regional programme for the identification and promotion of industrial investment projects for PTA member states

Table 3

INDUSTRIAL POLICY PRIORITIES IN PTA STATES

	S&T	export promotion	import substitution	indl rehabilitation	foreign investment	privatisation
Burundi	yes	yes	yes	yes		yes
Comoros islands						
Djibouti	yes		yes		yes	yes
Ethiopia	yes	yes		yes	yes	
Kenya	yes	yes	yes	yes	yes	yes
Lesotho	yes	yes	yes		yes	yes
Malawi	yes	yes		yes	yes	yes
Mauritius	yes	yes			yes	yes
Mozambique	yes	yes		yes	yes	yes
Rwanda	yes				yes	yes
Somalia	yes	yes	yes	yes	yes	yes
Swaziland	yes	yes			yes	
Utd Rep of Tanzania	yes	yes	yes	yes	yes	yes
Uganda	yes	yes		yes	yes	
Zambia	yes	yes	yes	yes	yes	
Zimbabwe	yes	yes	yes		yes	

Table 4

CONDITIONS FOR FOREIGN INVESTMENT

	foreign majority	repatriation of profits	repatriation of capital	tax incentives	grants, etc.
Burundi					
Comoros islands				yes	
Djibouti		yes		yes	
Ethiopia	no	yes	yes	yes	yes
Kenya	no	yes	yes	yes	yes
Lesotho	yes	restricted	yes	yes	yes
Malawi	yes	yes	yes	yes	
Mauritius		yes	yes	yes	
Mozambique		yes	yes	yes	yes
Rwanda				yes	yes
Somalia		yes	yes	yes	yes
Swaziland	yes			yes	
Utd. Rep. of Tanzania	restricted	yes	yes		
Uganda		yes	yes	yes	
Zambia	restricted			yes	
Zimbabwe					yes

cases such as Uganda, for instance. no new investment has taken place for some considerable time. The priority is not only to recondition machinery, but to include an analysis of the extent to which the structure could meet present-day needs. Rehabilitation thus also includes changes in technologies and product lines, upgrading of skills, new marketing activities, and closer and more flexible links with the rest of the industrial system. In the PTA context, this therefore includes an assessment, adaptation and re-direction in the light of subregional requirements. Somalia is another case where generally unfavourable economic conditions have compelled a re-assessment of industrial directions: this has in turn led to a new emphasis on rehabilitation. Larger-scale industrial enterprises tend to more inflexible, particularly when the initial investment was made some time ago in more favorable economic circumstances. For this reason any industrial policy in a climate of stringency will also have to emphasize rehabilitation. Such is the case in Ethiopia, Uganda, Tanzania and Zambia.

Privatization: This is an increasingly popular policy option in developing countries in general. For countries such as Tanzania, Somalia, and Malawi, where the state holding in industry has been of reasonable size, the emphasis is clearly directed towards improved efficiency of the industrial system and perhaps also the reduction of administrative burdens. In other countries the role of the state has been largely confined to rescue operations (such as in practice has been the case in Zimbabwe) or else it has not been so open to charges of inefficiency (as in Ethiopia, where the public sector has received favorable comment).

Import substitution: The final category of policy options considered here is one which is traditionally regarded as the first step in an industrialization strategy for developing countries. Perhaps for the reason, it is not so often explicitly adopted in recent policy statements. But the general emphasis on the importance of international trade and open economies, together with the growing moves towards subregional co-operation such as is exemplified in the PTA, mean that a simplistic policy of import substitution will not be usually be adopted at a broad level. The need is for selective import substitution, preferably in a way which will benefit the region as well as the individual country. In this light, the emphasis observed in Kenya, Tanzania and Zimbabwe is really one of selective diversification. This is particularly true of Zimbabwe, which well illustrates the need to continue the production of new products and to climb the technological ladder, even though it has by many standards a very diversified manufacturing sector already.

The issue of sectoral priorities as expressed by the individual member states of the PTA is a complex one. The expression of priorities is often best seen in investment decisions, or in special measures being taken in support of key enterprises. Again, the choice of priorities may be a more general one: the selection of, for instance, "agro-industries" is a priority that has been set by at least nine of the sixteen PTA countries. The priorities given to the main manufacturing sectors by the national plans and policies of the PTA countries are various. There is of course a connection between the priorities given to particular industrial sectors in a country and its general economic strategy. Thus, it is possible to see a link between adopting a classical import substitution policy and giving priority to metals, engineering and chemical industries. These are the cases of Ethiopia, Tanzania and within

limits of Zimbabwe as well, although its manufacturing industry has always been to some extent export-oriented. Zambia gives priority to the resources-based industries, which means agro-based industries but also metal, engineering and chemicals, and wants to promote non-traditional exports and small-scale industries. Malawi has the same priorities. On the other hand, countries as Kenya, Mauritius, Lesotho and Swaziland have addressed themselves to the promotion of agro-based export-oriented sectors.

As for Somalia and Uganda, it seems difficult to distinguish a clear set of sectoral priorities. For Uganda the first of all priorities is to rebuild an industrial structure. Somalia finds itself in a transition where the point at issue is the privatization of the economy. If it succeeds, the priorities will emerge directly from the choices made by private enterprises, and this may favour agro-based industries.

As regards the metals, engineering and chemicals priority sectors, three countries which have stated a definite choice in those sectors, namely Tanzania, Zambia and Zimbabwe, are continuing to strengthen their relative specialization within the PTA region. Ethiopia, for its part, is entering such fields, where its degree of specialization up to now has been very low. Another, more general emphasis found is on minerals-based industrialization. This issue shows clearly the distinction to be made between present policies and the present condition of industry. Zimbabwe has a large, diversified and successfully exporting mineral based manufacturing complex. It is precisely for this reason that it does not appear as part of the extra emphases to be seen in the present policy configuration. Tanzania, Somalia, Uganda and Rwanda are rich in certain mineral resources, and it appears to policy makers there that there is scope for considerable expansion. (In many cases these possibilities lie in non-metallic minerals). In some cases, such as Uganda, the emphasis is partly on recovery: natural resource based industrialization represents a necessary policy choice in a difficult economic situation. Regardless of sectoral priorities, a common problem characterizes the production structures of most PTA countries, that of under-utilization of capacities. Some examples of utilization rates are as follows:

Kenya (1987)	80 per cent
Somalia (1986)	26 per cent
Tanzania (1988)	20-30 per cent
Uganda (1988)	20-30 per cent
Zambia (1983-1987)	40-50 per cent

Under-utilization of capacity is in fact a symptom of a number of possible causes: machine breakdown, skills shortage, lack of essential imports, inadequate power supply, insufficient demand for the goods produced are some of the most obvious. While these are national problems, there is considerable scope for regional action to alleviate them. The role of the engineering industries, especially in the production of spare parts and the development of industrial services could usefully be expanded through co-ordination and investment promotion, and human resource development for management, technical maintenance and production and quality control would also contribute to improvement of capacity utilization. The PTA subregion has several particular strengths in these areas, in terms of individual specialists, institutions and companies: a vital task for subregional co-operation is to mobilize them and make the widest use of them.

1.3 Sectoral issues at the PTA level

1.3.1 Overview of industry in the PTA

The priority sectors have been selected by the PTA according to the criteria of enhancing the self-reliance of the region as a whole in some strategic fields. From this point of view, the metals, engineering and chemicals sectors (particularly fertilizers and pesticides) must be seen as having first priority. These are the sectors most notably under-developed in volume and value terms. They are also the sectors with enormously important actual and potential linkages to agriculture and to the mining sector, and will form the heart of a modern industrial sector in terms of providing the bulk of manufacturing activity and of acting both as a stimulus to the development of technology and industrial services as well as a major customer for them in the future. Table 5 shows the structure of industry in the PTA from a different perspective to the usual value-added or output statistics: the manufacturing sector is presented in terms of the number of establishments.⁸ These are the basic units of PTA industry, and it is at the establishment level that the success or failure of particular industrial strategies will ultimately occur. It is the factories which actually produce the output, provide employment, and buy the machines and raw materials. It is difficult, particularly at the subregional level, to keep this perspective, but it is essential for the success of an industrial programme. That is why, for instance, the activities of the PTA at the firm level, in organizing trade fairs, buyer-seller meetings, and setting up a committee of chambers of commerce, are so important. The industrial projects for the PTA not only have to meet the subregional priorities set by agreement among the member states: they also have to be helpful to the industrialists who will by their success or failure have a strong influence on the final shape of industrialization in the subregion.

1.3.2 Metals

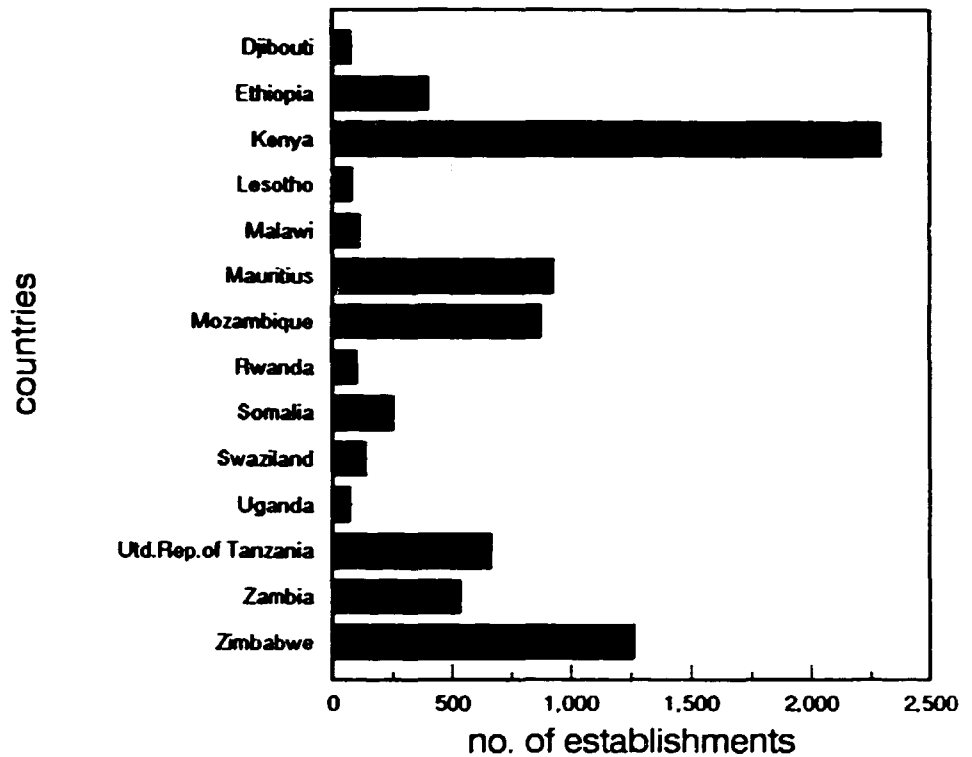
The iron and steel sector is the most important under this heading, both at present and in terms of expressed concerns at the PTA level. Other metals of importance include copper, tin, aluminum, lead, nickel and chromium, and some summary production figures can be found in Annex II. The position with respect to establishments in the metals sector is shown in Table 6.

Before discussing the iron and steel sector, a brief review of other metals may be given. Copper is important to several PTA countries, particularly Zambia, which is the world's fifth largest producer of copper ore, the sixth largest producer of primary copper and the fifth largest producer of refined copper. It is the largest producer in Africa. These products are converted into semi-finished products almost entirely outside the region, while at the same time the demand from PTA countries for such products is met by imports.

⁸The data are not strictly comparable. This is principally because of the minimum size of establishment to be included in the totals, as well as the year, which varies from country to country. Thus the figures for Ethiopia(1986), Mauritius(1987), Mozambique(1987), Uganda(1986), Tanzania(1986) and Zambia(1980) include establishments with 10 or more employees. In Lesotho(1985) the limit is 5 employees and in Malawi(1983) 20. The Kenya(1987) and Swaziland(1985) totals includes all establishments and that for Zimbabwe(1985) all with an annual turnover of Z\$2000 or more (effectively all). Rwanda(1986) includes all establishments with a social capital of 1 million francs or more. For Djibouti(1988) and Somalia(1986) details were not available.

Table 5

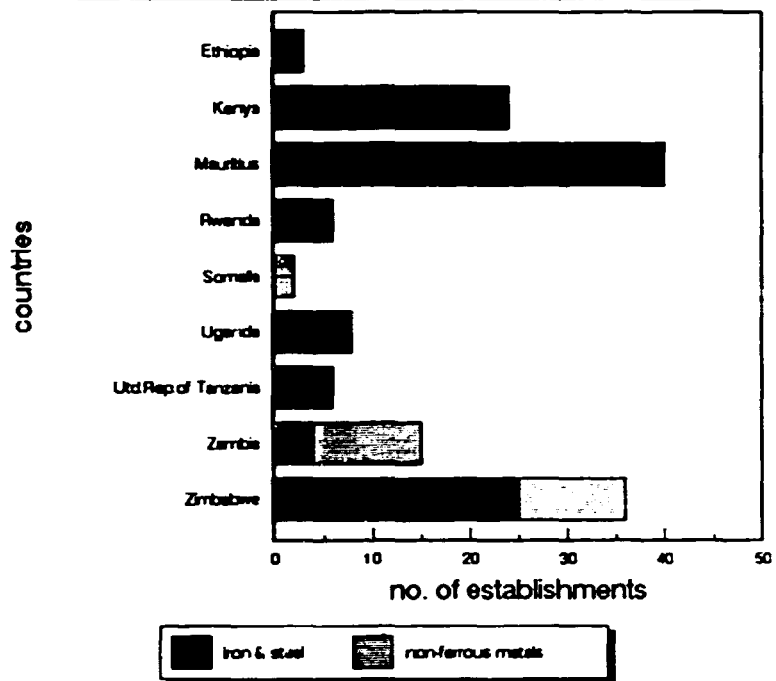
TOTAL MANUFACTURING
Number of establishments
(ISIC 3)



	total
Djibouti	76
Ethiopia	402
Kenya	2,294
Lesotho	80
Malawi	115
Mauritius	925
Mozambique	875
Rwanda	102
Somalia	252
Swaziland	138
Uganda	69
Utd. Rep. of Tanzania	664
Zambia	539
Zimbabwe	1,282

Table 6

BASIC METAL INDUSTRIES
Number of establishments
(ISIC 37)



	iron & steel	non-ferrous metals	TOTAL
Ethiopia	3		3
Kenya*	24		24
Mauritius**	40		40
Rwanda	6		6
Somalia		2	2
Uganda	8		8
Utd. Rep. of Tanzania#	6		6
Zambia##	4		4
Zimbabwe	25	11	36
TOTAL	116	13	129

*.### 371 includes 372
**371 includes 372 & 381

Primary aluminium is not produced at all in the region, although promising deposits are available in Malawi and on the border of Mozambique and Zimbabwe. Aluminium semi-finished products ("semis") are produced in limited quantities and forms in Tanzania using imported primary aluminium.

In general, there appears to be a need for the PTA to undertake further examination of these metals, especially with respect to production possibilities, market requirements, and rehabilitation of existing facilities. Options may include the enhanced production of semis, increased value added in copper products, and reduced imports from outside the region.

At present, the liquid steel installed capacity in the region is 1.2 million tonnes.⁹ Zimbabwe, with the only integrated steel plant in Southern Africa at Redcliffe (Ziscosteel) has 70 per cent of this total. In general, per capita consumption in the region is very low, at a level only 10 per cent of that in Latin America and 20 per cent of that in Asia.

Future requirements are forecast to increasingly emphasize plate and sheet steel, rather than bars, rods and flanges. This means the creation of a PTA capacity in this field. Projections also indicate the need to increase capacity in billet making, and this need will be heightened by the expected diversion of some of the existing supply, since Ziscosteel has purchased machinery for the production of flat steel, and it can be expected that some of their billet production will be an input to this.

The major problem, however, is the considerable degree of underutilization of capacity evident in this sector which has meant that a major part of the region's requirements are met from outside the subregion. This underutilization of capacity has its origins in a number of factors. These include shortages of raw materials, inefficient plant, shortages of skilled staff, lack of foreign exchange to buy spare parts, etc. Only concentrated efforts to improve capacity utilization can avert the need to further expand imports or to invest in new capacity. As against this it has to be said that rehabilitation of some of the older plants has been estimated to be almost as expensive as the establishment of new ones. A further difficulty is the shortage of scrap in the region, meaning that improvements in gathering and processing practices will be needed if imports of scrap are not to increase.

Technologically, the iron and steel sector continues to undergo rapid change, and increasingly the availability of mini-steel plants has altered the traditional equations with respect to investment costs and location of capacities. At the same time, new processes, such as smelting reduction, are at the development stage. In the longer term, the impact of new materials is expected to be considerable, replacing traditional uses of iron and steel as well as of many other metals. As far as the PTA region is concerned, this has most notably taken place in the case of copper, now often supplanted by fibre optics or other materials in some of its traditional application areas in the world economy. However, striking trends, such as the successful application of new materials within car engines, for instance, are already a reality. The future of some metals may lie more in the new families of composite materials

⁹See "A Survey of the Iron and Steel Sector in PTA and SADC Countries Vol. 1, Main Study" UNIDO/IS/R.44, 30 July 1986. This gives a comprehensive review of the main policy issues in this field, as well as considerable technological and statistical information on the condition of the sector. Much of the present discussion relies on this study.

and ceramics. Such questions are the focus of applied high-tech research programmes in several parts of the world, notably in the BRITE/EURAM programmes of the European Community and the EUREKA programme linking all Western European countries. The subject poses considerable challenges for the developing countries also, and UNIDO has taken several initiatives in this area. An International Centre for High Technology and New Materials is being established under UNIDO auspices within the framework of an International Centre for Science and High Technology, in Trieste, Italy.

According to IISI Statistics, there was a decreasing tendency in world scrap consumption between 1977 and 1986. Except for the centrally planned economy countries, developing countries have been importing at an increasing rate since 1977 (and have been exporting scrap at a rate of one tenth of the total imports). In 1977, scrap available was 264,950 thousands of tonnes, in 1986 248,043 thousands of tonnes. From the middle of 1987 scrap demand began to increase and the dollar scrap price rose by over 30 per cent between July 1987 and July 1988. This trend is expected to continue in the immediate future.

There are, however, opposite factors that would affect scrap requirements in the next decade, such as technological development in steel-making by the increase of continuous casting which generates less work arising. Again, pre-treatment of molten iron raises the quality of iron and requires less scrap as a cooling agent. In any case, scrap requirements will increase wherever the number of mini-units grows. At the same time, there are opportunities for improved efficiency in the collection of scrap.

As to the category of direct reduced irons to which sponge iron belongs, it also had a big increase in demand and prices in the last two years, as a consequence of the rise of scrap market. Its growth is destined to be strongest in countries with low energy costs and developing countries, with limited domestic scrap supply, will look at direct reduced iron as a means of reducing their dependence on imports.

As noted, the considerable variety of plants operating in the iron and steel sector in the PTA subregion is in general characterized by inefficient operation and outmoded equipment, and there is an urgent need to review requirements and introduce product rationalization and upgrading in the iron and steel mills and rolling mills, especially with respect to the production of flat steel. This is reflected in another proposal (MET/02). A related project with regional implications is the proposal to rehabilitate and expand the iron and steel mills in Uganda (MET/03). The proposal for a programme for sponge iron production (MET/04), reflects the need for decisions at a subregional level for decisions with respect to an investment decision of critical importance for the development of the iron and steel industry in the PTA. For years, a number of possible locations have been suggested as appropriate sites for the establishment of such a plant, which would meet the subregions growing need for inputs to the steel industry, given that the local supply of scrap is, as noted, in decline. The scale and timing of the necessary investment decisions is a difficult question demanding careful analysis of the existing and potential markets and the decision is not made easier by the fact that a number of PTA member states can make out a case for locating the plant in their countries. For this reason it seems essential that the PTA undertake such an analysis and prepare a final programme which can be convincingly and wholeheartedly promoted.

At the PTA level, the most important initiative has been the proposal for a Metallurgical Technology Centre. This is intended to serve the present and future metal industry in the PTA subregion and to cover both ferrous and non-ferrous metals. It will be based initially at the Institute of Mining Research in Zimbabwe with support from the government of Zimbabwe. To reach the operational phase, however, continued efforts will be needed, especially in the mobilization of resources, and this in turn will call for considerable elaboration of the proposal especially from the point of view of its envisaged activities. For this reason it is important that activities related to the Metallurgical Technology Centre should remain at the centre of the PTA programme in connexion with the metals industry, and accordingly, a proposal to this effect (MET/01) has been included in the present package. It concentrates on the initial phase of the Centre's operations, especially the development of a short term work-plan and the mobilization of the appropriate resources for its execution. However the need for the Centre to grow in close communication with the varied metals industry of the subregion is also recognized through extension activities. As a basic activity for the Centre, it is also suggested that it undertake an integrated development programme for metal surface treatment (MET/05). This is a multi-faceted approach to a complex set of problems at the nexus of the metals and chemicals sectors. Benefits would include improved metal product life and quality, which would consequently improve the reliability of many other industrial production areas in the sub-region and allow more efficient functioning of other sectors making use of the products.

1.3.3 Engineering

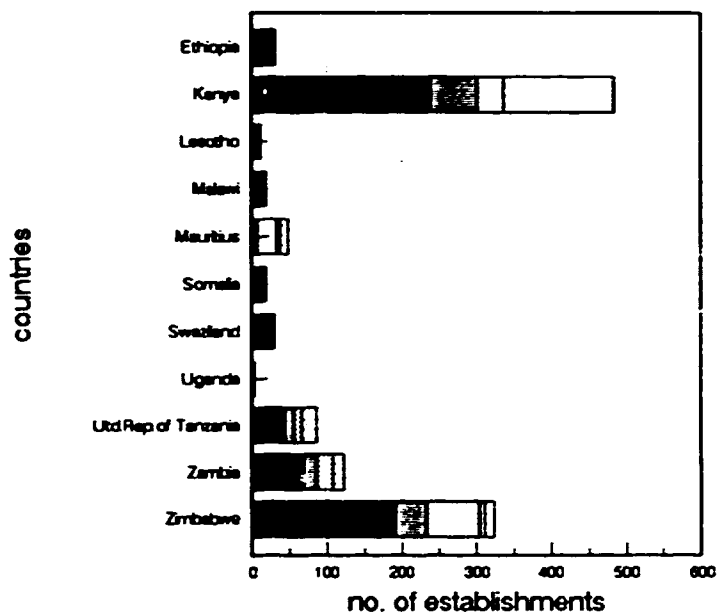
Some of the PTA countries already have an engineering industry of relatively considerable size, namely Kenya, Zambia and Zimbabwe. Zambia's engineering industry is specialized in production and repair of mining equipment and their components. Zimbabwe's engineering industries are relatively diversified. Most of these plants, however, are underutilized or need rehabilitation, due to lack of foreign exchange for purchasing raw materials and spare parts and to lack of skilled personnel. The role of such industries in developing industrial interlinkages, skilled employment, small-scale entrepreneurship and sub-contracting is quite significant. It is important to note that, as experience in industrialized and developing countries shows (e.g. Switzerland, Denmark, Singapore), the growth of the engineering industries does not require a basic iron and steel industry. The linkage between the two sectors is rather the other way round, as a "pull-effect" from the downstream industry (engineering) to the upstream (basic iron and steel) for growing and expanding in product range.¹⁰

Engineering activities in the PTA encompass a broad range of activities, ranging from the assembly or part construction of transport equipment in some countries to successful manufacture (including export) of agricultural hand tools and animal-drawn equipment. Other important focal sectors for the engineering industries include the mining sector as well as the manufacture or maintenance of equipment of important agro-industries such as sugar refining or textile manufacturing. Table 7 shows the position with respect to establishments in this sector. A detailed analysis of certain aspects of the engineering industry in the PTA has already been carried out through the

¹⁰ See "A Survey of the Iron and Steel Sector in PTA and SADCC Countries. Vol. 1. Main Study" UNIDO/IS/R 44, 30 July 1986

Table 7

FABRICATED METAL PRODUCTS, MACHINERY & EQUIPMENT
 number of establishments
 (1987-88)



	fabricated metal products	machinery	electrical machinery	transport equipment	professional goods	TOTAL
Ethiopia	25		3	3		31
Kenya	230	63	36	146	1	485
Lesotho	11					11
Malawi	12		4	2		18
Mauritius*		6	26	6	11	49
Somalia	17			1		18
Swaziland	26	3				29
Uganda	1		2			3
Utd Rep of Tanzania	43	13	10	20		86
Zambia	68	18	23	14		123
Zimbabwe	191	43	70	58	12	374
TOTAL	633	146	174	250	24	1,227

*381 is included in 371

preparation of model prefeasibility studies for the manufacture of machine tools, agricultural machinery and equipment and tractors, commercial vehicles and low cost transportation equipment.

The different engineering resources of the region cover design facilities and basic production facilities such as forges, stamping facilities, machine shops, and foundries. The position with respect to the presence of these in PTA countries can be summarized as follows¹¹: forges are found in all PTA countries (except Lesotho). Stamping facilities are to be found less frequently, and are missing in the smaller countries, but also in Ethiopia and Uganda. Information suggests, however, that such facilities tend to be used only to a very small percentage of their total capacity. Machining shops are also found mainly in the larger countries. In only one country (Zimbabwe) are the facilities in this regard described as very good. In two other countries (Kenya and Zambia) the facilities are described as good, and in a further five (Ethiopia, Malawi, Mauritius, Mozambique, and Tanzania) the facilities are described as limited. Thus in eight of the sixteen PTA states such facilities are altogether absent.

Another way of looking at the resources of the subregion is in terms of the presence or absence of manufacturing facilities for different types of equipment. Thus Table 9 gives an overview of the presence or absence of different types of facilities covering in general the machinery and equipment requirements of the agricultural sector, in terms of hand tools, animal drawn equipment, and simple power operated machinery. These three categories give a conspectus of technology levels. With the exception of Comoros, Djibouti and Swaziland, all PTA states have facilities to produce hand tools. At the level of the production of animal-drawn equipment, the number falls sharply, with Ethiopia, Kenya, Malawi, Mozambique, Tanzania, Zambia and Zimbabwe having such facilities. In the case of simple power-operated machinery, the number falls to five states, since Ethiopia and Kenya do not have such facilities. Again the higher technology level implied by the assembly of tractors is attained in only one PTA member state, Zimbabwe.

With respect to other, more advanced areas of engineering, the machine tool industry should be mentioned as a central component of the capital goods industry. Although projects are under consideration or development in Ethiopia, Kenya, and Zimbabwe, production of machine tools is as yet undertaken only in Tanzania, at the Kilimanjaro Machine Tool Manufacturing Company. This factory makes metal cutting and wood working machines.¹² It has to import the castings for these, however, and it needs upgrading to become more self-sufficient and to cater for the regional market. The pre-feasibility studies conducted by the joint ECA/UNIDO Industry Division with the assistance of the Government of India and the Commonwealth Secretariat recommended the manufacture in the PTA of simple general purpose metal cutting and wood-working machined in Tanzania, Kenya and Zimbabwe. This was to meet a forecast demand of 6900 machines in the subregion in 1990. The Tanzanian plant needs

¹¹The following discussion relies on data compiled by the Programme Development Support Unit of UNIDO in connexion with its work on the preparation of integrated country programmes, especially in connexion with agricultural machinery

¹²"Summary of Model Pre-feasibility reports..." United Nations Economic Commission for Africa, Industry and Human Settlements Division ECA/IND/011/89, September 1989. This summarises a completed set of model prefeasibility studies for the manufacture in the PTA of machine tools, agricultural machinery and equipment and tractors, commercial vehicles and low cost transportation equipment.

Table 8

BASIC ENGINEERING CAPABILITIES

	forges	stamping facilities	machine shops	foundries	design facilities
Burundi	yes	no	none	1	
Comoros islands	yes	no	none	1	
Djibouti	yes	no	none		
Ethiopia	yes	no	limited	4	1
Kenya	yes	yes	good	8	2
Lesotho	no	no	none	2	
Malawi	yes	yes	limited	10	
Mauritius	yes	yes	limited	2	1
Mozambique	yes	yes	limited	1	1
Rwanda	yes	no	none	4	
Somalia	yes	no	none	20	
Swaziland	yes	yes	none		
Utd. Rep. of Tanzania	yes	yes	limited	22	1
Uganda	yes	no	none	32	1
Zambia	yes	yes	good	5	2
Zimbabwe	yes	yes	very good	55	1

Source UNIDO (POSU)

Table 9

AGRICULTURAL MACHINERY CAPABILITIES

	hand tools	animal-drawn equipment	power operated machinery	tractor assembly
Burundi	X			
Cameroon Islands				
Cote d'Ivoire				
Guinea	X	X		
Kenya	X	X		
Lesotho	X			
Madagascar	X	X	X	
Malawi	X	X	X	
Mali	X			
Mozambique	X	X	X	
Niger	X			
Nigeria	X			
Rwanda				
United Rep. of Tanzania	X	X	X	
Uganda	X			
Zambia	X	X	X	
Zimbabwe	X	X	X	X

expansion. The two new entrants were suggested because of their relatively strong engineering infrastructure. The Kenyan project has already reached an advanced stage, with agreement having been reached with HMT of India to go ahead with the project. Accordingly at the PTA level, it is proposed that a full analysis of the existing production possibilities be carried out, to determine the subregional role of new investment in the machine tool industry (ENG/03).

The engineering industries cover not only the production of machines but also the parts needed for replacement of worn-out components (spare parts) as well as recurrent supplies for manufacture of machinery, equipment and structures. These would include screws, bolts and nuts, flanges, hinges and the like. The sheer variety of the components needed at first sight raises enormous difficulties in assessing the correct response, especially at the PTA level. And yet there are crucial areas in which a co-ordinated response could be an answer to the problem of market size in the production of spare parts. Precisely because of the diversity of spare parts required, it is possible to envisage a complex of spare parts production facilities distributed across the PTA subregion. Each plant would deal with a selected range of spare parts needed by industry in the PTA. Examples of sectors where such joint action could be of special value include the cement industry, where there is a recurring need for new grinding media, or the sugar refining industry, which is important in several PTA countries, and where the machinery used is similar from country to country. Such a complex represents a major investment project (ENG/02). Detailed definition of its scope would include consideration of the results of a survey being carried out by the PTA on spare parts production capabilities and demand in the member states.

There are other ways to develop inter-firm relations in the engineering industry also, and at the institutional and infrastructural level there is a need to encourage the growth of sub-contracting relationships between firms. Such structures are characteristic of mature economies. To some extent such links will develop naturally, through market forces, but, given the infrastructural difficulties in the PTA and the wide dispersion of its industrial base, there is a need to encourage links by providing a defined means of communication between firms needing a supplier of parts and others with equipment, experience and spare capacity. UNIDO has accumulated successful experience in the field of establishing sub-contracting exchanges, with a computer software system now known as UNISS (UN Industrial Subcontracting System). Application of this to the PTA subregion and the development of a network of sub-contracting systems is set out in another proposal (ENG/06).

As Table 8 shows, design facilities are found only in the larger or more advanced member states. Engineering design is a field now subject to rapid technological change in world industry. Two main trends can be discerned. The first is the increased automation of the design process itself, through computer-aided design and manufacturing (CAD/CAM). At a fundamental level, CAD is the process by which engineering drawings can be made and edited on a computer screen before being printed by a computer printer. The speed and accuracy can be very much increased compared to traditional methods. The second trend is the integration of the design process in the wider process of product development, involving more closely the development of product concepts, market research, product costing, choice of materials, production engineering and distribution considerations. Design in the traditional sense becomes an extended process in which it is one iterative phase of a complex

commercial operation. This suggests the importance of giving close attention, in developing design capabilities, to maintaining flexible and continuous communication with the industries concerned, especially when the proposal is for a national design centre of some kind under government auspices. An alternative approach, which needs lower initial investments and may be for this reason more appropriate at the subregional level, is the establishment of a network, which, if it functions properly, allows for the mobilization of more of the existing resources of the subregion. It is felt that this may be particularly appropriate in the case of automated design, since the equipment for CAD/CAM is falling in price and experience and techniques can be readily exchanged. A project (ENG/O1) to initiate activity, in co-operation with local industry, is therefore included.

1.3.4 Chemicals

The chemicals sector is one of the most diverse and important in the region. Its importance to other sectors is very considerable, and the choice of this sector as one of the key sectors in the PTA strategy is obvious, but, because of the diversity of the chemicals sector, it raises considerable problems of assessment of requirements and mobilization of resources. As can be seen from Table 10, the number of different establishments in the region is a large one, and even the smallest countries are represented.

Given the importance of chemicals as inputs to practically all branches of the economy, a considered strategy for its development is particularly important, and, in fact, the chemical industry can be used as a lever for the development of other sectors. To do this, a programme of identification of opportunities has to be undertaken in the light of the intermediate and final consumption of chemicals, both actual and potential. Selection of production choices will thus be made in the light of the needs of the economy as a whole, and will be the best guarantee of economic feasibility.

Petroleum refineries represent the smallest group in the subregion. The largest refineries are in Angola, Ethiopia, Kenya, Somalia, and Tanzania. (The refinery in Zimbabwe is no longer in use). However, there are, throughout the region, several plans and project ideas in the general field of petrochemicals development. Offshore oil and natural gas exploitation represent some of the reasons for development proposals in this subject area. For instance, the existing refinery in Angola is to be expanded to meet the needs of the SADCC countries, and this would also have implications for the PTA subregion. For this reason it is proposed that a situation analysis of the petrochemical industry in the PTA be carried out, which would allow especially for the formulation of consistent investment proposals in this field. (CHEM/O5).

With respect to fertilizers and pesticides in the PTA countries, there is a low level of usage, due to the impossibility for peasant farmers to raise sufficient substantial working capital and the lack of infrastructure for distribution. Therefore, without an fully functioning transport network throughout the subregion, an increase of local supply, coming from a traditional centralized plant, could be ineffective. On the other hand, ongoing developments in both fertilizers and pesticides do not need big plants for manufacturing and rely on biological local components. They thus have the effect of bringing nearer the locations of production and of consumption.

Given the progress already made in the production of mineral fertilizers in PTA countries, there is now an urgent need to complement it through the

development of inputs and technologies of biological origin. In the near future it will obviously be impossible completely to substitute biological fertilizers for mineral ones. But mineral fertilizers can be used more efficiently mixed with organic matter or using biotechnology approaches. Among the possibilities are the following:

Production of active humus: this uses a production process based on organic waste composting. Humus is not strictly speaking a fertilizer, but it can lead to a saving of up to 40 per cent of mineral fertilizers.

Low grade mixed organic fertilizers (e.g. HUMIFERT). These are made from the reaction of nitric oxides or other gaseous acidulating agents with organic waste material such as rice husk or corn cobs. The products include humic acids and low content N-P fertilizers, and production is of "village" size.

Biological treatment of fertilizers. This uses Penicillium bilaji to solubilise insoluble phosphate from phosphate rock. This option would make use of the low quality phosphate rock found in PTA countries and thus reduce investment requirements for phosphatic fertilizers.

To summarise, great attention has to be paid to the ways in which fertilizer is used, and the biological-based technologies can be very significant in reducing the need for mineral fertilizers and, consequently, for their production or import requirements. One project (CHEM/09) is a pilot demonstration scheme for more efficient solubilisation and absorption of phosphatic fertilizers. Similar demonstration schemes should be considered for bionic fertilizer production, using accelerated humus production and mixed bio-animal fertilizers.

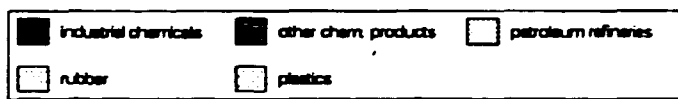
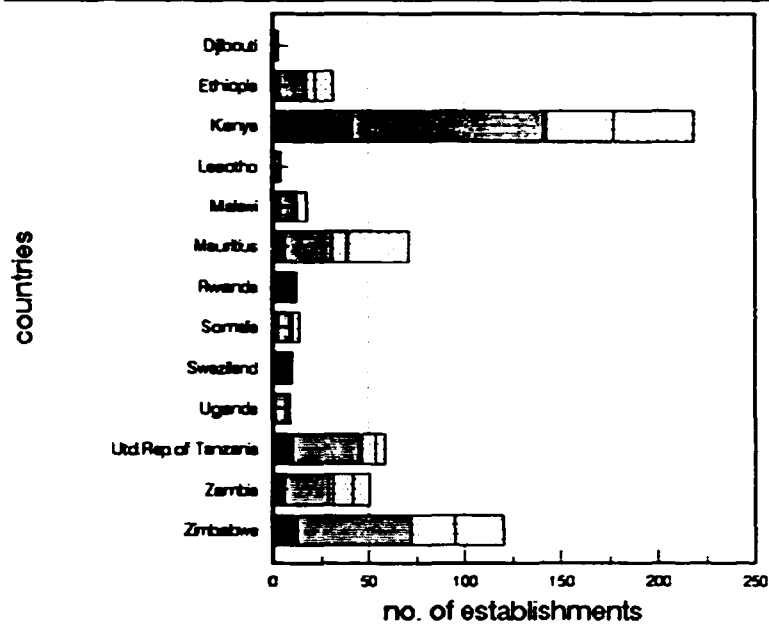
With respect to the role of the pesticides and fertilizers industries, considerable work has been done by UNIDO in analyzing the situation in each African country.¹³ Based on the interrelations between these sub-sectors and other variables, country typologies have been drawn up, with the intention of identifying groups of countries with common problems and for which generic programmes of technical assistance can be prepared. As far as pesticides are concerned, the country groupings can be described as follows: the largest group includes Burundi, Malawi, Rwanda, Swaziland, and Uganda. These are countries with high agricultural exports and growth potential in cash crops. Pesticides use is low, and practically no raw materials for pesticide production are available locally. Another group includes Ethiopia, Kenya and Tanzania, where there is a medium and growing consumption of pesticides, and capabilities for formulation. A further group contains Mozambique, Zambia, and Zimbabwe, which are net food exporters with good potential for expansion of agricultural land, and have potential for pesticide synthesis. Other countries of the PTA are found to fall into groups where there may be potential for increased use of pesticides, but where there is no potential, for one reason or another, for domestic production or formulation.

The total consumption of fertilizer in the PTA sub-region is at present about 1.3 million tonnes per year and is expected to amount to 1.8 million tonnes

¹³ This work has been done with respect to the agricultural machinery sector also, which provided the data for the preceding section dealing with the engineering industries. In addition, work has been done on fisheries systems.

Table 10

CHEMICALS, PETROLEUM, COAL, RUBBER, PLASTICS
Number of establishments
(NIC 36)



	industrial chemicals	other chem. products	petroleum refineries	rubber	plastics	TOTAL
Djibouti	2	1				3
Ethiopia	3	14	1	4	10	32
Kenya	41	100	1	35	41	218
Lesotho		4				4
Malawi	3	8		2	5	18
Mauritius	6	25		8	32	71
Rwanda	13					13
Somalia	2	7	1		4	14
Swaziland	10					10
Uganda	1	6		2		9
Utd Rep of Tanzania	10	35	1	8	5	59
Zambia	6	23	3	10	9	51
Zimbabwe	13	59		23	25	120
TOTAL	104	282	7	92	131	622

per year by the year 1995 and to 2.5 million tonnes per year by the year 2000. These data could increase if the usage by peasant farmers becomes more intensive. But it must be noted also that if tests of the most recent developments in the sector confirm that they are applicable also in Africa, these data could be lowered, keeping the same level of efficacy, or could remain the same, increasing the fertilizers usage. One of the projects proposed here deals with this question.

To meet present consumption, the actually installed capacity in the PTA of nutrient fertilizers is 900,000 tonnes year. In addition, the existing compounding units, based on imported intermediate chemicals, have a capacity of 620,000 tonnes year. The region is quite well endowed with all the natural resources required for manufacturing fertilizers. However, the installed capacity of nitrogenous fertilizers is 150,000 tonnes per year, with a projected consumption 1 million tonnes per year by the year 2000. For phosphate fertilizers the capacity is 190,000 tonnes per year and the projected demand will be 600,000 tonnes per year by the year 2000. For potassic fertilizers, due to the nature of the soil, the demand is not high at the moment, nor is it projected to be in the future. By the year 2000 it should reach 230,000 tonnes per year. In Ethiopia there is a project for a plant exploiting potash deposits for local use and for export in the PTA market, but it seems that the main export possibilities for this plant will lie outside the PTA subregion. This is because the need for this type of fertilizer is limited as far as the PTA is concerned, with little of the soil being short of potassium.

The PTA has already identified a number of fertilizer projects, which are at different stages of promotion. These include a triple superphosphate plant in Uganda, a single superphosphate plant in Burundi, a urea/ammonia project in Tanzania, and the potash fertilizer project in Ethiopia already mentioned above.¹⁴ In the area of fertilizer production, it is now suggested that there should be some analysis of the possibilities for a fertilizer formulation plant in Lesotho (CHEM/08). Supply would be further enhanced by the rehabilitation of an existing urea/ammonia plant in Somalia (CHEM/10). Given the extensive attention already received by this sector under PTA auspices, additional initiatives on the production side are not suggested.

For pesticides as well important changes in production and consumption patterns are taking place. These will reduce greatly the chemical active inputs (at present imported) and use local biological components. Two projects proposed by the present programme move in such direction. The first would seek to mobilize subregional co-operation in the development of new types of pesticides, based on plants containing specific compounds. Such an approach may have several benefits in terms of import reduction and also in the reducing negative environmental impacts (CHEM/11). Another approach is to reduce the quantities of pesticides consumed through seed dressing application, for which prototype mobile applicators should be developed (CHEM/12).

The question of pharmaceuticals is a complex one which, nevertheless, is of deep importance to the subregion. The industry in the subregion is quite developed and is stated to be capable of meeting most of the requirements. In

¹⁴ Progress Report on the Implementation of Multinational Fertilizer Projects, PTA/TC/CIC/IX/7, October 1989

practice these are largely imported from outside the subregion.¹⁵ A number of investment projects have been identified and project profiles are under preparation, covering bulk drugs production in several member states. However, there is also scope for new approaches to the pharmaceutical production issue, and it is suggested that a centre be established for the development and production of plant medicinal products for pharmaceutical use (CHEM/07). This would build on successful experience in other developing countries and be a potentially important development of indigenous natural resources.

Among the recommendations of the PTA Health Ministers meeting was that the possibility of development of ancillary industries for the pharmaceutical industry be investigated. In this connexion it should be noted that a number of the proposals in the present report have a bearing on the packaging aspect, in particular a proposed diagnostic survey of plastics transformation industries in PTA countries (CHEM/05), and the proposal for regional centres for standardization and quality control with emphasis on packaging materials (HRS/10). The survey of the plastics industries would have a wider scope than that of packaging and would look at the production configuration and development possibilities across a range of plastic goods and materials, with potentially important impacts on the clothing, textiles, infrastructure and household goods sectors, and most importantly, agriculture, where apart from the drainage and irrigation issue, plastic is also important for soil defence and green-houses.

The packaging issue is an important cross sectoral one which affects not only different types of users but also producers in different industrial sectors. For instance, important changes are taking place at the producer level because of changes in the relative costs of materials. Paper sacks are being used for tea in Malawi instead of the traditional wooden tea chests. In Zimbabwe and other countries, plastic sacks (made from extruded polystyrene) for agricultural products are being used instead of the traditional imported jute bags. Meanwhile in developed countries, rules and regulations are continually being developed and updated with respect to the packaging and labelling of processed food products.

The approaches mentioned above in connexion with pesticides and pharmaceuticals to be produced from natural products of the region represent an important policy option for the chemicals industry in other directions also. Such technologies may be cheaper than the more conventional ones, and the lessened dependence on external raw materials is another advantage. For this reason it is proposed that steps be taken to establish a regional essential oils industry (CHEM/02), and, also, that there be development of the production of industrial chemicals from indigenous carbohydrate (CHEM/01). The sugar industry is important in many PTA states, and the development of sugar-based chemicals would provide diversification for the sugar industry as well as providing a new source of many essential chemicals to be used in other processes.

Two other strategic questions in the chemical industry are those of industrial surfactants and of inorganic salts. They affect many other branches of industry. Industrial surfactants are chemicals used in the treatment and finishing of many industrial products, including those used in the textiles, metal products, wood products etc. Analysis of the supply and demand situation

¹⁵Report of the First Meeting of PTA Ministers of Health, PTA/CIC/M/HLT/I/2, October 1989

in PTA countries would address a group of products which are important inputs into other key branches of PTA industry, and it would also assist in identifying new investment opportunities and other co-operation possibilities (CHEM/03). With respect to inorganic salts, these are products with a variety of uses within and outside the chemical sector. For instance, chromium salts are used in the tanning process, and are thus an important link to the leather industry. The subject is one for which a subregional approach would seem appropriate, particularly for technology development, and the establishment of a PTA centre for inorganic salts is proposed (CHEM/06).

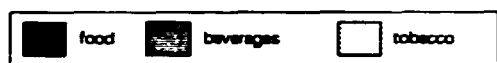
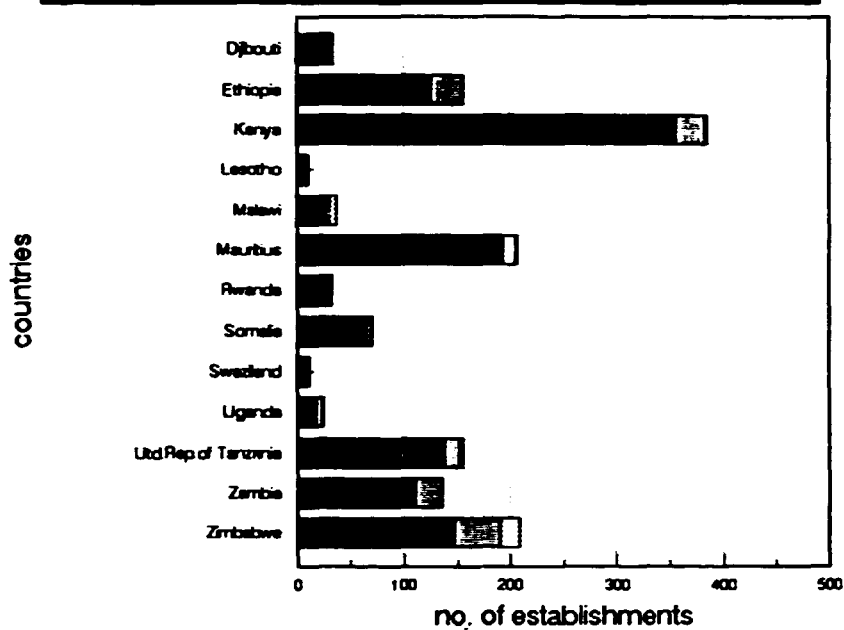
1.3.5 Agro-industries

In the vast field of agro- and agro-allied industries the PTA sub-region is highly endowed with all necessary resources. Apart from the cash crops (tea, coffee, tobacco, etc.) which are cultivated for export, within the sub-region all the food processing industries can be installed relying only on local resources: grain processing, sugar, meat and dairy products, fishery products, fruits and vegetable processing. There is in the region all the potential for attaining a total self-sufficiency in food production and moreover for exporting food industry products to other world countries not so well endowed. As already noted, the food processing industry dominates the industrial structure of the PTA, and this dominance is in fact the distinguishing feature of the structure from that of some other world regions. Like other industries, however, and especially to the extent that it is or is becoming export-oriented, it will have to take account of changes at the international level. Two of these changes, which are inter-related, may be briefly mentioned. The first is in the area of standards, where a complex international process of determination and application continues to extend its scope and its reach. This means that standards for processed food that are determined in developed countries have to be met by those PTA countries wishing to export to them. A striking example of the reach of such standards is the process by which the EEC approves selected meat processing plants in various PTA countries. This allows these plants to export their products to the EEC as meeting the health and quality requirements. The second important aspect is in packaging, where, again, standards are laid down, affecting not only the type of packaging but the information that has to put on the label.

As can be seen from the establishments data in Table 11, the number of factories in the food sector is very large, and in fact the total there presented is certainly an under-estimate. It is clear that direct intervention at the plant level to assist the food processing industry in the PTA subregion would be a very large task. It is felt that a strategic selection of issues should be made, and action taken in the key areas of standards and of quality control, which would stimulate and assist national action. This in turn would create a climate of improvement and quality upgrading for the industry as a whole. Food processing like other traditional manufacturing industries (textile, leather and so on) while continuing to rely on a base of unskilled labour, will more and more require a content of human capital, in the form of R&D, design, quality control and marketing. The packaging and standards issues are already addressed by other proposals made in this document, but specific action is also needed in improvement of skills in the quality control area, in particular. Quality control is not an issue for the external market alone: consumers in the PTA have a right to and will increasingly demand, products which fully meet accepted standards. For this reason it is recommended that

Table 11

FOOD, BEVERAGES, TOBACCO
Number of establishments
(ISIC 31)



	food	beverages	tobacco	TOTAL
Djibouti	32	2		34
Ethiopia	125	30	2	157
Kenya	356	28	2	386
Lesotho*	11			11
Malawi	27	4	6	37
Mauritius	193	13	1	207
Rwanda	33			33
Somalia	65	5	1	71
Swaziland	9	3		12
Uganda	18	6	1	25
Utd.rep.of Tanzania	128	15	3	156
Zambia	111	25		136
Zimbabwe	147	44	18	209
TOTAL	1,265	175	34	1,474

*311 includes 312 & 313

there be development of a training strategy for human resources in food processing testing and quality control (AGRO/02).

There is considerable scope for development of the food processing industry for the domestic market, especially in ways which make new or better use of existing local raw materials. Co-ordinated research and development in this field would be assisted by the development of an R&D programme for food technologies in special branches of regional interest (AGRO/03). This could begin by examining the development of animal protein production, for which there is scope for expansion in specific areas, and for which there is a considerable potential market in Africa as a whole. In this connexion it is also important to note the potential importance of fisheries, both marine and freshwater, as a source of food supply. Some PTA countries already have significant fish production but in many others there is considerable room for expansion. The fish processing industry through drying, freezing, canning, etc. offers a new source of employment, and there are also strong linkages to other sectors by the stimulation of demand for boats, fishing tackle, jetties, etc. For this reason the identification of opportunities for establishing fish processing plants, through a survey of the subregion, would be an important first step (AGRO/04).

One major food industry in the region is the sugar industry. Substantial quantities of raw sugar are produced in Ethiopia, Kenya, Malawi, Mauritius, Swaziland, Tanzania, Zambia and Zimbabwe. Many of these are also major refiners. In 1988 PTA countries exported 1.4 million tonnes of sugar, mostly to EEC countries, of which Mauritius exported 0.7 million tonnes, Swaziland 0.4 million tonnes and Zimbabwe 0.15 million tonnes. The sugar industry is already addressed by two the projects mentioned, from the point of view of improving its supply of spare parts for machinery, and in connexion with the production of chemicals from sugar. However, the industry would also benefit from direct support in terms of the development of human resources. Mauritius has a successful national training centre, which is well placed to play a regional role (AGRO/01). Such a development would have important effects on skills in several technologies associated with this key industry.

Grain milling is an activity which has considerable scope for expansion in the PTA subregion. Sorghum, millet and cassava are receiving increasing attention as a means of reducing dependence on maize and wheat, which is often imported. Research on composite flours is a desirable activity, especially if accompanied by co-ordinated development of agricultural development and industrial processing systems.

With respect to animal feed, there are observed shortages in several PTA countries. In Ethiopia, production is constrained by the lack of raw materials, and the story is similar in Kenya and Tanzania, although in Tanzania other factors are also affecting capacity utilisation. In spite of this, there is in the long term considerable potential for enhanced production, which would in turn facilitate moves towards more intensive livestock production.¹⁶

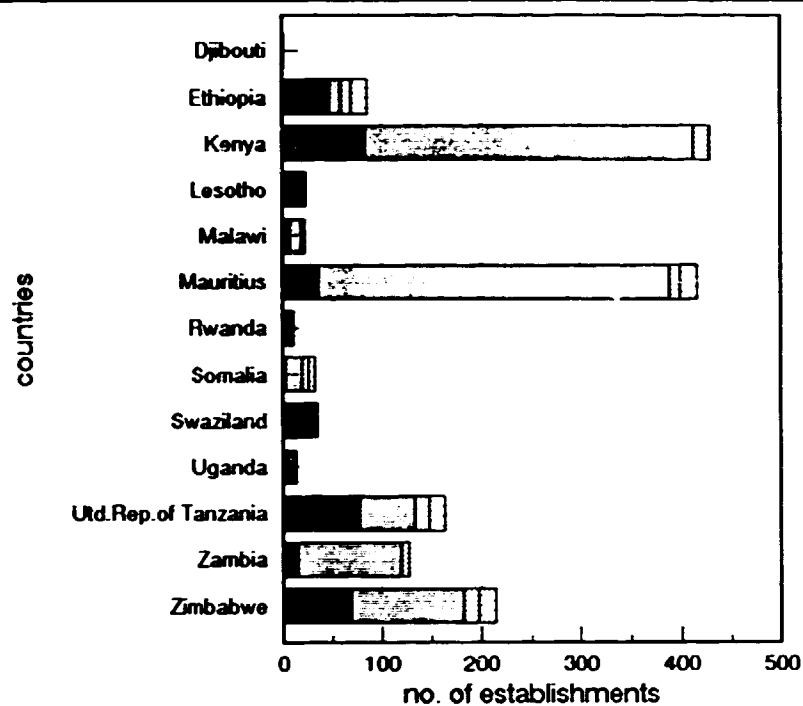
¹⁶See UNIDO Pre-feasibility Studies on Agro-Based Industries for Preferential Trade Area of Eastern and Southern African States Project No. DP/RAF/88/074. Projects Identification. Executive Summary. Animal Foodstuff Sector, Edible Oil Sector, Grain Milling Sector, Sugar Sector, Pulp and Paper Sector. Inter G March 1990

Textiles, wearing apparel, leather and footwear constitute another important group of agro-industries which are related in several senses. An overview is given by Table 12. They are oriented to the final consumer although textiles less so, and are traditionally labour intensive and a source of export earnings for a number of developing countries. They have been the subject of rapid and dramatic structural change especially in developed countries, and have often been the focus of international trade disputes and the direct occasion of frequent retreat from the principles of international free trade. Two major trends of development may be noticed at present internationally: the first is that towards complete integration of design, production, distribution and sales to the final consumer. All of these activities may be combined in the operations of a single firm. This is accompanied by location of production near or at least not too far removed from the intended final market. This trend is encouraged by the availability of automation in developed countries, and it suggests that opportunities for developing countries' exports will reduce. The second trend is that of international sub-contracting, where the wholesaler or retailer in a developed country specifies the product in terms of design and quality, and the actual production is carried out, often in a developing country. This type of arrangement can involve a true partnership, in which close relationships between the producer and the purchaser can lead to skills upgrading, improvements in quality control, closer contact with market and design trends, etc. However, such benefits are by no means guaranteed. Several PTA countries have entered international sub-contracting arrangements and there is variation in the degree to which long-term upgrading may result from this. It seems particularly important that the textile industry be made a subject of special focus in the PTA, through the establishment of a regional centre (AGRO/06). This would cover both the textiles industry and the garment industry. It would monitor and study trends in markets and technology, drawing its information not only from international sources but also from the experience of successful firms within the subregion. It would act as a channel for subregional co-operation in specific aspects of the industry, especially design and marketing for exports.

One export opportunity identified in the course of the present study is that of blanket making in Lesotho: the possibility needs further investigation and in view of the country's special position it is suggested that the PTA could appropriately provide support (AGRO/05). It would also give an insight into several of the issues with which the proposed centre would deal, since the product in question would be a higher price, higher quality product which might provide indications of the problems in moving up-market. The proposed textile centre would also have an important role in human resource development within this industrial branch, especially through the training of trainers and the organizing of seminars and information exchange in key areas related to textiles and clothing, especially in fields related to the external issues already mentioned. However it is felt that the training issue should also be addressed in the area of production and technology management in the textile industry. There is evidence in some countries of low productivity, of inadequate attention to machine maintenance, and other difficulties. Accordingly a new concentration on the human resource development aspect of production is proposed (AGRO/07).

With respect to pulp and paper, no up-to-date and comprehensive studies exist. But it has been reported that present consumption levels are below requirements, with per capita consumption figures varying from 0.5 kg in Ethiopia to 20 kg in Swaziland. Except in Zimbabwe, consumption is not matched by production. Imports are significant. For the subregion, they amounted to

Table 12

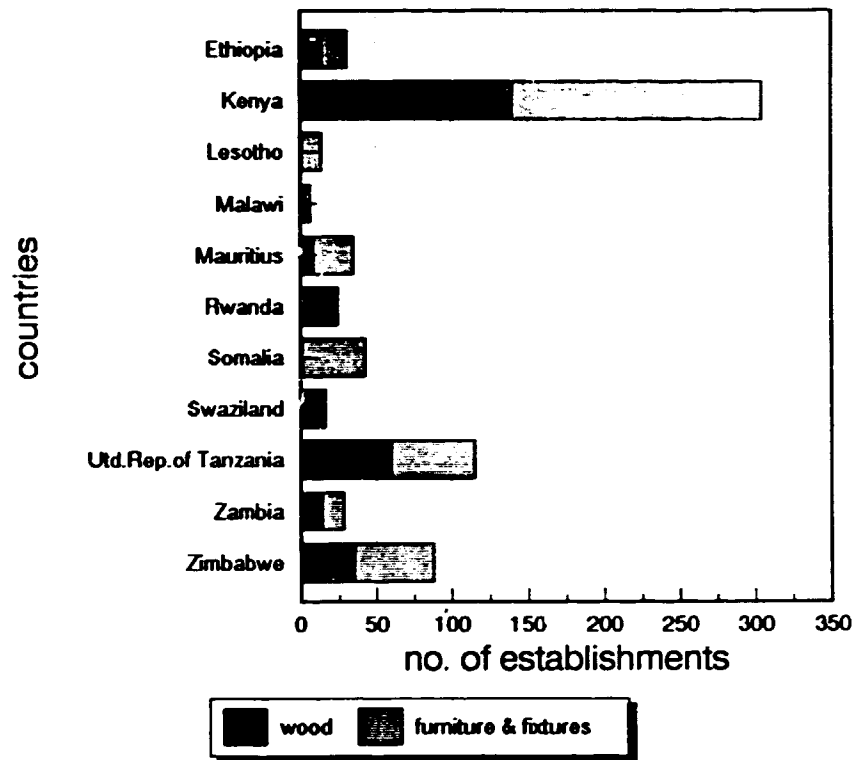
TEXTILES, WEARING APPAREL, LEATHER, FOOTWEARNumber of establishments
(ISIC 32)

	textiles	wearing apparel	leather	footwear	TOTAL
Djibouti		2			2
Ethiopia	48	12	18	16	88
Kenya	80	228	15	2	428
Lesotho	22				22
Malawi	8	12		2	22
Mauritius	28	264	18	17	418
Rwanda	11				11
Somalia	2	17	6	6	29
Swaziland	26				26
Uganda	7	2	1	2	12
Utd. Rep. of Tanzania	77	88	15	15	183
Zambia	15	100	2		127
Zimbabwe	88	124	14	17	243
TOTAL	414	1,088	78	78	1,575

Table 13

WOOD, FURNITURE & FIXTURES

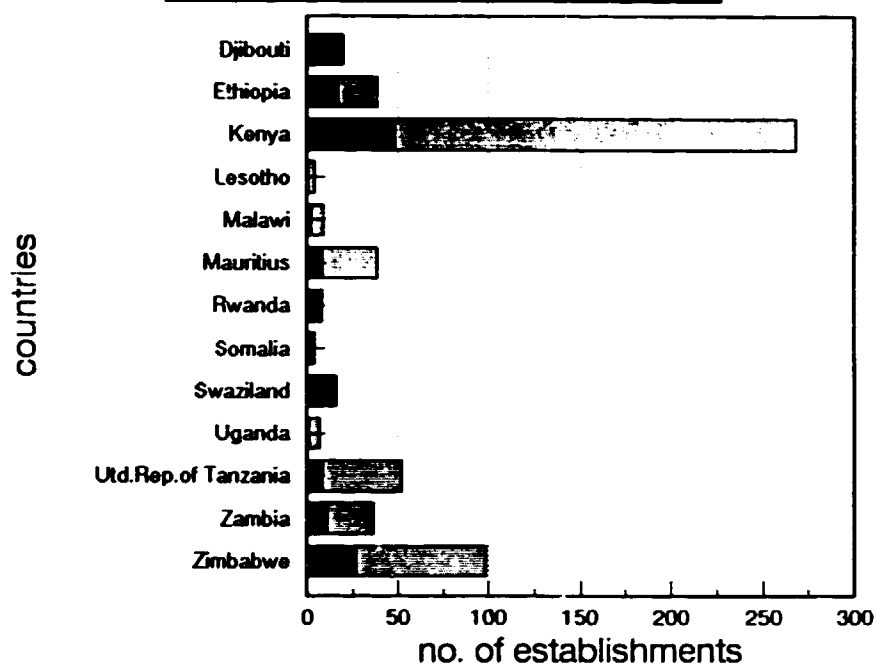
Number of establishments (ISIC 33)



	wood	furniture & fixtures	TOTAL
Ethiopia	14	17	31
Kenya	140	165	305
Lesotho		14	14
Malawi	4	3	7
Mauritius	9	26	35
Rwanda	25		25
Somalia		43	43
Swaziland	17		17
Utd. Rep. of Tanzania	80	35	115
Zambia	14	15	29
Zimbabwe	36	53	89
TOTAL	318	404	722

Table 14

PAPER, PRINTING
Number of establishments
(ISIC 34)



paper
 printing

	paper	printing	TOTAL
Djibouti	19	1	20
Ethiopia	17	22	39
Kenya	48	220	268
Lesotho		4	4
Malawi	2	7	9
Mauritius	8	31	39
Rwanda	8		8
Somalia	2	2	4
Swaziland	16		16
Uganda	1	6	7
Utd.Rep.of Tanzania	8	44	52
Zambia	11	26	37
Zimbabwe	27	72	99
TOTAL	167	435	602

about US\$ 287 million over the period 1981-1985, with exports reaching only US\$ 9 million. With respect to raw materials for pulp and paper production, the subregion is well supplied, but the need for technology and expertise from outside acts as a serious constraint to development of this important industry.

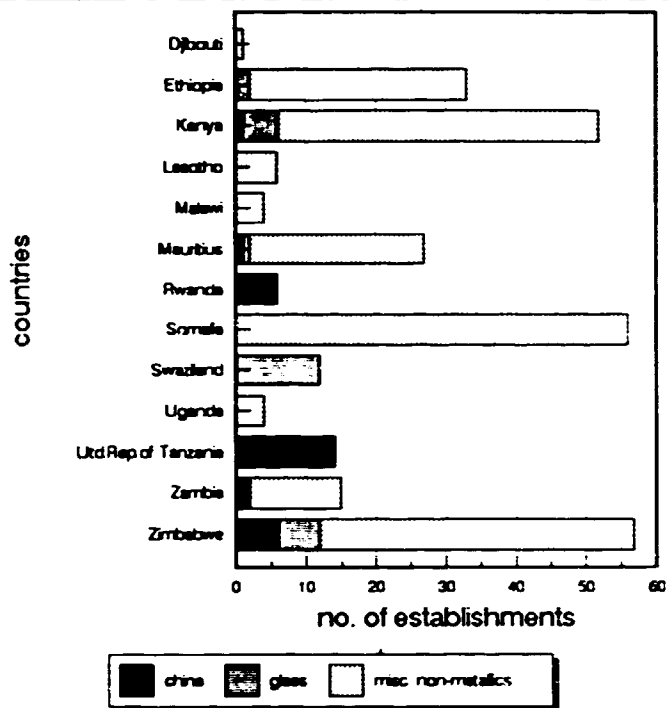
The leather industry is one which is important to many of the PTA states. Virtually all of them produce the raw materials (hides and skins). In aggregate, the PTA states have 48.4 per cent of cattle in Africa, together with 27.6 per cent of all sheep and 39.5 per cent of all goats. The total annual production of hides and skins in the subregion is estimated at 13.8 million cattle hides, 17.9 million sheep skins and 23.8 million goat skins annually. Several of the member states have leather industries of high quality, producing for export to Europe. The need for a PTA center for the leather industry has been recognized in the agreement that the existing national center in Ethiopia be upgraded to play a regional role. This would especially be in the area of leather technology, carrying out R&D, training and information services. The improvement of quality in some of the leather firms would be greatly assisted by the centre. As in the proposed textile centre, it would also have a role in information exchange, and, by bringing the different actors in the subregion's leather industry together, would open new channels of communication for co-operation. For instance, some countries have a surplus of skins but difficulties in tanning to an acceptable standard. Other firms make high quality leather products which are successfully exported, but suffer from shortages of raw material of acceptable quality. Several possible co-operative solutions suggest themselves, and the centre could play an important role in finding them. Again, at an international level, the impact of automation may be expected to be considerable in the future, since most of the special technical problems in dealing with leather appear to have been solved. The centre would have to confront these questions also, and provide strategic advice in the light of the latest world trends. Given the existence of the national centre in Ethiopia, the upgrading to a regional role will as a first step involve assessment of its expanded requirements and preparation of an implementation plan (AGRO/08).

1.3.6 Building materials

Table 15 shows establishments in the PTA region in the sector of non-metallic mineral products, which includes building materials. Cement is of primary interest for the sub-region. The actual total installed capacity of 8 million tonnes per year in 20 plants would be large enough for meeting the needs of the sub-region, but the production amounts only to 3.5 million tonnes per year. Particularly in Tanzania, Angola, Mozambique and Zambia the utilization level is very low, about 30 per cent. For cement industry the first PTA objective is therefore the rehabilitation of the existing plants, as well as improving the supply situation. (The only existing plant in Swaziland is actually not in production because of lack of clinker supply from Mozambique.) There is already a PTA/UNIDO project in connexion with the rehabilitation and rationalization of the cement industry, and this would be extended and intensified during a second phase (BLD/01), concentrating especially on extending the country coverage to PTA countries not included in the first phase.

An important area in this sector is that of glass which provides not only building materials but also packaging materials. In this context it should be noted that there is a considerable number of proposals to institute or expand

Table 15

CHINA, GLASS, MISC. NON-METALLICSNumber of establishments
(ISIC 36)

	china	glass	misc. non-metallics	TOTAL
Djibouti			1	1
Ethiopia		2	31	33
Kenya	1	5	46	52
Lesotho			6	6
Malawi			4	4
Mauritius	1	1	25	27
Rwanda	6			6
Somalia			56	56
Swaziland		12		12
Uganda			4	4
Utd. Rep. of Tanzania*	14			14
Zambia	2		13	25
Zimbabwe	6	6	45	57
TOTAL	30	26	221	297

*261 includes 360

glass production in the member states of the PTA. Local availability of raw materials, access to appropriate transport facilities for distribution, and the need to achieve import substitution are some of the considerations. The production of sheet and plate glass, as well as container glass, is an important question which would benefit from being explored at sub-regional level. This would allow for the harmonization of sometimes conflicting plans at the national level, as well as helping to remove anomalies (such as, for instance, the import of glass bottles from Europe for soft drinks). Accordingly it is proposed that the development of a glass programme for the PTA be undertaken (BLD/02).

2. CROSS-SECTORAL ISSUES FOR INDUSTRIAL DEVELOPMENT IN THE PTA

2.1 Transport and communications

The state of the transport facilities and infrastructure are a central issue for the effective achievement of an integrated market. In the PTA sub-region a reasonable main transport network, based principally on railways, was established some time ago. The bulk of the main road network is more recent. The main trunk-roads are to be upgraded, and an agreement to this effect has been reached between the PTA Secretariat and the World Bank, which will assist PTA in mobilizing finances for the study.

Problems of many kinds affect the PTA transport network:

- rehabilitation and upgrading of the major part of the transport network, both railways and roads;
- maintenance problems, which are not only the ones every African country normally faces, but also a question of co-ordination and possibly unification of criteria and programmes;
- co-ordination among different systems within the same mode of transport: one of the most striking cases is that of the passage from 1m gauge railway to the 1.067m gauge system which interrupts the East-African Railway between Tanzania and Kenya;
- administrative problems, which require the adoption of an unified approach by the member countries;
- security problems within certain areas.

Moreover, there is of course the need to enlarge the network both of railways and of roads, and of developing in a more rational way the sea and lake transport systems. The World Bank is giving priority to a Great Lakes Study. The World Bank and the African Development Bank are the main institutions co-operating with PTA in search of donors for financing the projects. The EEC also has been co-operating in transport questions mainly as concerns the so-called "Northern Corridor". These are the transport facilities and infrastructure connecting Uganda (from the Uganda-Zaire border), Burundi and Rwanda to the port of Mombasa in Kenya and to Nairobi. International action has also been important in connexion with the improvement of the rail links between Zimbabwe and the port of Beira in Mozambique, and renovation of the port itself has also been undertaken.

One relevant issue concerning the World Bank and African Development Bank assistance relates to the fact that neither institution accepts projects with an internal rate of return less than 10 per cent, which may lead to difficulties in finding some transport projects. But, as the World Bank representative recognized at the last PTA-World Bank meeting on sectoral projects and technical assistance (1988), the World Bank should perhaps agree on developing new techniques of project evaluation which would give emphasis to the long term as opposed to the short term.

As to the state of the PTA communication network, it is similar to that of transport. Postal services within the countries are very poor, and for this reason the World Bank suggested that PTA should consider creating an

independent international mailing system. The telecommunications network is functioning fairly well over long distances whereas for short distances the connections, mainly with small centres, are difficult and in some countries highly affected by the season (dry or rainy).

The importance of the transport and communication systems for the growth of trade and industry are obvious. But it should also be recognized that industry has a considerable role to play in their development. Some engineering industries in the PTA (particularly those in Zimbabwe) have already carried out notable work in providing heavy transport equipment such as railway rolling stock and buses suitable for demanding road conditions. There are many opportunities for industrial contributions to civil works such as bridges and road construction, and a number of manufacturing companies in the subregion have reached the necessary level. Opportunities for local inputs to large scale transport development projects, at the national or subregional level, should be carefully monitored to ensure that the capabilities of PTA industries are being used to their fullest possible extent.

2.2 Training

The skill shortage affects all the PTA countries in various ways. It is a shortage both of technical and administrative skills, and together with the foreign exchange shortage for buying spare parts is the major cause of the deterioration of the industrial stock of those countries and of its present need of rehabilitation. Moreover, the human capital resources are getting more and more strategic for industrial development, as the content of such inputs is increasing now also in the so-called traditional industries, not only in the innovating ones.

The PTA has identified human resources as a priority sector, and training institutions are established within all the major PTA countries and cover a wide range of specialization. Some of these have sectoral specialization (ZISCO Technical Training Centre is the most famous one), others have an enterprise specialization (e.g. EMI in Ethiopia for managers of public enterprises and MTAC in Uganda). A wide variety of institutions exists, and these have been summarized in Annex III.

For entrepreneurship training, too, every major country has its own institution to support small and medium industry. Often however these institutions lack human and capital resources for carrying out their task. Thus, the need for the training institutions is in any case to be upgraded, so to be put in the conditions to operate at full capacity, and for some of these to play a regional role.

Regional centres, however, have certain difficulties. First of all, a regional centre will of necessity be a long distance from much of its target market. The answer may be to have more than one centre if this can be justified, and to give particular emphasis to diffusion of skills. A second problem with regional centres, is, however, that many countries may wish to have them, even if they do not have the right infrastructure and local industrial community to ensure their efficiency and practical relevance. A further problem is a practical one, that institutions intended to play a regional role will have to provide residential accommodation for the participants. A general problem, also, is the financing of such centres, and the need to distribute costs across the beneficiaries in such a way that the centre can meet its outgoings and at the same time not charge fees so high as

to deter potential participants. This suggests some system of partial subsidy, but the apportionment of this among the different interests involved raises further problems. These difficulties, and the financial problems of setting up and maintaining such centres, both suggest the importance of dialogue within the PTA towards an agreed strategy for human resource development based on a frequent and comprehensive assessment of training needs and resources. Financial mechanisms for dealing with current and investment costs should be an important part of this dialogue. These considerations can be summarized as follows:

- The PTA should establish a strategy on priorities for human resource development. This would be built on the progress already made in subregional actions in such fields as human resource development in the energy, metals, fertilizer, project assessment, etc. At the same time it must be recognized that the formation of a strategy is not a once and for all exercise: the pace of change in technology and industrial structure is such that it is probably most useful to think of a five-year time horizon, with the position being re-assessed each year. Thus a rolling plan would be most appropriate.

- The financing of human resource development has to be addressed by the investigation of new forms of financing, so that the training activities can continue on an assured basis and expand in line with intended requirements. This suggests that the creation of funds for this purpose, at a national and at the PTA level, be investigated, in order to give the flexibility and structured approach necessary over the medium term. This would replace the process by which particular training institutes have to be financed on an ad hoc basis for each stage of their development, and each training course held by the PTA has to be financed as a special project. To establish such funds would not be easy, but the arguments for them are good ones, and if they are developed in a detailed way they would in the end prove more convincing as a means of mobilizing funds than a series of diverse initiatives.

- The implementation of the strategy involves substantive steps in terms of determining the appropriate subregional centres and the detailed types of training to be undertaken. Here national focal points will have an important role. The subregional component of this should concentrate on specialized areas for which economies of scale can be realized, i.e. in subject areas where the markets in individual countries may be too small to justify a national centre. Other things being equal, it is usually better to develop or strengthen an existing institution than to start a new one or a programme that duplicates existing activity. Existing institutions are only appropriate for a subregional role, however, if they have or can easily acquire all the facilities and infrastructure needed. Where a new institution has to be established, a pilot training centre, which will allow for testing of the approach, should be a first step. With respect to the target groups for training, opportunities should be offered for internal and external training both to the private and the public sectors. Incentive systems should also be provided to make sure that the training supplied is actually put to good use.

2.3 Finance

The gross domestic savings of the PTA sub-region as a whole amounted in 1987 US\$ 3663 million which was 11 per cent of the Gross Domestic Product. The

same ratio was 13 per cent for Sub-Saharan Africa. The countries with a savings ratio higher than 10 per cent were five out of twelve (Swaziland, Comoros and Djibouti are not included) and only three had a savings ratio over 20 per cent: Kenya, Zimbabwe and Mauritius. Two countries, Tanzania and Lesotho, have negative savings ratios.

However, none of the PTA countries is included in the group of highly externally indebted countries. The accumulated debt of the sub-region is US \$24,589 million, which is 66 per cent of GNP. In Sub-Saharan Africa the ratio is 85 per cent. The PTA countries with the highest debt ratio to GNP are Somalia, Zambia and Tanzania.

In 1987, PTA member countries received Official Development Assistance (ODA) from Development Assistance Committee (DAC) members, multilateral organizations and Arab countries amounting to US \$4,552 million dollars of net disbursements. This amount represents 40 per cent of the total ODA for Sub-Saharan Africa.

The population of PTA subregion in 1987 amounted to 150.3 million, which was 34 per cent of the total sub-Saharan African population. The average ODA per capita was thus 31.24 dollars. The total amount of ODA net disbursements received by PTA countries corresponded to 14 per cent of their total GDP of that year, whereas for Sub-Saharan Africa as a whole the ratio was 9 per cent.

The same amount of ODA receipts represented 12 per cent of the total GNP of PTA sub-region, while in Sub-Saharan Africa the ratio was 8 per cent.

Box 1: Official Development Assistance, 1987¹⁷

	PTA subregion	Sub-Saharan Africa
Population (millions)	150.3	441.7
Gross Domestic Product (million dollars)	33,640	128,840
Gross National Product (million dollars)	37,073	34,349
Total ODA net disbursement (million dollars)	4,552	11,151

As for direct foreign investments, the PTA region's net amount in 1987 was 93.4 millions of dollars. More than a half of this amount, exactly 47.7 million dollars, concerned Comoros and Swaziland. The share of PTA on total Sub-Saharan Africa direct foreign investment was only 11 per cent. Besides Comoros and Swaziland, the two major countries with a large amount of investment were Kenya (US \$37.2 millions) and Mauritius (US \$23.8 millions). Zimbabwe registered that year a large amount of disinvestment, 30.5 million dollars.

¹⁷ The data for Comoros, Djibouti and Swaziland are not included, as countries with populations of less than 1 million. The three countries altogether have received in 1987 total ODA net disbursements for an amount of 190 million dollars (Comoros 53 millions, Djibouti 92 millions, and Swaziland 45 millions). Tanzania and Ethiopia are the individual countries in PTA with the highest share of ODA. European countries are the biggest donors in the DAC.

This brief review of the financial environment within which industry operates points to particular difficulties and opportunities. Firstly, the relatively large size of ODA disbursements indicates that there may be a need for continued monitoring and co-ordination at the regional level. Most of the aid is bilateral and goes to non-industrial sectors, but it has important implications for industry and for regional integration. Secondly the high savings ratios in higher income member states point to possibilities for mobilizing increased investment in joint ventures within the region, and the administrative procedures in this regard should be looked at carefully. Finally, the small size of direct foreign investment reflects the PTA's locational disadvantages and inadequate perceptions of its suitability. But it reflects also an increasingly fierce competition among both developed and developing countries for the location of direct foreign investment. In this light new mechanisms may be needed to mobilize sufficient external financial resources, and one project in the present programme deals with this, in a proposal to explore the establishment of a manufacturing investment trust (HRS/09).

2.4 Technology

The degree of technological dependence of the PTA sub-region is still very high. Zimbabwe, one of the most industrialized countries in the PTA, has about 84 per cent of its total imports consisting of capital and intermediate goods such as light and heavy duty machinery, precision instruments, simple equipment and implements, etc. Moreover, about one third of industrial inputs in Zimbabwe have to be imported. Uganda has a similar average, but in the other PTA countries the proportion of imported industrial inputs is much higher. Programmes of co-ordination and technology exchange have to be implemented at a regional level. A single country's dimension is usually too small, in terms of industrial structure and market, to allow rational exploitation of a technology centre. The amount of capital and human resources which has to be spent without an immediate return means that it should be shared between as many potential users as possible.

Accordingly, regional centres represent an important policy instrument. Many of the same reservations have to be made about them as were made above in section 2.2 concerning regional training centres, i.e. that they will have to have the facilities and infrastructure needed to play a subregional role, and that the financing of them is complicated by the need to distribute costs partly at the level of individual users but also involving some subvention mechanism. However the characteristics of technology diffusion mean that the strategies of these centres may involve information networking, co-ordination of research between a number of national bodies, and dissemination of results through demonstration facilities, publications, computer data exchange, etc. This means that there is considerable scope for investigating new methods to make the best use of existing technology resources within the region and for making sure that the results and findings of the research are incorporated as quickly and as widely as possible within actual production activities in the PTA. This in turn means that technology centres can be very cost-effective if their relationships with the rest of the industrial system are carefully planned.

Some plans for regional technology centers have already reached an advanced stage within the PTA. The best known is the PTA project of a Metallurgical Technology Centre (MET/01), and a proposal for a regional leather centre has also been developed (AGRO/08). Other centres proposed in the present document,

and discussed above in the sections dealing with the relevant industrial branches, include those for inorganic salts (CHEM/06), plant medicinal products (CHEM/07), textiles (AGRO/06), and standardization with emphasis on packaging (HRS/10).

However, the creation of regional technology centres is only one of the many steps necessary to create a full technological infrastructure and to ensure continuous upgrading of technologies within the whole industrial structure. Many if not most of the proposals contained in the present report would have some role to play in this regard, and are probably best dealt with under the headings of their respective industrial branches. Particular mention should however be made of the proposal to draw up an R&D programme for the PTA (HRS/07) which would emphasize the role of regional co-operation along the organizational lines of co-operative programmes successfully implemented in Europe, with, however a concentration on technologies of special interest and application within the PTA subregion. Another desirable step would be the promotion and commercialization of small-scale industrial/rural technologies in the PTA sub-region (HRS/04).

2.5 Industrial information

The role of information in industrial development cannot be overstated. Apart from the centralized information that is exchanged between PTA countries, which is a precondition of regional co-ordination, there is the information flowing at a micro and sectoral level, which is exchanged between operators of the same industrial chain or of the same sector or between producers and traders. Provided that a basic information infrastructure exists, large firms can often manage to meet their information needs from their own resources, dedicating staff for market research, purchasing, etc. In small-scale industry, however, the need for information to be readily available (on processes, on products, on markets) is essential if a successful development of an industrial system is to take place.

In PTA countries the scattered location of industrial plants, the long distances and the difficulties of transport and communications make the spontaneous exchange of information very difficult. Therefore, industrial information exchange will have to be explicitly organized for some time to come. The PTA has already taken important initiatives in this regard, and has organized trade fairs, buyer-seller meetings, and other meetings of various types. Consideration should also be given to the encouragement of other, more informal, ways of exchanging industrial information, such as business meetings, where successful entrepreneurs of one country meet entrepreneurs of another country and tell them their experience, how they solved their problems and which opportunities they had taken. Many of the regional technology and industrial centres proposed, such as those for textiles, leather and metals, could be involved in the organization of such meetings. The technological content of the meetings would improve and the centres would be kept in touch with the commercial realities of the sector in question.

At the PTA level there will continue to be a need for significant action to improve information flow, particularly in connexion with large-scale investment projects, to ensure co-ordination and avoid overlap. This point is further discussed under section 3.1, Stages of industrial integration, below. Action can, however, go beyond merely avoiding overlap and ironing out conflicting proposals to generate a new system of inter-relations between industries, acting to fill the gaps left by incomplete information systems.

One example of this is the proposal for the development of sub-contracting systems, especially in the metals and engineering subsectors (ENG/06).

The problem of information would also be addressed by measures to help in the promotion of small and medium industries. While most countries have at least one government body, and sometimes several, intended to provide support to SMI, there is still considerable scope for improvement with respect to key issues in relation to SMI, such as the role of women entrepreneurs (addressed in HRS/05), and training for small scale industry (including industrial co-operatives (HRS/01)).

2.6 Environment

An increasingly important issue which has many implications for the industrial sector is the environment. Industrial processes are in some cases major contributors to environmental problems. In other cases, however, they contribute to effective solutions for environmental problems. Governments and inter-governmental bodies have devoted growing attention and resources to environmental issues. This trend may be expected to continue. The implications for PTA industrial policy are of several kinds, and include immediate and longer term effects. There will be increasing urgency attached to international negotiation on joint action to protect the environment, and, as a consequence, environmental considerations will increasingly enter discussions in other fora, including finance, human resources development, technology, development assistance, international trade in manufactures, agriculture, energy, etc. This means that industrialization strategies regarded as environmentally harmful will find little support elsewhere, and, further, that industrial products produced in what is internationally regarded as an environmentally unacceptable way will increasingly face trade barriers from other countries. Moreover, as the longer-term consequences of bad technological choices in industrialized countries over generations become more and more apparent, African countries will become increasingly selective in their own industrialization strategies, and will need to examine more and more critically investment projects and transfers of technology for their environmental effects.

At the PTA level, sub-regional co-operation has an important role to play in support of the environment. This is for several reasons. Firstly, many industrial activities can have environmental consequences outside the country in which they take place. Air and water are just two examples. Action at the sub-regional level can either abate or avoid such pollution, if there is a framework for detecting it assessing it and resolving disputes as to its causes and its effects. Secondly, a sub-regional framework provides an important information network possibility: the amount of information processing needed to develop and apply environmentally-sound industrial policies is very considerable. The sharing of experience and expertise is particularly valuable. With respect to resources, sub-regional co-operation can provide a pool of skills and in some cases of other resources as well: strategic choices can be made on environmental problems for which a sub-regional solution may be appropriate.

Action at the PTA level has to begin with a series of preparatory measures. Particularly important is the adoption of a common approach to the problems, and this in turn demands a set of definitions, so that the terminologies and

the criteria used in the different member states will be set on a path of convergence. Actions may be broadly grouped under the following headings:

(a) information: this would include both definitional and co-ordination activity. It would lay the basis for future legislative action and harmonization of regulatory activity. An important first step would be action in the field of environmental impact statements. These are standardized statements of the effects expected from a particular proposed industrial or other project. They are standardized in the sense that they always include the same considerations. The PTA needs to adopt a standard form for such environmental impact statements so that all appropriate considerations are taken into account in assessing the environmental impact of new projects and that this information is as far as possible transferable. Allied to any such system would be the need to set up a regular network of information exchange so that the member states would keep one another up to date on the progress of environmental project assessment and, most importantly the projects and processes rejected on environmental grounds. To meet this requirement, a project concept entitled "Preparation and Dissemination of a model Environmental Impact Statement" has been included as ENV/01.

(b) safety and accident prevention: this is a broad range of activities covering training, selection of technologies, organization of work practices, etc. The attention given to this area is often low, and yet it is a subject which if neglected can lead not only to environmental degradation and direct injury or loss of life, but also, even in apparently less serious cases to lost production through machine outage or absence of essential staff. In the present document the information exchange aspect is addressed by the proposal for industrial safety and accident prevention systems (Project ENV/05) together with a proposal for technology development in the field of pesticide formulation and application (Project ENV/03).

(c) treatment of waste: abatement of pollution involves the treatment of pollutants so that they are less harmful to the environment. This can mean that their volume is reduced through some chemical process. Industry is, of course a major producer of harmful waste. However, each of the different pollutants need different treatments. To achieve the necessary range of information and technologies to deal with all industrial production represents a considerable task for a developing country. The problem is of course better dealt with at the design stage. Thus, for instance, tanneries, traditionally a major sources of pollution, can be considerably less so if the problem is tackled before the tannery is constructed, so that specific treatment of the effluent can be accommodated within the overall process. At the PTA level, the fact that industrial plant and technologies exhibit considerable variety across the member states means that the choice of appropriate target sectors for joint action to abate pollution is a difficult one. It should be noted, however that industry is by no means the only source of pollution, and also that non-industrial pollution can still have an industrial solution, in that industrial technology plays an important role in reducing the level of many pollutants, whether these arise from the energy producing sector, services, or household activity. For instance, municipal services have as a major responsibility the provision of water and the disposal of waste water: industrial offers a variety of solutions to the latter problem. The fact that waste water treatment is a problem common to all

local authorities in the PTA sub-region suggests that there may be considerable scope for common action. For this reason, small scale industrial waste water treatment is the focus of a project in the present proposals (ENV/04).

(d) new product development and application: this covers changes in industrial products so that they are less harmful to the environment and also changes in the way that they are used. Considerable attention has been given in recent years at national and at international level to the use of chemicals in agriculture and the potentially harmful effects that some of these may have on the environment. Particular concern has focused on pesticides because of the way in which some types have characteristic chemical structures or residues which persist and accumulate in ways which are harmful to other living creatures besides their original targets. Because of the special biological conditions in many farming areas in Africa, the need to reduce harvest pre-harvest and post-harvest losses through action against pests will be a continuing one. Crops in the fields and in storage will always need to be protected through the use of various forms of pesticides. Therefore, the present proposals contain a suggested project to address this issue in two ways: firstly through the safer formulation and application of pesticides (ENV/02), and secondly by investigating the uses within the region of new pesticides of biological origin (ENV/03, which is to set up a demonstration plant for the production of non-persistent, non-chlorinated insecticides.)

2.7 Trade

Since most of the possibilities for industrialization within the PTA region are predicated on trade, it is understandably a fundamental issue in consideration of an industrialization strategy for the sub-region. Trade has of course a central place in both the concept and the realization of the PTA. Action has been taken on a broad range of fronts. Two headings may be adopted, of measures to encourage trade, and measures to facilitate trade. The former includes a number of promotional activities, including the holding of PTA Trade Fairs, the co-ordination carried out by the PTA Federation of Chambers of Commerce, the activities of the Trade Promotion and Development Project (ITC) in the setting up of computer information networks and the carrying out of the supply and demand surveys, etc. The PTA Trade and Investment Bank, because of its trade window, should also be mentioned in this context.

In the area of trade facilitation a number of steps have been taken. The agreed document for the customs clearance of goods carried by road, the Road Customs Transit Declaration Document, represents an important simplification of procedures for goods in transit and for final destination within another PTA country. There is also a harmonized system of coding and classification of tariffs. Tariff reduction is, of course, central to PTA activity, and the target is to reach zero rates by the year 2000. To qualify for these reductions and the eventual elimination of these tariffs, the goods must be on the so-called "common list", and must also satisfy a rules of origin criterion which at the moment is of a 51 per cent local equity holding in the producing company.

Under the same heading may be mentioned the operations of the PTA Clearing House, which is a payments system allowing for settlement of transactions in local currency in connexion with trade between PTA states. The system now

covers an estimated 73 per cent of the trade within the region and it is expected that it will eventually cover all of it.

However, it should be noted that, as yet, the trade of PTA states with one another remains small. The measures taken, although representing considerable achievements, are not by themselves enough:

".....foreign exchange allocation as practiced by most PTA countries is the binding constraint to trade. No evidence has been found from countries visited that would indicate trade diversion following PTA arrangements".¹⁸

Accordingly, the search for further relaxation of non-tariff barriers to trade will certainly have to continue. Not only is a foreign exchange allocation scheme in operation in most of the member states of the PTA, but in addition there is usually a further administrative complication in the form of an import licensing system. Often these are not directly linked with one another: the importer may have a foreign exchange allocation but not automatically receive an import licence, or vice versa.¹⁹

These issues are outside the direct scope of this report, but it is clear that the solutions found will strongly influence the overall success of the PTA industrialization efforts. The promotion of industrial projects at the PTA level is based on their expected ability to sell to the wider market afforded by the PTA countries as a group (although many of the projects in fact target a smaller number of countries as markets). However the intentions for industrialization involve a large number of enterprises and entrepreneurs, whose success will necessarily depend on general progress in the liberalization of trade within the region. This is true also for many of the projects included in the present document.

A further consideration is the question of external trade, i.e. with other African countries and with the world in general. The manufacturing sector of the PTA is not large in aggregate: it nevertheless contains a number of companies who are successful in highly competitive international markets. This underlines the importance of industrial co-operation within the PTA as a means, inter alia, of sharing successful international export experience. From this point of view, projects on the establishment of a Metallurgical Technology Centre (MET/01), the building of a regional essential oils industry (CHEM/02), the Sugar Industry Regional Training Centre (AGRO/01), training in food processing quality control (AGRO/02), a regional centre for the textile industry (AGRO/06) and a regional leather research institute (AGRO/07) are potentially significant, since they would provide a framework in which potential exporters could improve skills and quality, including through exchange of information and experience with manufacturers from other PTA countries who have managed to break into international markets.

¹⁸ Report of the Study Team on the Equitable Distribution of Costs and Benefits in the PTA. PTA Fourteenth Meeting of the Inter-governmental Commission of Experts, Arusha, Tanzania, 8-11 June 1989. PTA/GEN/2, May 1989.

¹⁹ The PTA has already devoted considerable attention to this question. See "Liberalization of Import Licences and Foreign Exchange Allocation for Intra-PTA Trade" PTA, Fourteenth Meeting of the Clearing and Payments Committee, Nairobi, Kenya, 17-18 November 1989. PTA/TC/CP/XIV/5, September 1989.

2.8 Industrial Services

At the international level, the concept of industrial services is one which continually undergoes redefinition as a consequence of technological and organizational change within industry. Large companies, pursuing vertical integration strategies, may link closely within a single organization all the necessary services such as market research, product design and development, production engineering, marketing, etc. On the other hand, alternative trends are also seen in the spread of specialized consultancies, and again in the diversification of traditional service companies into new fields, such as the move of accountancy firms into management consultancy and data processing, and advertising firms into product development.

The larger companies in the PTA may have several options with regard to meeting their needs for industrial services, and may choose to develop or expand their in-house capabilities in, for instance, machine maintenance or design. For smaller companies this is not an effective option. The problem is exacerbated by the shortage of available skills and the dependence on expatriate skills in key areas. The shortage often finds expression in services imports, where consultancy services from developed countries are used and paid for in hard currency. However, it can also be found in some cases that considerable local consultancy capabilities exist within the region.²⁰

Some of the skills required in the field of industrial services are specific to particular industrial branches, such as some of the engineering disciplines. Others address problems common to all industries, such as management, accounting, human resource development, etc., although even within those terms there is scope for specialization. As far as the PTA is concerned, the strategy with respect to industrial services had to be composed of a number of different approaches:

(a) Information and networking: the decision to use consultancy services from outside the region may be made without knowing that consultancy services are available from another PTA member state. Wide dissemination of information on the availability of consultants is one approach to the problem, and here the PTA Federation of Chambers of Commerce, the subregional arm of the Federation of African Consultants, government bodies, and industrial development services institutions all have important roles to play. Given the computerized data infrastructure already being set up by the PTA with respect to trade and procurement data, the opportunity should be taken to use this also as a means of diffusing information on consultancy services available within the region, by setting up an industrial services register. It is also proposed that an industrial services clearing house be set up for the PTA region. This would be a formal but straightforward structure to facilitate exchange of industrial services between countries of the PTA. (HRS/08)

(b) Advisory centres: given the variety of skills needed within the consultancy field, and the general shortage of supply, there is a need to concentrate strengths as far as possible, by building up sub-regional

²⁰Subregional Co-operation in the Fields of Industrial Training, Consultancy and Entrepreneurship Follow-up Subregional Meeting on the Promotion of Intra-African Industrial Co-operation within the Framework of the Industrial Development Decade for Africa. Harare, Zimbabwe, 31 October-4 November 1988. UNIDO/ID/WG.477/4/Rev.1(SPEC), 26 January 1989

centers of excellence in key industrial sectors. This approach, already followed by the PTA, will allow for a combination of research, information and consultancy activities. Examples include the Metallurgical Technology Centre (MET/01) and the Regional Leather Research Institute (AGRO/07). In addition a regional centre for the textile industry is proposed (AGRO/06).

(c) Technology development: these activities also have important contributions to make in the field of consulting and the provision of advisory services, since very often these are the main sources of access to techniques, materials, laboratory equipment, testing procedures and the like. Their principal function remains that of contributing to the technological development of the PTA subregion, lessening of its dependence on imported technology and finding new solutions to the problems of industry and other sectors within the region based on the PTA's own resources. Within that context, however, there will be scope for consultancy activity, and in fact the technology programmes will benefit from it also in terms of practical experience of the real needs of industry. Among the possible projects of relevance from this point of view would be the Metallurgical Technology Centre (MET/01), the R&D programme for food technologies (AGRO/03), the initiation of a CAD/CAM demonstration network (ENG/01), the programmes on industrial chemicals from indigenous carbohydrate (CHEM/01) and essential oils (CHEM/02), and promotion and commercialization of small-scale industrial/rural technologies (HRS/04).

(d) Training: human resources development may also be considered under this sub-heading because it is the essential component of long-term development of industrial services capabilities in the subregion. Among the relevant proposals would be those for a training strategy for the development of an integrated production and technology management system for the textile industry (AGRO/08), the industrial management development program, (HRS/02), and the programme for the development of manpower capabilities for project identification (HRS/06). The programmes, once operational, would increase the availability of consultancy services within the region, both in the short-term, since the trainers would be available for short-term assignments and in the longer-term, as numbers of skilled trainees were released into the industrial system.

2.9 Standardization and quality control

The internationally complex issue of industrial product standards and the related one of quality control can be expected increasingly to affect the PTA's industrialization prospects and, indeed, those of all countries. International standardization, as does national standardization, improves consumer and producer information, promotes network and scale economies, and promotes product safety and quality. International standardization also promotes international trade, and assists economic integration and global technology development. Increasing convergence of standards within Europe, together with the growing use of some national standards as de facto international standards raises important questions about the role and scope

of standards activity, particularly at the level of developing country regions.²¹

The complexity of the issues makes the strategic use of the PTA institutions in this field of great importance. The status of resources for this purpose varies from country to country. Action to be taken will therefore include assisting PTA countries without national standards bodies (NSBs) to establish them. It would be desirable that as far as possible the more advanced NSBs should participate fully in this process. Accordingly, there is a proposal for PTA action in the establishment of national standards bodies for those member states that do not yet have them (HRS/11). With the intention of building on existing resources, there is also a proposal for the Malawi Bureau of Standards to become a regional centre for packaging materials for the food industry (HRS/10). Again with reference to the food industry, there is a proposed training strategy project addressing food processing and quality control (AGRO/02), already mentioned under Section 2.7 Trade, above.

The importance of the development of standards and quality control activity within the PTA is not limited to its role in intra-regional trade, and it should not necessarily be seen as the only reason for pursuing improvements. In the first place, the increasing pervasion of international standards, already referred to, means that competition in world trade is more explicitly in terms of quality as well as of price. To the extent that the PTA industrialization strategy, as well as the strategies of individual enterprises, focus on developed country markets, the standards there in practice will be an important consideration. Continuing to improve standards and continuing to try to meet them brings benefits in terms of quality and reliability throughout the production change. It also improves economy of material use. In the second place, the improvement of standardization and quality control activities means that, as a consequence the region's technological capabilities are also improved through the availability of better laboratory testing equipment and trained staff. These in turn have contributions to make in area such as technology, industrial information and industrial services such as have been described above.

2.10 Energy

The subject of energy has been the focus of particular attention from the PTA, and an Energy Plan of Action has been drawn up.²² Energy demand is expected to grow substantially within the region. Additional strains are expected on land, water, and forest resources. The existing pattern of energy supply is given as: fuelwood 70-80 per cent, 8-10 per cent imported crude oil or petroleum products, and the remainder hydropower. Rapid deforestation has resulted in the destruction of water catchment areas, and the consequent degradation of the environment has led to drought and desertification.

The hydro-electric potential of the PTA member states is estimated at nearly 106 thousand MW, which could produce 600 billion KWh per annum. All the

²¹ See "Trends in International Standards and the Implications for Regional Co-operation among Developing Countries", UNIDO, Regional and Country Studies Branch (forthcoming)

²² Energy Plan of Action for PTA Countries, First Meeting of the Sub Committee on Energy, Lusaka, Zambia 22-23 October 1987, PTA/TC/CIC/VI/(1)/3, September 1987

existing PTA member states import their oil requirements and this is estimated to absorb more than half the available foreign exchange. Detailed statistics on energy resources and production can be found in Annex II, Tables 11.1 to 11.5.

Several considerations at once arise from this. The first is with respect to petroleum refining. Given that a number of countries Ethiopia, Kenya, Mozambique, Somalia, Tanzania and Zambia have petroleum refineries, there is a need to assess their present and potential contribution to the energy and other needs of the region, especially in view of the fact that several countries have also projects under consideration in this field. For this reason it is proposed that a survey of the petrochemical industry in the subregion be carried out, in order to allow for the development of a long term plans and perspectives for this sub-sector (CHEM/05). Its foreign exchange implications and the present and future possibilities in the allied field of natural gas exploitation make such an analysis very necessary.

Economies and increased efficiencies have to be sought right through the energy cycle, if the human and capital resources employed in the sector are to be used to their best capacities. Existing power plants, for instance, need to be analyzed for their operating efficiency and the degree to which they are in need of rehabilitation. This in turn demands a more detailed perspective of the electrical energy requirements of the subregion in order that the appropriate capacities to meet this can be identified. Hence it is proposed to carry out a power plant survey (ENY/01), which will identify the main problems and propose solutions to them. This is because the manufacturing sector is the major user of commercial energy, and it is particularly important that its use of energy be carefully examined in order to reduce it, if possible, and also to ensure that the energy is optimally used. This is not only to conserve existing energy sources but in some cases also to release them for other purposes. For example, bagasse is an important fuel in the PTA region, but an energy-inefficient sugar refinery may use up all the bagasse produced. In other circumstances, bagasse could be used as a source of pulp for paper making, as is done in Egypt, for instance.

An energy audit is a review of the energy use of an establishment. Its primary purpose is the identification of losses in the use of energy and then to find ways of reducing or eliminating those losses.²³ UNIDO has for some years been building up a considerable body of experience in the field of energy auditing and conservation through the establishment of a regional energy conservation network for European countries. The proposed PTA project would make use of this and of the existing activities already under way in some member states.

With respect to the depletion of existing energy resources, especially those whose reduction is associated with serious short and long term negative environmental consequences such as forest resources, progress has to be made on a broad front of technology development, testing and application. Some of this can come through the sharing of research and exchange of experience and expertise, such as in the projects for the promotion and commercialization of small scale industrial/rural development technologies (HRS/04), the development of an industrial R&D programme (HRS/07), and the development of an industrial services register (HRS/08). The latter in particular can also

²³ European Regional Industrial Energy Conservation Network (ENCONET). DP/RER/83/003. Technical Report. Energy Auditing and Management of Industrial Plants. Manual -Volume I. UNIDO DP/ID/SER.A/1119, 19 January 1989.

serve as the basis for consultancy exchanges in such areas as the development of hydropower, where the subregion has considerable unexploited potential and, at the same time, in some countries, a notable body of experience in the field. With respect to the particular area of forest resources, however, a further project is suggested which it is felt would make a practical impact on the problems in this area by using woodwastes for efficient production of charcoal.(ENY/03) The project would also cover the use of gasifiers for internal combustion engines. By so doing it would therefore tackle two major energy policy issues in the PTA region, the depletion of forest resources and the dependence on imported petroleum sources.

3. INDUSTRIAL INTEGRATION AND THE PTA

3.1 Stages of industrial integration

Industrial integration, as a concept, means that the different components of an economy work together, forming strong links in terms of input supply and thus giving the kind of resilience and flexibility which a complete industrial system can offer. At the international level, industrial integration cannot proceed in isolation from overall economic integration, since for its full functioning it needs open markets, free movement of capital and labour, removal of exchange controls and, most importantly of all, the free flow of information.

Information is important to any economic system, but is particularly essential for industrial integration because of the complexity of the subject. Industry as an activity contains an enormous variety of processes and products, and the rapid growth of technological change in recent years means that the problems and opportunities for industrial development are continually changing. Only a free flow of information can ensure that scarce resources are used in an optimal way. This is not a theoretical statement but a very practical one. For instance, some manufacturers may find themselves with under-utilized capacity because of lack of demand for their products. This lack of demand may only be because not enough customers know about their capabilities. Such a problem would clearly be improved by better information flows: that is why the activities of the PTA in stimulating trade, as well as facilitating it, are so important. Investment projects are another example, where the role of the PTA in trying to encourage consensus and avoid overlap is a crucial one. The establishment of a new factory may be based on the idea that it will have a large enough market to sustain it by exporting its output to other PTA countries. But, in fact, the same idea may have occurred to other member countries. The PTA secretariat has certainly already encountered such potential contradictions at the level of large national investment projects. Intervention can usually resolve problems of this order. But there is a much bigger class of smaller investment projects, perhaps involving the expansion or diversification of an existing private manufacturing enterprise. The greater and more detailed the information available to the entrepreneur about commercial developments in the country and the rest of the PTA subregion, the more likely is the investment decision to be a correct one.

Apart from the information problem, the process of industrial integration in the PTA confronts three immediate problems, which result from the starting point at which integration is taking place. Firstly, integration has to be aligned with a more general process of economic integration. The PTA has already made progress in many fields, but it must be stressed that progress can only continue if it is distributed relatively evenly across all fields. Only in this way will the collective consensus and impetus continue. This is because the benefits of integration can only be shared in aggregate, not in detail. The process of integration cannot ensure all countries achieve the same type and degree of industrialization at the same time: disparities will continue to exist and even to be accentuated. They can be compensated for by progress in other sectors, but this means that the integration process has to make progress in all sectors, not necessarily simultaneously, but with an acceptable degree of co-ordination. Again, the process of industrial integration is dependent, as was discussed in Chapter 2, on a wide range of issues, some of which are altogether outside the scope of an industrial programme, which nevertheless determine its success.

Some aspects of this problem are accentuated by the second issue, which is that of the present national industrial structures which are expected to form the basis for integration. The integration process cannot rely on a wide variety of industrial resources: what is to be integrated is not a full set of sophisticated industrial systems but instead a number of economies which are in many cases still highly dependent on imports of manufactures (especially with a high technology and capital content) from outside the region. It is partly a problem of lack of complementarity: there is a good deal of overlap in many sectors which dominate the total production, such as food processing, clothing, and textiles. There is overlap also in large scale mineral resource-based industries such as the metals sector, and even more overlap if one considers the aspirations of a number of countries in this field. It must also be said that the problems of overlap would be worse if the existing capacity were in better shape, and only the fact that it is in some cases run down and under-utilized prevents the position being much worse. Under-utilization of capacity, of course has its own negative effects in terms of the uncertainties induced throughout the system and the diversion of resources into costly temporary repair rather than planned maintenance. The structural problem, however, is also one of incompleteness. Putting all the industries of the PTA together still leaves many gaps, revealing considerable dependence on sources outside the region for many products. The industries of the subregion, even with a perfect market system in operation, cannot meet all the industrial needs. Nor should they: in spite of the large geographical spread of the PTA, it can never be expected that it would be the most efficient solution for it to produce all of its industrial requirements, but, rather, that by exchanging its goods and services with other world regions the best distribution of effort will be found. However, the fact that the industrial structure contains so many gaps, that so many of the capacities and the technologies are simply not in place, means that the industries which are there cannot find reliable sources of supply and wide enough markets for their products to ensure continuous production. This is seen very clearly in such industrial subsectors as metals and engineering, where the supply of spare parts is hampered by the absence of local producers, exacerbated by foreign exchange constraints on importing spare parts from outside the subregion.

Thus it may be useful to distinguish between actual and potential industrial integration. Actual integration means fitting together the existing pieces, getting the industries and other resources of the PTA working together, providing one another with capital goods and intermediate inputs, together with support services in fields such as training, engineering services, and R&D. Potential integration involves an analysis of gaps in the structure, not only by direct comparison with the most advanced industrialized countries but, more immediately important, by identifying just where shortages of particular products and support services are acting as major constraints to progress. The gaps have to be identified, therefore, in terms which can be dealt with at a national and subregional level. The absence of maintenance technicians for diesel engines, for instance, cannot be dealt with by a large investment project. But subregional action could still be very important in alerting national governments to the need for concerted action, and making sure that what training resources are to be found within the subregion are used in an optimal way. On the other hand there may be gaps and shortages that can indeed be dealt with by a single investment project, or a planned programme of investment in a few member states. Examples would be cases such as the need for the production of refractory bricks for use in the metals industry and the production of tanning salts for use in the leather industry.

Again, the transport and communication difficulties referred to in earlier sections, together with the geographical dispersion and language barriers, mean that the kind of information flow that would encourage industrial integration does not take place in sufficient volume. Given the levels of overall development and the magnitude of the problems with which national development planners are faced, there is a limit to the pace of progress to be expected in the transport and communications field. As the countries of the subregion continue with implementation of their plans for socio-economic development, the road, rail and shipping systems will certainly improve, but solutions will not be found overnight. Even if resources were available to tackle all problems in this field, many years will be needed to complete the tasks. This makes it all the more important to make a special concentration on methods and systems that attempt to speed up the information exchange that otherwise will take place only slowly and in pace with improvements to the physical infrastructure. The development of trade and commercial information systems, through computerized data systems in manufacturers associations and Chambers of Commerce, is one obvious step on which the PTA has already taken several initial steps. Another is the development of information in more traditional forms, especially through newspapers, television programmes, etc. The trade fair approach is certainly valuable, and can selectively target many important actors in industrial expansion, but it nevertheless lacks the broad coverage of other, media, approaches, and needs to be supplemented on a continuous basis.

3.2 Stages of industrial development: choices and criteria

The above discussion may be summarized by saying that there are two principles which should be followed in determining action at the subregional level. The first is that industrial development, like overall economic development, requires a reasonable similar degree of progress across a broad range of activities. (Just what that range is depends partly on natural resource endowments, existing structures, infrastructure, human resource capabilities, and potential market orientation). The second, and potentially contradictory consideration is that there is in practice a severe limit to what can be done by the member states in a situation of limited resources, and taking into consideration the essentially co-ordinating and promotional role of the PTA secretariat.

The priority industrial subsectors of the of the PTA, if developed sufficiently, would constitute a comprehensive industrial resource for the region. In principle they support one another and together they address the main needs of the population of the region. The present status of these sectors has been discussed above, and the need to move forward in all of them has been recognized by putting forward a broad set of proposed actions, outlined under the heading of individual industrial sectors and cross-sectoral issues.

However, the need to optimize the use of external resources, as well as the difficulty of co-ordinating action in many different areas, suggest that specific criteria be developed for the selection of industrial projects to be promoted at a regional level for the PTA. In other words, it is not enough to say that the project has to have a regional character (and the definition of this has certain difficulties in any case).

One way of classifying actions for industrial development in the region is in terms of three different kinds of project:

- Linkage projects: these address the interconnections between two productive branches
- Sectoral support projects: these address the human resources or industrial services inputs to a particular sector
- General support projects: these address the overall environment for industrial training or industrial support services and are not confined to a single industrial branch.

The term "industrial support services" is a loose one, but it includes a wide range of activities which are not part of a production process but which support it. It includes training, design, marketing, accounting, management computer services and the like. It can also include technological activities such as monitoring, acquisition and transfer, promotion and development of technology. Finally, for the present definition, the building up of institutions to provide such services is also included.

Another way of classifying actions is in terms of whether they relate to investment promotion, or assistance to existing production. The investment promotion activities include opportunity surveys, pre-investment analyses, feasibility studies, etc., as well as the actual mobilization of funds and implementation to the production stage. Assistance to existing production would include technological upgrading, training, technical assistance, etc. This covers in fact all activities not related to actual or potential large scale capital investment. In both of these fields choices have to be made, given that not all potentially useful projects can be supported. It is easier to make choices in the first field because the number of investment projects will probably be smaller than the number of projects of the second type. For both, however, some selection criteria will be needed.

The most important selection criterion may be that projects should address more than one priority sector. This will mean that the project will give a wider impetus to the agreed goals of industrial development in the region, other things being equal, than would a project narrowly confined to a single sector. It also means that the projects directly address the issue of integration from the point of view both of co-operation between the countries of the region and from the point of view of the development of intersectoral linkages.

3.3 Strategic action at the subregional (PTA) level: the selection of projects

During the course of this report reference has been made to a number of projects. These have been proposed under a number of different headings, i.e. the priority sectors of the PTA and important cross-sectoral issues that will determine the success of initiatives in the industrial field. Annex I of this report gives more information about each of the proposed projects. Table 16 therein shows the distribution of projects across key areas and the extent of their expected impact.

The selection can be summarized as follows:

- All the priority industrial subsectors of the PTA have been covered. However, the number of projects in each subsector is different. This reflects to some extent the complexity of the sectors, their relative importance and their amenability to action at a subregional level.
- In addition, a number of projects in the various fields of industrial support services have been included. As Table 16 indicates, these are usually envisaged as taking effect across the broad range of industrial subsectors.
- The encouragement and enhancement of linkages between priority subsectors has been an important consideration. These are not only services linkages, but address also key material inputs used by several sectors, such as, for instance, chemicals used in the metals and engineering sectors.
- Overall, there is an emphasis on informational, institution-building and R&D type activities and on the production side, towards rehabilitation, environmental considerations, improved efficiency and better use of natural resources.
- The origins of the projects are various. Some are based on those already agreed at PTA level, and others are derived from findings of the UNIDO Multi-disciplinary Programming Mission. Still others have been proposed from within UNIDO based on existing experience in the region. Finally, some projects have been developed in response to perceived gaps in the programme.
- In determining the location of projects, the need to avoid too great a bias towards a few countries has been kept in mind. However, it is still the case that some PTA countries have not been included as specific locations for a project. Still it should be recognized that many of the projects will directly benefit all member states, especially those in areas such as R&D, information exchange, human resources development, etc.

3.4 Financial implications of the proposed programme

- The majority of projects are development projects which need external assistance. Sometimes this is in respect of specific high level expertise, or specialized equipment not available within the region. In so far as it has been possible to costs the proposed projects, this has concentrated on the dimensions of the external component. However in many cases there is an important component required from within the subregion also, and in some cases this is the only one. This is particularly so for some special cases, where the project takes the form of a solidarity action by other PTA states on behalf of a smaller one with special difficulties.
- A few investment projects have also been included, but more often the activity proposed is essentially pre-investment in nature. This is because the investment opportunities need considerable further investigation before a final decision can be taken, or because there has been time enough for conditions to have changed since the original pre-investment

studies were done.²⁴ In addition there is a wider task in some cases of reconciling a number of potentially conflicting investment proposals from different parts of the sub-region.

- A number of projects are proposed for which the financial requirements are not large but which are thought to provide good potential for improving the information and services environment for industrial integration.

The financing of these projects is envisaged as taking place from a variety of sources. PTA states could themselves pool resources together to implement some of these projects. Others, especially those in specific areas of technology or having direct implications for issues such as rural development, could serve as a subject of discussion with bilateral donors who have shown particular interest in these subjects such as NORAD, SIDA, etc. Again, ADB, World Bank, and EEC/EIB might be appropriately approached in connexion with larger projects, especially those with an investment component or a particular link to national policy issues such as rehabilitation. Finally, UNDP and specialized agencies of the United Nations system, such as UNIDO, FAO, UNEP, ILO, and ITC could also be approached with regard to the financing of other parts of the programme.

²⁴A further consideration in this regard has been the co-operation between UNIDO and PTA in the identification and promotion of industrial investment opportunities for co-operation between partners in the PTA subregion and developed countries.

ANNEX I

COMPONENT PROJECTS FOR REGIONAL CO-OPERATION

Table 16

IMPACT OF THE PROJECTS ON KEY SECTORS & ISSUES

	metals	engineering	environment	chemicals	agro- industries	building materials	human resources/ services	energy	other key issue
MET/01	X	X					X		technology
MET/02	X	X							
MET/03	X	X						X	
MET/04		X							
MET/05	X	X		X					
ENG/01		X			X		X		technology
ENG/02	X	X		X	X	X			
ENG/03		X							
ENG/04		X				X			
ENG/05		X							health
ENG/06		X							
ENV/01	X		X	X	X	X			health
ENV/02			X						food,health
ENV/03			X						food,health
ENV/04			X						health
ENV/05			X	X					health
CHEM/01				X	X				agriculture
CHEM/02				X					agriculture
CHEM/03	X	X		X					
CHEM/04				X	X				packaging
CHEM/05				X				X	
CHEM/06				X	X				
CHEM/07				X					health
CHEM/08				X	X				agriculture
CHEM/09				X	X		X		agriculture
CHEM/10				X					

(continued)

	metals	engineering	environment	chemicals	agro- industries	building materials	human resources/ services	energy	other key issue
CHEM/11				X	X				agriculture
CHEM/12				X					agriculture
AGRO/01					X		X		
AGRO/02					X		X		
AGRO/03					X				technology
AGRO/04					X				marine resources
AGRO/05					X				
AGRO/06		X			X		X		technology
AGRO/07					X		X		technology
AGRO/08					X		X		technology
BLD/01		X			X				
BLD/02					X	X			packaging
HRS/01							X		
HRS/02				X	X	X	X		
HRS/03							X		standardization
HRS/04					X		X		SM, technology
HRS/05				X	X	X	X		SM
HRS/06	X	X	X	X	X	X	X	X	finance
HRS/07	X	X	X	X	X	X	X	X	technology
HRS/08	X	X	X	X	X	X	X	X	technology
HRS/09	X	X		X	X	X	X	X	finance
HRS/10					X		X		packg., std.
HRS/11							X		SM
ENY/01		X						X	
ENY/02	X		X	X	X	X	X	X	
ENY/03			X	X	X			X	

LIST OF PROJECTS

- MET/01: Initiation of activities of the PTA Metallurgical Technology Centre
- MET/02: Product rationalization and upgrading in iron and steel plants/rolling mills in the PTA sub-region
- MET/03: Rehabilitation and expansion of the East African Steel Corporation mill in Uganda
- MET/04: Development of a programme for the production of sponge iron in the PTA sub-region
- MET/05: Integrated development programme for metal surface treatment in PTA countries
- ENG/01: Initiation of a CAD/CAM demonstration network for the PTA region
- ENG/02: PTA programme for the production of spare parts
- ENG/03: Feasibility study on the expansion and development of machine tool production for PTA countries
- ENG/04: Metal fabrication unit for the building industry
- ENG/05: Policy analysis and feasibility evaluation of the indigenous sub-regional production of hospital equipment and its maintenance
- ENG/06: Pilot development of a regional network of industrial sub-contracting exchanges
- ENV/01: Preparation and dissemination of a model Environment Impact Statement
- ENV/02: Safer pesticide formulation/application technology
- ENV/03: Establishment of a demonstration plant for the production of non-persistent, non-chlorinated insecticides
- ENV/04: Small-scale industrial waste water treatment - Pilot testing installations
- ENV/05: Industrial safety and accident prevention system
- CHEM/01: Industrial chemicals from indigenous carbohydrate in the PTA states
- CHEM/02: Building a regional essential oils industry

- CHEM/03: Consumption/production survey of industrial surfactants in the PTA countries
- CHEM/04: Diagnostic survey of plastics transformation industries in PTA countries
- CHEM/05: Situation analysis of the development of the petrochemical industry in the PTA countries
- CHEM/06: Establishment of a regional Inorganic Salts Technology Development Centre (ISTDC)
- CHEM/07: Establishment of a sub-regional Centre for the Development and Production of Plant Medicinal Products for Pharmaceutical Use
- CHEM/08: Prefeasibility study for a fertilizers formulation plant in Lesotho
- CHEM/09: Pilot demonstration scheme for more efficient phosphatic fertilizers solubilization and absorption by a crop plant
- CHEM/10: Rehabilitation of the urea ammonia plant in Somalia
- CHEM/11: Inter-regional approach for the development of pesticides of botanical origin
- CHEM/12: Development of prototype mobile seed dressing applicators
- AGRO/01: Sugar Industry Regional Training Centre
- AGRO/02: Training strategy for human resources in food processing testing and quality control
- AGRO/03: R&D Programme for Food Technologies
- AGRO/04: Identification of the opportunities of establishing fish processing plants
- AGRO/05: Blankets manufacturing plant in Lesotho
- AGRO/06: Regional Centre for Textile Industry
- AGRO/07: Training Strategy for the Development of an Integrated Production and Technology Management System for Textile Industry in Kenya for PTA countries
- AGRO/08: Establishment of a Leather Research and Technology Centre for PTA sub-region
- BLD/01: Rehabilitation and rationalization of cement production in the PTA subregion: second phase
- BLD/02: Assessment of rehabilitation requirements of glass plant in Tanzania and the development of a glass programme for the PTA sub-region

- HRS/01: Training strategy for the development of human resources for the promotion and management of small-scale industries for the PTA sub-region
- HRS/02: Industrial Management Development Programme for the PTA sub-region
- HRS/03: Assistance to PTA member states in the promotion of standardization and quality control systems
- HRS/04: Promotion and commercialization of small-scale industrial/rural technologies in the PTA sub-region through the Development Technology Centre
- HRS/05: Programme for promotion and development of small- and medium-scale industrial activities in the PTA sub-region with particular emphasis on women in industrial development
- HRS/06: Programme for the development of manpower capabilities for project identification, formulation, monitoring and evaluation
- HRS/07: Pilot study on the development of an industrial R&D programme
- HRS/08: Industrial Services Register and Development of an Industrial Services Clearing House
- HRS/09: A Manufacturing Investment Trust for the PTA
- HRS/10: Regional Centres for Standardization and Quality Control with emphasis on packaging materials
- HRS/11: Intra-regional Co-operation for Small-scale industry Promotion
- ENY/01: Power Plant Rehabilitation
- ENY/02: Industrial Energy Conservation and Auditing Programmes for the PTA countries
- ENY/03: Programme for the utilization of woodwastes from existing forest plantations and forest industries for more efficient charcoal production in the PTA sub-region

PROJECT SUMMARY NO. MET/01

INDUSTRIAL AREA: FERROUS AND NON-FERROUS METALS

1. Project Title: Initiation of activities of the PTA Metallurgical Technology Centre
2. Objective: To develop, strengthen and diversify the metallurgical industries of the PTA through improved research, technical services and training
3. Location:
Redcliff, Zimbabwe, with satellite institutions in other PTA states
4. Institution(s):
MTC
5. Estimated costs:
\$US 750,000 - 1,000,000
6. Estimated duration:
1 year
7. Project description and additional information:

The long-standing proposal for a Metallurgical Technology Centre has been the subject of a workshop which endorsed recommendations on the scope and activities of the centre. A steering committee has been established. Zimbabwe has offered to provide facilities including the necessary buildings. These developments have been endorsed by the PTA Council of Ministers in 1989. A detailed report is now being completed outlining proposals for the practical operation of the centre, including organizational structure, proposed physical layout, equipment requirements, staffing needs, estimates of infrastructure and building costs (to be met by Zimbabwe) together with the cost requirements in terms of equipment, international expertise, and training. The Steering Committee of the MTC will meet on 30 April 1990 to make recommendations to the PTA on these findings, and may also make recommendations on initiation of activities. The present project is intended to cover initial operations of the MTC in the light of the Steering Committee's recommendations. Thus, it would provide a means by which the MTC, although still at its temporary site at the Institute of Mining Research, Harare, could begin to meet PTA objectives through selective action in the fields of metallurgical research, technical services and training.

PROJECT SUMMARY NO. MET/02

INDUSTRIAL AREA: IRON AND STEEL

1. Project Title: Product rationalization and upgrading in iron and steel plants/rolling mills in the PTA sub-region
2. Objective: To increase, rationalize and upgrade the production of steel plants/rolling mills in Ethiopia, Mozambique and Mauritius
3. Location:
Ethiopia, Kenya, Mozambique, Mauritius, and Tanzania
4. Institution(s):
Ministries of Industry, iron and steel companies
5. Estimated costs:
\$US 1,560,000
6. Estimated duration:
7. Project description and additional information:

Numerous small steel plants/rolling mills and re-rolling mills in the PTA sub-region are, without exception, operating with sub-standard equipment, low level of technological/metallurgical know-how and inadequately trained personnel. A number of steps have already been taken to improve the current situation. UNIDO has already engaged in two main projects aiming at carrying out an in-depth analysis of the subregion's existing steel plants and rolling mills and identifying the technical assistance and training requirements. The latest UNIDO funded project (UC/RAF/88/022) concerned a number of steel plants in Ethiopia, Kenya, Mozambique and Tanzania. The proposed project aims at increasing capacity utilization of the steel rolling mills in Ethiopia, Mozambique and Mauritius as well as at strengthening the technological capabilities, management and operations through the provision of expertise, equipment, on-the-job training and elaboration of an investment programme for longer term rehabilitation needs. The project will also review the status and likely impact of the proposed rolling mill in Zambia. Outputs of the project will be:

 - (1) Upgraded and more efficient steel plants/rolling mills with improved metallurgical practices for steel making and rolling operations;
 - (2) A cadre of trained technicians and plant managers;
 - (3) A report containing an elaboration of an investment programme for long-term operation of the plants.

PROJECT SUMMARY NO. MET/03

INDUSTRIAL AREA: IRON AND STEEL

1. Project Title: Rehabilitation and expansion of the East African Steel Corporation mill in Uganda
2. Objective: To increase productive capacity for iron and steel in the East African Steel Corporation mill
3. Location:
Uganda
4. Institution(s):
Ministry of Industry
5. Estimated costs:
\$US 31 million
6. Estimated duration:
3 years
7. Project description and additional information:

The project aims at rehabilitating and expanding the productive capacity of the East African Steel Corporation. The production is planned to increase to 25,000 tonnes by 1991. Scrap would be part of the raw material of the plant, although the real amount locally available has not yet been ascertained. If this was not enough for the plant, it would have to be imported from neighboring countries or substituted by sponge-iron from the plant proposed in Uganda. Another external linkage will be the importation of steel billets from Ziscosteel in Zimbabwe. The project will also be linked to the proposed sponge iron programme (MET/04). The project has been funded more than fifty per cent. However, the civil works programme cannot start because of lack of available working capital. This project is suggested for the medium-term, as far as promotion by the PTA is concerned.

PROJECT SUMMARY NO. MET/04

INDUSTRIAL AREA: IRON AND STEEL

1. Project Title: Development of a programme for the production of sponge iron in the PTA sub-region
2. Objective: To establish the techno-economic feasibility of the production of sponge-iron as an alternative feed stock for rolling mills in the PTA
3. Location:
To be determined (Mozambique, Tanzania, Uganda, Zambia, Ethiopia)
4. Institution(s):
Ministries of Industry and Economic Planning and Development and Ministry of Industry and Technology of Uganda
5. Estimated costs:
\$US 700,000
6. Estimated duration:
To be determined
7. Project description and additional information:

The expansion of the production of sponge iron in the PTA has been an objective for some considerable time. A number of candidate countries have emerged as offering to initiate or expand production in order to meet sub-regional needs. All of them have ore deposits and existing plants within the sector. Zambia also has coal supplies. So has Mozambique, but the security situation might be unfavourable for such development. Again, Tanzania has the necessary coal, but less than adequate infrastructure. Finally, Uganda has no coal (although it has agreed with Tanzania on supplies), and its infrastructure for its proposed site would need to be developed. (There is also an alternative site in Uganda which has good infrastructure but the ore deposits contain titanium, necessitating alternative technologies.) The situation is thus a complex one. Decisions as to promotion of individual projects and scheduling of on-stream capacities and production need careful analysis of markets, infrastructure and technology options, in order to make recommendations on the size, scope, timing and execution of investment decisions. The outputs of the project would be a set of feasibility studies covering production possibilities in the different locations.

PROJECT SUMMARY NO. MET/05

INDUSTRIAL AREA: METALS

1. Project Title: Integrated development programme for metal surface treatment in PTA countries
2. Objective: To increase the quality and operation time of metal elements for household, agriculture and engineering applications through: improvement of the technological processes of the metal surface treatment operated locally
3. Location:
To be determined
4. Institution(s):
Ministries of Industry, manufacturing associations, PTA Metallurgical Technology Centre
5. Estimated costs:
\$US 345,000 (\$US 134,000 for national inputs,
\$US 211,000 for external inputs)
6. Estimated duration:
1 year
7. Project description and additional information:

In general, the quality of metal produced in developing countries is low, and in many cases the surface treatment processes are decisive for the long term operation of machine tool or agricultural equipment parts. The processes of surface treatment require technological know-how and special chemical formulations. Surface metal treatment processes are rather complex and sophisticated from the technological point of view. Each process has its own specialized equipment, the properties of the metal surface have to be tested in a well equipped laboratory and for all protection processes special chemical compositions are required. However, this process, once established, is easy to operate and control. The efficiency of protective metal surface treatments has been shown in many theoretical studies. In fact, it determines the high quality of the products in the developed countries. As it is always cheaper and more efficient to use high quality, resistant material which guarantees long and stable operation and application of metal products, the intensive and integrated development of metal surface treatment must be one of important priority for further industrialization of PTA countries. Modernization of the technological processes of the metal surface treatment will have a direct impact on improving the economic and financial status of local small-scale industry, because it will mean a better quality of its metal inputs. The project would be carried out under the close supervision of the PTA Metallurgical Technology Centre or its Steering Committee.

PROJECT SUMMARY NO. ENG/01

INDUSTRIAL AREA: ENGINEERING

1. Project Title: Initiation of a CAD/CAM demonstration network for the PTA region
2. Objective: To encourage the diffusion of appropriate automation techniques in manufacturing industry in the PTA countries by setting up an experimental network for the exchange of experience in the use of CAD/CAM
3. Location:
Ethiopia, Kenya, Malawi, Tanzania
4. Institution(s):
Engineering Design Centre, Ethiopia, Kenya Industrial Research and Development Institute, Polytechnic of Malawi, Tanzania Engineering Manufacturing Design Organization (TEMDO), ARCDEM and local manufacturers
5. Estimated costs:
\$US 200,000
6. Estimated duration:
2 years
7. Project description and additional information:

Computer Aided Design and Manufacturing (CAD/CAM) is a term covering a set of techniques having increasing importance in manufacturing in both developed and many developing countries. The techniques make the graphic design process easier and more flexible (CAD) and can allow for automatic control of machines based on the design produced (CAM). This project would concentrate on (a) initial testing and familiarization of software and hardware; (b) pilot applications, of CAD in particular, in co-operation with selected factories in the countries concerned; (c) examining possible guidelines for hardware and software standardization; (d) making recommendations on applications in selected branches of manufacturing.

The project will be based on, *inter alia* experience of the CAD/CAM programmes UNIDO has operated in Europe. It will take account of rapid technological change and make use of cheap and robust solutions to design and tooling problems, such as PC-based and UNIX-platform-based CAD/CAM systems.

The network of centres will evaluate and test hardware and software and promote sector-specific solutions. The key sectors would include textiles, clothing, leather, wood products and furniture. Standard solutions, allowing for the exchange of software and data on floppy disks, or on standard expansion cards and modules, would be developed. This aspect would be co-ordinated with ARCDEM and ARSO.

PROJECT SUMMARY NO. ENG/02

INDUSTRIAL AREA: ENGINEERING

1. Project Title: PTA programme for the production of spare parts
2. Objective: To develop engineering industry of spare parts for manufacturing industry
3. Location:
Kenya, Malawi, Mauritius, Somalia, Tanzania, Uganda, Zambia, Zimbabwe
4. Institution(s):
Ministries of Industry, Manufacturing associations
5. Estimated investment costs:
\$US 80 - 120 million
6. Estimated duration:
2 - 4 years
7. Project description and additional information:

In the PTA sub-region, existing spare parts manufacturing is quite below the requirements of industry. Moreover, it is limited to agricultural machinery, to machinery, machines and equipment employed in mining industries and to parts for transport vehicles. However, progress to date means that the sub-region has a good base from which to develop. In order to meet the spare parts requirements of the PTA manufacturing industry, the present project suggests that, as a first step, the countries in the sub-region could establish a centralized, integrated spare parts manufacturing complex, on a country-level basis. The complex would cater to the milling companies, bakeries, breweries, refined oil plants, sugar plants, textile units, glass industries, engineering units, etc. of every country. The complex could offer the following products: simple mechanical spare parts, tool room products (required by industries such as metals, glass, plastics), fabricated parts (mainly for replacement in food processing industries), grinding media (required mainly for cement plants) and ferrous and non-ferrous castings. Services offered would include repair and overhaul of mechanical spares and sub-assemblies, repair and rewinding of electric motors, and heat-treatment and electro-plating. The plant should be integrated, of medium-scale size, with captive promotion facilities which would include foundry, machine shop, fabrication shop and service shops. The recommended capital investment would range approximately between 10 and 15 million dollars in each case. Maximum use would be made of existing achievements in this field, by linking and developing as far as possible operational spare parts and allied industries in PTA countries. This project is based upon the findings of the studies on spare parts production carried out by ECA for the PTA region. Other PTA studies, including the country surveys now under way, would also contribute.

PROJECT SUMMARY NO. ENG/03

INDUSTRIAL AREA: ENGINEERING

1. Project Title: Feasibility study on the expansion and development of machine tool production for PTA countries
2. Objective: To upgrade the production of machine tools in the PTA sub-region and lessen its dependence on imported inputs
3. Location:
Tanzania and other countries to be determined
4. Institution(s):
Ministries of Industry and existing production facilities
5. Estimated costs:
To be determined
6. Estimated duration:
To be determined
7. Project description and additional information:

The machine tool industry is both technologically sensitive and central to industrial development. However, few developing countries, whether in Africa or elsewhere, have significant production of machine tools. One of the few machine tools enterprises in the PTA sub-region is in Tanzania, the Kilimanjaro Machine Tools Company at Moshi. This enterprise operates with Bulgarian bilateral co-operation. It produces metal processing and wood processing machine tools, which could be exported to other PTA member countries. The plant is at present stopped because of lack of financing to import casted equipment components. The project will undertake a feasibility study on the replacement of parts of the imported castings through the locally welded constructions. Other PTA countries are considering beginning the production of machine tools. The present study will also assess existing studies on production possibilities and make recommendations on appropriate investments to meet the sub-regional requirements for machine tools.

PROJECT SUMMARY NO. ENG/04

INDUSTRIAL AREA: ENGINEERING

1. Project Title: Metal fabrication unit for the building industry
2. Objective: Increase the production of steel structures for the building industry
3. Location:
Lesotho
4. Institution(s):
Lesotho National Development Corporation
5. Estimated costs:
\$US 140,000
6. Estimated duration:
To be determined
7. Project description and additional information:

Lesotho National Development Corporation has undertaken a prefeasibility study based on imports of angles and sections etc. for production of steel structures for the building industry. The project would be based on iron and steel products from Zimbabwe, and LNDC has already carried out preliminary work. A full fledged feasibility study is therefore recommended to establish the viability of the venture. This study should include a survey of the workshops and industrial plants producing metal components for the building industry in Lesotho and an assessment of their profitability.

PROJECT SUMMARY NO. ENG/05

INDUSTRIAL AREA: MEDICAL SUPPLIES

1. Project Title: Policy analysis and feasibility evaluation of the indigenous sub-regional production of hospital equipment and its maintenance
2. Objective: To enhance and upgrade the local production and maintenance capacity of hospital equipment in the sub-region
3. Location:
PTA member countries (to be determined)
4. Institution(s):
Ministries of Public Health, local authorities, private companies
5. Estimated costs:
To be determined
6. Estimated duration:
To be determined
7. Project description and additional information:

Within the sub-region there are some countries with a well developed policy towards the medical sector and other, economically equally well developed countries, with a less well developed policy towards the equipment of the hospital sector. And in the relatively less developed countries of the sub-region there is an enormous shortage of appropriate hospital equipment. Experience has also shown that even when the equipment is available it is often out of service due to the absence of replacement parts or of the trained maintenance personnel. The project will carry out comparative analysis of the policies and achievements as well as of the local productive capacity of hospital equipment in the sub-region. On this basis, it would then carry out pre-feasibility studies for the production of generic types of equipment closely related to existing productive capacity in a similar industry (e.g. hospital tables, beds, night stands, etc., as cases of product diversification in existing medicalworking enterprises). The project would also carry out pre-feasibility studies for the development of a network of sub-regional maintenance centres for hospital equipment, complete with a mobile maintenance facility for servicing equipment in situ in the rural areas.

PROJECT SUMMARY NO. ENG/06

INDUSTRIAL AREA: SUPPORT SERVICES (METALS, ENGINEERING)

1. Project Title: Pilot development of a regional network of industrial sub-contracting exchanges
2. Objective: To diffuse information on sub-contracting capacities within the region, with emphasis on the mobilization of small and medium-scale industry
3. Location:
Kenya, Zimbabwe, Mauritius, Tanzania
4. Institution(s):
National Chambers of Commerce and Industry, Federations of Industry or Manufacturers Associations
5. Estimated costs:
\$US 400,000
6. Estimated duration:
2 1/2 years
7. Project description and additional information:

The project will set up sub-contracting exchanges in each of the countries listed above. A sub-contracting exchange is an information and promotion centre for industrial sub-contracting between main contractors and sub-contractors. It aims at the optimal utilization of the productive capacities of the member industries. In sectoral terms, sub-contracting is usually most important in the metalworking industry, followed by mechanical, electrical and electronic engineering. The exchanges to be set up would initially concentrate on the metalworking industry, to be broadened to include other sectors as the systems were developed. Not only the larger companies would be involved, since this is a branch where a wide range of small and medium-scale industries can also be involved, covering a wide range of products and processes, from simple to advanced. The present project will set up national exchanges, with a view to linking them in a regional network when they are successfully operating and the major work of data collection, administrative action and sensitization of manufacturers has been carried out. As well as increasing the sectoral scope of the exchanges, their number can also be increased by establishing them in other PTA countries on the basis of the experience gained in the present project. The sub-contracting exchange concept is one which has been successfully applied by UNIDO at a national level in North Africa (where a regional network has also been set up) and Latin America. Given the objective of laying the ground for a regional network, the present project will give particular attention to co-ordination at a regional level and the application of a common methodology and a common nomenclature for standardized databases on sub-contracting.

PROJECT SUMMARY NO. ENV/01

INDUSTRIAL SUPPORT AREA: PROJECT APPRAISAL

1. Project Title: Preparation and dissemination of a model Environmental Impact Statement
2. Objective: To prepare and disseminate a model Environmental Impact Statement among environmental protection authorities in the PTA sub-region
3. Location:
To be determined
4. Institution(s):
Ministries of Industry, environment protection agencies
5. Estimated costs:
\$US 183,000
6. Estimated duration:
1 year
7. Project description and additional information:

The project is intended to evaluate and select from the many available concepts on Environment Impact Statements, the most suitable one and adapt it to the local conditions and regulations. The preparation and dissemination of the model Environment Impact Statement among the Environment Protection Authorities in the PTA countries will make it possible for them to formalize the procedures for investment decisions in the field of environment protection. The model statement will also assist in the identification of pollution and wasteful technologies already in operation as well as giving the opportunity to suggest necessary remedies. Thus the approach followed will be a differentiated one, on having an impact on the investment promotion process and the establishment of a safely operated industry.

PROJECT SUMMARY NO. ENV/02

INDUSTRIAL AREA: PESTICIDES

1. Project Title: Safer pesticide formulation/application technology
2. Objective: To introduce efficient and economic ways of formulating and applying pesticides for the benefit of small- and medium-scale farmers in the PTA sub-region
3. Location:
Two or three PTA countries to be selected (e.g. Rwanda, Kenya, Somalia)
4. Institution(s):
Ministries of Agriculture
5. Estimated costs:
\$US 1,840,000
6. Estimated duration:
5 years
7. Project description and additional information:
Today in African countries more than a third of food crops are lost due to pests both during pre-harvest and post-harvest stages. Recent developments both in the introduction of new pesticides, safer formulation and effective target oriented application technologies have made it possible to apply pesticides at a rate per hectare several times lower than normally used in the 50's, the 60's and the 70's. These types of technologies would be very useful to the small/medium scale farmers to increase food production by protecting the crop at the pre-harvest and post-harvest stages. This will also reduce risks for those working with the pesticides, and will mean a lower use and lesser amount of pesticides per unit area. The project aims at establishing regional centres in two or three countries of the PTA sub-region for developing technologies for formulation and application.

PROJECT SUMMARY NO. ENV/03

INDUSTRIAL AREA: PESTICIDES

1. Project Title Establishment of a demonstration plant for
the production of non-persistent, non-
chlorinated insecticides
2. Objective: To develop capability in the PTA sub-region
for the production of non-persistent pesticides,
including less toxic and non-chlorinated insecticides
3. Location:

One PTA country to be selected
4. Institution(s):

Ministries of Agriculture
5. Estimated costs:

\$US 2,625,000
6. Estimated duration:

4 years
7. Project description and additional information:

There is considerable controversy world-wide concerning the use of pesticides in general and especially on the persistent organo-chlorine and other toxic pesticides. However, in developing countries insecticides have become an essential input into agriculture to protect crops being devastated by insects. While the organo-chlorines are being phased out, organo-phosphorus insecticides offer a wide range of compounds (most of them patent free) with broad spectrum of activity, less toxic to mammals and not persistent in the environment. With UNIDO's experience in the production of dimethoate and malathion, it is possible to establish a demonstration plant in a country which has a sizeable market and use it as a focal point for other countries of the region. Such an establishment would depend on the infrastructure available in the country, that is on the availability of a good transport network and of safety and effluent control facilities. The demonstration plant would serve for future expansion in the manufacture of pesticides in the region with possible joint venture arrangements in the sub-regional market.

PROJECT SUMMARY NO. ENV/04

INDUSTRIAL SUPPORT AREA: ENVIRONMENTAL TECHNOLOGIES

1. Project Title Small-scale industrial waste water treatment - Pilot testing installations
2. Objective: To test small-scale installation for the proper treatment of industrial sewage waters of industrial estates

3. Location:

To be determined

4. Institution(s):

Ministries of Industry, municipal water authorities

5. Estimated costs:

\$US 753,000 (\$US 254,000 for national inputs,
\$US 499,000 for external inputs)

6. Estimated duration:

3 years

7. Project description and additional information:

Practical measures developed and recommended by the international community on industrial waste problems include the following:

- Minimizing of hazardous wastes through modifying production processes
- Reprocessing/recycling of wastes
- Promoting cleaner (low-waste) and safer, renewable energy sources not producing hazardous wastes
- Supporting and financing research and development, and commercialization

of cleaner production technologies

- Separating hazardous and non-hazardous wastes
- Instituting guidelines for handling and storing hazardous wastes
- Transforming hazardous wastes to non-hazardous
- Disposing of waste in controlled landfills.

The project is intended to evaluate and select from the many available concepts on industrial sewage water treatment, the most economical one and to establish the pilot installation at the existing industrial estate. The dispersion of the small-scale industry in the PTA countries is a considerable obstacle in the application of the large-scale waste water treatment technologies developed and implemented in the industrialized countries. At an existing and functioning industrial estate, it would be possible to establish an universal pilot installation and test its operation at different available waste waters to prepare recommendations and guidelines for the design and selection of equipment for other industrial estates or dispersed industries in large cities.

PROJECT SUMMARY NO. ENV/05

INDUSTRIAL SUPPORT AREA: CHEMICALS

1. Project Title: Industrial safety and accident prevention system
2. Objective: To establish uniform guidelines and disseminate international and regional experience in the field of industrial safety
3. Location:
To be determined
4. Institution(s):
Ministries of Industry, manufacturing associations of the chemical industry
5. Estimated costs:
\$US 817,000 (\$US 424,000 for national inputs,
\$US 393,000 for external inputs)
6. Estimated duration:
3 years
6. Project description and additional information:

At present, the production of chemicals, and the transportation and consumption of chemicals by non-chemical companies, involves a wide range of hazards related to processing and handling of potentially dangerous materials. Furthermore, a large variety and quantity of waste materials is being generated. An integrated safety system responding to the needs of decision-makers in the Ministries of Industry and Manufacturing Associations of the Chemical Industry should be established to respond to the following needs:

- how to manage industrial production and its development in full co-ordination with environment protection;
- how to consider the impacts of waste and hazardous substances;
- how to handle accidents and disasters in a factory and at the national level.

At present, there are no local capabilities for developing such an integrated system, and the requirements of safe industry operation and further clean-technology directed development call for the international assistance. The aim of the project is to transfer knowledge and theoretical as well as practical skills and abilities to executive officers and experts working in the field of risk assessment and management, technology evaluation, waste management, and environment protection and pollution control. The project will establish a computerized system providing the decision-makers with the necessary information on risk assessment, environment protection and local safety measures at given scenarios. Also a data bank on hazardous materials and accident prevention methodology will be provided.

PROJECT SUMMARY NO. CHEM/01

INDUSTRIAL AREA: ORGANIC CHEMICALS

1. Project Title: Industrial chemicals from indigenous carbohydrate in the PTA states
2. Objective: To undertake a screening survey to select locations within PTA member states for detailed studies to determine the financial attractiveness of investment in sucro-chemicals plants

3. Location:

PTA states

4. Institution(s):

To be determined

5. Estimated costs:

Screening survey: \$US 100,000
Site specific detailed studies: \$US 500,000 each

6. Estimated duration:

Screening survey: 6 months
Detailed studies: 12 months each

7. Project description and additional information:

Sucro-chemicals are industrial (and fine) chemicals produced from sugar and molasses by fermentation. Their production contributes to diversification of the market for sugar - an important agricultural product in many PTA states, the price of which is frequently at the mercy of the international commodity market.

Chemicals such as acetone, n-butanol, acetic acid, acetic anhydride, ethyl acetate, butyl acetate are generally manufactured by petrochemical processes on a large scale in industrialized countries. Local manufacture from indigenous resources saves foreign exchange. Fermentation - based production can be on a small scale with minimum waste products.

Chemicals such as fructose, citric acid, MSG and L-lysine could be manufactured in certain PTA states for export.

Countries wanting to produce basic petrochemicals for plastics may be unable to because the minimum economic scale is much greater than home market requirements and the minimum investment is too high.

Fermentation- based petrochemicals (ethanol - ethylene) are an attractive alternative.

PROJECT SUMMARY NO. CHEM/02

INDUSTRIAL AREA: ORGANIC CHEMICALS

1. Project Title: Building a regional essential oils industry
2. Objective: To set up model field distillation facilities for production of essential oils
3. Location:
Comoros, Ethiopia, Kenya, Malawi, Rwanda and Zambia
4. Institution(s):
Ministries of Agriculture
5. Estimated costs:
\$US 230,000
6. Estimated duration:
2 years
7. Project description and additional information:

Processing of aromatic plants to produce essential oils is a rural-based industry ideally suited to developing countries. The wide climatic regions make it possible to cultivate a variety of such plants and the simple technology of stem-distillation lends itself to easy transfer and application in a developing country context. UNIDO has successfully instituted technology for the processing of essential oils in Nepal and Vietnam and commercial production of quality oils is now beginning. These products are low volume, high value products and can bring in valuable foreign exchange earnings. The focal points could be countries such as Ethiopia, Kenya, Malawi and Rwanda. The present project will consist of the preparatory assistance by an expert or a UNIDO staff Technical Adviser, for assessment and project formulation and advice on the acquisition of technology hardware, technology transfer and manpower development.

PROJECT SUMMARY NO. CHEM/03

INDUSTRIAL AREA: CHEMICALS

1. Project Title: Consumption/production survey of industrial surfactants in the PTA countries
2. Objective: Identification and formulation of an integrated development programme in the field of surfactants and improvement of the technological processes in existing installations
3. Location:
Selected PTA member countries
4. Institution(s):
Ministries of Industry, manufacturing associations
5. Estimated costs:
\$US 321,000 (\$US 104,000 for national inputs,
\$US 217,000 for external inputs)
6. Estimated duration:
1 year
7. Project description and additional information:

The project is intended to prepare an integrated programme of the surfactants production development. More than 8,000 chemicals are used in fibre and textile treatment (excluding dyes). These products are not used as individual components of a treatment process, but as complex mixtures, playing a very specific role in the technological process and specially adapted to the kind of equipment and machinery used, the quality of fibres or yarns as well as the future textile material applications. Structural changes in the consumption of the chemicals in Africa was the reason why in the last five years the chemical industry was favorably growing in the region. The aim of the project is to identify the production output of each product and the preparation of an overall production programme which will be possible after completion of the demand/consumption study and identification of the major chemicals used in the treatment recipes. Modernization of the technological processes of the soaps and surfactants will have a direct impact on improving the economical and financial status of the local small-scale industry. This project complements project MET/05, on an integrated metal surface treatment development programme.

PROJECT SUMMARY NO. CHEM/04

INDUSTRIAL AREA: CHEMICALS, PACKAGING

1. Project Title: Diagnostic survey of plastics transformation industries in PTA countries
2. Objective: To survey the plastics transformation industries in selected PTA countries
3. Location:
Selected PTA countries
4. Institution(s):
Ministries of Industry, national manufacturing associations of PTA member countries
5. Estimated costs:
\$US 149,000
6. Estimated duration:
1 year
7. Project description and additional information;

Analysis survey of statistics shows that a dominant role in the plastics processing industry may be played by the following countries: Ethiopia, Kenya, Tanzania, Uganda, Zambia and Zimbabwe. The proposed survey intends to determine which action should be taken on to: (a) improve the efficiency of plastics commodity utilization, and (b) develop the pattern of profitable use of plastics products in the country, in particular the use of plastics in agriculture. Survey results will be generalized later for the whole PTA area, allowing for country-level analysis of policies and options for development.

The following reports will be prepared:

- (1) Regional study on the plastics consumption pattern with recommendations on production profile, technology and production techniques;
- (2) Analytical reports on plastics application in particular in agriculture using existing facilities and recommended directions of the further development;
- (3) Project proposals on further technical assistance in the field of plastics industry development.

PROJECT SUMMARY NO. CHEM/05

INDUSTRIAL AREA: CHEMICALS, ENERGY

1. Project Title: Situation analysis of the petrochemical industry in the PTA countries
2. Objective: To contribute to the development of an appropriate structure of the petrochemical industry in the PTA countries through analysis of the present status and proposals for expansion
3. Location:
PTA countries
4. Institution(s):
Ministries of Industry, Ministries of Energy
5. Estimated costs:
\$US 687,000
6. Estimated duration:
2 years
7. Project description and additional information:

The project is intending to provide an integrated techno-economic study, supported by selected opportunity studies on priority projects in the petrochemical sub-sector in the PTA countries. The project intends to provide methodological assistance in the formulation of investment projects and master plans of the development of the petrochemical industry, to allow decision-makers to up-date and continue development without repetitive external assistance. It will also review and disseminate UNIDO experience in the preparation of integrated master plans in the petrochemical sub-sector. A relevant number of local specialists will be trained in techno-economic assessment through participation in the work of the project. As an additional output of the project one can expect further assistance in selected problems of petrochemical industry development.

PROJECT SUMMARY NO. CHEM/06

INDUSTRIAL AREA: CHEMICALS

1. Project Title: Establishment of a regional Inorganic Salts Technology Development Centre (ISTDC)
2. Objective: To enhance the development of the chemical industry in the PTA countries with respect to inorganic salts production
3. Location:
To be determined
4. Institution(s):
Ministries of Industry, manufacturing associations, a university in the PTA sub-region
5. Estimated costs:
\$US 1,435,000
6. Estimated duration:
4 years
7. Project description and additional information:

Inorganic chemicals play an important role in all sub-sectoral production development, and at certain levels of a country's industrialization, the demand for inorganic chemicals is continuously growing. The leather, glass and ceramics, textile, electronics and electrotechnical industries, and above the chemical industry itself, are large scale consumers of low tonnage inorganic products. Therefore, the development of the R&D facilities is becoming a necessary condition for further industrialization in the chemical industry sub-sector. Considering these options, the PTA would initiate the establishment of a self-reliant Inorganic Salts Chemicals Technology Development Centre (ISTDC). The aim of the project is the development of local R&D facilities and capabilities to develop technological know-how in the field of inorganic salts, and to transfer it to the industry. The project will establish the self-reliant Inorganic Salts Chemicals Technology Development Centre (ISTDC). ISTDC will work as a self-supporting enterprise in the field of research and technology development, chemicals marketing and management. The research and development activities of ISTDC will be concentrated on the fine inorganic chemicals technology development, using local natural resources. The first steps would be taken by selecting a suitable existing facility in the sub-region, probably a university, and improving its resources and upgrading its skills to allow the formation of the ISTDC within this framework.

PROJECT SUMMARY NO. CHEM/07

INDUSTRIAL AREA: PHARMACEUTICALS

1. Project Title: Establishment of a sub-regional Centre for the Development and Production of Plant Medicinal Products for Pharmaceutical Use
2. Objective: To assist member states of the PTA sub-region in their efforts to increase natural resources utilization for industrial development and promote related R&D activities
3. Location:

R&D facilities for medicinal plants in the member states (Zimbabwe and other countries)
4. Institution(s):

Ministries of Health, Industry and Technology, existing R&D facilities
5. Estimated costs:

\$US 1,065,000
6. Estimated duration:

3 1/2 years
7. Project description and additional information:

Although bulk drug manufacture is not being done in the PTA sub-region, the countries are endowed with natural resources which are essential raw materials for the manufacture of a number of drugs and biological products. A proper survey has not been done on the quantities and types of plant species available in the sub-region. However, in Zimbabwe, some varieties have been identified and analysis done on the content of active ingredients. There is a need to provide substitutes for imported bulk drug through the utilization of the country's natural resources (fauna and flora). To set up a well established R&D laboratory is not only capital intensive, but involves high investment costs. The work can however be done on a small-scale by utilizing and upgrading existing R&D institutions in the sub-region. Of these institutions, the Department of Pharmacy of the Faculty of Medicine in the University of Zimbabwe has been identified to host the technical assistance programme for the extraction of indigenous plant material for pharmaceutical use. The project aims at demonstrating the feasibility of extracting essential active ingredients from medicinal plants with a view to promoting their wide-spread utilization in existing pharmaceutical formulation plants and other chemical industries in the sub-region. The outputs of the project will be:

- (1) A fully established Regional Medicinal Natural Products Development and Production Centre consisting of (a) an operational technology development unit; (b) an operational quality control laboratory; (c) an extension service/training unit; (d) information and documentation unit.
- (2) A report containing description of the R&D pilot project, techno-economy analysis and date of field trials.
- (3) Trained technical personnel.

PROJECT SUMMARY NO. CHEM/08

INDUSTRIAL AREA: FERTILIZERS

1. Project Title: Prefeasibility study for a fertilizers formulation plant in Lesotho
2. Objective: To meet the specific fertilizers requirements of Lesotho crop and soil
3. Location:
Lesotho
4. Institution(s):
Ministry of Agriculture, Ministry of Industry
5. Estimated costs:
To be determined
6. Estimated duration:
To be determined
7. Project description and additional information:

Lesotho imports about 25,000 tonnes of fertilizer per annum. In view of the fact that fertilizer has to meet specific requirements in terms of crop and soil type there is a need for a formulation plant (mixing plant) to supply local needs. Fertilizers could be imported from PTA region. Moreover, a significant development in the production of non-traditional crops/vegetables is hoped to take place, in order to reduce the gap between agricultural income and urban and migrant income. In such a case the need for chemical inputs could increase. In view of these considerations, it is proposed here to undertake a pre-feasibility study. It would review the supply and demand levels, including the sources and conditions of supply, and make proposals for a specific solution in regard to a fertilizer formulation plant for Lesotho. Not only is Lesotho one of the BLS states, which in view of their distinctive economic and geographical situation have been targeted for special attention by the PTA, but also Lesotho is one of the PTA states whose manufacturing sector is highly dependent on food processing and other agro-based industries. The project would thus target significant aspects of the country's industrial structure.

PROJECT SUMMARY NO. CHEM/09

INDUSTRIAL AREA: FERTILIZERS

1. Project Title: Pilot demonstration scheme for more efficient phosphatic fertilizers solubilization and absorption by a crop plant
2. Objective: To test the species and suggest a plan of action in the field of optimization of the fertilizers consumption

3. Location:

Burundi

4. Institution(s):

Ministries of Industry, Ministries of Agriculture, University of Burundi

5. Estimated costs:

\$US 441,000

6. Estimated duration:

2 years

7. Project description and additional information:

The project is intended to test the microorganisms increasing the solubility of the phosphatic fertilizers. A number of studies on the use of fertilizers have shown that up to 70 per cent of the phosphate applied by the farmer can become absorbed onto soils clays and organic matter becoming bound to the soil and therefore not readily available to the plant. One of the naturally occurring microorganisms (fungus Penicilinum bilaji) has the ability to solubilize phosphate in the soil. Some research has shown that this microorganism can reduce the amount of commercial phosphate required by up to 50 per cent solubilizing both mineral and organic phosphate while maintaining crop yields. It may be also expected that microorganisms can make available phosphor directly from the phosphate rock, what would lead to substantial investment economy, especially in the small countries with phosphate rock resources but with no possibility to establish feasible phosphatic fertilizer plants. The testing scheme requires establishment of the field experiments with the local production of the microorganism and its application. The project would be centered at the University of Burundi. Relevant tests will be carried out in two or three countries, followed by later dissemination to other with similar soils and crop patterns.

PROJECT SUMMARY NO. CHEM/10

INDUSTRIAL AREA: FERTILIZERS

1. Project Title: Rehabilitation of the urea ammonia plant in Somalia
2. Objective: To ensure proper selection of the equipment and the technical operation scheme of an installed mini-fertilizer plant in Somalia and gain experience for other similar plants in the PTA region

3. Location:

Somalia

4. Institution(s):

Ministry of Industry and Commerce

5. Estimated costs:

\$US 507,000

6. Estimated duration:

2 years

7. Project description and additional information:

A nitrogen fertilizers plant with a capacity of 150 MTPD of urea (and 87 MTPD of ammonia) was established in the years 1980 - 1984 in Somalia. The plant is located 10 km South of Mogadishu on the Indian Ocean coast. From its start-up, production capacity was never achieved and during the period 1985 - 1986 the plant was operational at 20 per cent of capacity. In the years 1986 - 1988 the plant was idle. The reasons for the shut-down were complex, and a combination of technical and economic problems need to be addressed, including revamping of the compressors and analysis of the raw material problem. It is now proposed to rehabilitate the plant through a combination of bilateral and multilateral co-operation. The present project will cover important preparatory and supervisory functions in the rehabilitation process. It will include the proper selection of technology, equipment, and a scheme of operation appropriate for the available technical skills. As the capacity of the plant is typical of a minifertilizer plant, the experience gained at the start-up and operation of the Mogadishu factory will be valuable for other PTA countries with small markets and raw materials availability where the logistic conditions are difficult and minifertilizer plants are under consideration.

PROJECT SUMMARY NO. CHEM/11

INDUSTRIAL AREA: PESTICIDES

1. Project Title: Inter-regional approach for the development of pesticides of botanical origin
2. Objective:
 - (a) To develop use of natural products of the region known to possess pesticidal activity both in agriculture and public health outlets;
 - (b) to reduce the impact of synthetic pesticides in the environment by using locally available natural products.
3. Location:

Asia/Eastern and Southern African (PTA region) countries
4. Institution(s):

Ministries of Agriculture, Agricultural R&D Institutions
5. Estimated costs:

\$US 2,402,000
6. Estimated duration:

5 years
7. Project description and additional information:

Since classical times a variety of substances of natural origin have been used by agriculturalists and horticulturalists for pest control. Research work in recent years has shown that the bitter principle of neem trees contains compounds which are known to be responsible for the biological activity. Even though a number of papers have been published in this area, no systematic application studies have been co-ordinated with the application of neem extracts for agricultural and public health outlets. In the Asian and African (East) regions, work that has been carried out has shown great promise, but there is a lack of expertise to take the work through to commercial success. In order to overcome this, it is proposed to have a co-ordinated approach between the two regions for a systematic approach to exploit the work on neem extracts and take it to the commercial possibility stage. This could be one product or a number of products even in combination with synthetic pesticides if there is an overall advantage. The most important factor is consistency in the quality of production, tested storage stability and proven biological results in medium to large scale field trials. In Asia, countries such as India, Vietnam, the Philippines, Thailand and Malaysia could play an important role while in Africa, countries like Tanzania, Kenya, Ethiopia, Malawi could form the focal points. In the process UNIDO could make use of the extensive experience of GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit).

PROJECT SUMMARY NO. CHEM/12

INDUSTRIAL AREA: PESTICIDES

1. Project Title: Development of prototype mobile seed dressing applicators
2. Objective: To increase agricultural production and achieve self-sufficiency in food production by minimizing the risk of pre-harvest losses
3. Location:
Malawi, Kenya, Somalia, Tanzania, Uganda and Zambia
4. Institution(s):
Ministries of Agriculture, Agriculture R&D institutions
5. Estimated costs:
\$US 908,000
6. Estimated duration:
3 years
7. Project description and additional information:

Many of the common crops such as maize, sorghum, wheat, barley, groundnuts, cotton and vegetables in the PTA sub-region as everywhere in Africa are prone to seed and soil borne pests. Seed dressing over the years has proved to be one of the most effective and economic methods of plant protection. Protection given to crops at an early stage of their growth against soil borne pathogens and pests is considered to be a healthy cost-effective pest control method. It is also well recognized that it offers advantages in terms of efficiency, of economy of materials, reduced contamination of the environment and least damaging to non-target organisms. Given the difficulties of transport and communication in rural societies, it is proposed to develop a mobile seed treatment plant which could serve different parts of the country and which would offer on-the-spot treatment of seeds to be used by the farmers. This, however, means that a few proto-type mobile seed treatment applicators would have to be developed and tested in some countries. The technical knowledge used for the development of seed applicators could be adapted using a modern technology to develop appropriate mobile seed dressing applicators for use in Africa. The project aims at validating the techno-economic feasibility of the seed dressing technology through the development of proto-type mobile seed dressing applicators specifically tailored to the needs of the African farmers with a view to promoting its widespread utilization in the PTA sub-region. It aims too at developing/upgrading skills of technical personnel in operation and maintenance of the mobile seed dressing applicators.

PROJECT SUMMARY NO. AGRO/01

INDUSTRIAL AREA: FOOD PROCESSING (SUGAR)

1. Project Title: Sugar Industry Regional Training Centre
2. Objective: To upgrade and enhance the training capability of the sugar industry training centre in Mauritius so as to allow it to play a regional role
3. Location:
Mauritius
4. Institution(s):
Ministries of Agriculture and Industry
5. Estimated costs:
\$US 50,000
6. Estimated duration:
6 months
7. Project description and additional information:

The Sugar Training Centre in Mauritius is a highly qualified world-famous institution. A preparatory assistance project is proposed here to assess all around the region the potential demand for training and identifying the additional requirements for the Centre to be put in the condition of operating as regional centre. These requirements will be specified, based on the analysis of regional needs, in terms of additional staff requirements, curriculum development, equipment and training material, etc. Modalities for regional use of the Centre, together with a timetable for implementation, will also be included.

PROJECT SUMMARY NO. AGRO/02

INDUSTRIAL AREA: FOOD PROCESSING, HUMAN RESOURCES

1. Project Title: Training strategy for human resources in food processing testing and quality control
2. Objective: Promotion and improved quality of food products through a training capacity and capability based on a policy for strengthening regional co-operation and attaining self-sufficiency and self-reliance
3. Location:
Tanzania
4. Institution(s):
Tanzania Bureau of Standards, PTA Secretariat
5. Estimated costs:
\$US 743,490
6. Estimated duration:
15 months
7. Project description and additional information:

A UNIDO-Tanzania Bureau of Standards (TBS) project started in 1979 on the "Establishment of a food testing and quality control in Tanzania" in co-operation with SIDO (Small Industries Development Organization). Since its inauguration in 1982 the Tanzania Bureau of Standards has published over 100 standards for food and agriculture and carried out hundreds of quality control tests for compliance with these standards. The TBS has a quality control section and organized some basic training courses for the food processing industry, but to-date no special training has been given to the TBS technical personnel to train them as trainers to organize theoretical training at TBS and practical training in industry. In addition to the lack of qualified personnel in the food processing industry, there is a chronic shortage of basic quality control equipment. Most quality control training could be organized at TBS. In the case of the tea industry, the quality control processing training and pilot plant facilities need to be at the processing site where green leaf is handled.

It is proposed therefore to select TBS as the focal point for training trainers for the PTA countries. The pilot plant for training and demonstration to be established at one of the tea processing plants should be established also in other PTA countries with the assistance of TBS. For the success of the project, the co-operation of the food processing industry in Tanzania and in other PTA countries is crucial.

PROJECT SUMMARY NO. AGRO/03

INDUSTRIAL AREA: FOOD PROCESSING

1. Project Title: R&D Programme for Food Technologies
2. Objective: To develop a R&D Programme for Food Technologies in special branches of regional interest
3. Location:
Zambia
4. Institution(s):
PTA Secretariat, National Council of Scientific Research of Zambia
5. Estimated costs:
\$US 1,066,000
6. Estimated duration:
3 years
7. Project description and additional information:

R&D has a major role in developing food technologies aiming at increasing the food processing industry supply so as to allow a country a higher degree of food self-sufficiency. In Zambia the National Council of Scientific Research (NCSR), established in 1967, has developed a number of processes for manufacturing processed food from local raw materials, e.g. carbonated fruit beverages, high protein biscuits and wine. It is proposed here to strengthen the facilities of the centre (machinery and equipment, library and information section) and to upgrade the skills of professional and technical personnel through an intensive fellowship programme and study tours, in order to allow the Centre to work on an R&D programme of regional interest. Given the past experience of the centre in livestock and pest research, it is suggested that it specializes in the field of animal protein production (livestock and meat processing, fishery products, dairy products). Products of animal origin amount indeed to a very small percentage in the total calories intake in Africa (6.5 per cent of total, developed economies 31.7 per cent, Latin America 17.1 per cent, Near East 10.7 per cent). At the same time, PTA countries are highly endowed with animal resources, and the present project could contribute to their better utilization.

PROJECT SUMMARY NO. AGRO/04

INDUSTRIAL AREA: FISHERIES

1. Project Title: Identification of opportunities for establishing fish processing plants
2. Objective: To map opportunities of establishing fish processing plants in selected PTA countries
3. Location:
Selected PTA countries
4. Institution(s):
Ministries of Fishery, FAO
5. Estimated costs:
To be determined
6. Estimated duration:
To be determined
7. Project description and additional information:

At present, fishery resources, with which the PTA region is quite well endowed are largely underexploited. Among the major causes there is the lack of an adequate transport network and the poorly developed level of cold storage/refrigeration facilities. But the increasing consumption of fish is a fact emerging from all the PTA countries statistics. At the same time, fish processing plants have begun to be established around the region: recently Kenya, Mauritius and Tanzania have undertaken projects in this field. The identification of all the possible locations for fish processing plants in the PTA countries has not yet been carried out, although fish processing plants have to be close to the fishery sources (sea, lakes, rivers, coasts) and they rely on power and labour availability, besides good transport connections. A mapping of the most suitable locations for fish processing plants in the PTA sub-region is proposed here, as a result of an identification study, to be carried out in some selected countries of the region.

PROJECT SUMMARY NO. AGRO/05

INDUSTRIAL AREA: TEXTILES

1. Project Title: Blankets manufacturing plant in Lesotho
2. Objective: To diversify agro-industries in Lesotho through the production of woollen blankets of mohair
3. Location:
Lesotho
4. Institution(s):
Lesotho National Development Corporation
5. Estimated costs:
\$US 85,000
6. Estimated duration:
To be determined
7. Project description and additional information:

Lesotho has an ideal climate for the production of mohair. All the mohair produced in Lesotho is exported to South Africa where blankets are manufactured and then imported in Lesotho. The demand for blankets or warm overcoats is high especially in the cold months when temperatures are so low that it even snows on the mountains. Lesotho would therefore like to establish a blanket manufacturing plant which would utilize mohair. A prefeasibility study had been made by UNIDO 16 years ago. The result was negative, because the costs were too high for the internal market and the price could not compete with the prices of large South African producers which imported the raw material from Lesotho. Now it is suggested to update the UNIDO feasibility study only with the export market in view. Here the high prices of the product could find more easily acceptance, given the high quality of its material. In view of the special position of Lesotho as one of the BLS states, the project would represent a supportive action on the part of PTA states directed towards a potentially promising manufactures export possibility for Lesotho.

PROJECT SUMMARY NO. AGRO/06

INDUSTRIAL AREA: TEXTILES

1. Project Title: Regional Centre for Textile Industry
2. Objective: To support the development of the textile industry in the PTA sub-region by designing regional rationalization and improvement policies, by training and by information exchange
3. Location:
PTA countries
4. Institution(s):
Ministries of Industry and of External Trade, small-scale industry institutions, cotton producers associations
5. Estimated costs:
To be determined
6. Estimated duration:
To be determined
7. Project description and additional information:

The textile industry is a basic sector in the entire sub-region, where it has many competitive advantages, such as good quality local raw materials and cheap manpower. World competition is however increasing and this industry, whose bulk is constituted by SMIs, needs more and more the support of specialized services, which the typical firm is not large enough to provide for itself.

The tasks of the region centre would be:

 - (a) to monitor world trends in the textile cotton industry and the main cotton substitutes, and to monitor main market outlets;
 - (b) to study and design rationalization and improvement policies for the textile industry of each PTA country, aiming first of all at enhancing their capacity utilization and then at enlarging this capacity.
 - (c) to organize information exchange within the sector, especially by means of study tours, and workshops on important sector issues (e.g. export strategies, industrial sub-contracting in garment industry).
 - (c) to train the trainers for the member countries' textile sector and SMI associations to work in the textile industry of each PTA country.

PROJECT SUMMARY NO. AGRO/07

INDUSTRIAL AREA: TEXTILES

1. Project Title: Training Strategy for the Development of an Integrated Production and Technology Management System for Textile Industry in Kenya for PTA countries
2. Objective: Strengthening sub-regional industrial co-operation for human resources development for textile industry
3. Location:
Kenya
4. Institution(s):
Kenya Textile Training Institute (KTTI) in co-operation with the textile industry
5. Estimated costs:
\$US 950,000
6. Estimated duration:
18 months
7. Project description and additional information:
The textile industry in Africa, as in most of the other developing countries, employs a considerable work force but it lacks key qualified manpower to improve quality and productivity particularly at middle and senior management levels. With the phasing out of expatriate management and technical personnel, the need for a thorough and systematic training of indigenous personnel becomes more acute. In 1986 UNIDO conducted a preliminary study in Kenya under RP/RAF/85/640/11-01 which recommended that the Kenya Textile Training Institute (KTTI) be strengthened through the training of trainers and the introduction of systematic training and new management concepts and systems. It needs new inputs, the development of a strategy, and the introduction of computers and computer-based training, and an advanced curriculum to cover technology and production management. For this, overseas training of trainers will be needed. The project will develop a training system at the KTTI in Nairobi in co-operation with one or two textile mills on a pilot basis, which would be then extended to the textile industry in Kenya and other PTA countries in a later phase. The PTA Secretariat and the Kenyan authorities have already indicated their interest for the project and KTTI as indicated above has the capability to act as the host institution.

PROJECT SUMMARY NO. AGRO/08

INDUSTRIAL AREA: LEATHER

1. Project Title: Establishment of a Leather Research and Technology Centre for PTA subregion
2. Objective: To upgrade the existing capacities, technological and research capabilities of the Ethiopian Leather and Shoe Research Institute into a regional centre for PTA countries
3. Location:
Ethiopia
4. Institution(s):
Ethiopian Leather and Shoe Research Institute
5. Estimated costs:
\$US 2,200,000
6. Estimated duration:
3 years
7. Project description and additional information:

The economic benefits that the sub-region gets from its potential sources of hides and skins could be increased through co-ordinated and strategic development of the leather industry. Some member states, through bilateral and multilateral technical co-operation programmes have initiated leather industry development schemes. The success and intensity of these schemes had, by and large, been dependent on the relative importance attached to the schemes by each country, the amount of financial and technical assistance obtained from external sources, and also the extent to which the respective countries could commit their own scarce resources for the leather industry programmes. Although leather manufacturing from hides and skins involves a series of complicated operations requiring the utilization of various chemicals and other inputs, no meaningful research is being done with the basic raw materials and in developing indigenous tanning chemicals and other inputs. To accelerate development of the sub-sector, there is a particular need to expand research and development activities. The PTA has therefore identified the Ethiopian Leather and Shoe Research Institute as the Regional Research and Development Centre. The Centre's programme will focus on improvement of raw hides and skins, product development, development of chemicals and other auxiliaries. The present project is designed to provide the necessary inputs to allow the existing Centre to fulfill its envisaged sub-regional role.

PROJECT SUMMARY NO. BLD/01

INDUSTRIAL AREA: BUILDING MATERIALS

1. Project Title: Rehabilitation and rationalization of cement production in the PTA sub-region: second phase
2. Objective: To extend and strengthen the efficiency of cement plants in the PTA region and to foster their contribution to overall economic and social development
3. Location:
PTA countries (to be determined)
4. Institution(s):
Cement companies
5. Estimated costs:
To be determined
6. Estimated duration:
To be determined
7. Project description and additional information:

This project builds on an existing UNDP/UNIDO project dealing with the rehabilitation and rationalization of cement plants in the PTA region. The existing project has as the main objectives the following: (a) rehabilitation of cement plants; (b) rationalization and diversification; (c) action in the field of spare parts; (d) manpower development and (e) exchange of information. The present project when completed will have made progress in several PTA countries under these headings. However, continued efforts will be needed to build on the progress made and follow-up the conclusions reached on the appropriate future evolution of this branch of industry. The need to rationalize, selectively refurbish, and upgrade the existing capacity compels continued analysis and the promotion of co-operation schemes, pre-investment activity, technical assistance, and training. The coverage and depth of the programmes will thus be extended as follows: (a) Rationalization of production will be assessed through a comprehensive analysis of existing capacities, refurbishment requirements and market demand; (b) Training needs will be assessed (including those likely in consequence of technological upgrading and of rationalization of capacities) and the capabilities with the region to provide training will be examined and (c) direct technical assistance, advisory services and pre-investment activity will be programmed and executed in the light of (a) and (b) above.

PROJECT SUMMARY NO. BLD/02

INDUSTRIAL AREA: BUILDING MATERIALS

1. Project Title: Assessment of rehabilitation requirements of glass plant in Tanzania and the development of a glass programme for the PTA sub-region
2. Objective: To develop and rationalize the supply of sheet, plate and container glass for the PTA sub-region
3. Location:
Burundi, Tanzania and other PTA location to be determined later
4. Institution(s):
Glass factories in the PTA sub-region
5. Estimated costs:
\$US 150,000
6. Estimated duration
One year
7. Project description and additional information:

The project will carry out the following tasks:

(i) A survey will be carried out of existing glass production facilities in Tanzania and proposed new projects in other countries, taking into account their supply of raw materials (including recycling), the equipment installed, its condition and refurbishment requirements, the supply of skilled labour, transport facilities for distribution of products (including development of shipping facilities) and technologies in use and their continued suitability in the light of world trends.

(ii) An assessment will be made of present and future demand in the glass industry, including sheet, plate and container glass, and taking into account the expected future evolution of the construction industry, packaging requirements and environmental considerations.

(iii) Proposals will be drawn up for the development of the glass industry in the sub-region based on the analyses of (i) and (ii) above. These will include assessment of training and capital requirements in conjunction with recommendations of capacities to be up-graded or reduced.

(iv) Terms of reference will be prepared for pre-investment analysis and technical assistance requirements in the light of (iii) above.

PROJECT SUMMARY NO. HRS/01

INDUSTRIAL AREA: ALL INDUSTRIAL SECTORS. HUMAN RESOURCES

1. Project Title: Training strategy for the development of human resources for the promotion and management of small-scale industries for the PTA sub-region
2. Objective: Promotion and development of small-scale industries within PTA member countries as part of achieving accelerated economic, industrial, rural and social development within the PTA region
3. Location:
Moshi, Tanzania
4. Institution(s):
PTA Secretariat, Moshi Co-operative College
5. Estimated costs:
\$US 941.800
6. Estimated duration:
22 months
7. Project description and additional information:

The establishment and development of small-scale industries is a central part of industrial development in the PTA sub-region, and one which can be significantly assisted by increasing the number of trained people in the fields of promotion and management. The Moshi Co-operative College (MCC) at Moshi, Tanzania, at present provides training inter alia on insurance co-operatives, and with the establishment of the Industrial Co-operatives Training Unit, it will act as the focal point for the development of a training strategy for the development of human resources for the promotion and for the organization and management of industrial co-operatives. This project will be developed and implemented in close co-ordination with HRS/11, which addresses the role of national SMI promotion and support bodies. The outputs of the project will be:

 - (1) The central focal point equipped with:
three trainers; appropriate training facilities, including audio-visual aids plus other training equipments; and training scheme/systems and training software
 - (2) A network of national focal points with senior policy and decision-making and management personnel trained in policies, strategies and management for the promotion and management of industrial co-operatives.
 - (3) 36 senior policy, decision-making and management personnel with upgraded knowledge and skills and respective fields through modular training.

PROJECT SUMMARY NO. HRS/02

INDUSTRIAL AREA: ALL INDUSTRIAL SECTORS, HUMAN RESOURCES

1. Project Title: Industrial Management Development Programme for the PTA sub-region
2. Objective: To assist the member states of the PTA in developing management capabilities for industrial development
3. Location:
Uganda and Zimbabwe
4. Institution(s):
Zimbabwe Institute of Management (ZIM), and the Management Training and Advisory Centre (MTAC) of Uganda in collaboration with other management training institutes in the sub-region
5. Estimated costs:
\$US 1,880,000
6. Estimated duration:
3 years
7. Project description and additional information:

IN the PTA sub-region one of the main factors limiting the rate of economic growth and industrial development is the lack of skilled managers and managerial capabilities. Most of the established industries have to rely on external sources for managerial capabilities. Although industrial management is crucial for any meaningful industrial programme it is quite often disregarded as management is too closely linked to administrative functions. At present very few existing institutions at the national/sub-regional level concentrate on management training and the curricula developed so far put emphasis on management in general and do not cover industrial management with the required methods of training. In addition, as a result of the limited resources available for management training, infrastructural facilities, staffing and audio-visual equipment and services for effective implementation of training programmes are inadequate. The Zimbabwe Institute of Management is one of the few management institutes in the sub-region which train managerial personnel for the productive sector.

Outputs of the project will be:

- (1) Two well-established industrial management training departments with adequate staffing, modern infrastructural facilities, audio-visual and training equipment, technical services, library and documentation services.
- (2) 50 - 60 Managers with increased capabilities in industrial management.

PROJECT SUMMARY NO. HRS/03

INDUSTRIAL AREA: ALL INDUSTRIAL SECTORS, STANDARDS

1. Project Title: Assistance to PTA member states in the promotion of standardization and quality control systems
2. Objective: To assist national standards bureaux in establishing standard and quality control policies
3. Location:
Lesotho, Swaziland, Rwanda, Somalia, Djibouti, Comoros
4. Institution(s):
PTA Subcommittee on Standardization and Quality Control, PTA countries National Standard Bodies and Ministries of Industry and of Agriculture, ISO, IEC, ARSO
5. Estimated costs:
\$US 15,000,000
6. Estimated duration:
To be determined
7. Project description and additional information:

Some PTA countries have active and successful national bureaux of standards and quality control, while others have no bodies of this kind. Standardization and quality control are essential to the development of strong and competitive industries, and the experience of other regions has clearly shown the significance of standards in the process of regional economic integration and strategic management of industry. The PTA Secretariat has already carried out a study of the requirements in member states for appropriate and effectively functioning standards bureaux. The present project is intended to give effect to the findings of this study by setting up a bureau in each member state that is without one. The outputs of the project will be fully established and operational national standard bureaux in the relevant countries, with the necessary trained personnel, testing facilities, and information centres.

PROJECT SUMMARY NO. HRS/04

INDUSTRIAL AREA: SUPPORT SERVICES, SMI

1. Project Title: Promotion and commercialization of small-scale industrial/rural technologies in the PTA sub-region through the Development Technology Centre
2. Objective: To assist the PTA countries in their efforts to build up technological capacities and capabilities for industrialization and integrated rural development
3. Location:
Harare with linkages to other small-scale technology development centres in the sub-region.
4. Institution(s):
Development Technology Centre of the University of Zimbabwe (DTC)
5. Estimated costs:
\$US 795,000
6. Estimated duration:
3 1/2 years
7. Project description and additional information:

Although regional institutions, e.g. the African Regional Centre for Technology (ARCT) have been established to create greater awareness of the need for technological development in Africa and promote the use of technology suitable for integrated rural development, they often lack adequate capabilities and resources to effectively cover the collection and dissemination of technological information at all levels. This project will concentrate on integrated rural development, particularly the development and promotion of technologies in support of agricultural production, energy technologies and building materials technologies. It is also proposed to establish a rural technology information exchange network which would be linked with the African Technology Information Exchange System (TIES) and the ARCT. The project would be implemented through the DTC, with nodes in each PTA member state. The project would thus also lead gradually, through strengthening of these nodes, to a decentralization and diffusion of technological capabilities throughout the PTA sub-region. DTC is currently involved in R&D work for the development of rural technologies and operates a small technological information network covering over 600 addresses in Zimbabwe and elsewhere in Africa and Europe. The work of DTC is however limited by lack of appropriate capacities for R&D work, inadequate capabilities, support services and limited resources. The Centre, if strengthened could however play a lead role in promoting the development and utilization of appropriate rural technologies in the PTA sub-region.

PROJECT SUMMARY NO. HRS/05

INDUSTRIAL AREA: SUPPORT SERVICES. SMI

1. Project Title: Programme for promotion and development of small- and medium-scale industrial activities in the PTA sub-region with particular emphasis on women in industrial development
2. Objective: To assist PTA member states in promoting a rational and integrated development of the small-scale industrial sub-sector with a view to creating a strong industrial base in the PTA sub-region
3. Location:
SEDCO, Harare
4. Institution(s):
Ministry of Industries, small-scale industrial organizations
5. Estimated costs:
\$US 1,300,000
6. Estimated duration:
3 years
7. Project description and additional information:

The small-scale industrial sub-sector has received relatively little attention by Governments of the PTA member states. The industrial policy instruments and the policy environment are appropriate for the development of large-scale industrial enterprises. Partly as a result of the educational system which is not functional and not geared towards productive activities, there is a lack of indigenous entrepreneurial capabilities. In general, the lack of capacities to collect and make effective use of information relating to products to be manufactured, production technology, equipment and their supplier market, etc. There is a need to develop entrepreneurial capabilities and introduce a steady flow of information on techno-economic aspects of small-scale industrial activities.

PROJECT SUMMARY NO. HRS/06

INDUSTRIAL AREA: SUPPORT SERVICES

1. Project Title: Programme for the development of manpower capabilities for project identification, formulation, monitoring and evaluation
2. Objective: To develop manpower capabilities for economic development and industrial development in particular, by training a core of personnel in project development and appraisal for the PTA sub-region
3. Location:
Zimbabwe
4. Institution(s):
Zimbabwe Development Bank as host institution
5. Estimated costs:
\$US 900,000
6. Estimated duration:
3 1/2 years
7. Project description and additional information:

The PTA countries lack efficient machineries for project identification and implementation and the capabilities to identify, formulate, design, evaluate and monitor projects. Consequently, considerable large amounts of foreign exchange are spent every year on foreign consultancy services to undertake feasibility studies and prepare bankable projects. It is therefore proposed to strengthen the capacity and capabilities of one of the existing development financing institutions into a centre of excellence for training in project development and appraisal in the sub-region. Since its inception the Zimbabwe Development Bank has assisted in developing/appraising a large number of projects for financing in such areas as metal and metal products, food and beverages, leather, textiles, energy, wood, paper and chemicals. In 1987, the total projects appraised and approved for the Bank's funding amounted to \$US/21,000,000 (\$US/4 million was in local currency). The Bank like all other development financing institutions in the sub-region is not fully equipped in terms of its existing facilities and manpower capabilities for the development and appraisal of industrial projects. The target beneficiaries of the project are the existing and potential industrial entrepreneurs in the private sector and the Governments for whom projects will be developed and appraised by trained personnel. Outputs of the project will be: (1) a full upgraded project appraisal division in the Zimbabwe Development Bank, and (2) 60-80 trained personnel with upgraded skills in project development and appraisal, to be used by regional institutions.

PROJECT SUMMARY NO. HRS/07

INDUSTRIAL AREA: SUPPORT SERVICES

1. Project Title: Pilot study on the development of an industrial R&D programme
2. Objective: To assess the needs and capabilities within the sub-region for industrial R&D, to prepare proposals for an R&D programme and to elaborate mechanisms for its implementation
3. Location:
PTA states
4. Institution(s):
Research institutes, universities, larger manufacturing companies
5. Estimated costs:
\$US 240,000 external finance
6. Estimated duration:
1 1/2 years
7. Project description and additional information:

The project will analyze existing PTA resources in industrial research and development, and ways in which their strengths can be combined to solve technological problems in key areas of industry in the region. The industrial R&D resources of PTA consist of bodies such as universities, standards bureaux, research institutes, company laboratories, and other bodies in related sectors, such as agriculture, mining, and health, which could also be drawn upon. The project is to develop a framework in which these resources can be used at a regional level. As a first step their existing capacities in terms of staff and equipment and capabilities, will be systematically enumerated. Simultaneous analysis will take place of research requirements in industry in the PTA, especially through interviews with manufacturing and government bodies. The areas of research would be in those sectors of industry most immediately relevant to the member states, especially in areas such as food processing, textile production, fisheries, wood and wood products, and minerals. The subjects of research would include quality control, standardization, product development, and new uses of natural resources.

The study would conclude with detailed proposals for mechanisms of implementation of an industrial R&D programme. This would draw on experience in the EEC, where research programmes disburse funds in response to co-operative proposals from institutions in at least two member states.

A meeting of scientists and representatives of PTA countries and donors would review the findings.

PROJECT SUMMARY NO. HRS/08

INDUSTRIAL AREA: SUPPORT SERVICES

1. Project Title: Industrial Services Register and Development of an Industrial Services Clearing House
2. Objective: To provide information to industry in the PTA sub-region on industrial services available within the sub-region, and to develop a mechanism for exchange of industrial services between countries
3. Location:
Rwanda and other PTA states
4. Institution(s):
PTA Secretariat, Ministries of Industry, Chambers of Industry
5. Estimated costs:
\$US 100,000 external finance
6. Estimated duration:
9 months
7. Project description and additional information:

While some provision of industrial services take place between countries of the PTA sub-region, there is scope for considerable expansion. The sub-region has resources in many areas of industrial services, in the form of experienced consultancy companies, engineers, technologists, accountants, scientists, designers and specialists in related fields. If information were more widely available, companies with a need for industrial services would be able to increase their use of services from within the sub-region and consequently reduce their need to bring such services from outside the region. The project will compile a computerized register of contractors and individual consultants, their background and specializations, and other relevant information. This information will be circulated on diskette to appropriate bodies in member states. Governments and private companies who need the service of an expert can then search the register to check whether help can be found within the region. The register will be compiled from individual country data supplied by each of the member states. A database specialist will design the national questionnaire and data collection and the database structure and format. In designing this, a corresponding accounting procedure will be included, so that a clearing house system could be implemented at a later stage when agreed by member states. Such a clearing system would be analogous to the present PTA merchandise trade clearing house system operated by the Reserve Bank of Zimbabwe, and would allow some degree of settlement in local currency for the use of industrial services within the region. It would also be linked to the sub-contracting exchange mechanism proposed as project no. ENG/06.

PROJECT SUMMARY NO. HRS/09

INDUSTRIAL AREA: SUPPORT SERVICES

1. Project Title: A Manufacturing Investment Trust for the PTA
2. Objective:
 - (a) To design a new mechanism to mobilize foreign investment in the PTA region
 - (b) Launching of the Trust in international financial markets
3. Location:
PTA countries
4. Institution(s):
To be determined
5. Estimated costs:
(a) \$US 120,000 (b) \$US 450,000
6. Estimated duration:
3 months
7. Project description and additional information:

As manufacturing investment trust would be a public company whose shares would be quoted on an international stock exchange, thus attracting the foreign investor looking for new opportunities but anxious to have the possibility of realizing his investment easily. The trust would, in turn, invest in manufacturing companies within the PTA region.

(a) The first phase of the present project is to make an assessment of the potential market for the Trust and the conditions for its success. The project would analyze information on existing equity and other investment markets, company law, and investment law in member states of the PTA. It would also collect information in financial centres in developed countries on trends in foreign equity investments and the market prospects for an investment trust specializing in investment in industry in the PTA. Based on this analysis, an outline of the investment trust will be prepared. This will include consideration of the size, structure, and launching mechanisms of the Trust, and will take into account the legal, fiscal and monetary aspects. It will therefore include an outline of any changes needed in present legislation in the PTA countries with respect to direct foreign investment, the structure and organization of public companies, taxation and exchange control, etc. Proposals and a timetable for necessary changes would be put forward, together with proposals for the form and content of the trust deed, and for the financial markets in which the Trust might be launched.

(b) This phase would involve the necessary action in launching the Trust as an investment vehicle for industry in the PTA countries. It would include mobilization of the necessary support among financial institutions and industry in developed countries.

PROJECT SUMMARY NO. HRS/10

INDUSTRIAL SUPPORT AREA: STANDARDS. PACKAGING

1. Project Title: Regional centres for Standardization and Quality Control with emphasis on packaging materials
2. Objective: To assist the member states of the PTA sub-region of Africa to improve their quality control standards of industrial goods, to promote better and uniform quality products with the initial emphasis on packaging materials
3. Location:
Malawi and three other PTA countries to be selected
4. Institution(s):
PTA Subcommittee on Standardization and Quality Control. Malawi Bureau of Standards, Ministries of Trade and Transport
5. Estimated costs:
\$US 3,045,500
6. Estimated duration:
5 years
7. Project description and additional information:

Packaging materials are of vital importance to industry in production, storage and distribution and they need strict quality control/standardization for efficiency, safety and ease of transportation. In the PTA region, most of the packaging materials are imported and hence there is no standardization of quality, shapes and sizes. In the region there is a need for the existing standards institutions to promote the use of local raw materials for the packaging industry and provide required quality standards. No data are available in the region for reference. Only the Malawi Bureau of Standards has completed a study for a Centre for quality control/standardization with emphasis on packaging materials and building materials. The project aims at strengthening two or three centres in the region which could provide standardization/quality control guidelines for packaging industry and also for products produced in the region, e.g. building materials. The Centres will have a databank for exchange of information on quality control on various products especially for the packaging industry. The Centres will be able to train people in the area of quality control, standardization and monitoring of industrial goods with emphasis on packaging materials. The present proposal would build on the experience of the Malawi NBS as an information centre for an existing SADCC packaging project.

PROJECT SUMMARY NO. HRS/11

INDUSTRIAL AREA: SUPPORT SERVICES. SMI

1. Project Title: Intra-regional Co-operation for Small-scale Industry Promotion
2. Objective: To establish a PTA co-operation network to enhance small-scale industry development and national promotional capabilities
3. Location:
Zambia and PTA member states
4. Institution(s):
PTA Secretariat as a focal point and governmental and non-governmental small-scale industry promotional institutions in the PTA member states
5. Estimated costs:
\$US 1,110,000
6. Estimated duration:
5 years
7. Project description and additional information:
The PTA Workshop on Small and Medium-scale Industries was held in Kampala, Uganda, in October 1989. It was the first time in the PTA region that the Government authorities, public sector promotional agencies, small-scale industry associations, individual small-scale industry entrepreneurs, regional development banks and international agencies came together to exchange views on priority issues related to SMI promotional experiences. This project follows the meeting recommendations and addresses the promotion of the SMI sector from the PTA region-wide perspective. The project consists of the following inter-related objectives: (1) to establish a Co-ordinating Unit within the PTA Secretariat to support the Sub-committee on Small- and Medium-scale Industries. For this purpose, 12 w/m of advisor will be provided (approx. \$US 150,000); (2) to create a region-wide data network. As a first step this component will create a computerized directory of SMI enterprises for each member state, including technical business data. The project will provide advisory, equipment and logistic support (approx. \$US 260,000); (3) to support PTA in sponsoring a workshop similar to the one held in 1989 for 5 consecutive years. The project will provide 3 short-term consultants for each workshop, a total of 60 w/m (approx. \$US 400,000); (4) to assist national level promotional agents to enhance intra-regional co-operation. The project will provide a set of short-term consultants and study tours (approx. \$US 300,000).

PROJECT SUMMARY NO. ENY/01

INDUSTRIAL AREA: ENERGY

1. Project Title: Power Plant Rehabilitation
2. Objective: Rehabilitation of power plants in PTA states
3. Location:
PTA states
4. Institution(s):
Ministries of Industry and Energy, Electric Power Authorities
5. Estimated costs:
 - (i) \$US 85,000
 - (ii) To be determined
6. Estimated duration:
6 months
7. Project description and additional information:

In the PTA sub-region, considerable potential exists as far as energy resources are concerned. The PTA has already elaborated an energy programme, in which the resources of the sub-region are already set out. The question of electrical capacity, however, needs to be addressed in detail. In many developing countries, power plants face problems of operation and maintenance, and their breakdowns are causing losses many times their interrupted sale of electrical power.

The first phase of the project is to identify power plants in need of rehabilitation and to collect sufficient information for a well prepared follow-up action, with possible support from aid organizations, suppliers and financial institutions.

The survey will have the following stages:

- (1) A perspective power supply scenario of the need for electrical power in the years 1995 and 200 to meet demands from factories, consumers, etc.
- (2) Identification of existing power plants in use and quantification of the actual production of electrical power. The identification will be based on annual reports from the power plants and information from various authorities.
- (3) Elaboration of feasibility studies/technical specifications for assistance required for rehabilitation of existing power plants in the region.
- (4) Description of needs for maintenance-systems and training of employees at the power plants.

The second phase of the project would cover the actual rehabilitation of the priority plants identified in the region, including the re-equipment and training as assessed in phase 1.

PROJECT SUMMARY NO. ENY/02

INDUSTRIAL AREA: ENERGY

1. Project Title: Industrial Energy Conservation and Auditing Programmes for the PTA countries
2. Objective: To enhance efficiency in the management and use of energy and to achieve self-sufficiency and security in energy supply
3. Location:
Eight to ten PTA countries (to be selected)
4. Institution(s):
Ministries/Departments of Energy, industrial enterprises
5. Estimated costs:
\$US 850,000
6. Estimated duration:
2 1/2 years
7. Project description and additional information:

In most industries, there is in practice a considerable potential for increasing the efficiency with which energy is used. But the complexity of industrial energy applications/alternative choice possibilities and determination of energy saving measures to be instituted by member states requires a comprehensive energy auditing and conservation programme. This is currently lacking in the PTA sub-region. This problem was first identified by the member states themselves in 1983. Through this project a number of institutions and industries will be selected in some 8 - 10 countries of the PTA sub-region for the implementation of energy conservation and auditing programme. The programme aims at organizing demonstration workshops, lectures and site visits to factories and institutes and introducing energy saving measures. By so doing a core of well trained personnel would be developed in various countries and a considerable improvement of energy utilization and efficiency would be achieved. The programme will also establish a sub-regional network for energy exchange of information and experience in the field of energy conservation. It is also envisaged that the institutional capacities and capabilities for energy development and management would also be strengthened.

Outputs of the project will be:

 - (1) A core of about 20 - 25 trained technical personnel on energy auditing, principles and techniques in each of the selected PTA countries, and
 - (2) A well established sub-regional network for the exchange of energy information expertise and experience.

PROJECT SUMMARY NO. ENY/03

INDUSTRIAL AREA: ENERGY

1. Project Title: Programme for the utilization of woodwastes from existing forest plantations and forest industries for more efficient charcoal production in the PTA sub-region
2. Objective: To demonstrate the viability of improved charcoal production and gasification for power generation and to provide adequate information on charcoal development through improved technology
3. Location:
Some selected PTA countries
4. Institution(s):
Ministries of Energy, Ministries of Agriculture, private companies
5. Estimated costs:
\$US 2,430,000
6. Estimated duration:
3 1/2 years
7. Project description and additional information:

Charcoal is a major fuel for the low and middle income households in all the countries of the PTA sub-region. It is estimated that approximately 600 kilograms per capita of charcoal is consumed annually. Regrettably charcoal is not always produced in existing sawmills. Production is done by peasant farmers who cut down trees. The demand for charcoal far exceeds current supply. As a result there is a woodfuel/charcoal crisis in some countries. Inefficient methods of producing charcoals and high cost of production including transportation cost to the urban areas are some of the factors responsible. The proposed project addresses the need to demonstrate the efficient and environmentally acceptable conversion of corn-cobs, as well as deadwood and woodwaste, the latter woodwaste mainly from managed plantations and existing sawmills to useful energy through improved charcoal production and gasifier-powered internal combustion engines. This programme therefore also aims at developing a programme for the large-scale production of charcoal testing and dissemination including training.

The outputs of the project will be:

- (1) 8-10 fully operational charcoal production demonstration kilns
- (2) 8-10 operational gasifier demonstration plants utilizing woodwaste and agricultural residues established and operational
- (3) A report on the organization of 3 biomass energy investment promotion exhibition covering the production of charcoal and wood gasification
- (4) A report on charcoal/gasification technologies including survey

ANNEX II

STATISTICAL TABLES

NOTE

The six-digit ISIC codes used in the Annex Tables correspond in most cases with those in the United Nations, Yearbook of Industrial Statistics 1987, Vol. II. For commodities which are not explicitly defined according to the ISIC classification codes (e.g. Metal bars), unique codes have been created until such time as the commodity in question can be more precisely identified.

Table 1.
Production in the manufacture of food, beverages and tobacco

ISIC Commodity Division 31

Country	I S I C	Name of product	Year	Unit of measure	Production
Burundi	311101	Beef and veal	1987	metric tons	6000
Burundi	311137	Calf, goat and sheep skins	1987	metric tons	1000
Burundi	311134	Cattle and horse hides	1987	metric tons	1000
Burundi	311104	Mutton and lamb	1987	metric tons	4000
Burundi	311107	Pork	1987	metric tons	5000
Burundi	311110	Poultry	1987	metric tons	3000
Burundi	311207	Butter	1987	metric tons	100
Burundi	311200	Milk	1986	hectolitres	15308
Burundi	311500	Edible oils	1985	metric tons	2000
Burundi	311601	Wheat flour	1986	metric tons	5088
Burundi	311704	Bread	1986	pieces	34350000
Burundi	313304	Beer	1987	hectolitres	939000
Burundi	313404	Soft drinks	1987	hectolitres	130000
Burundi	314007	Cigarettes	1987	millions	271
Comoros	311101	Beef and veal	1987	metric tons	2000
Djibouti	311101	Beef and veal	1987	metric tons	2000
Djibouti	311137	Calf, goat and sheep skins	1987	metric tons	1000
Djibouti	311104	Mutton and lamb	1987	metric tons	4000
Djibouti	311200	Milk	1987	hectolitres	63360
Djibouti	311601	Wheat flour	1987	metric tons	9000
Djibouti	312201	Prepared animal feed	1988	metric tons	150
Djibouti	313401	Mineral waters	1987	cartons	316000
Ethiopia	311101	Beef and veal	1987	metric tons	246000
Ethiopia	311137	Calf, goat and sheep skins	1987	metric tons	29000
Ethiopia	311134	Cattle and horse hides	1987	metric tons	47000
Ethiopia	311104	Mutton and lamb	1987	metric tons	148000
Ethiopia	311107	Pork	1987	metric tons	1000
Ethiopia	311110	Poultry	1987	metric tons	72000
Ethiopia	311207	Butter	1987	metric tons	9100
Ethiopia	311210	Cheese	1987	metric tons	4000
Ethiopia	311500	Edible oils	1986	metric tons	14772
Ethiopia	311601	Wheat flour	1986	metric tons	211090
Ethiopia	311707	Biscuits	1986	metric tons	200
Ethiopia	311801	Raw sugar	1986	metric tons	181000
Ethiopia	311904	Sugar confectionary	1987	metric tons	3800
Ethiopia	313204	Wine	1986	hectolitres	99970
Ethiopia	313304	Beer	1986	hectolitres	797110
Ethiopia	313305	Liquors and spirits	1986	hectolitres	59930
Ethiopia	313401	Mineral waters	1986	bottles	32073000
Ethiopia	313404	Soft drinks	1986	hectolitres	796000
Ethiopia	314007	Cigarettes	1986	millions	2619
Kenya	311101	Beef and veal	1987	metric tons	163000
Kenya	311137	Calf, goat and sheep skins	1987	metric tons	11000
Kenya	311134	Cattle and horse hides	1987	metric tons	27000
Kenya	311104	Mutton and lamb	1987	metric tons	44000
Kenya	311107	Pork	1987	metric tons	5000
Kenya	311110	Poultry	1987	metric tons	43000

Table 1.
Production in the manufacture of food, beverages and tobacco

ISIC Commodity Division 31

Country	I S I C	Name of product	Year	Unit of measure	Production
Kenya	311122	Sausages	1985	metric tons	2000
Kenya	311207	Butter	1987	metric tons	4745
Kenya	311210	Cheese	1987	metric tons	207
Kenya	311200	Milk	1987	hectolitres	4610000
Kenya	311299	Miscellaneous dairy products	1987	metric tons	5879
Kenya	311330	Canned fruits and vegetables	1987	metric tons	405000
Kenya	311401	Fish, frozen	1987	metric tons	3900
Kenya	311404	Fish, salted, dried or smoked	1987	metric tons	12300
Kenya	311500	Edible oils	1987	hectolitres	25870
Kenya	311501	Margarine	1985	metric tons	95200
Kenya	311601	Wheat flour	1987	metric tons	260000
Kenya	311707	Biscuits	1986	metric tons	4009
Kenya	311704	Bread	1987	metric tons	80332
Kenya	311801	Raw sugar	1987	metric tons	365000
Kenya	311804	Refined sugar	1987	metric tons	390000
Kenya	312201	Prepared animal feed	1987	metric tons	169913
Kenya	313304	Beer	1987	hectolitres	3075000
Kenya	313305	Liquors and spirits	1987	hectolitres	9814
Kenya	313401	Mineral waters	1987	hectolitres	1867000
Kenya	314007	Cigarettes	1987	millions	6372
Lesotho	311101	Beef and veal	1987	metric tons	12000
Lesotho	311137	Calf, goat and sheep skins	1987	metric tons	1000
Lesotho	311134	Cattle and horse hides	1987	metric tons	2000
Lesotho	311104	Mutton and lamb	1987	metric tons	7000
Lesotho	311107	Pork	1987	metric tons	3000
Lesotho	311110	Poultry	1987	metric tons	1000
Malawi	311101	Beef and veal	1987	metric tons	14000
Malawi	311137	Calf, goat and sheep skins	1987	metric tons	1000
Malawi	311134	Cattle and horse hides	1987	metric tons	1000
Malawi	311104	Mutton and lamb	1987	metric tons	4000
Malawi	311107	Pork	1987	metric tons	8000
Malawi	311110	Poultry	1987	metric tons	9000
Malawi	311801	Raw sugar	1987	metric tons	168000
Malawi	313304	Beer	1987	hectolitres	675000
Malawi	314007	Cigarettes	1987	millions	908
Mauritius	311101	Beef and veal	1987	metric tons	1000
Mauritius	311107	Pork	1987	metric tons	1000
Mauritius	311110	Poultry	1987	metric tons	8100
Mauritius	311401	Fish, frozen	1987	metric tons	6500
Mauritius	311404	Fish, salted, dried or smoked	1987	metric tons	200
Mauritius	311407	Fish, tinned	1987	metric tons	5400
Mauritius	311801	Raw sugar	1987	metric tons	691134
Mauritius	311804	Refined sugar	1987	metric tons	43000
Mauritius	312100	Tea	1987	metric tons	7147
Mauritius	312201	Prepared animal feed	1987	metric tons	43600
Mauritius	313204	Wine	1987	hectolitres	40723
Mauritius	313304	Beer	1987	hectolitres	238090

Table 1.
Production in the manufacture of food, beverages and tobacco

ISIC Commodity Division 31

Country	I S I C	Name of product	Year	Unit of measure	Production
Mauritius	313305	Liquors and spirits	1987	hectolitres	1178
Mauritius	313404	Soft drinks	1987	hectolitres	391000
Mauritius	314007	Cigarettes	1987	millions	1392
Mozambique	311101	Beef and veal	1987	metric tons	38000
Mozambique	311137	Calf, goat and sheep skins	1987	metric tons	1000
Mozambique	311134	Cattle and horse hides	1987	metric tons	6000
Mozambique	311104	Mutton and lamb	1987	metric tons	2000
Mozambique	311107	Pork	1987	metric tons	10000
Mozambique	311110	Poultry	1987	metric tons	20000
Mozambique	311122	Sausages	1987	metric tons	53000
Mozambique	311299	Miscellaneous dairy products	1987	metric tons	1545
Mozambique	311401	Fish, frozen	1987	metric tons	633
Mozambique	311404	Fish, salted, dried or smoked	1987	metric tons	1051
Mozambique	311407	Fish, tinned	1987	metric tons	327
Mozambique	311500	Edible oils	1987	metric tons	3919
Mozambique	311501	Margarine	1987	metric tons	827
Mozambique	311607	Flour, excluding wheat	1987	metric tons	63126
Mozambique	311601	Wheat flour	1987	metric tons	89082
Mozambique	311801	Raw sugar	1987	metric tons	19429
Mozambique	311904	Sugar confectionary	1987	metric tons	1610
Mozambique	312201	Prepared animal feed	1987	metric tons	22896
Mozambique	313204	Wine	1987	hectolitres	1847
Mozambique	313304	Beer	1987	hectolitres	213680
Mozambique	313305	Liquors and spirits	1987	hectolitres	3213
Mozambique	313401	Mineral waters	1987	hectolitres	4552
Mozambique	313404	Soft drinks	1987	hectolitres	45800
Mozambique	314007	Cigarettes	1987	millions	899
Rwanda	311101	Beef and veal	1987	metric tons	14000
Rwanda	311137	Calf, goat and sheep skins	1987	metric tons	1000
Rwanda	311134	Cattle and horse hides	1987	metric tons	2000
Rwanda	311104	Mutton and lamb	1987	metric tons	5000
Rwanda	311107	Pork	1987	metric tons	3000
Rwanda	311110	Poultry	1987	metric tons	1000
Rwanda	311207	Butter	1986	metric tons	400
Rwanda	311801	Raw sugar	1987	metric tons	3000
Rwanda	311804	Refined sugar	1983	metric tons	2112
Rwanda	311904	Sugar confectionary	1987	metric tons	400
Rwanda	313204	Wine	1987	hectolitres	4883000
Rwanda	313304	Beer	1987	hectolitres	596000
Rwanda	313401	Mineral waters	1985	bottles	49962700
Rwanda	313404	Soft drinks	1987	hectolitres	180000
Rwanda	314007	Cigarettes	1987	millions	698
Somalia	311101	Beef and veal	1987	metric tons	44000
Somalia	311137	Calf, goat and sheep skins	1987	metric tons	15000
Somalia	311134	Cattle and horse hides	1987	metric tons	8000
Somalia	311104	Mutton and lamb	1987	metric tons	86000
Somalia	311110	Poultry	1987	metric tons	3000

Table 1.
Production in the manufacture of food, beverages and tobacco

ISIC Commodity Division 31

Country	I S I C	Name of product	Year	Unit of measure	Production
Somalia	311207	Butter	1987	metric tons	9700
Somalia	311200	Milk	1986	hectolitres	10000
Somalia	311330	Canned fruits and vegetables	1986	metric tons	350
Somalia	311407	Fish, tinned	1985	metric tons	14
Somalia	311801	Raw sugar	1987	metric tons	35000
Somalia	313404	Soft drinks	1986	bottles	5938000
Somalia	314007	Cigarettes	1986	metric tons	301
Swaziland	311101	Beef and veal	1987	metric tons	15000
Swaziland	311134	Cattle and horse hides	1987	metric tons	2000
Swaziland	311104	Mutton and lamb	1987	metric tons	3000
Swaziland	311107	Pork	1987	metric tons	1000
Swaziland	311110	Poultry	1987	metric tons	1000
Swaziland	311207	Butter	1987	metric tons	200
Swaziland	311801	Raw sugar	1987	metric tons	437000
Uganda	311101	Beef and veal	1987	metric tons	59000
Uganda	311137	Calf, goat and sheep skins	1987	metric tons	2000
Uganda	311134	Cattle and horse hides	1987	metric tons	8000
Uganda	311104	Mutton and lamb	1987	metric tons	14000
Uganda	311107	Pork	1987	metric tons	21000
Uganda	311110	Poultry	1987	metric tons	24000
Uganda	311200	Milk	1986	hectolitres	129489
Uganda	311500	Edible oils	1986	metric tons	130
Uganda	311607	Flour, excluding wheat	1986	metric tons	1370
Uganda	311601	Wheat flour	1986	metric tons	7218
Uganda	311707	Biscuits	1986	metric tons	81
Uganda	311801	Raw sugar	1985	metric tons	800
Uganda	311904	Sugar confectionary	1986	metric tons	82
Uganda	312100	Tea	1986	metric tons	118
Uganda	312201	Prepared animal feed	1986	metric tons	6145
Uganda	313304	Beer	1987	hectolitres	118840
Uganda	313305	Liquors and spirits	1986	hectolitres	1164
Uganda	313404	Soft drinks	1987	hectolitres	75690
Uganda	314007	Cigarettes	1987	millions	1464
Uganda	314001	Prepared tobacco	1987	metric tons	14000
Untd. Rep. Tanz.	311101	Beef and veal	1987	metric tons	160000
Untd. Rep. Tanz.	311137	Calf, goat and sheep skins	1987	metric tons	7000
Untd. Rep. Tanz.	311134	Cattle and horse hides	1987	metric tons	33000
Untd. Rep. Tanz.	311104	Mutton and lamb	1987	metric tons	30000
Untd. Rep. Tanz.	311107	Pork	1987	metric tons	5000
Untd. Rep. Tanz.	311110	Poultry	1987	metric tons	27000
Untd. Rep. Tanz.	311207	Butter	1987	metric tons	3900
Untd. Rep. Tanz.	311210	Cheese	1987	metric tons	1000
Untd. Rep. Tanz.	311200	Milk	1985	hectolitres	299000
Untd. Rep. Tanz.	311330	Canned fruits and vegetables	1987	metric tons	2500
Untd. Rep. Tanz.	311401	Fish, frozen	1987	metric tons	1000
Untd. Rep. Tanz.	311404	Fish, salted, dried or smoked	1986	metric tons	47800
Untd. Rep. Tanz.	311500	Edible oils	1987	metric tons	4000

Table 1.
Production in the manufacture of food, beverages and tobacco

ISIC Commodity Division 31

Count.;	I S I C	Name of product	Year	Unit of measure	Production
Untd. Rep. Tanz.	311501	Margarine	1986	metric tons	27300
Untd. Rep. Tanz.	311607	Flour, excluding wheat	1985	metric tons	53500
Untd. Rep. Tanz.	311601	wheat flour	1987	metric tons	22382
Untd. Rep. Tanz.	311797	Biscuits	1987	metric tons	1411
Untd. Rep. Tanz.	311801	Raw sugar	1987	metric tons	115000
Untd. Rep. Tanz.	311804	Refined sugar	1987	metric tons	21000
Untd. Rep. Tanz.	312100	Tea	1985	metric tons	22273
Untd. Rep. Tanz.	312201	Prepared animal feed	1987	metric tons	27000
Untd. Rep. Tanz.	313204	Wine	1987	hectolitres	4000
Untd. Rep. Tanz.	313304	Beer	1987	hectolitres	590000
Untd. Rep. Tanz.	313305	Liquors and spirits	1987	hectolitres	9000
Untd. Rep. Tanz.	313404	Soft drinks	1987	hectolitres	49000
Untd. Rep. Tanz.	314007	Cigarettes	1987	millions	2635
Untd. Rep. Tanz.	314001	Prepared tobacco	1987	metric tons	12000
Zambia	311101	Beef and veal	1987	metric tons	36000
Zambia	311134	Cattle and horse hides	1987	metric tons	5000
Zambia	311104	Mutton and lamb	1987	metric tons	2000
Zambia	311107	Pork	1987	metric tons	7000
Zambia	311110	Poultry	1987	metric tons	17000
Zambia	311207	Butter	1987	metric tons	300
Zambia	311210	Cheese	1987	metric tons	900
Zambia	311404	Fish, salted, dried or smoked	1987	metric tons	8000
Zambia	311501	Margarine	1986	metric tons	273000
Zambia	311601	wheat flour	1986	metric tons	580000
Zambia	311801	Raw sugar	1987	metric tons	130000
Zambia	311804	Refined sugar	1986	metric tons	112000
Zambia	313304	Beer	1986	hectolitres	782000
Zambia	313404	Soft drinks	1986	hectolitres	314000
Zambia	314007	Cigarettes	1987	millions	1500
Zimbabwe	311101	Beef and veal	1987	metric tons	58000
Zimbabwe	311137	Calf, goat and sheep skins	1987	metric tons	1000
Zimbabwe	311134	Cattle and horse hides	1987	metric tons	8000
Zimbabwe	311104	Mutton and lamb	1987	metric tons	7000
Zimbabwe	311107	Pork	1987	metric tons	10000
Zimbabwe	311110	Poultry	1987	metric tons	10000
Zimbabwe	311207	Butter	1987	metric tons	2500
Zimbabwe	311210	Cheese	1987	metric tons	4900
Zimbabwe	311299	Miscellaneous dairy products	1987	metric tons	5600
Zimbabwe	311401	Fish, frozen	1987	metric tons	1800
Zimbabwe	311404	Fish, salted, dried or smoked	1987	metric tons	8800
Zimbabwe	311407	Fish, tinned	1987	metric tons	200
Zimbabwe	311601	wheat flour	1984	metric tons	187000
Zimbabwe	311801	Raw sugar	1986	metric tons	507000
Zimbabwe	313304	Beer	1985	hectolitres	1100000
Zimbabwe	314007	Cigarettes	1987	millions	2400
Zimbabwe	314001	Prepared tobacco	1986	metric tons	118000

Table 2.
Production in textile, wearing apparel & leather industries

ISIC Commodity Division 32

Country	ISIC	Name of product	Year	Unit of measure	Production
Burundi	321100	Cloth and fabrics	1982	square metres	9773219
Burundi	321201	Blankets	1987	pieces	342000
Ethiopia	321100	Cloth and fabrics	1986	square metres	84000000
Ethiopia	321101	Yarn	1986	metric tons	11320
Ethiopia	321201	Blankets	1986	square metres	3243000
Ethiopia	321202	Jute bags	1986	metric tons	11349
Ethiopia	321301	Knitwear	1986	pieces	6466000
Ethiopia	321401	Carpets	1986	square metres	33000
Ethiopia	322000	Wearing apparel	1986	pieces	3033000
Ethiopia	323100	Leather	1986	square feet	10889000
Ethiopia	323101	Semi-processed hides	1986	square feet	5501000
Ethiopia	323102	Semi-processed skins	1986	pieces	7281000
Ethiopia	323103	Sole leather	1986	metric tons	406
Ethiopia	324000	Leather footwear	1986	pairs	1533000
Kenya	321100	Cloth and fabrics	1987	square metres	54900000
Kenya	321101	Yarn	1987	kilogrammes	2071000
Kenya	321201	Blankets	1987	pieces	2850000
Kenya	321202	Jute bags	1987	pieces	18490000
Kenya	322034	Men's and boys' shirts	1987	pieces	1300000
Kenya	322010	Men's and boys' suits	1985	pieces	337000
Kenya	322013	Men's and boys' trousers	1985	pairs	1085000
Kenya	322016	Women's and girls' blouses	1985	pieces	24000
Kenya	322022	Women's and girls' dresses	1985	pieces	1943000
Kenya	323100	Leather	1987	metres	203000
Kenya	324000	Leather footwear	1987	pairs	1300000
Malawi	321201	Blankets	1987	pieces	980000
Malawi	322034	Men's and boys' shirts	1987	pieces	709000
Malawi	322013	Men's and boys' trousers	1987	pairs	241000
Malawi	324000	Leather footwear	1984	pairs	300000
Mauritius	320000	Wearing apparel	1987	pieces	80706000
Mozambique	321100	Cloth and fabrics	1987	square metres	7263339
Mozambique	321201	Blankets	1987	pieces	328407
Mozambique	321301	Knitwear	1987	pairs	415282000
Mozambique	321401	Carpets	1987	square metres	2591
Mozambique	322034	Men's and boys' shirts	1987	pieces	1194022
Mozambique	323100	Leather	1987	square metres	22568
Mozambique	324000	Leather footwear	1987	pairs	441251
Mozambique	324999	Leather articles	1987	pieces	8095
Rwanda	321100	Cloth and fabrics	1985	yards	1721319
Rwanda	321201	Blankets	1985	pieces	479525
Rwanda	323100	Leather	1987	square feet	195500
Rwanda	324000	Leather footwear	1987	pairs	24000
Rwanda	324999	Leather articles	1985	pieces	19257
Somalia	321100	Cloth and fabrics	1986	yards	5500000
Somalia	323101	Semi-processed hides	1986	pieces	90000
Somalia	323102	Semi-processed skins	1986	pieces	502500
Somalia	324000	Leather footwear	1986	pairs	12500

Table 2.
Production in textile, wearing apparel & leather industries

ISIC Commodity Division 32

Country	I S I C	Name of product	Year	Unit of measure	Production
Uganda	321100	Cloth and fabrics	1987	square metres	10239400
Uganda	321201	Blankets	1987	pieces	171200
Uganda	321202	Jute bags	1986	metric tons	611
Uganda	321501	Cordage, rope and twine	1986	metric tons	24
Uganda	322000	Wearing apparel	1986	pieces	39087
Uganda	323100	Leather	1987	square feet	280000
Uganda	324000	Leather footwear	1986	pairs	544000
Untd. Rep. Tanz.	321100	Cloth and fabrics	1987	square metres	66612000
Untd. Rep. Tanz.	321201	Blankets	1987	pieces	548000
Untd. Rep. Tanz.	321202	Jute bags	1988	pieces	2251800
Untd. Rep. Tanz.	321301	Knitwear	1985	square metres	11400000
Untd. Rep. Tanz.	321401	Carpets	1985	square metres	107800
Untd. Rep. Tanz.	321501	Cordage, rope and twine	1987	metric tons	16370
Untd. Rep. Tanz.	323100	Leather	1985	square feet	5407300
Untd. Rep. Tanz.	323101	Semi-processed hides	1985	pieces	608000
Untd. Rep. Tanz.	324000	Leather footwear	1987	pairs	609000
Zambia	321100	Cloth and fabrics	1986	square metres	18000000
Zambia	321201	Blankets	1986	pieces	1027000
Zambia	321501	Cordage, rope and twine	1985	metric tons	57

Table 3.
Production of wood and wood products, including furniture

ISIC Commodity Division 33

Country	ISIC	Name of product	Year	Unit of measure	Production
Ethiopia	331122	Particle board	1987	cubic metres	5000
Ethiopia	331116	Plywood	1987	cubic metres	2000
Ethiopia	331107	Sawnwood, broadleaved	1987	cubic metres	11000
Ethiopia	331104	Sawnwood, coniferous	1987	cubic metres	34000
Kenya	331116	Plywood	1987	cubic metres	21000
Kenya	331107	Sawnwood, broadleaved	1987	cubic metres	68000
Kenya	331104	Sawnwood, coniferous	1987	cubic metres	113000
Malawi	331116	Plywood	1987	cubic metres	2000
Malawi	331107	Sawnwood, broadleaved	1987	cubic metres	12000
Malawi	331104	Sawnwood, coniferous	1987	cubic metres	11000
Malawi	331110	Veneer sheets	1987	cubic metres	2000
Mauritius	331107	Sawnwood, broadleaved	1984	metric tons	1000
Mauritius	331104	Sawnwood, coniferous	1987	cubic metres	3000
Mozambique	331122	Particle board	1987	cubic metres	7742
Mozambique	331116	Plywood	1983	cubic metres	1000
Mozambique	331107	Sawnwood, broadleaved	1987	cubic metres	25490
Mozambique	331104	Sawnwood, coniferous	1987	cubic metres	8000
Mozambique	331110	Veneer sheets	1987	cubic metres	1000
Mozambique	331101	Wooden railway sleepers	1987	cubic metres	4000
Mozambique	331200	Wood containers	1987	pieces	100081
Mozambique	332001	Mattresses	1985	metric tons	266
Rwanda	331116	Plywood	1987	cubic metres	2000
Rwanda	331107	Sawnwood, broadleaved	1987	cubic metres	13000
Somalia	331122	Particle board	1987	cubic metres	20000
Somalia	331107	Sawnwood, broadleaved	1987	cubic metres	14000
Swaziland	331116	Plywood	1987	cubic metres	8000
Swaziland	331104	Sawnwood, coniferous	1987	cubic metres	136000
Uganda	331116	Plywood	1987	cubic metres	6000
Uganda	331107	Sawnwood, broadleaved	1987	cubic metres	16000
Uganda	331104	Sawnwood, coniferous	1987	cubic metres	7000
Uganda	332001	Mattresses	1986	pieces	674
Untd. Rep. Tanz.	331122	Particle board	1987	cubic metres	2000
Untd. Rep. Tanz.	331116	Plywood	1987	cubic metres	2000
Untd. Rep. Tanz.	331107	Sawnwood, broadleaved	1987	cubic metres	105000
Untd. Rep. Tanz.	331200	Wooden containers	1988	metric tons	14500
Zambia	331122	Particle board	1987	cubic metres	4000
Zambia	331116	Plywood	1987	cubic metres	10000
Zambia	331107	Sawnwood, broadleaved	1987	cubic metres	45000
Zambia	331104	Sawnwood, coniferous	1987	cubic metres	5000
Zimbabwe	331122	Particle board	1987	cubic metres	27000
Zimbabwe	331116	Plywood	1987	cubic metres	10000
Zimbabwe	331107	Sawnwood, broadleaved	1987	cubic metres	12000
Zimbabwe	331104	Sawnwood, coniferous	1987	cubic metres	163000
Zimbabwe	331110	Veneer sheets	1987	cubic metres	4000
Zimbabwe	331101	Wooden railway sleepers	1987	cubic metres	7000

Table 4.
Production in paper, paper products, printing and publishing

ISIC Commodity Division 34

Country	I S I C	Name of product	Year	Unit of measure	Production
Burundi	341990	Sanitary paper	1986	rolls	739736
Burundi	342010	Prints	1986	kilogrammes	1102003
Ethiopia	341125	Kraft paper and paperboard	1987	metric tons	1000
Ethiopia	341131	Paper and paperboard excl. kraft	1987	metric tons	1000
Ethiopia	341122	Printing and writing paper	1987	metric tons	2005
Ethiopia	341201	Paper cartons	1986	metric tons	2887
Ethiopia	341990	Sanitary paper	1986	bundles	8491000
Kenya	341150	Fibreboard	1987	cubic metres	49000
Kenya	341125	Kraft paper and paperboard	1987	metric tons	61000
Kenya	341119	Newsprint	1987	metric tons	8000
Kenya	341131	Paper and paperboard excl. kraft	1987	metric tons	68000
Kenya	341122	Printing and writing paper	1987	metric tons	30000
Kenya	341100	Wood pulp	1987	metric tons	53000
Kenya	341990	Sanitary paper	1987	metric tons	2968
Malawi	341122	Printing and writing paper	1987	metric tons	1000
Mauritius	341122	Printing and writing paper	1987	metric tons	1000
Mozambique	341125	Kraft paper and paperboard	1987	metric tons	725900
Mozambique	341131	Paper and paperboard excl. kraft	1987	metric tons	2000
Mozambique	341122	Printing and writing paper	1983	metric tons	3000
Mozambique	341201	Paper cartons	1987	pieces	2614000
Rwanda	341122	Printing and writing paper	1984	metric tons	1000
Rwanda	341990	Sanitary paper	1985	pieces	476040
Somalia	341201	Paper cartons	1986	pieces	6000000
Somalia	342001	Books	1986	pieces	9600000
Somalia	342010	Prints	1986	sheets	15360000
Swaziland	341100	Wood pulp	1987	metric tons	180000
Uganda	341131	Paper and paperboard excl. kraft	1987	metric tons	2000
Uganda	341201	Paper cartons	1985	pieces	919000
Uganda	341920	Paper sacks	1986	pieces	632300
Uganda	341990	Sanitary paper	1985	rolls	1352400
Uganda	342001	Books	1985	pieces	5595408
Untd. Rep. Tanz.	341140	Fibreboard	1987	cubic metres	6000
Untd. Rep. Tanz.	341122	Printing and writing paper	1987	metric tons	4000
Untd. Rep. Tanz.	341920	Paper sacks	1986	pieces	11500000
Zambia	341131	Paper and paperboard excl. kraft	1987	metric tons	2000
Zambia	341122	Printing and writing paper	1987	metric tons	1000
Zimbabwe	341119	Newsprint	1987	metric tons	18000
Zimbabwe	341131	Paper and paperboard excl. kraft	1987	metric tons	62000
Zimbabwe	341122	Printing and writing paper	1987	metric tons	5000
Zimbabwe	341100	Wood pulp	1987	metric tons	32000

Table 5a.
Production of chemicals, chemical, rubber & plastic products

ISIC Commodity Division 35

Country	I S I C	Name of product	Year	Unit of measure	Production
Burundi	351105	Acetylene	1986	kilogrammes	5476
Burundi	351100	Oxygen	1986	cubic metres	33050
Burundi	351216	Insecticides	1986	metric tons	2783
Burundi	352100	Paints	1986	metric tons	612
Burundi	352300	Soaps, detergents, shampoos, etc.	1986	metric tons	3058
Burundi	352950	Matches	1986	cartons	31423
Burundi	355916	Rubber footwear	1985	metric tons	373000
Burundi	356100	Plastic bags	1986	kilogrammes	183517
Burundi	356200	Plastic containers and bottles	1986	pieces	192696
Burundi	356300	Plastic footwear	1987	pairs	398000
Burundi	356500	Plastic (PVC) tubes	1986	kilogrammes	154845
Djibouti	351105	Acetylene	1987	cubic metres	7000
Djibouti	351158	Ammonia	1987	cubic metres	500
Djibouti	351100	Oxygen	1987	cubic metres	22000
Djibouti	352300	Soaps, detergents, shampoos, etc.	1988	bottles	65000
Ethiopia	351199	Carbon dioxide	1986	metric tons	520
Ethiopia	351100	Oxygen	1986	cubic metres	139000
Ethiopia	352100	Paints	1986	litres	971000
Ethiopia	352300	Soaps, detergents, shampoos, etc.	1986	metric tons	15784
Ethiopia	352901	Candles	1986	pieces	7030000
Ethiopia	352950	Matches	1986	boxes	49000000
Ethiopia	355100	Tyres	1986	pieces	100000
Ethiopia	355916	Rubber footwear	1986	pairs	2324000
Ethiopia	356200	Plastic containers and bottles	1986	metric tons	227
Ethiopia	356300	Plastic footwear	1986	pairs	4273000
Kenya	351166	Soda ash	1986	metric tons	221000
Kenya	351216	Insecticides	1985	metric tons	1000
Kenya	351337	Non-cellulosic staple and tow	1987	metric tons	1100
Kenya	352100	Paints	1986	litres	6344000
Kenya	352300	Soaps, detergents, shampoos, etc.	1986	metric tons	32843
Kenya	352950	Matches	1986	boxes	2832000000
Kenya	355100	Tyres	1987	pieces	425000
Kenya	355916	Rubber footwear	1987	pairs	6120000
Kenya	356100	Plastic bags	1987	metric tons	1376
Kenya	356300	Plastic footwear	1987	pairs	1500000
Mauritius	351299	Fertilizers (total)	1987	metric tons	11000
Mauritius	351200	Fertilizers, nitrogenous	1987	metric tons	11000
Mauritius	352950	Matches	1987	gross boxes	236472
Mozambique	351105	Acetylene	1987	cubic metres	159975
Mozambique	351100	Oxygen	1987	cubic metres	584190
Mozambique	351198	Sulphuric acid	1983	metric tons	1000
Mozambique	351200	Fertilizers, nitrogenous	1984	metric tons	1000

Table 5a.
Production of chemicals, chemical, rubber & plastic products

ISIC Commodity Division 35

Country	I S I C	Name of product	Year	Unit of measure	Production
Mozambique	351216	Insecticides	1987	metric tons	245
Mozambique	352100	Paints	1987	litres	302704
Mozambique	352300	Soaps, detergents, shampoos, etc.	1987	metric tons	12972
Mozambique	352810	Medicinal salts	1987	number	1032000
Mozambique	352950	Matches	1987	boxes	9000000
Mozambique	355100	Tyres	1987	pieces	22204
Rwanda	351216	Insecticides	1987	metric tons	3
Rwanda	352100	Paints	1987	metric tons	700
Rwanda	352300	Soaps, detergents, shampoos, etc.	1987	metric tons	5500
Rwanda	352800	Pharmaceuticals	1987	kilogrammes	3360
Rwanda	352901	Candles	1985	metric tons	41
Rwanda	352950	Matches	1985	boxes	35428200
Rwanda	355100	Tyres	1985	pieces	8726
Rwanda	356300	Plastic footwear	1985	pairs	66265
Somalia	351299	Fertilizers (total)	1985	metric tons	3000
Somalia	351200	Fertilizers, nitrogenous	1985	metric tons	3000
Somalia	352100	Paints	1986	kilogrammes	1350000
Somalia	352300	Soaps, detergents, shampoos, etc.	1986	metric tons	8500
Somalia	355900	Foam rubber	1986	cubic metres	12000
Somalia	356100	Plastic bags	1986	pieces	8680000
Swaziland	351299	Fertilizers (total)	1983	metric tons	5000
Uganda	351105	Acetylene	1986	cubic metres	10393
Uganda	351100	Oxygen	1986	cubic metres	602163
Uganda	352100	Paints	1984	litres	397000
Uganda	352300	Soaps, detergents, shampoos, etc.	1982	metric tons	200
Uganda	352800	Pharmaceuticals	1985	kilogrammes	3840
Uganda	352950	Matches	1986	boxes	391752
Uganda	355100	Tyres	1986	pieces	99900
Untd. Rep. Tanz.	351198	Sulphuric acid	1985	metric tons	229000
Untd. Rep. Tanz.	351299	Fertilizers (total)	1987	metric tons	19276
Untd. Rep. Tanz.	351200	Fertilizers, nitrogenous	1987	metric tons	5740
Untd. Rep. Tanz.	351203	Fertilizers, phosphate	1987	metric tons	4659
Untd. Rep. Tanz.	351216	Insecticides	1985	metric tons	1589
Untd. Rep. Tanz.	352100	Paints	1987	litres	2374000
Untd. Rep. Tanz.	352300	Soaps, detergents, shampoos, etc.	1987	metric tons	19000
Untd. Rep. Tanz.	352950	Matches	1985	pieces	335664000
Untd. Rep. Tanz.	355101	Inner tubes	1987	pieces	182600
Untd. Rep. Tanz.	355100	Tyres	1987	pieces	275000
Untd. Rep. Tanz.	356100	Plastic bags	1988	pieces	4400000
Zambia	351105	Acetylene	1986	metric tons	300
Zambia	351101	Sulphur (by-product)	1987	metric tons	80000
Zambia	351102	Sulphur (from pyrites)	1987	metric tons	19000

Table 5a.
Production of chemicals, chemical, rubber & plastic products

ISIC Commodity Division 35

Country	I S I C	Name of product	Year	Unit of measure	Production
Zambia	351198	Sulphuric acid	1987	metric tons	304000
Zambia	351299	Fertilizers (total)	1987	metric tons	15000
Zambia	351213	Fertilizers, multinutrient	1987	metric tons	7000
Zambia	351200	Fertilizers, nitrogenous	1986	metric tons	14000
Zambia	352300	Soaps, detergents, shampoos, etc.	1986	metric tons	11300
Zambia	352907	Explosives	1986	metric tons	12200
Zimbabwe	351101	Sulphur (by-product)	1987	metric tons	5000
Zimbabwe	351102	Sulphur (from pyrites)	1987	metric tons	25000
Zimbabwe	351299	Fertilizers (total)	1987	metric tons	114000
Zimbabwe	351200	Fertilizers, nitrogenous	1986	metric tons	74000
Zimbabwe	351203	Fertilizers, phosphate	1986	metric tons	47000

Table 5b.
Production in the manufacture of petroleum and coal products

ISIC Commodity Division 35

Country	I S I C	Name of product	Year	Unit of measure	Production
Ethiopia	353034	Asphalt	1987	metric tons	14000
Ethiopia	353020	Gas oil	1987	metric tons	215000
Ethiopia	353008	Gasolene, regular	1987	metric tons	122000
Ethiopia	353004	Jet fuel	1987	metric tons	66000
Ethiopia	353013	Kerosene	1987	metric tons	13000
Ethiopia	353037	Light petroleum gas	1987	metric tons	7000
Ethiopia	353022	Residual fuel oils	1987	metric tons	338000
Kenya	353034	Asphalt	1987	metric tons	31000
Kenya	353060	Diesel oil	1987	metric tons	580900
Kenya	353019	Fuel oil	1987	metric tons	372800
Kenya	353020	Gas oil	1987	metric tons	581000
Kenya	353007	Gasolene, premium	1987	metric tons	138300
Kenya	353008	Gasolene, regular	1987	metric tons	198000
Kenya	353004	Jet fuel	1987	metric tons	412800
Kenya	353013	Kerosene	1987	metric tons	166000
Kenya	353037	Light petroleum gas	1987	metric tons	26000
Kenya	353022	Residual fuel oils	1987	metric tons	633000
Mozambique	353034	Asphalt	1985	metric tons	20000
Mozambique	353019	Fuel oil	1985	metric tons	145000
Mozambique	353008	Gasolene, regular	1985	metric tons	85000
Mozambique	353004	Jet fuel	1985	metric tons	17000
Mozambique	353013	Kerosene	1985	metric tons	55000
Mozambique	353037	Light petroleum gas	1985	metric tons	10000
Mozambique	353025	Lubricating oil	1987	metric tons	4841
Mozambique	353022	Residual fuel oils	1985	metric tons	195000
Somalia	353034	Asphalt	1987	metric tons	4000
Somalia	353019	Fuel oil	1987	metric tons	82000
Somalia	353020	Gas oil	1987	metric tons	82000
Somalia	353008	Gasolene, regular	1987	metric tons	79000
Somalia	353004	Jet fuel	1987	metric tons	21000
Somalia	353013	Kerosene	1987	metric tons	9000
Somalia	353025	Lubricating oil	1987	metric tons	2000
Somalia	353022	Residual fuel oils	1987	metric tons	14000
Untd. Rep. Tanz.	353020	Gas oil	1987	metric tons	147000
Untd. Rep. Tanz.	353008	Gasolene, regular	1987	metric tons	85000
Untd. Rep. Tanz.	353004	Jet fuel	1987	metric tons	27000
Untd. Rep. Tanz.	353013	Kerosene	1987	metric tons	34000
Untd. Rep. Tanz.	353037	Light petroleum gas	1987	metric tons	6000
Untd. Rep. Tanz.	353022	Residual fuel oils	1987	metric tons	212000
Untd. Rep. Tanz.	354007	Coke	1987	metric tons	1000
Zambia	353034	Asphalt	1987	metric tons	11000
Zambia	353019	Fuel oil	1987	metric tons	210000
Zambia	353008	Gasolene, regular	1987	metric tons	117000
Zambia	353004	Jet fuel	1987	metric tons	38000

Table 5b.
Production in the manufacture of petroleum and coal products

ISIC Commodity Division 35

Country	I S I C	Name of product	Year	Unit of measure	Production

Zambia	353013	Kerosene	1987	metric tons	27000
Zambia	353037	Light petroleum gas	1987	metric tons	8000
Zambia	353022	Residual fuel oils	1987	metric tons	95000
Zambia	354007	Coke	1987	metric tons	32000
Zimbabwe	354007	Coke	1987	metric tons	120000
Zimbabwe	354013	Gas produced by cokeries	1987	terajoules	1300

Table 6.
Production in manufacture of non-metallic mineral products

ISIC Commodity Division 36

Country	I S I C	Name of product	Year	Unit of measure	Production
Burundi	362004	Glass bottles	1986	metric tons	2583
Burundi	369204	Cement	1984	metric tons	44
Djibouti	369101	Clay bricks	1988	cubic metres	1040
Ethiopia	362004	Glass bottles and tumblers	1986	pieces	39635000
Ethiopia	369101	Clay bricks	1986	pieces	13000000
Ethiopia	369204	Cement	1986	metric tons	271000
Ethiopia	369201	Lime	1986	metric tons	8000
Kenya	362004	Glass bottles	1987	metric tons	26800
Kenya	369204	Cement	1987	metric tons	1243300
Kenya	369201	Lime	1986	metric tons	30000
Malawi	369204	Cement	1987	metric tons	75000
Mauritius	369201	Lime	1987	metric tons	5400
Mozambique	369102	Tiles	1987	pieces	5847000
Mozambique	369204	Cement	1987	metric tons	73105
Mozambique	369201	Lime	1984	metric tons	110000
Rwanda	369102	Tiles	1985	pieces	225072
Rwanda	369204	Cement	1987	metric tons	57000
Rwanda	369201	Lime	1984	metric tons	125
Somalia	369204	Cement	1987	metric tons	25000
Uganda	369102	Tiles	1986	metric tons	9964
Uganda	369204	Cement	1986	metric tons	96376
Uganda	369201	Lime	1987	metric tons	1000
Untd. Rep. Tanz.	362004	Glass bottles	1988	metric tons	29000000
Untd. Rep. Tanz.	369204	Cement	1987	metric tons	498000
Untd. Rep. Tanz.	369201	Lime	1987	metric tons	5000
Zambia	369204	Cement	1987	metric tons	468000
Zambia	369201	Lime	1986	metric tons	239000
Zimbabwe	369101	Clay bricks	1987	pieces	14900000
Zimbabwe	369204	Cement	1987	metric tons	811000

Table 7.
Production of products within the basic metal industries

ISIC Commodity Division 37

Country	I S I C	Name of product	Year	Unit of measure	Production

Burundi	371999	Metal sheets	1986	metric tons	1290
Ethiopia	371000	Iron bars	1986	metric tons	10269
Ethiopia	371050	Iron sheets	1986	metric tons	16335
Mauritius	371000	Iron bars	1987	metric tons	20000
Mozambique	371050	Iron sheets	1987	metric tons	4737
Rwanda	371050	Iron sheets	1987	metric tons	10000
Rwanda	372049	Tin, unwrought	1985	metric tons	487000
Uganda	371900	Steel products	1986	metric tons	5495
Untd. Rep. Tanz.	371050	Iron sheets	1987	metric tons	16561
Untd. Rep. Tanz.	372031	Aluminium sheets and plates	1987	metric tons	2659
Untd. Rep. Tanz.	372037	Lead, unwrought	1985	metric tons	9000
Untd. Rep. Tanz.	372043	Zinc, unwrought	1985	metric tons	23000
Zambia	371055	Steel castings in the rough	1986	metric tons	24000
Zambia	372001	Copper blister and unrefined	1987	metric tons	474000
Zambia	372004	Copper, refined, unwrought	1987	metric tons	463200
Zambia	372037	Lead, unwrought	1987	metric tons	6000
Zambia	372043	Zinc, unwrought	1987	metric tons	21000
Zimbabwe	371019	Crude steel ingots	1987	metric tons	400000
Zimbabwe	371013	Ferro-alloys other than steel	1987	metric tons	205000
Zimbabwe	371014	Ferro-chromium	1987	metric tons	155000
Zimbabwe	371010	Pig iron, steel-making	1987	metric tons	644000
Zimbabwe	371900	Steel products	1989	metric tons	3500
Zimbabwe	372001	Copper blister and unrefined	1987	metric tons	30000
Zimbabwe	372004	Copper, refined, unwrought	1987	metric tons	20000
Zimbabwe	372020	Nickel, unwrought	1987	metric tons	98000
Zimbabwe	372049	Tin, unwrought	1987	metric tons	1100000

Table 8.
Production of metal products, machinery and equipment

ISIC Commodity Division 38

Country	I S I C	Name of product	Year	Unit of measure	Production
Burundi	381990	Metal bottle caps	1986	pieces	269000000
Djibouti	381201	Aluminium fixtures	1987	pieces	3100
Ethiopia	381107	General hardware	1986	pieces	259000
Ethiopia	381901	Metal cans	1986	pieces	1154000
Ethiopia	381997	Metal wires	1986	metric tons	1301
Ethiopia	381913	Nails	1986	metric tons	3951
Ethiopia	382200	Animal-drawn carts	1987	pieces	4725
Ethiopia	382261	Tractors	1988	units	350
Ethiopia	382942	Pumps	1988	units	200
Ethiopia	383910	Battery cells	1986	pieces	9379000
Kenya	383204	Radio receivers	1987	pieces	54000
Kenya	384300	Motor vehicles	1987	units	11803
Mozambique	381107	General hardware	1987	metric tons	24710579
Mozambique	381299	Metal furniture	1987	pieces	13285
Mozambique	381350	Metal screen	1987	square metres	146596
Mozambique	381380	Structural metal products	1987	metric tons	4456
Mozambique	381999	Metal products, n.e.s.	1987	metric tons	122114000
Mozambique	382320	Metal- and woodworking machinery	1987	pieces	69
Mozambique	382500	Office machines	1987	pieces	949
Mozambique	382510	Weighing equipment	1987	units	158
Mozambique	382952	Elevators, repair thereof	1987	metric tons	144389000
Mozambique	383100	Electric motor repair	1987	metric tons	10081000
Mozambique	383204	Radio receivers	1987	pieces	99930
Mozambique	383358	Household electric refrigerators	1987	pieces	2328
Mozambique	383360	Refrigeration equipment repair	1987	metric tons	206972000
Mozambique	383910	Battery cells	1987	pieces	25278
Mozambique	384113	Naval construction and repair	1987	metric tons	484707000
Mozambique	384210	Railway cars	1987	pieces	63
Mozambique	384404	Bicycles	1987	pieces	21003
Mozambique	384401	Motorcycles, scooters	1987	pieces	825
Mozambique	385310	Alarm clocks	1987	pieces	48587
Rwanda	381107	General hardware	1985	pieces	743423
Rwanda	381913	Nails	1987	metric tons	1100
Rwanda	383204	Radio receivers	1986	pieces	12000
Somalia	381998	Metal sanitary fixtures	1986	metric tons	84
Uganda	381107	General hardware	1986	pieces	514000
Uganda	381299	Metal furniture	1986	pieces	3151
Uganda	381999	Metal products, n.e.s.	1986	metric tons	122
Uganda	383910	Battery cells	1986	pieces	8066
Untd. Rep. Tanz.	381990	Metal bottle caps	1988	pieces	120000000
Untd. Rep. Tanz.	381901	Metal cans	1988	pieces	6900000
Untd. Rep. Tanz.	382904	Stoves, ranges, cookers, etc.	1987	pieces	13000
Untd. Rep. Tanz.	383204	Radio receivers	1987	pieces	72000
Untd. Rep. Tanz.	383910	Battery cells	1987	pieces	26000000
Untd. Rep. Tanz.	383913	Electric accumulators	1987	pieces	28000
Untd. Rep. Tanz.	383916	Electric lamps	1986	pieces	1000000
Untd. Rep. Tanz.	383904	Electrical switches	1985	units	110

Table 8.
Production of metal products, machinery and equipment

ISIC Commodity Division 38

Country	I S I C	Name of product	Year	Unit of measure	Production
Untd. Rep. Tanz.	383907	Insulated wire and cable	1987	metric tons	713
Untd. Rep. Tanz.	384319	Road tractors	1985	units	729
Untd. Rep. Tanz.	384315	Trucks	1987	pieces	333
Zambia	383913	Electric accumulators	1986	pieces	34000
Zambia	384312	Assembled buses and motor coaches	1987	units	77
Zambia	384307	Assembled passenger cars	1986	units	1000
Zambia	384315	Assembled trucks	1987	number	333
Zimbabwe	382261	Tractors	1988	units	733
Zimbabwe	384312	Assembled busses and motor coaches	1987	number	90
Zimbabwe	384307	Assembled passenger cars	1987	units	1000

Table 9.
Production of selected miscellaneous manufactured products

ISIC Commodity Division 39

Country	I S I C	Name of product	Year	Unit of measure	Production
Ethiopia	390970	Umbrellas	1986	pieces	460000
Mozambique	390100	Jewellery, silverware, etc.	1987	metric tons	9456000
Mozambique	390980	Painters' brushes (for walls, etc.)	1987	pieces	34452

Table 10. Data on manufacturing in current prices, 1987

Manufacture of food products					Manufacture of beverages						
ISIC Commodity Major Group 311/312					ISIC Commodity Major Group 313						
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US\$)			(million US\$)	(million US\$)	(US\$)	(US\$)
Burundi	2177	84.75	140.54	38930	64558	Burundi	0	0.00	0.00	0	0
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	769	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	17002	151.14	379.51	8890	22321	Ethiopia	8214	137.22	268.57	16706	32696
Kenya	44380	235.47	2706.29	5306	60980	Kenya	4108	70.50	430.60	17162	104821
Lesotho	1924	28.54	90.37	14833	46971	Lesotho	0	0.00	0.00	0	0
Malawi	25213	57.66	61.47	2287	2438	Malawi	2364	10.19	40.43	4310	17103
Mauritius	10100	63.84	429.36	6321	42511	Mauritius	1848	8.66	40.71	4685	22030
Mozambique	50500	15.59	38.98	309	772	Mozambique	2430	7.71	9.64	3174	3967
Rwanda	2773	151.79	159.09	54740	57370	Rwanda	0	0.00	0.00	0	0
Somalia	12483	6.24	21.42	500	1716	Somalia	917	8.78	12.58	9572	13717
Swaziland	4752	40.09	165.21	8435	34766	Swaziland	428	5.52	23.59	12888	55113
Uganda	5225	28.58	0.00	5470	0	Uganda	1621	3.60	0.00	2219	0
Untd. Rep. Tanz.	18334	21.45	102.22	1170	5575	Untd. Rep. Tanz.	3925	8.27	26.94	2108	6863
Zambia	28485	146.49	244.21	5143	8573	Zambia	0	0.00	0.00	0	0
Zimbabwe	30459	366.99	1000.68	12049	32853	Zimbabwe	8020	260.01	343.39	32420	42817

Table 10. Data on manufacturing in current prices, 1987

Manufacture of tobacco products

ISIC Commodity Major Group 314

Country	Employees	Manufacturing value added (million US\$)	Gross output (million US\$)	MVA per worker (US\$)	Gross output per worker (US\$)
Burundi	0	0.00	0.00	0	0
Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0
Ethiopia	2535	46.87	120.70	18488	47612
Kenya	2022	23.50	128.15	11622	63376
Lesotho	0	0.00	0.00	0	0
Malawi	2290	3.36	24.51	1466	10703
Mauritius	380	5.03	18.79	13228	49442
Mozambique	600	0.43	8.66	722	14437
Rwanda	0	0.00	0.00	0	0
Somalia	0	0.00	0.00	0	0
Swaziland	0	0.00	0.00	0	0
Uganda	800	3.43	0.00	4292	0
Untd. Rep. Tanz.	5340	6.30	14.52	1180	2720
Zambia	0	0.00	0.00	0	0
Zimbabwe	5596	144.61	159.41	25842	23486

Manufacture of textiles

ISIC Commodity Major Group 321

Country	Employees	Manufacturing value added (million US\$)	Gross output (million US\$)	MVA per worker (US\$)	Gross output per worker (US\$)
Burundi	490	3.57	7.51	7279	15328
Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0
Ethiopia	42123	84.17	209.99	1998	4985
Kenya	26120	53.84	379.78	2061	14540
Lesotho	1277	5.20	10.51	4074	8228
Malawi	4314	17.20	31.69	3988	7345
Mauritius	4146	18.35	63.14	4425	15228
Mozambique	12000	3.42	6.09	286	508
Rwanda	500	5.67	17.36	11337	34718
Somalia	653	1.94	3.74	2973	5727
Swaziland	601	1.74	17.46	2891	29055
Uganda	8750	48.74	0.00	5570	0
Untd. Rep. Tanz.	29722	15.74	78.22	529	2632
Zambia	12038	54.02	142.85	4487	11867
Zimbabwe	21833	168.64	567.85	7724	26009

Table 10. Data on manufacturing in current prices, 1987

Manufacture of wearing apparel ----- ISIC Commodity Major Group 322						Manufacture of leather ----- ISIC Commodity Major Group 323					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US\$)			(million US\$)	(million US\$)	(US\$)	(US\$)
Burundi	569	4.71	9.54	8284	16764	Burundi	120	1.16	2.27	9630	18896
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	3953	11.99	36.91	3034	9336	Ethiopia	2918	14.93	60.76	5118	20822
Kenya	8250	20.17	304.02	2444	36851	Kenya	960	3.48	16.56	3621	17250
Lesotho	0	0.00	0.00	0	0	Lesotho	0	0.00	0.00	0	0
Malawi	1648	2.53	8.67	1537	5263	Malawi	111	0.11	0.11	997	1014
Mauritius	74526	105.74	295.49	1419	3965	Mauritius	430	1.54	5.26	3591	12241
Mozambique	5600	1.51	7.57	270	1352	Mozambique	1600	1.11	5.57	697	3483
Rwanda	0	0.00	0.00	0	0	Rwanda	0	0.00	0.00	0	0
Somalia	184	0.12	0.45	639	2421	Somalia	586	0.69	1.51	1178	2569
Swaziland	0	0.00	0.00	0	0	Swaziland	0	0.00	0.00	0	0
Uganda	289	0.00	0.00	0	0	Uganda	125	0.00	0.00	0	0
Untd. Rep. Tanz.	5019	1.35	13.80	269	2750	Untd. Rep. Tanz.	1977	1.46	5.14	738	2599
Zambia	0	0.00	0.00	0	0	Zambia	0	0.00	0.00	0	0
Zimbabwe	15454	80.63	130.30	5217	8431	Zimbabwe	744	3.29	7.31	4417	9822

Table 10. Data on manufacturing in current prices, 1987

Manufacture of leather footwear ----- ISIC Commodity Major Group 324						Manufacture of wood products ----- ISIC Commodity Major Group 331					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US\$)			(million US\$)	(million US\$)	(US\$)	(US\$)
Burundi	90	0.62	1.19	6852	13200	Burundi	208	0.27	0.78	1287	3728
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	2701	11.47	38.55	4245	14420	Ethiopia	1310	7.87	13.45	6008	10266
Kenya	1980	6.75	35.19	3408	17773	Kenya	8600	17.54	77.45	2039	9005
Lesotho	0	0.00	0.00	0	0	Lesotho	0	0.00	0.00	0	0
Malawi	526	0.71	2.37	1352	4508	Malawi	2038	3.72	6.01	1825	2950
Mauritius	660	2.23	4.56	3378	6903	Mauritius	750	1.38	3.23	1845	4303
Mozambique	0	0.00	0.00	0	0	Mozambique	3745	3.05	13.56	815	3621
Rwanda	0	0.00	0.00	0	0	Rwanda	874	8.56	8.72	9789	9975
Somalia	0	0.00	0.00	0	0	Somalia	0	0.00	0.00	0	0
Swaziland	0	0.00	0.00	0	0	Swaziland	2260	3.96	15.13	1751	6697
Uganda	264	0.00	0.00	0	0	Uganda	405	0.00	0.00	0	0
Untd. Rep. Tanz.	3760	2.28	5.69	606	1514	Untd. Rep. Tanz.	3365	2.24	9.48	666	2817
Zambia	0	0.00	0.00	0	0	Zambia	4045	8.19	12.11	2025	2994
Zimbabwe	4692	46.98	67.09	10013	14298	Zimbabwe	5265	27.61	51.48	5244	9778

Table 10. Data on manufacturing in current prices, 1987

Manufacture of wooden furniture						Manufacture of paper					
ISIC Commodity Major Group 332						ISIC Commodity Major Group 341					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US\$)			(million US\$)	(million US\$)	(US\$)	(US\$)
Burundi	0	0.00	0.00	0	0	Burundi	0	0.00	0.00	0	0
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	40	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	1060	4.06	10.24	3833	9663	Ethiopia	1456	12.31	28.86	8454	19818
Kenya	3830	8.66	20.82	2260	5436	Kenya	5400	30.08	206.41	5571	38225
Lesotho	650	1.11	2.44	1714	3759	Lesotho	0	0.00	0.00	0	0
Malawi	1067	1.42	3.50	1334	3285	Malawi	247	2.24	7.84	9080	31746
Mauritius	629	1.56	5.38	2478	8555	Mauritius	961	2.44	7.19	2538	7481
Mozambique	0	0.00	0.00	0	0	Mozambique	886	0.34	3.98	381	4487
Rwanda	0	0.00	0.00	0	0	Rwanda	253	4.84	7.40	19137	29239
Somalia	387	1.53	2.55	3965	6588	Somalia	0	0.00	0.00	0	0
Swaziland	0	0.00	0.00	0	0	Swaziland	1838	9.31	40.54	5066	22059
Uganda	170	0.00	0.00	0	0	Uganda	554	0.00	0.00	0	0
Untd. Rep. Tanz.	1739	1.11	5.18	638	2980	Untd. Rep. Tanz.	2104	2.98	10.86	1417	5164
Zambia	0	0.00	0.00	0	0	Zambia	2911	17.30	40.06	5942	13762
Zimbabwe	5385	26.78	46.34	4972	8605	Zimbabwe	4486	49.16	110.85	10959	24711

Table 10. Data on manufacturing in current prices, 1987

Printing and publishing ----- ISIC Commodity Major Group 342						Manufacture of ind. chemicals ----- ISIC Commodity Major Group 351					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US\$)			(million US\$)	(million US\$)	(US\$)	(US\$)
Burundi	277	1.36	2.78	4918	10034	Burundi	470	3.85	11.45	8198	24367
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0	Djibouti	23	0.00	0.00	0	0
Ethiopia	3261	17.65	30.10	5412	9232	Ethiopia	357	1.82	5.92	5107	16589
Kenya	5930	23.90	137.86	4031	23247	Kenya	3490	18.97	218.24	5436	62534
Lesotho	349	1.46	3.60	4184	10329	Lesotho	0	0.00	0.00	0	0
Malawi	796	5.82	14.47	7313	18184	Malawi	333	3.38	18.34	10151	55088
Mauritius	1059	4.63	11.61	4370	10960	Mauritius	1271	8.72	42.27	6857	33255
Mozambique	2738	1.14	3.79	415	1383	Mozambique	900	0.60	2.00	667	2222
Rwanda	0	0.00	0.00	0	0	Rwanda	1390	11.74	39.51	8448	28421
Somalia	675	0.52	7.35	773	10890	Somalia	0	0.00	0.00	0	0
Swaziland	0	0.00	0.00	0	0	Swaziland	647	7.44	47.04	11500	72699
Uganda	0	0.00	0.00	0	0	Uganda	0	0.00	0.00	0	0
Untd. Rep. Tanz.	2524	4.71	27.94	1866	11069	Untd. Rep. Tanz.	1296	5.46	14.33	4215	11053
Zambia	0	0.00	0.00	0	0	Zambia	6773	34.07	150.27	5030	22187
Zimbabwe	6129	93.49	98.52	15254	16074	Zimbabwe	3412	56.58	189.44	16584	55522

Table 10. Data on manufacturing in current prices, 1987

Manufacture of non-ind. chemicals						Petroleum refineries					
ISIC Commodity Major Group 352						ISIC Commodity Major Group 353					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US \$)			(million US\$)	(million US\$)	(US\$)	(US \$)
Burundi	120	1.42	3.09	11822	25726	Burundi	0	0.00	0.00	0	0
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	2962	22.95	51.64	7748	17436	Ethiopia	1202	54.95	266.62	45714	221815
Kenya	7520	51.22	653.62	6811	86918	Kenya	290	12.01	1454.84	41429	5016673
Lesotho	213	1.61	7.48	7538	35131	Lesotho	0	0.00	0.00	0	0
Malawi	924	10.49	34.62	11352	37469	Malawi	0	0.00	0.00	0	0
Mauritius	0	0.00	0.00	0	0	Mauritius	0	0.00	0.00	0	0
Mozambique	275	2.89	9.02	10498	32807	Mozambique	0	0.00	0.00	0	0
Rwanda	0	0.00	0.00	0	0	Rwanda	0	0.00	0.00	0	0
Somalia	382	2.42	3.92	6330	10269	Somalia	216	0.26	20.99	1215	97197
Swaziland	0	0.00	0.00	0	0	Swaziland	0	0.00	0.00	0	0
Uganda	155	0.00	0.00	0	0	Uganda	0	0.00	0.00	0	0
Untd. Rep. Tanz.	2216	6.10	33.76	2754	15233	Untd. Rep. Tanz.	0	0.00	0.00	0	0
Zambia	0	0.00	0.00	0	0	Zambia	0	0.00	0.00	0	0
Zimbabwe	5285	118.40	191.02	22403	36144	Zimbabwe	0	0.00	0.00	0	0

Table 10. Data on manufacturing in current prices, 1987

Manufacture of petr. & coal products						Manufacture of rubber products					
ISIC Commodity Major Group 354						ISIC Commodity Major Group 355					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US \$)			(million US\$)	(million US\$)	(US\$)	(US \$)
Burundi	0	0.00	0.00	0	0	Burundi	0	0.00	0.00	0	0
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	0	0.00	0.00	0	0	Ethiopia	1941	14.14	37.48	7286	19311
Kenya	0	0.00	0.00	0	0	Kenya	2050	36.69	180.38	17896	87992
Lesotho	0	0.00	0.00	0	0	Lesotho	0	0.00	0.00	0	0
Malawi	0	0.00	0.00	0	0	Malawi	222	0.72	1.83	3228	8247
Mauritius	0	0.00	0.00	0	0	Mauritius	362	1.25	4.13	3463	11401
Mozambique	0	0.00	0.00	0	0	Mozambique	750	0.62	2.07	829	2764
Rwanda	0	0.00	0.00	0	0	Rwanda	0	0.00	0.00	0	0
Somalia	0	0.00	0.00	0	0	Somalia	0	0.00	0.00	0	0
Swaziland	0	0.00	0.00	0	0	Swaziland	0	0.00	0.00	0	0
Uganda	0	0.00	0.00	0	0	Uganda	185	0.00	0.00	0	0
Untd. Rep. Tanz.	0	0.00	0.00	0	0	Untd. Rep. Tanz.	955	4.41	20.92	4623	21966
Zambia	0	0.00	0.00	0	0	Zambia	0	0.00	0.00	0	0
Zimbabwe	100	5.91	25.34	59114	253438	Zimbabwe	2160	33.23	49.88	15385	23091

Table 10. Data on manufacturing in current prices, 1987

Manufacture of plastic products						Manufacture of pottery & china					
ISIC Commodity Major Group 356						ISIC Commodity Major Group 361					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US \$)			(million US\$)	(million US\$)	(US\$)	(US \$)
Burundi	79	0.46	0.70	5837	8824	Burundi	0	0.00	0.00	0	0
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	1563	11.47	18.33	7340	11726	Ethiopia	0	0.00	0.00	0	0
Kenya	2190	18.20	120.41	8312	54980	Kenya	240	0.65	3.77	2698	15714
Lesotho	0	0.00	0.00	0	0	Lesotho	0	0.00	0.00	0	0
Malawi	600	2.81	6.55	4675	10913	Malawi	0	0.00	0.00	0	0
Mauritius	786	2.23	7.99	2838	10160	Mauritius	20	0.12	0.15	5824	7571
Mozambique	935	0.67	1.69	722	1805	Mozambique	0	0.00	0.00	0	0
Rwanda	0	0.00	0.00	0	0	Rwanda	0	0.00	0.00	0	0
Somalia	105	0.10	0.47	999	4439	Somalia	0	0.00	0.00	0	0
Swaziland	0	0.00	0.00	0	0	Swaziland	0	0.00	0.00	0	0
Uganda	0	0.00	0.00	0	0	Uganda	0	0.00	0.00	0	0
Untd. Rep. Tanz.	566	0.70	3.10	1237	5468	Untd. Rep. Tanz.	0	0.00	0.00	0	0
Zambia	0	0.00	0.00	0	0	Zambia	0	0.00	0.00	0	0
Zimbabwe	3198	53.86	80.39	16842	25139	Zimbabwe	780	4.69	6.93	6017	8885

Table 10. Data on manufacturing in current prices, 1987

Manufacture of glass & glassware						Miscellaneous non-metallic products					
ISIC Commodity Major Group 362						ISIC Commodity Major Group 369					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US \$)			(million US\$)	(million US\$)	(US\$)	(US \$)
Burundi	0	0.00	0.00	0	0	Burundi	304	3.45	7.05	11341	23198
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	871	3.35	10.19	3850	11704	Ethiopia	3335	13.98	46.41	4190	13917
Kenya	1200	4.33	27.66	3611	23047	Kenya	4930	20.35	172.27	4129	34943
Lesotho	0	0.00	0.00	0	0	Lesotho	285	0.70	1.96	2449	6871
Malawi	0	0.00	0.00	0	0	Malawi	1968	3.13	10.41	1592	5292
Mauritius	45	0.11	0.33	2489	7337	Mauritius	1147	5.16	15.13	4501	13191
Mozambique	900	0.57	1.42	629	1573	Mozambique	1776	0.46	0.77	260	433
Rwanda	0	0.00	0.00	0	0	Rwanda	530	28.41	32.70	53601	61701
Somalia	0	0.00	0.00	0	0	Somalia	510	0.50	1.07	981	2097
Swaziland	0	0.00	0.00	0	0	Swaziland	327	2.69	9.28	8237	28381
Uganda	0	0.00	0.00	0	0	Uganda	870	0.65	0.00	750	0
Untd. Rep. Tanz.	0	0.00	0.00	0	0	Untd. Rep. Tanz.	3572	1.36	26.65	380	7460
Zambia	0	0.00	0.00	0	0	Zambia	4199	23.19	72.41	5523	17246
Zimbabwe	855	15.22	21.93	17802	25645	Zimbabwe	5656	65.79	112.60	11632	19908

Table 10. Data on manufacturing in current prices, 1987

Basic iron and steel industries						Basic non-ferrous metals industries					
ISIC Commodity Major Group 371						ISIC Commodity Major Group 372					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US \$)			(million US\$)	(million US\$)	(US\$)	(US \$)
Burundi	0	0.00	0.00	0	0	Burundi	0	0.00	0.00	0	0
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	735	11.21	38.22	15247	51998	Ethiopia	0	0.00	0.00	0	0
Kenya	2770	8.10	162.61	2924	58704	Kenya	0	0.00	0.00	0	0
Lesotho	400	1.61	5.34	4035	13351	Lesotho	0	0.00	0.00	0	0
Malawi	0	0.00	0.00	0	0	Malawi	0	0.00	0.00	0	0
Mauritius	0	0.00	0.00	0	0	Mauritius	0	0.00	0.00	0	0
Mozambique	1725	0.36	2.88	501	1670	Mozambique	0	0.00	0.00	0	0
Rwanda	0	0.00	0.00	0	0	Rwanda	0	0.00	0.00	0	0
Somalia	0	0.00	0.00	0	0	Somalia	0	0.00	0.00	0	0
Swaziland	0	0.00	0.00	0	0	Swaziland	0	0.00	0.00	0	0
Uganda	1160	0.00	0.00	0	0	Uganda	0	0.00	0.00	0	0
Untd. Rep. Tanz.	1736	3.96	39.69	2282	22862	Untd. Rep. Tanz.	0	0.00	0.00	0	0
Zambia	1140	2.90	9.85	2543	8638	Zambia	0	0.00	0.00	0	0
Zimbabwe	14500	166.54	295.85	11486	20404	Zimbabwe	1100	15.00	37.69	13634	34264

Table 10. Data on manufacturing in current prices, 1987

Manufacture of basic metal products						Manufacture of non-electrical machinery					
ISIC Commodity Major Group 381						ISIC Commodity Major Group 382					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US \$)			(million US\$)	(million US\$)	(US\$)	(US \$)
Burundi	329	3.61	9.04	10962	27484	Burundi	0	0.00	0.00	0	0
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	1698	11.46	28.79	6750	16956	Ethiopia	0	0.00	0.00	0	0
Kenya	10690	32.40	379.42	3031	35493	Kenya	1630	4.67	36.66	2863	22491
Lesotho	0	0.00	0.00	0	0	Lesotho	0	0.00	0.00	0	0
Malawi	3451	6.19	13.89	1795	4024	Malawi	228	0.73	1.11	3215	4854
Mauritius	1247	6.75	22.28	5411	17863	Mauritius	788	1.13	3.46	1437	4397
Mozambique	2750	1.20	7.99	436	2907	Mozambique	0	0.00	0.00	0	0
Rwanda	604	20.93	32.69	34652	54114	Rwanda	0	0.00	0.00	0	0
Somalia	402	0.19	0.52	477	1298	Somalia	0	0.00	0.00	0	0
Swaziland	597	4.12	13.56	6905	22713	Swaziland	424	2.47	16.22	5814	38260
Uganda	352	0.00	0.00	0	0	Uganda	0	0.00	0.00	0	0
Untd. Rep. Tanz.	2936	6.03	26.25	2053	8941	Untd. Rep. Tanz.	1417	1.38	6.53	971	4610
Zambia	10283	65.06	223.44	6327	21729	Zambia	0	0.00	0.00	0	0
Zimbabwe	13300	121.91	204.50	9166	15376	Zimbabwe	5000	51.26	77.18	10252	15436

Table 10. Data on manufacturing in current prices, 1987

Manufacture of electrical equipment						Manufacture of transport equipment					
ISIC Commodity Major Group 383						ISIC Commodity Major Group 384					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US \$)			(million US\$)	(million US\$)	(US\$)	(US \$)
Burundi	25	0.20	0.47	7993	18890	Burundi	0	0.00	0.00	0	0
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	111	0.70	1.21	6346	10932	Ethiopia	0	0.00	0.00	0	0
Kenya	1960	41.15	294.52	20994	150264	Kenya	16950	51.94	1812.85	3064	106953
Lesotho	0	0.00	0.00	0	0	Lesotho	0	0.00	0.00	0	0
Malawi	230	1.23	4.62	5335	20086	Malawi	525	1.07	4.29	2043	8173
Mauritius	691	2.57	10.90	3724	15767	Mauritius	304	1.40	2.48	4591	8148
Mozambique	1110	0.65	10.79	583	9724	Mozambique	1631	1.74	1.98	1069	1215
Rwanda	0	0.00	0.00	0	0	Rwanda	0	0.00	0.00	0	0
Somalia	0	0.00	0.00	0	0	Somalia	0	0.00	0.00	0	0
Swaziland	0	0.00	0.00	0	0	Swaziland	0	0.00	0.00	0	0
Uganda	0	0.00	0.00	0	0	Uganda	0	0.00	0.00	0	0
Untd. Rep. Tanz.	1304	2.36	18.23	1808	13982	Untd. Rep. Tanz.	3389	7.39	27.55	2181	8130
Zambia	0	0.00	0.00	0	0	Zambia	0	0.00	0.00	0	0
Zimbabwe	5815	79.60	115.14	13689	19800	Zimbabwe	5461	82.59	85.40	15124	15637

Table 10. Data on manufacturing in current prices, 1987

Manufacture of professional goods -----						Miscellaneous manufactures -----					
ISIC Commodity Major Group 385						ISIC Commodity Major Group 390					
Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker	Country	Employees	Manufacturing value added	Gross output	MVA per worker	Gross output per worker
		(million US\$)	(million US\$)	(US\$)	(US \$)			(million US\$)	(million US\$)	(US\$)	(US \$)
Burundi	0	0.00	0.00	0	0	Burundi	0	0.00	0.00	0	0
Comoros	0	0.00	0.00	0	0	Comoros	0	0.00	0.00	0	0
Djibouti	0	0.00	0.00	0	0	Djibouti	0	0.00	0.00	0	0
Ethiopia	0	0.00	0.00	0	0	Ethiopia	0	0.00	0.00	0	0
Kenya	0	0.00	0.00	0	0	Kenya	2120	12.47	83.41	5882	39342
Lesotho	0	0.00	0.00	0	0	Lesotho	480	0.92	1.39	1922	2896
Malawi	0	0.00	0.00	0	0	Malawi	217	0.37	1.33	1694	6117
Mauritius	744	5.13	20.16	6895	27092	Mauritius	3059	7.85	23.35	2566	7632
Mozambique	0	0.00	0.00	0	0	Mozambique	0	0.00	0.00	0	0
Rwanda	0	0.00	0.00	0	0	Rwanda	0	0.00	0.00	0	0
Somalia	0	0.00	0.00	0	0	Somalia	110	0.75	1.65	6833	14988
Swaziland	0	0.00	0.00	0	0	Swaziland	218	0.19	0.51	879	2354
Uganda	0	0.00	0.00	0	0	Uganda	436	0.00	0.00	0	0
Untd. Rep. Tanz.	0	0.00	0.00	0	0	Untd. Rep. Tanz.	899	0.58	3.50	644	3891
Zambia	0	0.00	0.00	0	0	Zambia	361	1.15	2.37	3193	6565
Zimbabwe	170	0.82	1.65	4840	9684	Zimbabwe	2172	13.56	22.39	6243	10308

Table 11.1
Annual consumption of fuelwood and Bagasse - 1986

COUNTRY	Fuelwood	Bagasse
BURUNDI	3,697	-
COMOROS	-	-
DJIBOUTI	-	-
ETHIOPIA	37,105	629
KENYA	32,174	652
LESOTHO	-	-
MALAWI	6,017	547
MAURITIUS	40	2,440
RWANDA	5,602	7
SOMALIA	4,464	98
SWAZILAND	-	-
TANZANIA	22,388	375
UGANDA	11,245	33
ZAMBIA	9,418	389
ZIMBABWE	5,988	1,654
Subtotal	138,138	6,824
ANGOLA	4,005	163
BOTSWANA	-	-
MADAGASCAR	6,259	319
MOZAMBIQUE	14,270	120
SEYCHELLES	-	-
Subtotal	24,534	612
Total	162,672	7,436

Source: UN Energy Statistics Yearbook 1986, estimates.

Table 11.2
Hydro-Power 1986, 1987

COUNTRY	Capability (1987)		Installed capacity (1986) (MW)	Generation (GWH)
	Theoretical (GWH/year)	Exploitable		
BURUNDI	6.605	1.445	2	-
COMOROS	-	-	1	-
DJIBOUTI	-	-	-	-
ETHIOPIA	650.000	20.000	222	647
KENYA	6.626	4.207	354	1.680
LESOTHO	-	-	-	-
MALAWI	2.500	-	126	515
MAURITIUS	200	160	54	110
RWANDA	-	-	56	166
SOMALIA	-	-	-	-
SWAZILAND	-	-	-	-
TANZANIA	20.000	20.000	259	620
UGANDA	-	-	156	647
ZAMBIA	33.500	10.500	1.538	10.065
ZIMBABWE	18.500	17.500	633	3.155
<i>Subtotal</i>	737.931	73.812	3.401	17.605
ANGOLA	150.000	86.100	400	1.336
BOTSWANA	-	-	-	-
MADAGASCAR	400.000	-	45	268
MOZAMBIQUE	50.000	-	1.523	58
SEYCHELLES	-	-	-	-
<i>Subtotal</i>	600.000	86.100	1.968	1.661
TOTAL	1.337.931	159.912	5.369	19.266

Source: UN Energy Statistics Yearbook 1986; WEC, Survey of Energy Resources.

Table 11.3
Production, trade and consumption of electricity
(Quantities in GWH [million KWH] and KWH per capita)
1986

COUNTRY	PRODUCTION	IMPORTS	EXPORTS	CONSUMPTION	
				TOTAL	PER CAPITA
BURUNDI	2	72	-	74	15
COMOROS	12	-	-	12	26
DJIBOUTI	165	-	-	165	439
ETHIOPIA	802	-	-	802	18
KENYA	2,500	220	-	2,720	127
LESOTHO	-	-	-	-	-
MALAWI	528	-	1	527	73
MAURITIUS	518	-	-	518	485
RWANDA	170	20	3	187	30
SOMALIA	143	-	-	143	30
SWAZILAND	-	-	-	-	-
TANZANIA	880	-	-	880	38
UGANDA	656	-	110	546	34
ZAMBIA	10,100	20	3,100	7,020	1,018
ZIMBABWE	5,988	3,000	-	8,988	988
Subtotal	22,464	3,332	3,214	22,582	3,321
ANGOLA	1,790	-	-	1,790	199
BOTSWANA	-	-	-	-	-
MADAGASCAR	500	-	-	500	49
MOZAMBIQUE	497	103	-	600	42
SEYCHELLES	66	-	-	66	835
Subtotal	2,853	103	-	2,956	1,125
TOTAL	25,317	3,435	-	25,538	

Source: UN Energy Statistics Yearbook 1986.

Table 11.4
Petroleum refinery distillation capacity
(Quantities in thousand metric tons)
1982 - 1984

COUNTRY	LOCATION	CAPACITY	REMARKS
BURUNDI	-	-	-
COMOROS	-	-	-
DJIBOUTI	-	-	-
ETHIOPIA (1)	Assab	722	(1) A second refinery is planned for Addias Ababa with pipeline form Assab
KENYA	Momabssa	4,750	-
LESOTHO	-	-	-
MALAWI	-	-	-
MAURITIUS	-	-	-
RWANDA	-	-	-
SOMALIA (2)	Mogadishu	500	(2) Operating since 1978
SWAZILAND	-	-	Expansion considered
TANZANIA	Dar-es-Salaam	750	-
UGANDA	-	-	-
ZAMBIA (3)	Ndola	1,220	(3) Supplied with crude oil the Taz Pipeline from Dar-es-Salaam
ZIMBABWE (4)	Feruka	1,000	(4) Has been shut down 1966
Subtotal	6 Refineries	8,942	Only 5 operating with a capacity of 7,942,000 tons
ANGOLA	Luanda	1,500	(5) Proposed "SADCC refinery" by expanding the existing Luanda refinery to 3 bill.t
BOTSWANA	-	-	-
MADAGASCAR	Tamatave	818	-
MOZAMBIQUE	Maputo	800	-
SEYCHELLES	-	-	-
Subtotal	3 Refineries	3,118	-
TOTAL	9 Refineries	12,060	Only 8 operating with a capacity of 1.1 million t

Sources: Energy Resources in Africa, 1982 - Joint OAU/ECA Meeting of African Experts on Energy; SADCC Energy Sector Co-operation Development - A desk study, (March 1984) by Gladson K. Kayira, Energy Department, World Bank; UN Energy Statistics, Yearbook, 1982.

Table 11.5
Production, trade and consumption of energy petroleum products
(In thousand metric tons and kilogrammes per capita)
1986

COUNTRY	PRODUCTION	IMPORTS	EXPORTS	CONSUMPTION	
				TOTAL	PER CAPITA
BURUNDI	-	50	-	48	10
COMOROS	-	13	-	13	28
DJIBOUTI	-	477	-	72	191
ETHIOPIA	689	147	222	542	12
KENYA	1,790	55	588	902	42
LESOTHO	-	-	-	-	-
MALAWI	-	148	-	138	19
MAURITIUS	-	363	-	232	217
RWANDA	-	128	-	119	19
SOMALIA	352	124	42	348	73
SWAZILAND	-	-	-	-	-
TANZANIA	503	126	44	552	24
UGANDA	-	253	2	251	16
ZAMBIA	478	13	37	422	61
ZIMBABWE	-	738	-	638	70
<i>Subtotal</i>	3,812	2,635	935	4,259	782
ANGOLA	1,270	13	135	398	44
BOTSWANA	-	-	-	-	-
MADAGASCAR	208	78	40	237	23
MOZAMBIQUE	-	316	-	251	18
SEYCHELLES	-	100	-	40	506
<i>Subtotal</i>	1,478	507	175	926	591
TOTAL	5,290	3,142	1,110	5,185	1,373

Source: UN Energy Statistics Yearbook 1986.

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ANNEX III

**INSTITUTIONS FOR RESEARCH AND TRAINING
IN THE PTA SUBREGION**

LIST OF INSTITUTES

Institute	Activities	Personnel
BURUNDI		
Centre universitaire de recherche pour le developpement economique et social (curdes), Bujumbura	Research	35 part-time
Institut des sciences agronomiques du Burundi (ISABU), Bujumbura	Research, consultancy	59 full-time 2 part-time
Service national des etudes et statistiques, Bujumbura	Research	
COMOROS		
DJIBOUTI		
ETHIOPIA		
Ethiopian Management Institute (EMI)	Training, consultancy	
Engineering Design Centre	Training	
African Association for Public Administration and Management (AAPAM), Addis Ababa	Research, consultancy	100 full-time
African Training and Research Centre for Women, Addis Ababa	Research, education, consultancy	5 full-time
ARSSI Rural Development Project, Arssi	Research, technical education, training	
Economic Research and Planning Division, Addis Ababa	Research,	14 full-time
Educational Research Service, Ministry of Education, Addis Ababa	Research	4 full-time
Ethiopian Nutrition Institute (ENI), Addis Ababa	Research, education, consultancy	15 full-time, 2 part-time
Institute of African studies, Asmara	Research	2 full-time, 3 part-time
Institute of Agricultural Research, Addis Ababa	Research	171 full-time

ETHIOPIA (continued)

Institute of Development Research, Addis Ababa	Research	9 full-time 30 part-time
Institute of Ethiopian Studies, Addis Ababa	Research, consultancy	8 full-time
International Livestock Centre for Africa (ILCA), Addis Ababa	Research, education, consultancy	100 full-time
Research and Planning Services, Addis Ababa	Research	
Research Unit, Addis Ababa	Research	
Science Popularization Research Council, Addis Ababa	Research	
Technical Teachers Education Dept., Addis Ababa	Research	

KENYA

Directorate of Industrial Training (DIT) Ministry of Technical Training and Applied Technology with 4 centres:	Training	
Kenya Textile Training Institute (KTII), Nairobi	Vocational training	
Kisumu Industrial Training Centre	Vocational training	
National Industrial Vocational Training Centre, Nairobi	Vocational training	
Mombasa Industrial Training Centre	Vocational training	
African Institute for Higher Tech- nical Technical Training and Research (AIHTR)	Training	
African Regional Standardization Organization (ARSO)	Training	
Eastern and Souther Africa Trade Promotion and Training Centre	Training	
Kenya Polytechnic		
Kenya Institute of Business Training Faculty of Engineering, University of Nairobi	Training Training	

KENYA (continued)

Kenya Industrial Research and Development Institute (KIRDI)	Training	
American Medical and Research Foundation, Nairobi	Research, education, consultancy	250 full-time
Appropriate Technology Centre for Education and Research, Nairobi	Research, training, technical education	2 full-time 3 part-time
Bureau of Education Research, Nairobi	Research, education	8 full-time 4 part-time
Department of Adult Education, Nairobi	Research	
Department of Agricultural Economics, Nairobi	Research, education, consultancy	8 full-time
Department of Agricultural Engineering, Nairobi	Research	8 full-time
Department of Community Health, Nairobi	Research	
Department of Land Development, Nairobi	Research, education, consultancy	12 full-time, 2 part-time
Department of Sociology, Nairobi	Research	
Economics Department, Nairobi	Research, education, consultancy	23 full-time
Education Research Bureau, Nairobi	Research	
Housing Research and Development Unit (HRDU), Nairobi	Research, education, consultancy	11 full-time\
Industrial Research and Consultancy Unit, Nairobi	Research	
Institute for Development Studies, Nairobi	Research, consultancy	13 full-time
Institute for African Studies, Nairobi	Research	14 full-time
Institute for Computer Science, Nairobi	Research, education	

KENYA (continued)

Institute of Cultural Affairs, Nairobi	Research	85 full-time
International Council for Research in Agroforestry (ICRAF), Nairobi	Research, education	36 full-time
Kenya Institute of Administration, Nairobi	Research, education	
Mazingira Institute, Nairobi	Research	
National Poultry Development Programme, Nairobi	Research	
Population Studies and Research Institute, Nairobi	Research, education, consultancy	12 full-time
Research Department, Nairobi	Research	
UN Centre for Human Settlements, (HABITAT), Nairobi	Research, consultancy	

LESOTHO

Bureau of Statistics, Maseru	Research	
Department of Political and Administrative Studies, Roma	Research, consultancy	7 full-time
Institute of Extra-mural Studies, Roma	Research	17 full time, 70 part-time
Institute of Labour Studies, Maseru	Research	4 full-time, 12 part-time
Institute of Southern African Studies (ISAS), Roma	Research, consultancy	7 full-time 17 part-time
Lesotho Institute of Public Administration, Maseru	Research	15 full-time

MALAWI

Centre for Social Research, Zomba	Research, consultancy	5 full-time 3 part-time
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Department of Sociology, Zomba	Research, education	3 full-time
Rural Development Department, Lilongwe	Research, consultancy	45 fulltime
School of Social Science, Zomba	Research	

MAURITIUS

Regional Sugar Cane Training Centre for Africa	Training	
John Kennedy Technical Training Centre	Training	
Agricultural Services, Reduit	Research	260 full-time
Mahatma Gandhi Institute (MGI), Moka	Research, education	15 part-time
Mauritius Institute of Education, Reduit	Research, education	75 full-time 9 part-time
Mauritius Sugar Industry Research Institute, Reduit	Research, education, consultancy	26 full-time
School of Administration, Reduit	Research, education, consultancy	22 full-time, consultancy
School of Agriculture, Reduit	Research, education, consultancy	16 full-time
School of Industrial Technology, Reduit	Research, vocational technical education	8 part-time
School of Mauritian, African and Asian Studies, Moka	Research	

MOZAMBIQUE

Ecology Centre, Maputo	Research, education	3 full-time
Centre for African Studies, Maputo	Research, consultancy	18 full-time 1 part-time

Faculty of Agronomy and Forestry, Maputo	Research	
National Institute for Physical Planning, Maputo	Research	
Universidade Eduardo Mondlane, Maputo	Research, education, consultancy	288 full-time

RWANDA

Centre d'etudes et d'application de l'energie au Rwanda (CEAER), Butare	Research, consultancy	6 full-time
Centre de recherche appliquee et de formation permanente (CRAFOP), Butare	Research	1 full-time 39 part-time
Direction des etudes et recherches, Kigali	Research	
Direction generale de la recherche scientifique, Kigali	Research	
Faculte des sciences economiques, sociales et de gestion, Butare	Research, education	24 full-time
Centre universitaire de recherche sur la pharmacopee et la medecine tra- ditionnelle (CURPHAMETRA), Butare	Research	10 full-time, 12 part-
Institut des sciences agronomiques du Rwanda (ISAR), Butare	Research, consultancy	28 full-time
Institut national de recherche scientifique (INRS), Butare	Research	7 full-time 9 part-time

SOMALIA

Industrial Vocational Training Centre of Mogadiscio	Training	
Somali Institute for Development Administration and Management (SIDAM)	Training	
SOMALIA (continued)		
Dahrer Training and Consulting Company (DATCO)	Training	
Department of Natural Sciences, Mogadishu	Research	

SWAZILAND

Department of Economics, Kwaluseni	Research	
Mananga Agricultural Management Centre (MAMC), Mhlume	Research, education	8 full-time
Social Science Research Unit (SSRU), Kwaluseni	Research, education, consultancy	6 full-time 3 part-time
Swaziland Institute for Educational Research, Kwaluseni	Research, consultancy	2 full-time
Swaziland Institute of Management and Public Administration (SIMPA), Mbabane	Research, education	11 full-time 8 part-time

TANZANIA

Tanzania Engineering, Manufacturing and Design Organization (TEMDO)	Training, consultancy	
Faculty of Engineering, University of Dar-es-Salaam	Training	
National Textile Corporation		
Centre for Housing Studies, Dar-es-Salaam	Research, education, consultancy	15 full-time 5 part-time
Centre on Integrated Rural Develop- ment for Africa (CIRDAFRICA), Arusha	Research, technical education	8 full-time
Institute of Development Management, Mzumbe	Research, education	120 full-time
Department of agricultural engineering and land planning, Morogoro	Research, technical education, vocational training	18 full-time
Department of economics, Dar-es-Salaam	Research, education	30 full-time 6 part-time
Department of forest economics, Morogoro	Research, education	4 full-time 1 part-time

TANZANIA (continued)

Department of rural economy, Morogoro	Research, education, consultancy	11 full-time 2 part-time
Department of sociology, Dar-es-Salaam	Research, education	14 full-time
District development corporations section, Dodoma	Research	
Eastern and Southern African management Institute, Arusha	Research, education, consultancy	32 full-time
Economic Research Bureau, Dar-es-Salaam	Research, consultancy	22 full-time
Faculty of Agriculture, Forestry and Veterinary Science, Morogoro	Research	
Institute of Development Studies, Dar-es-Salaam	Research, education, consultancy	18 full-time
Institute of Resource Assessment (IRA), Dar-es-Salaam	Research, consultancy	15 full-time
Tanzania Food and Nutrition Centre, Dar-es-Salaam	Research	120 full-time

UGANDA

Management Training and Advisory Centre (MTAC)	Training, consultancy, research	
Uganda Polytechnic	Training, consultancy, research	
Directorate of Industrial Training	Training	
Department of Agricultural Engineering, Kampala	Research, vocational training, technical education	15 full-time
Institute of Statistics and Applied Economics, Kampala	Research, education, consultancy	34 full-time 2 part-time
Makerere Institute of Social Research (MISR), Kampala	Research, consultancy	3 full-time
National Research Council, Kampala	Research, education, consultancy	17 full-time

UGANDA (continued)

Uganda Institute of Public Administration, Kampala	Research, education, consultancy	59 full-time
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ZAMBIA

Department of Rural Economy and Extension Education, Lusaka	Education, consultancy	3 full-time 2 part-time
Department of Social Development Studies, Lusaka	Research, education	14 full-time
Educational Research Bureau, Lusaka	Research, consultancy	5 full-time
Institute of African Studies, Lusaka	Research, consultancy	13 full-time
Manpower Research Institute, Lusaka	Research, consultancy	3 full-time
National Council for Scientific Research, Lusaka	Research, consultancy	78 full-time
National Food and Nutrition Commission, Lusaka	Research, consultancy	13 full-time
National Institute of Public Administration, Lusaka	Research, education, consultancy	79 full-time 10 part-time
Pan African Institute for Development (PAID-ESA), (East and Southern Africa Region), Kabwe	Education, consultancy, training, research	10 full-time 8 part-time
Presidents Citizenship College, Kabwe	Research, education, consultancy	40 full-time
Research Unit, Lusaka	Research	3 full-time
Rural Development Studies Bureau, Lusaka	Research, consultancy	8 full-time 3 part-time
School of Business and Industrial Studies, Kitwe	Research	11 full-time 5 part-time
School of Environmental Studies, Kitwe	Research, consultancy	10 full-time 12 part-time
School of Humanities and Social Sciences, Lusaka	Research, education, consultancy	78 full-time 3 part-time
Technology Development and Advisory Unit, Lusaka	Research	10 full-time

ZAMBIA (continued)

UN Institute for Namibia, Lusaka	Research, consultancy	46 full-time
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Urban Community Research Unit, Lusaka	Research	
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ZIMBABWE

Association for Appropriate Technology, Harare	Research	
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Centre for Applied Social Sciences, Harare	Research, consultancy	5 full-time
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Department of Adult Education, Harare	Research, education, consultancy	9 full-time 3 part-time
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Department of Land Management, Harare	Research, education, consultancy	22 full-time
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Department of Political Science, Harare	Research	
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Department of Rural and Urban Planning, Harare	Research, education	12 full-time
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Development Technology Centre, University of Zimbabwe	Research (rural technology)	
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Economics Department, Harare	Research, education, consultancy	15 full-time
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Faculty of Education, Harare	Research, education	32 full-time 9 part-time
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Institute of Education, Harare	Research, consultancy	8 full-time
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Timber Engineering Research Centre, Harare	Research	
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Zimbabwe Institute of Development Studies (ZIDS), Harare	Research, education, consultancy	
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Zimbabwe Institute of Management	Training	
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Source: Based on Directory - Development Research and Training Institutes in Africa, OECD Development Centre, Paris, 1986.