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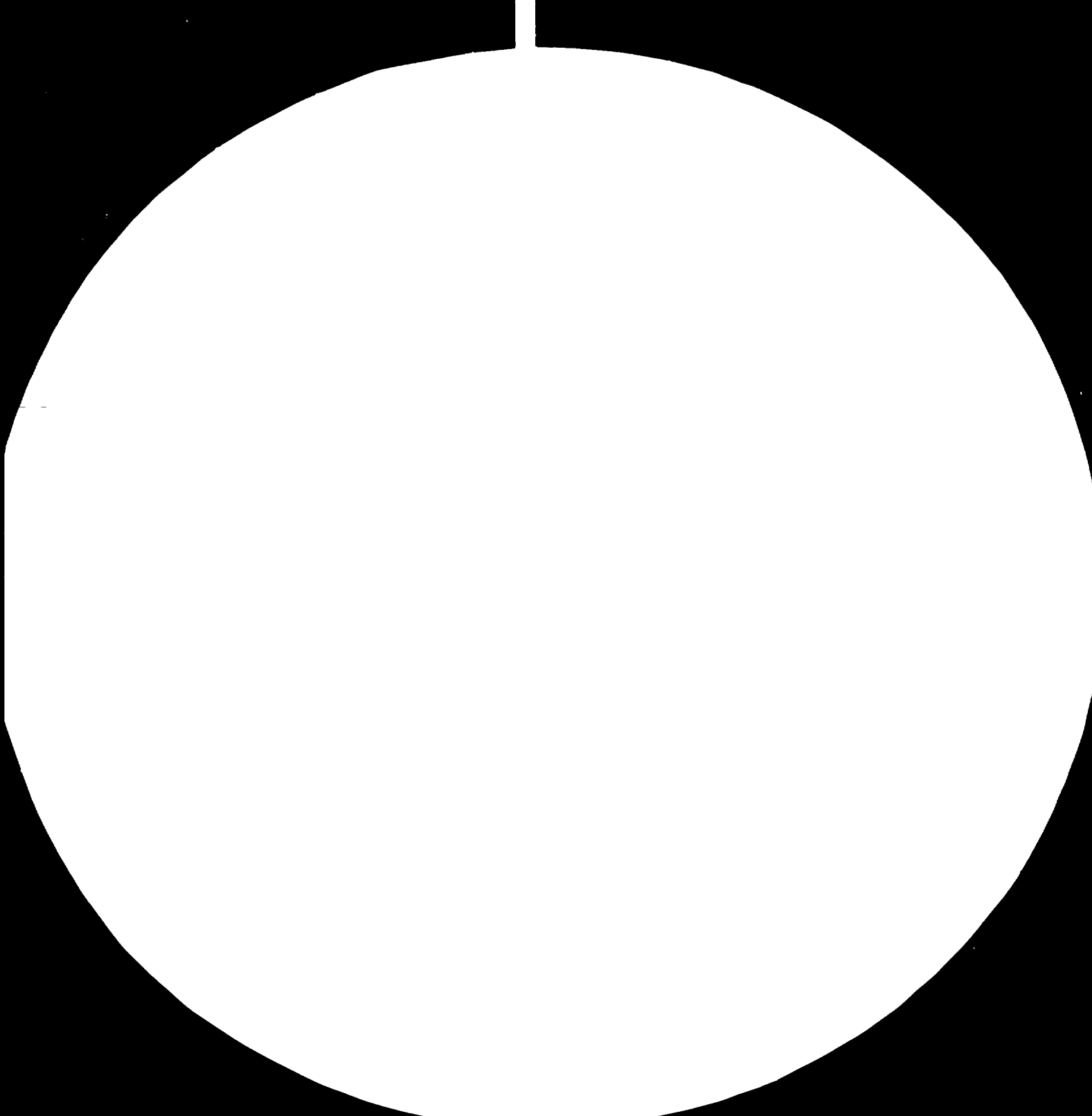
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ASSISTANCE TO INDUSTRY DEVELOPMENT

DP/MOZ/80/010

MOZAMBIQUE

Technical Report: Proposed Assistance to the Secondary Wood  
Processing Industries \*

Prepared for the Government of the People's Republic of Mozambique  
by the United Nations Industrial Development Organization  
executing agency for the United Nations Development Programme

Based on the work of Antoine V. Bassili,  
Senior Industrial Development Officer  
Agro-industries Branch  
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United Nations Industrial Development Organization  
Vienna

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INTRODUCTION:

The Government of the People's Republic of Mozambique requested UNDP/UNIDO assistance to undertake exploratory technical assistance missions in the following sectors: agro-industries, secondary wood processing industries, building materials, petrochemicals and industrial trainign. A mission by a consultant of the Forest Industries Advisory Group for Africa identified the following priority fields for possible assistance to the wood industries sector which were subsequently confirmed in an informal request by the National Directorate of Forests:

- (a) Establishment of a wood-drying centre of industrial capacity in Maputo;
- (b) Establishment of a woodwroking tool and machine maintenance centre in Maputo;
- (c) Complete restoration of the veneer and plywood factory also in Maputo;
- (d) Establishment of a unit for the production of low cost wooden modular prefabricated bridges;
- (e) Reactivation and expansion of the furniture industry.

As a result of this request, a Senior Industrial Development Officer from UNIDO's Agro-industries Branch, Antoine V. Bassili, undertook a ten day mission to Maputo, Mozambique, from 31 August to 10 September 1980.

During his stay in Maputo he had discussions with officials of the Ministry of Agriculture (National Directorate of Forests) Ministry of Industry and Energy (National Directorates of Light Industry and of Chemical and Food Industries), Ministry of Public Works and Housing (National Directorates of the Building Materials Industry and Technology of Construction) as well as with UNDP officials.

The list of persons he met with is given in Annex I.

DISCUSSIONS WITH OFFICIALS OF THE MINISTRY OF AGRICULTURE (NATIONAL DIRECTORATE OF FORESTS):

A meeting was arranged on the first day of the mission with all

concerned. It appeared immediately that Mr. Jaime H. Tohá, the FAO/UNDP Senior Forestry Advisor, was interested in the two Centres, object of the original informal request (for wood drying - and eventually preservation - and tool maintenance) only if they were to be financed fully from UNIDO funds. Since neither the UNIDO staff member who undertook this mission nor the Industrial Development Field Adviser stationed in Maputo could make such a promise (each project costing approximately US\$ 350,000), the requests were summarily withdrawn.

Furthermore, the officials of this National Directorate never mentioned the assistance to the plywood mill included in the original informal request.

As a result of this reduction in the envisaged fields of assistance it was decided, with the Resident Representative's approval, to shorten the mission by two days. (This proved to be impossible due to airline ticketing problems in Maputo).

DISCUSSIONS WITH OFFICIALS OF THE MINISTRY OF INDUSTRY AND ENERGY (NATIONAL DIRECTORATE FOR LIGHT INDUSTRY):

Meetings were held with Messrs. Eugenio D. de Lemos, Anibal Cardoso and Jens Erik Torp of the above National Directorate, and the mission visited a leading furniture manufacturer, MORFEO, who has been incorporated in a state-owned enterprise, as well as several furniture retail shops in Maputo and stands of the various factories at the 16th FACIM (International Fair of Maputo).

Because of the available skilled craftsmen (including cabinet makers and carvers), and the availability of excellent species for furniture (Notably Jambiré (Millettia laurentii De Wild. and Millettia stuhlmannii Taub.)), the existing furniture industry could once again enter export markets, provided it manages to increase its productivity, improve the quality of the products (to attain the level of interchangeable parts) and re-design - as far as possible - products for knock-down construction as well as to use kiln dried timber in all products for export overseas.



There also exists a need for design of furniture for low income housing both in urban and rural areas. The mission was pleased to note that the design cell of the National Directorate had in its staff talented designers who only needed to acquire basic knowledge of modern furniture design, specially with respect to modern construction techniques such as using special fittings to obtain knock-down construction, design of components for serial production, introduction of modern auxiliary materials (eg. in upholstery) which reduce labour and raw material requirements, etc.

Knock-down construction is not only important for export, but also for catering for the local market, because of the sheer size of the country.

The mission is of the opinion that, notwithstanding the fact that the supply of sawnwood of adequate quality and sufficiently dry, is the responsibility of the National Directorate of Forests; based on world-wide experience, the sawnwood delivered to furniture factories in hot humid climates is never dry enough for production for export to cold climates and has to be further dried in a kiln by the furniture plant prior to machining. It therefore strongly recommends that before exports of furniture overseas are seriously envisaged, the factories producing for export be assured adequately dry sawn timber, even if this necessitates that the Directorate establishes its own Central Kiln-drying facility. (It did not include this in its proposal for technical assistance because it feels that in the coming two to three years it is unlikely that these factories will reach a level of productivity and quality to enable them to enter overseas markets. This should nevertheless be considered at the appropriate time).

The furniture industry in Mozambique is currently utilizing practically exclusively hardwoods which it could replace by timbers of lesser value on world markets and thus liberate the corresponding volumes for export. Softwoods could be used for certain types of low cost furniture, but these would probably have to be treated immediately after sawing for preservation against stain by fungi. This should be studied and recommendations made in the master plan.

Having noted the quality of the furniture components that were machined but not hand-finished in all the furniture seen, and also having seen the poor tool maintenance in both factories visited, the mission strongly recommends the creation of a central woodworking machine and tool maintenance centre that would not only provide services to the Directorate's factories in Maputo, but also train specialists in this field.

Although the furniture industry could develop to produce not only for the internal market but also for that of neighbouring countries and even overseas this could only happen if it rationalizes its production methods. A considerable number of firms have been taken over by the state yet all still produce using "mechanized craftsman" methods - i.e. finishing all pieces by hand and not producing inter-changeable parts. This is probably due to the fact that there has been no specialization when these firms belonged to private individuals and competed with one another, and since independence no attempt at doing this has yet been made. This is a pre-requisite for successful industrial production, and steps must be taken to introduce rational industrial production in these enterprises as soon as possible.

Consequently, the mission also endorsed the suggestion made by the officials it met with that a survey of the sector is needed and included it, as well as the subsequent elaboration of a master plan, in its proposal for technical assistance.

This assistance is to comprise also assistance in the implementation of this plan through the introduction of modern industrial production methods, serial production, etc. in at least one factory in the Maputo area.

The proposed organization of the Vice Directorate for Furniture was discussed and it was recommended to add to the proposed organizational chart two departments: one to cover quality control and the other to be responsible for technical aspects related to selection of equipment, standardization of tools, plant layout and central maintenance and technical stores. If the feeling was that quality control did not justify a department of its own, then it was recommended that it be

placed under the commercial department and not under that responsible for production.

A draft project document outlining the proposed assistance to the furniture sector is given in Annex II. It foresees assistance over a period of 30 months at a cost to UNDP of US\$ 1,050,000.

DISCUSSIONS WITH OFFICIALS OF THE MINISTRY OF INDUSTRY AND ENERGY  
(NATIONAL DIRECTORATE FOR CHEMICAL AND FOOD INDUSTRIES):

The mission met with Mr. Angelo Dias of the above Directorate and discussed, in general terms, possible UNDP/UNIDO assistance to two projects being studied by the Directorate.

The first relates to the creation of a match factory in Nampula (tentatively with bilateral assistance from the Democratic People's Republic of Korea). The problem it faces at present is to select an appropriate specie for the splints, including if necessary, the establishment of the necessary plantations. Mr. Dias was informed of UNIDO's experience in the preparation of feasibility studies, evaluation of bids and start-up of match factories.

The second relates to re-activating an existing tannin factory that is currently stopped due to lack of raw materials (imported wattle from the Republic of South Africa). The mission discussed the request for assistance in the production of tannins from mangrove bark with specialists in this matter who are of the opinion that since the local market cannot absorb the proposed capacity, it is unlikely that the factory to be reactivated would be viable because overseas markets would probably not accept tannins from mangrove due to their lower quality and dark colour.

Since both projects are still at the idea stage, no project proposals were drafted.

DISCUSSIONS WITH OFFICIALS OF THE MINISTRY OF PUBLIC WORKS AND HOUSING:

The mission met with the following officials of this Ministry;

Mr. Francisco Loforte Ribeiro (Director, National Directorate of building Materials Industry)

Mr. Inocente Vembane (Engineer, same Directorate)

Mr. Nuno Arez (Department Head, National Directorate of Construction Technology)

Mr. Jaime Alejandro Gandy (Engineer, same Directorate)

It was originally intended that the mission discusses possible assistance in the field of production of low-cost modular prefabricated bridges, but it soon became apparent to all concerned that assistance was needed - and could be provided - in a far wider field, namely the use of wood in construction.

Timber has a vital role to play in the development of Mozambique's rural areas. Because of its local availability, its ease of manufacture, the existence of sawmills to process the logs, and skilled carpenters, as well as the fact that timber construction is a labour intensive operation, there exists a wide scope for development in this sector.

Consequently an integrated approach was discussed and the following major fields of technical assistance were identified:

Study on the Grouping of Mozambique Timbers used in Construction:

The rational use of timber in construction in countries in the tropics calls for the utilization of as wide a range as possible of the species growing in the forests. In spite of the fact that considerable work has already been done on the properties of these species, no attempt seems to have been made in Mozambique to group them according to major parameters (strength, durability and shrinkage) with a view to their use, in mixed assortments, in construction.

The mission therefore recommends that a study be commissioned to develop this grouping. Once such a study has been prepared it will serve for all applications of timber in construction in the country, thus not only reducing costs, and promoting additional, hitherto unutilized

species in construction, but also liberating timber of some of the better known species currently used in local construction for possible export. Such a scientifically based study would also ensure that timber is used correctly thus preventing consumer resistance to this material on the one hand and costly remedial action to timber construction on the other.

Study on the comparative cost of timber construction:

In order to determine the role that timber can play in construction, the mission proposes that a comparative study be carried out to determine the costs, suitability, ease and speed of construction, availability of raw materials and of production capacity and skills, transport costs, of timber and the building materials it could replace for various end-uses.

This study should compare various types of wooden components used in construction (eg. roof trusses, internal and external walls, doors, windows, flooring joists, agricultural buildings such as barns, pigsties, silos, roof systems for industrial buildings and timber bridges). The methodology used should be such that the study could be easily updated to take into account changes in costs of raw materials, transport, labour or production costs.

Based on the findings of this study it would be possible to determine for which possible uses in construction timber should be seriously considered, and special efforts be devoted to design appropriate structures and components using the system of grouped species referred to above.

Development of designs for the rational use of timber in construction:

The mission recommends that, once the above mentioned two studies have been completed, the authorities in the Ministry should determine their priorities for developing the use of wood in construction and, once this has been determined, have designs (for prefabricated wooden modular systems and not just designs for specific items) developed by a consulting engineering firm specialized in design of timber engineered products. This assistance should not only comprise the designs but also

the erection of prototypes of each design system developed and preparation of design, production and erection manuals.

Development of Modular Prefabricated Wooden Bridges:

The mission explained the advantages of the system developed by UNIDO in Kenya. The 37 minute film, in Spanish, describing the system was shown to some 20 technicians of the Ministry. The film will be shown again to directors of the Ministry's provincial offices after the Mission's departure.

Such bridges are eminently suited for non-metallized rural roads, since they can have spans of up to 30 meters, carry loads of upto 40 tons and also be produced in series and erected quickly using unskilled labour and no mechanical devices (such as cranes). Furthermore, once a manual has been prepared, bridges can be "composed" from the basic elements by referring to the various tables in the manual.

The proposal for providing assistance was discussed with all concerned, and is included in the overall proposal for assistance to the Ministry given in Annex III.

Assistance to the Existing Joinery Industry:

The mission visited a joinery factory attached to the Ministry in Machava. It, and all other factories, face similar problems as the furniture industry (production using "mechanized craftsmen" techniques, non standardization of products, lack of specialization, poor plant layout, total lack of industrial engineering concepts, low productivity, lack of appropriate cutting tools, etc.)

The increase of productivity, the rationalization of production and the development of designs suited to low cost housing and local conditions will result in a reduction in the cost of joinery thus lower the cost of construction while increasing the number of units produced.

In order to achieve this, assistance is required, and a detailed programme was elaborated by the Mission and discussed with all concerned.

Reactivation of the Wood-wool cement Plant in Beria:

The mission was requested to include in its proposed assistance the reactivation of the above plant. Since wood-wool cement is a low cost product utilizing locally available raw materials eminently suitable for prefabrication of low cost houses and the plant is lying idle, the mission endorses the proposal to re-activate it.

It suggests furthermore that designs for the correct application of this building material be developed as part of the assistance to be provided, since, here again, incorrect applications result in poor housing and consumer resistance.

Detailed proposals for all the above suggested topics of technical assistance have been incorporated in one project document, reproduced as Annex III of this report.

ANNEX I

LIST OF PERSONS ENCOUNTERED

MINISTRY OF AGRICULTURE

National Directorate of Forests and Conservation (DINAF)

Mr. Jaime M. Tohá	Senior Forestry Advisor UNDP/FAO Project Manager
Mr. Nelson Carvalho	Industries Specialist
Mr. José H. Ferreira de Castro	UNDP/FAO Sylviculturist

MINISTRY OF INDUSTRY AND ENERGY

National Directorate of Light Industries (DNIL)

Mr. Jens Erik Torp	Deputy Director
Mr. Eugenio D. de Lemos	Vice Director, Vice Directorate for the Furniture Industry.
Mr. Anibal Cardoso	Vice Directorate for the Furniture Industry

National Directorate for Food and Chemical Industries (DNIQA)

Mr. Angelo Dias	Department of Planning
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MINISTRY OF PUBLIC WORKS AND HOUSING

National Directorate of Building Materials Industry (DNIC)

Mr. Francisco Loforte Ribeiro	Director
Mr. Inocente Vembane	Engineer

National Directorate of Construction Technology (DNIC)

Mr. Nuno Arez	Department Head
Mr. Jaime Alejandro Gandy	Engineer

National Directorate for Housing (DNH)

Mr. Bjorn Brandberg	Architect/Engineer UNDP/Habitat project.
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UNITED NATIONS DEVELOPMENT PROGRAMME

Mr. Juan Blanch-Soler	Resident Representative
Mr. Carlos Alberto Goulart	Industrial Development Field Adviser



ANNEX II

UNITED NATIONS DEVELOPMENT PROGRAMME

Project of the Government of the People's Republic of Mozambique

DRAFT PROJECT DOCUMENT

Title: Rehabilitation of the Furniture Industry  
Number: MOZ/8X/XXX/A/01/37 Duration 2 1/2 years  
Primary Function: Direct Support  
Secondary Function: --  
Sector: (Government class): Industrial Development  
(UNDP) Manufacturing industry.  
Sub-sector:  
(Government class): Light industries  
(UNDP): Industrial Development Support Services  
Government Implementing Agency: Ministry of Industry and Energy, National Directorate for Light Industry.  
Executing Agency: United Nations Industrial Development Organization (UNIDO)  
Estimated starting date: June 1981  
Government inputs: (in kind) UNDP inputs: US\$ 1,120,000

Signed:

\_\_\_\_\_  
on behalf of the Government Date

\_\_\_\_\_  
on behalf of the Executing Agency Date

\_\_\_\_\_  
on behalf of the United Nations Development Programme Date

PART I. LEGAL CONTEXT:

This project document shall be the instrument referred to as such in Article I, paragraph 1, of the Assistance Agreement between the Government of the People's Republic of Mozambique and the United Nations Development Programme signed by the Parties on 15 September 1976.

PART II. THE PROJECT:

A. Development Objectives:

The long term objective of the project is to assist the Government in rehabilitating the furniture industry sector, increase its productivity and eventually enable it to enter once again export markets.

B. Immediate Objectives:

The immediate objectives of the project are:

1. To survey the sector so as to compile data on:

- The existing physical facilities (buildings, etc.);
- the production and auxiliary equipment installed including an assessment of its state and its suitability for industrial production);
- the manpower available (including an assessment of skills and suitability for industrial production);
- the present utilization of installed capacity for the range of products that the equipment could be used for;
- the quality of the products produced:

2. Based on the above survey, prepare, in collaboration with the Planners of the National Directorate for Light Industries, a master plan for the development of this sector of the economy for the next five and ten years.

This plan will make proposals for:

- the consolidation of existing industries into larger specialized units each specializing in a smaller range of specific products initially for the national market, but eventually also for exports;
- the additional investments needed both for physical facilities, rehabilitation of existing equipment and purchase of new equipment;
- the cost of re-location of the existing equipment to the consolidated specialized plants;
- the training needs for the existing manpower, including schedules and programmes for in-plant training;
- the need for expatriate personnel (field of specialization, number, duration, etc.)
- the range of products to be manufactured by the various specialized plants and an indication of the expected quality and sizes of series (or batches);

- the assumptions made in drawing up the master plan;
- the requirements for the implementation of the above master plan both with respect to availability of raw materials, auxiliary materials, power, and financial requirements (including foreign exchange requirements);
- the possibility of reducing imports of auxiliary materials (abrasive belts, adhesives, surface finishing and upholstery materials, hardware fittings, etc.) through the production locally of such products and/or modifications to be made to the designs of the furniture;
- the requirements for the implementation of the above master plan with respect to changes and/or additions to the existing industrial infrastructure and marketing channels.

3. To improve the productivity, product quality and the level of skills (both at middle management and operator levels) at the furniture factories attached to the National Directorate for Light Industries of the Ministry of Industry and Energy. (To assure a major impact, one or two factories, selected by the Government, will receive the major share of the assistance, so as to serve as "model factories" and to then be used by the Directorate for in-plant training of the staff of other factories).

4. To develop new furniture designs and/or to modify existing designs to suit the requirements of serial production and shipment in knock-down form. These designs will not be limited to high cost products (eventually for export) but also for low cost household and institutional furniture suitable for the country's new development areas.

5. To conduct courses for local designers on various aspects of furniture design (ergonomics, production techniques, properties of materials, aesthetics, etc.)

6. To introduce sound tool and machine maintenance in the industry through the creation of a centre for woodworking machine and tool maintenance in Maputo that will cater for the industrial enterprises in this city and also serve as a training centre.

7. To familiarize three Mozambican production managers with modern conditions through two study tours to countries whose furniture industry is developed, during which they will be accompanied by the respective experts.

8. To create a nucleus of a documentation centre to cater for the sector.

C. Special Considerations:

None.

D. Background and Justification:

The furniture industry in Mozambique consisted prior to independence

of a relatively large number of small plants, most of which were family enterprises, each producing a wide range of products, mainly for the local market, but with some exports to neighbouring countries.

The equipment installed consisted mainly of simple woodworking machines suited for the prevailing "mechanized craftsmen" level of production.

After independence the Government has taken over some 35 enterprises whose owners left the country. Twenty-nine of these are in Maputo, and they employ a total of about 1100 persons out of a total employment in the state-owned portion of the sector of some 1,500 persons.

Because of the departure of middle and top management from these factories, the level of production and the maintenance of the equipment installed suffered drastically. The present low efficiency and low capacity utilization is compounded by a shortage of tools, spares and auxiliary materials, and by the lack of trained personnel at all levels.

The country still relies on imports of auxiliary materials (abrasive belts, adhesives, upholstery materials, paints, hardware fittings, etc. It is expected that these will attain some Meticaís 65 million (US\$ 2 million) in the coming year.

The Government's policy is at short term, to concentrate all efforts in the re-organization of the larger units of production in Maputo, ensuring the utilization of their maximum capacity and, in the medium term, to create the conditions permitting to restructure adequately the plants located in the North and to establish new units in areas nearer to the forest resources. This is imperative, since the nearest raw material is situated some 500 km. to the north of Maputo, while the majority of the country's forest resources are some 1,000 to 1,500 km from Maputo, resulting in high transport costs.

The furniture presently produced is of a type suited mainly for middle to high income levels in urban areas. The Government intends to increase production of low cost furniture for the lower income groups which is to be produced in large series. These products would be produced from species not presently being utilized, thus liberating, for eventual exports, equivalent volumes of the expensive solid wood presently used. It is also envisaged to use extensively particle board in furniture as soon as the plant in Manica, presently at the planning stage, is erected. This type of furniture (or its components) will probably be produced in a new plant still to be erected as part of the Manica complex.

Other plants for production of solid wood furniture for export are also envisaged. These will probably be located in harbours.

A master plan for the development of this sector, to be completed based on a survey of the existing plants (still to be carried out) is necessary. Assistance is also needed in implementing this master plan.

A factor limiting the quality of the furniture presently being produced is the poor level of machine and tool maintenance. It is therefore necessary to provide assistance in this field.

It follows logically from the above that a technical assistance programme should, in the first instance, focus on improving the operations of existing factories. Instead of attempting to cover the whole sector and thereby spreading resources too thin, the programme should concentrate on one or two of the better equipped factories where a successful introduction of the new technologies, new products and new production methods can best be achieved.

E. Outputs:

The principal outputs of the project will be:

1. The preparation of a detailed survey of the existing factories under the responsibility of the National Directorate for Light Industries.
2. The elaboration of a master plan for this sector.
3. The introduction of industrial production methods in one or two factories which will subsequently be used as "model factories" for in-plant training of personnel from other plants.
4. The development of designs for low cost furniture, suitable for industrial production, including also the correct use of particle board in furniture.
5. The design of new products - or modification of existing furniture designs - for shipment in knock-down form.
6. The creation of a centre for the maintenance of woodworking tools and machines and training of personnel in the above skills in Mozambique.
7. The exposure of three Mozambican managers to modern conditions in furniture plants in more developed countries through two study tours.
8. The establishment of a nucleus of a documentation centre to cater for the furniture industry.

F. Activities: (all located in Maputo or Beira unless specified):

	<u>Description</u>	<u>Starting time</u>	<u>Duration</u>
	Purchase of project vehicles	June 1981	
1 <sup>1/</sup>	Survey of the sector	June 1981	3 months
2	Elaboration of a master plan	September 1981	3 months
3	Introduction of the plan in selected factory(s)	January 1982	24 months
3	Purchase of demonstration equipment, tools, etc...	January 1982	24 months
3	Improvement of plant layout	January 1982	24 months (on an <u>ad hoc</u> basis)
3	Introduction of production planning	January 1982	- ditto -
3	Introduction of process and quality control	January 1982	- ditto -
3	Introduction of machine maintenance	January 1982	24 months
3	Introduction of industrial costing	January 1982	24 months (on an <u>ad hoc</u> basis)
3	Training of personnel in the above fields	January 1982	- ditto-
3	Preparation of manuals and reports	March 1982	21 months (on an <u>ad hoc</u> basis)
4	Development of designs for low cost furniture	January 1982	Total 12 months over 24 months' period
4	Development of designs (and adaptation of existing designs) for knock-down furniture	January 1982	Total 12 months over 24 months' period
5	Conducting courses in specific topics related to design(ergonomics, production techniques properties of materials, aesthetics, etc.) for local designers	January 1982	Total 12 months over 24 months' period
5	Production of prototypes of above furniture	March 1983	2 months
5	Preparation of manuals and reports	June 1983	2 months.
6	Identification of needs for a tool and machine maintenance centre and ordering of equipment	January 1982	2 months

<sup>1/</sup> Numbers refer to the corresponding numbering of the immediate objectives (see II B above)

	<u>Description</u>	<u>Starting time</u>	<u>Duration</u>
6	Arrival of equipment and its installation	August 1982	4 months
6	Training of staff of centre	October 1982	15 months
6	Training of staff of industry	January 1983	(on an <u>ad hoc</u> basis) 12 months
6	Preparation of manuals and reports	January 1983	(on an <u>ad hoc</u> basis) 12 months
7	Study tour by three production managers + expert to countries whose furniture industry is developed	May 1983	3 weeks
7	Study tour by three designers + expert to countries whose furniture industry is developed	September 1983	3 weeks
8	Compilation of a nucleus for a documentation centre for the furniture industry	June 1981	(on an <u>ad hoc</u> basis) 30 months
-	Mid term technical review with a staff member of UNIDO (from Vienna)	September 1982	one week
-	Tripartite review with a staff member of UNIDO (from Vienna)	September 1983	one week

F. Inputs

Government Inputs:

The government of the People's Republic of Mozambique will contribute to the project in the following way:

- counterpart technical personnel for the international experts and consultants, at all levels;
  - counterpart administrative personnel (secretaries and drivers) for the international experts and consultants;
  - premises, furniture, and office supply and equipment;
  - premises, cost of power and staff for the tool maintenance centre;
  - information, as necessary for the execution of the project (specially with respect to objective no. 2);
  - fuel costs for the project vehicles;
  - raw materials available locally, as required, for prototypes, jigs, modifications to equipment, etc.
- (for details see Government's budget annexed)

UNDP/UNIDO Inputs:

Experts and consultants:

The internationally recruited team will comprise the following experts and consultants (the numbers in bracket refer to their involvement in the various immediate objectives). Total durations are indicated in man/months (m/m) some missions being split.

11-01	Expert in furniture production (team leader) (1 to 8)	30 m/m
11-02	Expert in production of furniture (3, 4, 5, 6 and 8)	24 m/m
11-03	Industrial Engineer (furniture industry)(3,6, and 8)	24 m/m
11-04	Expert in maintenance of woodworking tools and machines (3, 6 and 8)	18 m/m
11-05	Associate expert - draughtsman	12 m/m
11-06	Expert(s) in furniture design (4, 5, 7 and 8)	24 m/m
11-50	Consultants (in fields to be determined later) ( 1 to 8?)	18 m/m

Component total: 150 m/m

Study tours:

Two study tours of three weeks each, to countries whose furniture industries are developed for three participants plus an accompanying expert.

Equipment:

1. A sum of US\$ 50,000 is foreseen to purchase two project vehicles (one small car and one station wagon) and demonstration equipment for quality control, as well as samples of special tools, fittings, etc. to be introduced in conjunction with the industrial production of furniture the new knock-down designs, etc. These funds will also be used for the creation of a nucleus of a documentation unit for the furniture industry sector.

2. A sum of US\$ 90,000 is foreseen to purchase a small station wagon - for use by the tool maintenance centre - and the necessary demonstration equipment, tools, etc. for this centre.

G. Work Plan:

A tentative work plan is shown under section F (Activities) of this document. A detailed work plan for the implementation of the project will be prepared by the Team Leader, in consultation with his national counterpart within three months of the start of the project. It will be updated yearly. This detailed work plan will be annexed to this project document, after its approval by all the three parties concerned, and will



be considered as an integral part of this project document.

H. Preparation of the Framework for Effective Participation of National and International Staff in the Project:

The activities necessary to achieve the project's immediate objectives will be carried out jointly by the national and international staff assigned to it. The National Directorate for Light Industries of the Ministry of Industry and Energy will provide all the requisite facilities for the implementation of the project. The respective roles of the national and international staff shall be in accordance with the established concept and specific purposes of technical co-operation.

I. Development Support Communication:

Not applicable.

J. Institutional Framework:

The project will be integrated through the National Directorate for Light Industries, Ministry of Industry and Energy, into the plant(s) selected to serve as "model factories". It will be selected from among the plants in or near Maputo or Beira.

Other Government authorities will, as and when appropriate, collaborate in drafting the master plan.

K. Prior Obligations and Prerequisites:

1. Prior Obligations:

None.

2. Prerequisites:

- (a) Assignment of adequate technical administrative and support personnel.
- (b) Provision of suitable office premises and equipment.
- (c) Provision of suitable premises for the woodworking tool and machine maintenance centre, and staff and financial resources for its operation.
- (d) Provision of adequate financial resources to cover costs of locally available materials for prototypes, etc. and for fuel for the project vehicles.

(For details of (a), (b), (c) and (d) see attached Government's budget.)

UNDP/UNIDO assistance to the project will be provided subject to UNDP receiving satisfaction that the pre-requisites listed above have been fulfilled or will be fulfilled. When anticipated fulfillment of one of more pre-requisites fails to materialize, the problem will be discussed between the three parties in order to resolve the situation. If no solution appears possible UNDP may, at its discretion, either suspend or terminate its assistance.

Future UNDP assistance:

Future UNDP assistance, if any, will be determined by a review of the project three months before its scheduled completion.

PART III SCHEDULES OF MONITORING, EVALUATION AND REPORTS:

A. Tripartite Review Meetings:

The project will be subject to a midterm technical review some 15 months after its starting date. A special review to consider the necessity for further assistance should take place three months before project completion.

B. Evaluation:

The project will be subject to evaluation, in accordance with the policies and procedures established for this purpose by UNDP. The organization, terms of reference and timing of the evaluation will be decided upon by consultation between the national authorities, UNDP and UNIDO.

C. Reports:

Progress Reports:

These will be submitted at six months intervals according to the format prescribed by UNDP

Technical reports:

These will be prepared by the project staff on an ad hoc basis. Their titles and schedules will be indicated in the Work Programme.

Terminal Report:

The Terminal Report will be prepared by the Team Leader for UNIDO's review one month prior to the completion of the project. It will be submitted formally by UNIDO upon completion of the project.





UNIDO

PROJECT BUDGET/REVISION

3 COUNTRY MOZAMBIQUE	4 PROJECT NUMBER AND AMEND /MOZ/BX/XXX/A/01/37	5 SPECIFIC ACTIVITY 31.7.A.
10 PROJECT TITLE Rehabilitation of the Furniture Industry.		

15 10 PROJECT PERSONNEL	16. TOTAL		17. 1981		18. 1982		19. 1983		20.	
	m/m	\$	m/m	\$	m/m	\$	m/m	\$	m/m	\$
11 EXPERTS / Post title										
11-01 Expert in Furniture Production (team leader)	30	186,000	6	34,800	12	75,600	12	75,600		
02 Expert in furniture production	24	151,200			12	75,600	12	75,600		
03 Industrial Engineer (furniture industry)	24	151,200			12	75,600	12	75,600		
04 Expert in maintenance of wood-working tools	18	113,400			6	37,800	12	75,600		
05 Associate Expert (Draughtsman)	12	p.m.			9	p.m.	3	p.m.		
06 Expert in furniture design	24	151,200			12	75,600	12	75,600		
07 Consultants ( in fields to be determined later)	18	113,400			9	56,700	9	56,700		
1150										
08										
10										
11										
12										
13										
14										
11-99 SUBTOTAL:	150	866,400	6	34,800	72	396,900	72	436,700		
21. REMARKS										



UNIDO

## PROJECT BUDGET/REVISION

PAGE 2

4 PROJECT NUMBER	16 TOTAL		17 1981		18 1982		19 1983		20 1984		2 PAO NUMBER
	m/m	\$	m/m	\$	m/m	\$	m/m	\$	m/m	\$	
12.01											
13.00											
14.00											
15.00		22,500		900		10,800		20,800			
16.00		10,000				5,000		5,000			
17.01											
17.02											
19.00	150	908,900	6	35,700	72	412,700	72	460,500			
20.											
29.00											
30.											
31.00											
32.00	6	40,000					6	40,000			
33.00											
34.00											
35.00											
39.00	6	40,000					6	40,000			
40.											
49.00		140,000		20,000		100,000		20,000			
50.											
51.00		5,000		1,000		2,000		2,000			
52.00		13,000		2,000		5,000		6,000			
53.00		13,100		3,100		5,000		5,000			
55.00											
59.00		31,100		6,100		12,000		13,000			
99.											
		GRAND TOTAL:	156	1,120,000	6	61,800	72	524,700	78	533,500	

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ANNEX III

UNITED NATIONS DEVELOPMENT PROGRAMME

Project of the Government of the People's Republic of Mozambique

DRAFT PROJECT DOCUMENT

Title: Development of the use of wood in construction.

Number: MOZ/8X/XXX/A/01/37      Duration: 3 1/2 years

Primary Function: Direct support.

Secondary function: Development of new construction technologies.

Sector (government class): Construction      (UNDP): 0520 Manufacturing industries

Subsector:      (UNDP): wood and wood products.  
(government class):

Government Implementing Agency: Ministry of Public Works and Housing.

Executing Agency: United Nations Industrial Development Organization (UNIDO)

Estimated starting date: June 1981

Government inputs:      (in kind)      UNDP inputs: US\$ 1,516,400  
(Meticais)      (US Dollars)

Signed:

\_\_\_\_\_

on behalf of the Government

\_\_\_\_\_

Date

\_\_\_\_\_

on behalf of the Executing Agency

\_\_\_\_\_

Date

\_\_\_\_\_

on behalf of the United Nations Development Programme

\_\_\_\_\_

Date

PART I. LEGAL CONTEXT:

This project document shall be the instrument referred to as such in Article I, paragraph 1, of the Assistance Agreement between the Government of the People's Republic of Mozambique and the United Nations Development Programme, signed by the Parties on 15 September 1976.

PART II. THE PROJECT:

A. Development Objectives:

The long term objective of the project is to develop the use of wood, (a renewable resource available locally which can to a large extent be processed in rural areas by using labour intensive resources) in construction, and to train Mozambican personnel in the use of wood in construction.

B. Immediate Objectives:

The immediate objectives of the project are:

1. Carry out a study on the grouping of Mozambican timber species which could be used in construction, based on a list of species provided by the National Directorate of Forests.
2. Prepare a study on the comparative costs of timber construction, comparing the relative merits of various building materials (such as, but not limited to: clay bricks, cement blocks, timber poles, sawnwood, various wood based panels, asbestos cement sheets, metal sheeting, metal construction, reinforced concrete, ...); their availability, costs, storage and transport costs, ease of utilization (including skills required), and costs of constructions using them.
3. Based on the above study, to develop designs for the rational use of wood in construction through the use of prefabricated modular systems for series production, and not ad hoc designs for on site construction suitable for the local climatic and social conditions and prepare design, production and erection manuals.
4. Erect prototypes of each design system developed under 3 above.
5. Adapt the system developed by a UNIDO project in Kenya for low cost modular prefabricated wooden bridges to suit the timber species and loading conditions of Mozambique and prepare design, production and erection manuals.
6. Erect prototype bridges using the system developed under 5 above.
7. Complement and update the survey of the joinery plants belonging to the National Directorate of Building Materials Industry to assure that the following data is available:
  - the existing physical facilities (buildings, etc.);
  - the production and auxiliary equipment installed (including an assessment of its state and its suitability for industrial production);

- the manpower available (including an assessment of skills and suitability for industrial production);
- the present utilization of installed capacity for the range of products that the equipment could be used for;
- the range of products presently being produced and that which could be produced with the equipment installed both in its present state and after its overhaul and re-conditioning;
- the quality of the products produced.

8. Based on the above survey, prepare, in collaboration with the Planners of the National Directorates for Building Materials Industries and Construction Technology a master plan for the development of this sector of the economy for the next 5 and 10 years.

This plan will make proposals for:

- the consolidation of the existing industries into larger specialized units each specializing in a smaller range of specific products, producing also the components of the systems designed by the project;
- the additional investments needed both for physical facilities, rehabilitation of existing equipment and purchase of new equipment;
- the cost of re-location of the existing equipment to the consolidated specialized plants;
- the training needs for the existing manpower, including schedules and programmes for in-plant training;
- the need for expatriate personnel (field of specialization, number, duration, etc.);
- the range of products to be manufactured by the various specialized plants and an indication of the expected quality and sizes of series (or batches);
- the assumptions made in drawing up the master plan;
- the requirements for the implementation of the above master plan both with respect to availability of raw materials, auxiliary materials, power, and financial requirements (including foreign exchange requirements);
- the requirements for the implementation of the above master plan with respect to changes and/or additions to the existing industrial infrastructure and marketing channels.

9. To improve the productivity, product quality and the level of skills (both at middle management and operator levels) at the joinery factories attached to the National Directorate of Building Materials Industries of the Ministry of Public Works and Housing. (To assure a major impact, one or two factories, selected by the Government, will receive the major share of the assistance, so as to serve as "model factories" and to then be used by the Directorate for in-plant training of the staff of other factories).

10. To introduce sound tool and machine maintenance in the industry.

11. To create a nucleus of a documentation centre to cater for the sector.



12. To assist in the re-activation of a wood-wool cement plant in Beria currently idle, through the provision of expert services, training of its personnel, spare parts and missing equipment and through the provision of sound designs for low cost housing using wood-wool cement slabs whenever appropriate, suited for local climatic and social conditions, and erect prototypes of these houses.

C. Special considerations:

None.

D. Background and Justification:

Although Mozambique is endowed with large forest resources, and has a sawmilling industry even prior to independence, timber has so far not been used in construction to any where near its potential.

The Government is interested in developing rural areas as quickly as possible and, in doing so, wishes to introduce timber constructions whenever appropriate to assure the rational utilization of its renewable natural resources, the rapid development of its rural areas, and the creation of employment in rural areas (since timber construction is labour intensive and does not call for high skills).

To this effect it wishes to have carried out a study on the grouping of timber species native to Mozambique to assure on the one hand their correct utilization, and a rational and intensive use of the forest resources on the other.

To achieve this the Government also wishes to obtain designs for industrial production of modular prefabricated timber structures and their components specially suited to the local climatic and social conditions. These could then be produced either in the existing factories in the urban areas or, using simpler production methods, on site.

Another field in which timber is called upon to play an important role in Mozambique is in its use in the construction of bridges. UNIDO has developed a system of low cost modular prefabricated timber bridges, which the Government wishes to adapt for use in Mozambique.

The Joinery industry in Mozambique consisted prior to independence, of a relatively large number of small plants most of which were family enterprises, each producing a wide range of products exclusively for the local market.

The equipment installed consisted mainly of simple woodworking machines suited for the prevailing "mechanised craftsmen" level of production.

After independence the Government has taken over some 25 enterprises, whose owners left the country. The six largest are in Maputo and they have over one third of the installed capacity.

Because of the departure of middle and top management from these factories the level of production and the maintenance of the equipment installed suffered drastically. The present low efficiency and low capacity utilization is compounded by a shortage of tools, spares and auxiliary materials, and by the lack of trained personnel at all levels.

The Government's policy is at short term, to concentrate all efforts in the re-organization of the larger units of production in Maputo and Beria, ensuring the utilization of their maximum capacity and, in the medium term, to create the conditions permitting to restructure adequately the plants located in the North and to establish new units in areas nearer to the forest resources. This is imperative, since the nearest raw material is situated some 500 km to the north of Maputo, while the majority of the country's forest resources are some 1,000 to 1,500 km from Maputo, resulting in high transport costs, and timber's role in construction is greater in rural than in urban areas.

A master plan for the development of this sector, to be completed based on a survey of the existing plants (which is being carried out) is necessary. Assistance is also needed in implementing this master plan.

It follows logically from the above that a technical assistance programme should, in the first instance, focus on improving the operations of existing factories. Instead of attempting to cover the whole sector and thereby spreading resources too thin, the programme should concentrate on one or two of the better equipped factories where a successful introduction of the new technologies, new products and new production methods can best be achieved.

Another field in which assistance has been requested is in the re-activation of an existing wood-wool cement plant located in Beria. This had been supplied by Messrs. Canali (Federal Republic of Germany) prior to independence and had started production. Production has subsequently stopped due to lack of spare parts and due to the departure of the former owners. Wood-wool cement is a low cost building material suited to local conditions since it utilizes wood of small dimensions and cement produced locally. The product is termite and fire resistant, and has good thermal and acoustic insulation properties. The Government is interested in reactivating this plant and in training the staff and contractors in the correct utilization of the product.

E. Outputs:

The principal outputs of the project will be:

1. A study on the grouping of Mozambican Timber Species which could be used in construction according to their main characteristics (eg. strength, durability, shrinkage).

2. A study on the comparative costs of timber construction comparing the relative merits and costs of timber with various other building materials as well as the cost of various timber based building components (eg. joists, trusses, doors, windows, load bearing walls, non load bearing partitions, etc.) with alternative non-wood-based components. This study will take into account also the comparative costs of the building materials proper, the cost of transport, the cost of labour (both at a factory fabricating the component and on site) and the effect of the use of the building material in question on other costs (eg. additional costs of foundations due to increased dead weight, etc.).

3. Designs for low cost timber constructions (and timber components for non timber constructions) for dwellings, institutional and agricultural buildings in rural areas, as well as for these and industrial buildings in urban areas, according to specifications to be drafted by the National Directorate of construction (including designs, production and erection manuals).

4. Prototypes of the above designs.

5. Designs for low cost modular prefabricated timber bridges, to suit local species and road loading regulations. (Including design, production and erection manuals).

6. Prototypes of the above designs.

7. The training of teams of Mozambican technicians in the production and erection of all these timber structures.

8. A master plan for the joinery industry plants belonging to the Ministry of Public Works and Housing.

9. The introduction of industrial production methods in one or two factories which will subsequently be used as "model factories" for in-plant training of personnel from other plants.

10. The training of the personnel of plants in this sector in the above skills.

11. The establishment of a nucleus of a documentation centre to cater for the sector.

12. The re-activation of the wood-wool cement plant in Beria presently idle, the training of its staff, and the design of low cost housing units using wood-wool cement board wherever appropriate.

F. Activities:

(All located in Maputo or Beria unless specified).

<u>Description</u>	<u>Starting time</u>	<u>Duration</u>
- Purchase of two project vehicles	June 1981	-
1. <sup>1/</sup> Study on the grouping of Mozambican Timber Species	June 1981 (HQ of consulting engineering firm or institute)	4 months
7. Complement and update the survey of the joinery plants belonging to the National Directorate of Building Materials Industries	June 1981 (all over the country)	3 months
11. Create a nucleus of a documentation centre	June 1981	40 months (on an <u>ad hoc</u> basis)
8. Prepare a master plan for this sector	September 1981	3 months
2. Study on the comparative costs of construction (field work) - (Headquarters work)	September 1981 (HQ of consulting engineering firm or institute)	2 months
5. Adapt the designs for the low-cost modular prefabricated bridges to loading conditions and timber species of Mozambique	November 1981	2 months
12. Survey situation in a wood-wool cement plant	January 1982	one month
- Purchase a project vehicle	January 1982	-
12. Recondition existing equipment	February 1982	5 months
9. Implement master plan (improve productivity, skills, products, etc. in model factories) Train Mozambican personnel	February 1982	34 months
10. Introduce tool and machine maintenance. Train Mozambican personnel	February 1982	34 months
3. Elaboration of specifications for timber constructions by the National Directorate for Construction	February 1982	one month

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<sup>1/</sup> Numbers refer to the corresponding numbers of the immediate objectives (see II B. above)

	<u>Description</u>	<u>Starting time</u>	<u>Duration</u>
6.	Preparation of manuals fellowships of two Mozambicans to train in production and erections	February 1982 (Kenya ?)	one month
6.	Selection of site for prototypes bridge and construction of abutments	February 1982 (Mozambique ?)	2 months
6.	Purchase of equipment for the produc- tion of the bridges - including one four-wheel drive vehicle and mobile pressure impregnation cylinder	February 1982 (Vienna)	2 months
12.	Order spare parts and equipment	March 1982	one month
3.	Design of timber constructions Preparation of manuals	May 1982 (HQ of consulting engineering firm or institute)	6 months
6.	Arrival of equipment production of elements	June 1982	one month
6.	Erection of prototype bridge(s)	August 1982 (Mozambique ?)	4 months
-	Mid-term technical review with a staff member of UNIDO (from Vienna)	September 1982	one week
12.	Receipt of equipment and spare parts and its installation	October 1982	3 months
4.	Erection of prototype wooden constructions	January 1983	4 months
12.	Start-up of wood-wool cement plant training of personnel	January 1983	18 months
12.	Design of housing systems using wood- wool cement boards (based on spe- cifications supplied by the National Directorate of Construction) Prepa- ration of manuals	March 1983 (HQ of consulting engineering firm or institute).	3 months
-	Tripartite review with a staff member of UNIDO (from Vienna)	June 1984	one week

E. Inputs:

Government Inputs:

The Government of the People's Republic of Mozambique will contribute to the project in the following way:

- Counterpart technical personnel for the international experts and consultants, at all levels;
- Counterpart administrative personnel (secretaries and drivers) for the international experts and consultants;
- premises, furniture and office supply and equipment;
- transport vehicle(s) for transporting sawn timber and wooden elements;
- information, as necessary, for the execution of the project (specially with respect to objectives Nos. 1, 2, 5, 7, 8, and 12)
- fuel costs for the project vehicles;
- raw materials available locally as required, for prototypes, jigs, modifications to equipment, etc.

(For details see Government's budget in Appendix I)

UNDP/UNIDO Inputs:

(For details see Appendix II)

Experts and consultants:

11-01	Timber construction expert (team leader) (1 to 12)	40 m/m
11-02	Timber engineer (wooden bridges)	6 m/m
11-03	Joinery production expert	36 m/m
11-04	Expert in the production of wood-wool cement boards	24 m/m
11-05	Technician in the operation of wood-wool cement production equipment	18 m/m
11-06	Associate expert (Joinery production)	24 m/m
11-07	Associate Expert (draughtsman)	24 m/m
11-50	Consultants in fields to be determined later	12 m/m

Sub-contracts:

The following sub-contracts will be awarded:

- (1) A study on the grouping of some 50 timber species native to Mozambique which could be used in construction, based on a list of species provided by the National Directorate of Forests. This study will group the species according to their characteristics important in construction, namely strength, natural durability and shrinkage (Draft terms of reference are attached in Appendix III).
- (2) A study on the comparative costs of timber construction, comparing the relative merits and costs of timber with various other building materials as well as the cost of various timber based building components (joists, trusses, doors, windows, load bearing partitions, etc.) with alternative, non wood-based components. This study will take into account also the comparative costs of the building material proper, the cost of transport, the cost of labour (both at the factory fabricating the component and on site) and the effect of the use of the building materials in question on other costs. (eg. additional costs of foundations due to increased dead weight, etc.). (Draft terms of reference are attached in Appendix VI).
- (3) Development of designs for low cost timber constructions (and timber components for non timber constructions) for dwellings, institutional and agricultural buildings in rural areas as well as for these and industrial buildings in urban areas, according to specifications to be drafted by the National Directorate of Construction, taking into account the findings of sub-contracts (1) and (2) above.  

This sub-contract will comprise not only the design work, but also the preparation of design, production and erection manuals for the products envisaged, and supervise the production and erection of the prototypes. (Draft terms of reference are attached in Appendix V).
- (4) Development of designs for low cost modular housing using wood-wool cement boards whenever appropriate, according to specifications to be drafted by the National Directorate of Construction, taking into account the finding of sub-contracts (1) and (2) above, and using whenever appropriate complementary elements designed under sub-contract (3) above. (Draft terms of reference are attached in Appendix VI)

This sub-contract will comprise not only the design work, but also the preparation of design, production and erection manuals for these houses and supervise the production and erection of the prototypes. (Draft terms of reference are attached in Appendix VI)

Training:

Two one month fellowships for Mozambican technicians who will be responsible for the production of the modular bridge elements and their erection on site respectively.

Equipment:

- 4 vehicles: one four-wheel drive car, two sedans, one station wagon. (\$ 10,000)
- Equipment for production and launching of modular bridges (approximately US\$ 10,000)
- Mobile pressure impregnation cylinder (approximately US\$ 75,000)
- Prototype tools and hardware fittings for joinery products (approximately US\$ 30,000)
- Spare parts for the Wood-wool cement board plant (approximately US\$ 175,000)
- Chemicals for pressure impregnation of wood (approximately US\$ 15,000).

H. Work plan:

A tentative work plan is shown under section F (Activities) of this document. A detailed work plan for the implementation of the project will be prepared by the team leader, in consultation with his National Counterpart within three months of the start of the project. It will be updated yearly. This detailed work plan will be annexed to this project document, after its approval by all three parties concerned, and will be considered as an integral part of this project document.

I. Preparation of the Framework for Effective Participation of the National and International Staff in the Project:

The activities necessary to achieve the project's immediate objectives will be carried out jointly by the national and international staff assigned to it. The appropriate National Directorates of the Ministry of Public Works and Housing will provide all the requisite facilities for the implementation of the project. The respective roles of the national and international staff shall be in accordance with the established concept and specific purposes of technical co-operation.

J. Development Support Communication:

Not applicable.



K. Institutional framework:

The project will be integrated through the National Directorate for Building Materials Industries of the Public Works and Housing into the plant(s) selected to serve as "model factories". It will be selected from among the plant in or near Maputo or Beira.

Other Government authorities will be called upon to collaborate with the project as and when appropriate.

L. Prior Obligations and Prerequisites:

1. Prior obligations:

None

2. Pre-requisites:

- (a) Assignment of adequate technical administrative and support personnel.
- (b) Provision of suitable office premises and equipment.
- (c) Provision of suitable sites for the prototypes of the timber constructions and bridges to be designed, and staff, transport facilities, building materials and financial resources for these constructions.
- (d) Provision of adequate financial resources to cover costs of locally available materials for joinery prototypes, etc. and for fuel for the project vehicles.

(For details of (a),(b), (c) and (d) see attached Government's budget)

UNDP/UNIDO assistance to the project will be provided subject to UNDP receiving satisfaction that the pre-requisites listed above have been fulfilled or will be fulfilled. When anticipated fulfillment of one or more pre-requisites fails to materialize the problem will be discussed between the three parties in order to resolve the situation. If no solution appears possible, UNDP may, at its discretion, either suspend or terminate its assistance.

M. Future UNDP assistance:

Future UNDP assistance, if any, will be determined by a review of the project three months before its scheduled completion.

PART III. SCHEDULES OF MONITORING, EVALUATION AND REPORTS:

A. Tripartite review meetings:

The project will be subject to a mid-term technical review some fifteen months after its starting date. A special review to consider the necessity for further assistance should take place three months before project completion.

B. Evaluation:

The project will be subject to evaluation, in accordance with the policies and procedures established for this purpose by UNDP. The organization, terms of reference and timing of the evaluation will be decided upon by consultation between the national authorities, UNDP and UNIDO.

C. Reports:

Progress Reports:

These will be submitted at six months' intervals according to the format prescribed by UNDP.

Technical reports:

These will be prepared by the project staff on an ad-hoc basis. Their titles and schedules will be indicated in the work programme.

Terminal report:

The terminal report will be prepared by the team leader for UNIDO's review one month prior to the completion of the project. It will be submitted formally by UNIDO upon completion of the project.





PROJECT BUDGET/REVISION

UNIDO

3 COUNTRY MOZAMBIQUE	4 PROJECT NUMBER AND AMEND MOZ/8X/XXX/A/01/37	5 SPECIFIC ACTIVITY 31.7.A
10 PROJECT TITLE Development of the Use of Wood in Construction.		

15 10. PROJECT PERSONNEL 11 EXPERTS / Post title	16. TOTAL		17. 1981		18. 1982		19. 1983		20. 1984	
	m/m	\$	m/m	\$	m/m	\$	m/m	\$	m/m	\$
11-01 Timber Construction Expert (team leader)	40	252,000	6	37,800	12	75,600	12	75,600	10	63,000
02 Timber Engineer (Wooden Bridges)	6	37,800	2	12,600	4	25,200				
03 Joinery Production Expert	36	226,800			12	75,600	12	75,600	12	75,600
04 Expert in the production of wood-wool cement boards	24	151,200			12	75,600	12	75,600		
05 Technician in the production of wood-wool cement production equip.	18	113,400			4	25,200	12	75,600	2	12,600
06 Associate expert (Joinery Prod.)	24	p.m.			12	p.m.	12	p.m.		
07 Associate expert (Draftsman)	24	p.m.			12	p.m.	12	p.m.		
50 Consultants in fields to be determined later	12	75,600			4	25,200	4	25,200	4	25,200
11-99 SUBTOTAL:	184	856,800	8	50,400	72	302,400	76	327,600	28	176,400
21. REMARKS										

APPENDIX II



UNIDO

PROJECT BUDGET/REVISION

2 PAID NUMBER

4 PROJECT NUMBER MOZ/8X/XXX/A/01/37	16 TOTAL		17 1981		18 1982		19 1983		20 1984	
	m/m	\$	m/m	\$	m/m	\$	m/m	\$	m/m	\$
12.01 OPAS Experts										
13.00 Support Personnel										
14.00 Volunteers										
15.00 Experts Travel		27,600		1,200		10,800		11,400		4,200
16.00 Other Personnel Costs	1	10,000			0.5	5,000			0.5	5,000
17.01 Locally hired Experts										
17.02 Locally hired Experts										
19.00 Total Personnel Component	185	894,400	8	51,600	72.5	318,200	76	339,000	28.5	185,600
20. SUBCONTRACTS										
29.00 Total Subcontracts Component		260,000		75,000		125,000		60,000		
30. TRAINING										
31.00 Fellowships										
32.00 Study Tours, UNDP G. Training/Meetings										
33.00 In-service Training										
34.00 Group Training (non-UNDP)	2	3,000			2	3,000				
35.00 Meetings/Consultations (non-UNDP)										
39.00 Total Training Component	2	3,000			2	3,000				
40. EQUIPMENT										
49.00 Total Equipment Component		333,000		13,000		290,000		15,000		15,000
50. MISCELLANEOUS										
51.00 Operations - Maintenance		8,000		1,000		3,000		3,000		1,000
52.00 Reports		10,000				2,000		3,000		5,000
53.00 Sundries		8,000		1,000		3,000		2,000		2,000
55.00 Hospitality (non-UNDP)										
59.00 Total Miscellaneous Component		26,000		2,000		8,000		8,000		8,000
99. GRAND TOTAL:	189	1,516,400	8	141,600	76.5	744,200	76	422,000	29.0	208,600

APPENDIX III

DRAFT TERMS OF REFERENCE IN  
GROUPING OF TIMBER SPECIES NATIVE TO MOZAMBIQUE FOR USE  
IN CONSTRUCTION

I. Introduction

The United Nations Industrial Development Organization is to provide the Government of the People's Republic of Mozambique with Technical Assistance in the form of a technical study on the grouping of some 60 timber species, native to Mozambique or growing there on man-made plantations, which could be used in construction of buildings and other timber engineered products both as load bearing and non load bearing elements.

The project is to be implemented using the services of a firm of consulting engineers or an institution specialized in such work, referred to hereafter as the "Contractor".

II. Duties of the Contractor

The Contractor shall:

1. Obtain data on the natural occurrence of these species in the various regions of Mozambique;
2. Review the results of tests done in Mozambique and abroad on the properties (strength, durability and treatability, machining characteristics, drying characteristics, etc.) of the timber species more commonly found in Mozambique and compile these for inclusion in comparative tables of the report;
3. Group the species selected according to common properties;
4. Compile data on the relative prices of these species and on cost of pressure impregnation;
5. Based on the above group those species best suited for use in buildings in Mozambique into categories having common properties and give reasons for the choice.

### III. Implementation

The National Directorate of Forests (the Ministry of Agriculture) and/or the National Directorate of Construction Technology of the Ministry of Public Works and Housing will make available to the Contractor (through UNIDO) a list of some 80 species they wish the Contractor to consider. This list will be made available to the Contractor at the time of the signature of the Contract with UNIDO.

He shall, based on already published material, both in Mozambique and abroad, carry out a study, within a period not exceeding ten weeks from the signature of the contract, and submit a draft report, in 5 copies in English, to UNIDO for review. The methodology used in classifying the species should be explained in detail in an annex to the report.

The final report, (40 copies in English) is to be submitted not later than two weeks from the receipt of UNIDO's comments on the draft report.

### IV. Background Information

Mozambique is endowed with large forest reserves, currently not fully utilized. Since independence, the Government has embarked on a large-scale development of rural areas, including the creation of agricultural communities and the necessary infrastructure (roads, bridges, schools, hospitals, etc.).

Timber is one of the country's major resources, and, furthermore, it is a renewable resource. A certain number of sawmills existed before independence, and there are ambitious plans for the development of this sector to cater both for the local as well as regional and overseas markets. Plans also exist for the creation and subsequent exploitation of man-made forests and the establishment of modern integrated timber processing complexes.

The Government's wish to increase the use of timber in construction, (both in rural and urban areas) for such products as bridges, trusses, joists, load bearing and non load bearing wall elements, floors, joinery, shuttering, etc.

In order to assure a rational use of its timber resources and to avoid consumer resistance due to incorrect applications, it is felt necessary to undertake a study on the grouping of species.



APPENDIX IV

DRAFT TERMS OF REFERENCE

FOR A STUDY ON THE COMPARATIVE COSTS OF CONSTRUCTION USING TIMBER  
AND OTHER BUILDING MATERIAL IN MOZAMBIQUE

I. Introduction

The United Nations Industrial Development Organization is to provide the People's Republic of Mozambique with Technical Assistance in the form of a study on the comparative costs of timber products <sup>1/</sup> and timber building elements <sup>2/</sup> used in construction, and those of other products it could compete with and replace.

The project is to be implemented using the services of a firm of consulting engineers or an institution specialized in such work, referred to hereafter as the "Contractor".

II. Duties of the Contractor

The Contractor shall delegate qualified personnel to Mozambique to:

1. Compile information on the availability of timber products <sup>1/</sup> (both produced locally and those currently imported but which it is envisaged will be produced in Mozambique in the near future), their specifications and costs.
2. Compile information on the building materials being produced in the country with which timber and timber products could compete. <sup>3/</sup>

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<sup>1/</sup> Poles; sawnwood; plywood, wood-wool cement slabs, particle board and fibreboard; shingles; bamboo.

<sup>2/</sup> Such as but not limited to: modular bridges: roof trusses for dwellings, agricultural and industrial buildings and warehouses; joists, wall (both load bearing and non load bearing) floor and ceiling systems, staircases, doors windows, agricultural buildings (barns, silos, etc.) shuttering for concrete their specifications and costs.

<sup>3/</sup> Such as: sand, aggregate, cement, mortar, lime, steel (reinforcing rods and sections used in trusses and metal joinery) metal sheet material (galvanized and arrodized, corrugated or flat), cement blocks, soil stabilized blocks, baked and unbaked bricks, gupsum board roofing material (asbestos sheets and clay tiles).

3. Compile information on the availability, specifications and costs of timber building elements <sup>2/</sup> being produced in Mozambique.
4. Visit a representative sample of joinery plants to assess production methods used and hence be able to estimate costs of timber building products if productivity and designs were improved.
5. Compile information on the availability, specifications and costs of non-wood building elements (metal trusses, metal joinery, metal partitions and external walls for silos and industrial buildings, pre cast concrete elements, etc.).
6. Compile information on the major consumption centers where timber construction could play a large role and the location of the plants producing the various building materials and building elements mentioned above.
7. Compile information on the availability and costs of transport, and limitations - if any - on the transport of large elements.
8. Compile information on the availability, skills, cost and productivity of labour and for on-site construction and for assembly on site of prefabricated elements.
9. Visit some building sites to assess the methods used and hence be able to estimate costs if productivity were improved.
10. Study the statutory limitations - if any - on the use of timber and timber products in construction.

Based on the above data, the consultant shall prepare a comparative study on the costs of timber products <sup>1/</sup> and timber building elements <sup>2/</sup> compared with other building materials or building elements which compete with timber and which it could eventually replace.

This study shall basically take into account the present situation; it shall also identify the changes which would occur if productivity of the plants were to increase and/or if the designs of the products were to be modified.

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1/ and 2/ on page 43

The methodology of the study and its presentation should be such that the figures could be easily updated by the authorities in Mozambique if and when the situation with respect to costs of the various inputs changes.

The study should compare not only the costs of the building materials and the building elements themselves, but also the effect they have on the costs of the complete structure due to the use of a given building material (e.g. prefabricated timber constructions call for lighter foundations and hence lower costs than prefabricated concrete construction).

### III. Implementation

The contractor is to delegate a team of qualified specialists to Mozambique within two weeks of the submission of the contract to him for signature, to obtain the necessary information on the availability and costs of the various building materials and services related to the study. These specialists (or the team leader) shall visit UNIDO, Vienna, on their way to and from Mozambique for briefing and exchange of views. The tentative total duration of the specialists' stay in Mozambique is about 3 to 4 man months.

The team should tentatively be composed of a quantity surveyer and an architect or engineer with experience in the production of a wide range of building components.

Five copies in English of the draft report should be submitted to UNIDO, Vienna, within two months of the return of the team from Mozambique. It will be received by UNIDO, and the comments made should be incorporated by the contractor in the Final Report, of which 30 copies in English should be submitted to UNIDO within one month of the receipt of the comments.

### IV. Background Information

Mozambique is endowed with large forest reserves, currently not fully utilized. Since independence, the Government has embarked on a large scale development of rural areas including the creation of agricultural communities and the necessary infrastructure (roads, bridges, schools, hospitals, etc.).

Timber is one of the country's major resources, and, furthermore, it is a renewable resource. A certain number of sawmills existed before independence, and there exists ambitious plans for the development of this sector to cater both for the local as well as regional and overseas markets. Plans also exist for the creation and subsequent exploitation of man-made forests and the establishment of modern integrated timber processing complexes.

The Government's wish is to increase the use of timber in construction, (both in rural and urban areas) for such products as: bridges, trusses, joists, load bearing and non load bearing wall elements, floors, joinery, shuttering, etc.

In order to assure a rational use of its timber resources and to avoid consumer resistance due to incorrect applications, a study on the grouping of species has been undertaken.

Before embarking on the design of timber structures and their industrial production, it is felt that a study on the comparative costs of timber and timber building components and those materials it could replace should be undertaken.

APPENDIX V

DRAFT TERMS OF REFERENCE  
FOR THE DESIGN OF WOODEN BUILDINGS AND TRUSSES FROM SPECIES NATIVE  
TO MOZAMBIQUE

I. Introduction

The United Nations Industrial Development Organization is to provide the Government of the People's Republic of Mozambique with Technical Assistance in the form of designs (drawings and specifications for buildings (low-cost dwellings, agricultural buildings, schools, hospitals, offices, etc.) and wooden trusses for the more common spans and using species native to Mozambique.

The project is to be implemented using the services of a firm of consulting engineers or an institution specialized in such work, referred to hereafter as the "Contractor".

II. Duties of the Contractor

The Contractor shall:

- Survey the present and potential future demand for pre-cut and prefabricated low-cost dwellings, agricultural and institutional buildings made from wood, as well as that for pre-cut and prefabricated wooden trusses for use by industry or as warehouses.
- Based on the above considerations design and draft complete specifications incorporated in production and erection manuals for the institutional buildings best suited for the local conditions and living habits, taking into account the studies on the grouping of species growing in Mozambique and the comparative study on costs of timber products and timber building elements and those of materials timber competes with and could replace, already prepared by UNIDO for the Government of Mozambique under the same project of technical assistance.

In particular he will:

A. Compilation of data

1. Review the above mentioned two studies, and, if he deems it necessary update and/or complement them;
2. Review the medium and long-range programmes for construction of low-cost dwellings, agricultural and institutional buildings as well as for industrial buildings and warehouses which the various governmental bodies have drawn up;
3. Obtain the present specifications for the above constructions and information on cost estimates for such buildings (and their components) for various rural (and eventually also urban) sites;
4. Compile basic information on climate, rainfall, etc.

B. Design requirements

1. The Contractor will present two standardized types of designs for the buildings enumerated above:
  - a) Full timber construction except for concrete foundations;
  - b) Mixed-type construction of timber and other materials, namely: floors and certain walls of non timber construction.
2. The designs will be based on the modular system in order to reduce to a minimum the number of standard components as well as to facilitate the subsequent addition of new building units.
3. If economic lly feasible, both external walls and internal partitions should present recesses easily convertible into built-in cabinets when required, thus reducing expenditures in free-standing furniture.

C. Design of pre-cut (and eventually prefabricated) low-cost wooden housing and institutional buildings

Based on the above information, the Contractor is to design a modular building component system for the buildings listed above which

should conform to the required specifications (with respect to area, height of ceilings, size of rooms, etc.) and to suit local climatic conditions, living habits, buildings codes, and/or traditional building habits. This design is to make full use of the inherent properties of the local species - preferably using the lesser utilized ones - and take into account the skills available locally for both production and erection.

The Contractor will present his designs in the following way:

1. Propose narrative descriptions of the buildings with the necessary plans, perspective views, etc., highlighting the building's characteristics, features, methods of erection, etc.
2. Complete production and erection manuals, written for the understanding of the persons with the limited education and skills available in the areas where the buildings are to be erected.

Each set of manuals will comprise - but not be limited to - the following items:

- a) Narrative specifications of the building with a perspective drawing;
- b) Overall drawing of the type of building designed;
- c) Detailed, dimensional drawings for each element;
- d) Wherever needed, detailed sections and/or explosions and/or detailed drawing showings method of fastening of element;
- e) Detailed cutting list of the wood to be used for each unit, including detailed instructions on its marking and crating;
- f) Detailed lists of species that could be used for the various elements of this building, indicating the preservation treatment needed whenever applicable;
- g) Detailed qualitative specifications of masonry and related work;
- h) Detailed qualitative specifications of the non wood inputs (hardware, etc.) needed for the erection of the building;
- i) Detailed step-by-step instructions for the erection of the building designed, including inter alia:

- i) Marking of site;
- ii) Preparation of foundations;
- iii) Concrete work;
- iv) Erection of structure;
- v) Erection of roofing;
- vi) Erection of cladding;
- vii) Erection of partitions - if any;
- viii) Installation of doors, windows, etc.;
- ix) Surface finishing alternatives and electrical and sanitary installations - if any.

3. Cost calculation of the building designed for:

- a) The wood raw material and other inputs used;
- b) Cost of machining and bundling and/or crating;
- c) Estimated cost of transport of the components both pre-cut and prefabricated for each complete building for distances of, say, 25 and 100 kilometers;
- d) Cost of erection - including size and qualifications of the team of erectors;

4. Qualitative specifications of the inputs needed for each building - including if convenient, grouping of species that could be used for the structural and non-structural elements; indicating for these species needing preservation the best suited preservative treatment.

D. Design of pre-cut and prefabricated wooden trusses

Based on the information compiled under A above the Contractor will design a total of nine trusses, to be constructed using timbers with three different strength groupings; for each strength group, three trusses will be designed with spans of 9, 12 and 15 meters. He will select the pitch best suited to the climate conditions in Mozambique. These trusses should be for general industrial, or agricultural use, or for use for warehouses. They should be usable in conjunction with wooden concrete or masonry wall or posts, and with various types of roofing materials (corrugated metal sheets, corrugated asbestos sheets, tiles, shingles, etc.).



The Contractor will present his design in the following way:

1. Specifications of the trusses, indicating:
  - a) Loading characteristics (assumed wind load, load of roofing material, etc.);
  - b) Selection of type of gusset plate used (plywood, solid timber, metal plate - "Gangnail" type - other metal connectors, etc.) bearing in mind local conditions and skills, and justifying his choice;
  - c) Species to be used - listing three groups according to strength and indicating the preservative treatment for these species that are subject to fungal and/or termite attack.
2. Design of the trusses, indicating:
  - a) Overall drawing of the type of truss designed;
  - b) Detailed, dimensional drawings for each truss;
  - c) Wherever needed, detailed sections and/or explosions and/or detailed drawing showing method of fastening of element (e.g. nailing patterns).
3. Qualitative specifications of the wood to be used and all other inputs (metal connectors, etc.).
4. Cost calculation of the trusses, for:
  - a) The wood raw material and other inputs used;
  - b) Cost of machining;
  - c) Cost of assembling - in factory and on site;
  - d) Cost of transport for each truss for a distance of, say: 100 kilometers, both for on-site and in-plant assembly.
- D. Equipment and labour requirements for industrial production

Bearing in mind the local conditions and the size of batches envisaged, the contractor shall briefly enumerate the minimum equipment needed for the industrial production of the items he has designed giving technical specifications, tentative plant layout, and describing, in

greater detail, any jigs which may be needed to produce these components in Mozambique. He shall also enumerate the size and skills of the labour force needed for the above plant.

### III. Implementation

#### 1. Phase one - compilation of data

The contractor is to delegate a qualified specialist to Mozambique within two weeks of the submission of the contract to him for signature, to obtain all the necessary information. This specialist and/or team leader shall visit UNIDO, Vienna, on his way to and from Mozambique for briefing and exchange of views. The tentative duration of the specialist's stay in Mozambique is about 4 weeks.

#### 2. Phase two - Preparation of designs and specifications

The designs and specifications will be prepared by the contractor's specialist team and are to be submitted to UNIDO as a draft report in five copies in English within three months of the return of the specialist from Mozambique. Thirty copies of the final report in English must be submitted to reach UNIDO within four weeks of the date of UNIDO's comments on the draft report.

#### 3. Phase three

Within one month of the delivery of the report to UNIDO, the contractor will delegate a qualified specialist to Mozambique to follow-up and assist in the erection of at least one prototype of each design system. The consultant will carry out revisions of the original designs as required. Duration of the mission is 6 man months.

### IV. Background information

Mozambique is endowed with large forest reserves, currently not fully utilized. Since independence, the Government has embarked on a large scale development of rural areas, including the creation of agricultural communities and the necessary infrastructure (roads, bridges, schools, hospitals, etc.).

Timber is one of the country's major resources, and, furthermore, it is a renewable resource. A certain number of sawmills existed before independence,

and there exists ambitious plans for the development of this sector to cater both to the local as well as regional and overseas markets. Plans also exist for the creation and subsequent exploitation of man-made forests.

The Government's wish is to increase the use of timber in construction, (both in rural and urban areas) for such products as: bridges, trusses, joists, load bearing and non load-bearing wall elements, floors, joinery, shuttering, etc.

In order to assure a rational use of its timber resources, and to avoid consumer resistance due to incorrect applications, studies on the grouping of species and comparative costs of construction using various building materials have been undertaken. These are to be complemented by a set of designs for building systems for prefabricated or pre-cut low-cost wooden dwellings, institutional and agricultural and industrial buildings and warehouses, based on general specifications prepared by the National Directorate for Housing.

APPENDIX VI

DRAFT TERMS OF REFERENCE  
FOR THE DESIGN OF LOW COST HOUSING USING WOOD-WOOL CEMENT SLABS IN  
MOZAMBIQUE

I. Introduction

The United Nations Industrial Development Organization is to provide the Government of the People's Republic of Mozambique with Technical Assistance in the form of designs (drawings and specifications) for a system of low-cost housing using wood-wool cement slabs wherever appropriate.

The project is to be implemented using the services of a firm of consulting engineers or an institution specialized in such work, referred to hereafter as the "Contractor".

II. Duties of the Contractor

The Contractor shall:

- Survey the present and potential future demand for prefabricated low-cost housing using wood-wool for cement slabs wherever appropriate.
- Based on the above considerations design and draft complete specifications incorporated in a production and erection manual for the low-cost modular housing best suited for the local conditions and living habits, taking into account the comparative study on costs of timber products and timber building elements and those of materials timber competes with and could replace, already prepared by UNIDO for the Government of Mozambique under the same project of technical assistance.

In particular he will:

A. Compilation of data

1. Review the above mentioned study, and, if he deems it necessary update and/or complement it;
2. Review the medium and long-range programmes for construction of low-cost housing which the various governmental bodies have drawn up;

3. Obtain the present specifications for the above constructions and compile information on cost estimates for such buildings (and their components) for various rural (and eventually also urban) sites; based on the existing study.

4. Compile basic information on climate, rainfall, etc.

B. Design requirements

1. The Contractor will present two sets of designs for construction systems for low-cost housing using wood-wool cement slabs as follows:

- a) Using the "dry construction" method (nailing the slabs on wooden studs);
- b) Using the "wet construction method" (using mortar as a builder).

2. The designs will be based on the modular system in order to reduce to a minimum the number of standard components as well as to facilitate the subsequent addition of new building units.

3. If economically feasible, both external walls and internal partitions should present recesses easily convertible into built-in cabinets when required, thus reducing expenditures in free-standing furniture.

C. Design of the low-cost housing using wood-wool cement slabs

Based on the above information, the Contractor is to design two systems of low-cost housing using wood-wool cement slabs wherever appropriate to conform to the required specifications (with respect to area, height of ceiling, size of rooms, etc. and to suit local climatic conditions, living habits, building codes, and/or traditional building habits. This design is to make full use of the inherent properties of the wood-wool cement slabs produced in Mozambique - and take into account the skills available locally for both production and erection.

The Contractor will present his designs in the following way:

1. A narrative description of the buildings designed with the necessary plans, prespective views, etc., highlighting the buildings' characteristics,

features, methods of erection, etc.;

2. Complete production and erection manuals, written for the understanding of the persons with the limited education and skills available in the areas where the building is to be erected.

These manuals will comprise - but not be limited to - the following items:

- a) Narrative specifications of the buildings with perspective drawings;
- b) Detailed cutting lists of the wood and wood-wool cement slabs to be used for each unit, including detailed instructions on marking;
- c) Detailed lists of species that could be used for in the various elements of this building, indicating the preservation treatment needed whenever applicable;
- d) Overall drawing of the type of each element designed;
- e) Detailed, dimensional drawings for each element;
- f) Wherever needed, detailed sections and/or explosions and/or detailed drawings showing method of fastening of element;
- g) Detailed qualitative specifications of masonry and related work;
- h) Detailed qualitative specification of the non-wood inputs (hardware, etc.) needed for the erection of the building;
- i) Detailed step-by-step instructions for the erection of the buildings designed, including inter alia:
  - (i) Marking of site;
  - (ii) Preparation of foundations;
  - (iii) Concrete work;
  - (iv) Erection of structure;
  - (v) Erection of roofing;
  - (vi) Erection of cladding;
  - (vii) Erection of partitions - if any;
  - (viii) Installation of doors, windows, etc.;
  - (ix) Surface finishing alternatives and electrical and sanitary installations - if any.

3. Cost calculation of the buildings designed for:

- a) The wood-wool cement slabs utilized;
- b) The wood raw material used;
- c) Other inputs (cement, hardware, etc.);
- d) Cost of machining;
- e) Estimated cost of transport of the components for each complete building for distances of, say 25 and 100 kilometers;
- f) Cost of erection - including size and qualifications of the team of erectors.

4. Qualitative specifications of the inputs needed for each building - including: if convenient, grouping of species that could be used for the structural and non-structural elements; indicating for these species needing preservation the best suited preservative treatment.

D. Equipment and labour requirements for industrial production

Bearing in mind the local conditions and the size of batches envisaged, the contractor shall briefly enumerate the minimum equipment needed for the industrial production of the items he has designed giving technical specifications, tentative plant layout, and describing, in greater detail, any jigs which may be needed to produce these components in Mozambique. He shall also enumerate the size and skills of the labour force needed for the above plant.

III. Implementation

1. Phase one - compilation of data

The contractor is to delegate a qualified specialist to Mozambique within two weeks of the submission of the contract to him for signature, to obtain all of the necessary information. This specialist and/or team leader shall visit UNIDO, Vienna, on his way to and from Mozambique for briefing and exchange of views. The tentative duration of the specialist's stay in Mozambique is about 3 weeks.

2. Phase two - Preparation of designs and specifications

The designs and specifications will be prepared by the contractor's specialist team and are to be submitted to UNIDO as a draft report in five copies in English within two months of the return of the specialist from Mozambique. Thirty copies of the final report in English must be submitted to reach UNIDO within four weeks of the date of UNIDO's comments on the draft report.

3. Phase three

Within one month of the delivery of the report to UNIDO, the contractor will delegate a qualified specialist to Mozambique to follow-up and assist in the implementation of the proposed designs. The consultant will carry out revisions of the original designs as required. Duration of mission is 3 months.

IV. Background information

Mozambique is endowed with large forest reserves, currently not fully utilized. Since independence, the Government has embarked on a large scale development of rural areas, including the creation of agricultural communities and the necessary infrastructure (roads, bridges, schools, hospitals, etc.).

Timber is one of the country's major resources, and, furthermore, it is a renewable resource. A certain number of sawmills existed before independence, and there exists ambitious plans for the development of this sector to cater both for the local as well as regional and overseas markets. Plans also exist for the creation and subsequent exploitation of man made forests.

The government's wish is to increase the use of timber in construction, (both in rural and urban areas) for such products as: bridges, trusses, joists, load bearing and non-load bearing wall elements, floors, joinery, shuttering, etc.

In order to assure a rational use of its timber resources, and to avoid consumer resistance due to incorrect application, studies on the grouping of species and comparative costs of construction using various building materials have been undertaken. These are to be complemented by a set of designs for building systems for prefabricated or precut low cost wooden dwellings, institutional and



agricultural and industrial buildings and warehouses, based on general specifications prepared by the National Directorate for Housing.



