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Interregional Expert Group Meeting
on the Building Materials Industry
for Africa and Asia*

Nairobi, Kenya, 20-23 November 1989

REPORT **

* This meeting was organized by UNIDO in co-operation with the United Nations Centre for Human Settlements (Habitat).

** This document has not been edited.

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INTRODUCTION

1. At its Fourth Session, held in Vienna, 10-18 October 1988, the UNIDO Industrial Development Board approved the Director-General's proposal to initiate work on the preliminary preparations for the convening of the Second Consultation on the Building Materials Industry during the biennium 1990-1991 (IDG.4/18, 29 July 1989).
2. In the process of preparation for the Second Consultation, UNIDO, in co-ordination with UNCHS (Habitat), made arrangements for the convening of an Interregional Expert Group Meeting on the Building Materials Industry for Africa and Asia. The meeting was held in Nairobi, Kenya, from 20-23 November 1989.
3. A total of 15 participants from 13 countries attended the meeting of which 9 participants were from 7 countries in Africa and one participant from each of the 6 countries in Asia (see Annex 1).

Objectives

4. The principal objectives of the meeting are to:

(a) Analyse the trends of the building materials industry and to discuss the basic constraints confronted by the developing countries of these two regions with particular emphasis on the low-cost building materials;

(b) Propose appropriate measures to promote the production of low-cost building materials mainly for the benefit of the low-income sector of the community;

(c) Analyse the implications arising from the transfer of technology and the appropriate standards for indigenous low-cost building materials as well as the co-operation that can be developed in this particular field between developing countries;

(d) Select and propose issues that are of relevance to the regions and that can be subject to further study by the UNIDO Secretariat and by HABITAT in the preparation process for the Second Consultation on Building Materials.

Documentation

5. Annex II contains a list of documents produced and presented at this Interregional Expert Group Meeting.

I. AGREED CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The meeting concluded as follows:

6. The building materials industry in the developing countries plays a key role in the growth of the gross national product, employment and investment. However, this industry has become increasingly dependent on imports in some countries due, in several cases, to the relatively low utilization of indigenous resources. This situation can be explained, in part, by problems of productivity and quality confronted by the enterprises involved in this type of production.

7. In the national plans of many developing countries the building materials industry is not considered as a whole; they mainly consider certain outputs of the modern or formal sector. In this context, there is a certain lack of appropriate policies and promotional measures needed to enhance the development of smaller size production units for low-cost building materials.

8. The institutional framework in many developing countries does not permit adequate co-ordination among the formal and informal building materials industries, or between the different actors involved such as:

- Policy-makers;
- Producers;
- Users;
- Technology support institutions such as research and development, formulation of standards, human-resource development, dissemination of technical information;
- Universities.

9. There is an urgent need to improve the productivity and the quality of the production of small enterprises in the formal and informal sectors, as well as the need to promote the development of these types of enterprise in the urban and rural areas.

10. The optimal utilization of natural resources, including energy resources, required for the indigenous production of building materials is being hindered by the absence of an inventory of such resources in terms of both quality and quantity.

11. There is a need to select technologies for the production of indigenous building materials that can be mastered locally, which are based on the utilization of indigenous resources, and which are not high users of energy and do not adversely affect the environment.

12. Training is a key aspect for upgrading the technical and managerial capabilities especially of the small enterprises producing building materials for low-income housing.

13. Research and development activities on low-cost building materials in many developing countries are not always relevant to local needs and up to now have not had the desirable practical applications. The R+D activities, therefore, need to be reviewed to achieve the desired objectives.

14. Current financial policies and mechanisms prevailing in many developing countries tend to favour production in large enterprises of the modern sector of the economy.

15. Regional and interregional co-operation has been limited to a great extent due to the lack of information on experiences gained in the different countries in the field of low-cost building materials.

Recommendations

The meeting recommended that:

16. Governments in developing countries should adopt policies, strategies, and promotional measures conducive to an integrated development of the building materials industry. This means that the policies and other incentive measures should promote a selective complementarity among the formal and informal sectors as well as between the urban and rural producers and amongst different

alternative building materials. Also policies should support in a progressive manner the linkages between the building materials industry and the rest of the economy in order to contribute to the establishment of a coherent productive system at the national level.

17. In order to establish an adequate balance among the formal and informal sectors of the building materials industry, developing countries should promote policies and measures that will channel resources to both sectors in an appropriate manner. In this context, suitable policies and mechanisms to finance the production of low-cost building materials in small enterprises should be established as well as policies that address pricing in order to arrive at affordable building materials. The policies and measures should include the upgrading of technological capabilities.

18. For the selection of basic building materials for low-income housing, developing countries should establish appropriate guidelines, concerning among others, the following.

- (i) Natural resources availability;
- (ii) Technologies which are compatible with local capabilities;
- (iii) Cost effectiveness;
- (iv) Strength and durability;
- (v) Installation and maintenance costs;
- (vi) Low energy consumption;
- (vii) Satisfactory environmental conditions.

19. Developing countries, for the development of low-cost building materials, should select, according to their socio-economic and technological conditions, key building materials for foundations, walling, binding, roofing and doors and windows. Among these materials, special consideration should be given to the following:

- (i) Burnt-clay bricks and tiles;
- (ii) Other soil-based products;
- (iii) Stone and aggregates;
- (iv) Lime, gypsum, pozzolanas and blended cements;
- (v) Organic and inorganic material components for roofing such as fibre concrete;
- (vi) Timber.

20. Developing countries, according to their own conditions, should promote the establishment of national co-ordination mechanisms that would develop the building materials industry in an integrated manner. This co-ordinating mechanism should take into consideration the normative, planning, financial and technical supportive institutions, as well as the actors involved such as producers and users in both the formal and informal sectors.

21. The selection of technologies in developing countries should take due consideration of the availability of natural resources, national technological capabilities, use of energy and their impact on the environment. For the adequate selection of technologies, it is recommended that an inventory be drawn up of national resources including energy used in the production of building materials as well as studies of the impacts on the environment. For the proper transfer of technology between developing countries, it is advisable to take into consideration the technological capacity of the recipient country, the scale of the technology and the correct option of technology transfer.

22. UNIDO, UNCHS and other international and regional organizations involved should promote regional co-operation through:

- (i) Training courses at all levels, for managers, technicians, operators, including maintenance personnel;
- (ii) Relevant research and development activities;
- (iii) Formulation of standards for selected building materials for low-income housing;
- (iv) Exchange of technical information as well as of national experiences in the production of low-cost building materials;
- (v) Identification and implementation of production complementarities;
- (vi) Pilot demonstration projects organized at the national and/or regional levels in order to familiarize small contractors and workers, particularly in the rural areas, in the national production, use and application of low-cost building materials and standards.

23. National governments may consider creating mechanisms to take over the outcome of the results following from the above up to the grass-root level within the country.

24. The meeting recommended for discussion at the Second Consultation the following two issues:

Issue I: Strategies and policies for the integrated development of the building materials industry with special emphasis on low-cost building materials.

Issue II: Technological development for the production of low-cost building materials.

For the development of above issues the following aspects should be considered, among others:

Issue I:

- (i) The promotion of linkages within the building materials industry, including the formal and informal sectors, as well as urban and rural production;
- (ii) The articulation of the building materials industry with the other sectors of the economy;
- (iii) Supportive policies and promotional measures;
- (iv) Special incentives and the development of associate forms of organizations for the promotion of the informal sector;
- (v) Institutional framework;
- (vi) Regional, interregional and international co-operation in the areas of developing master plans for the building materials industry and in the establishment of programmes of production complementarities.

Issue II:

- (i) Main constraints for the selection and transfer of technology;
- (ii) Criteria for the selection of key building materials for low-income housing;
- (iii) Criteria and mechanisms for the transfer of technology;
- (iv) Policies on technological choice, measures and mechanisms for the promotion of indigenous technologies for the production of selected low-cost building materials;

- (v) Training programmes for the mastering of technologies;
- (vi) Standardization, research and development activities to be promoted;
- (vii) Regional, interregional and international co-operation in the field of exchange of information and technological experience, as well as in transfer of technology.

II. ORGANIZATION OF THE MEETING

Opening of the meeting

25. The Interregional Expert Group Meeting was opened by the Executive Director of the United Nations Centre for Human Settlements (Habitat). He noted that the growing demand for residential, and non-residential buildings, infrastructure and public works would result in the construction industry in developing countries playing a leading role in improvement of the environment and the economic conditions through optimal usage of productive factors i.e. building materials and technology, plant and equipment, and financing. To achieve such targets he emphasized the need for adequate policies to reduce reliance on imports through the development of locally-produced building materials and components and technologies compatible with available local raw materials and manpower. He noted that such policies should be envisaged as a step in the development of an overall policy in accordance with other objectives for the construction sector such as increased output, full use of available plant capacity, development of suitable technologies, training and optimal use of the capacities of the informal sector. He also emphasized that the forthcoming Consultation would provide the opportunity for interaction among developing and developed countries and international agencies with a view to establishing effective strategies and comprehensive programmes of action for the development of the indigenous building material industry.

26. The UNIDO representative made a brief presentation on the System of Consultations whose main function is to promote industrialization of the developing countries. He stressed specifically the role that the System can play in encouraging direct negotiations among interested parties i.e. entrepreneurs, governments, investors, industrialists from private and public sectors, research centres and social actors participating in a particular economic sector with the view to improve and increase the share of developing countries in that particular sector of production. He also explained that the System is a forum at which industrial trends and issues at global, regional and interregional levels can be discussed and new opportunities for developing countries assessed. A brief summary was given of the activities undertaken in preparation for the Second Consultation scheduled for October 1990.

Election of officers

27. The following officers were elected:

- | | |
|----------------|---|
| Chairman: | Dr. H.C. Visvesvaraya (India), Chairman, National Council for Cement and Building Materials |
| Vice-chairman: | Ms. A. Tiongson (Philippines), Executive Director, Construction Industry Authority |
| Rapporteur: | Mr. E.S. Yaw (Ghana), Director, Department of Rural Housing and Cottage Industries |

Adoption of the agenda

28. The following agenda was approved:

1. Opening of the meeting
2. Brief description of the System of Consultations
3. Election of the chairman and officers
4. Presentation of the agenda
5. Presentation of the UNIDO discussion paper
6. Presentation of the HABITAT background paper
7. Presentation by participants regarding the situation of the building materials industry in various countries
8. Discussion of the key issues presented in the discussion document
9. Adoption of the meeting's conclusions and recommendations

Approval of the conclusions and recommendations

29. At the closing session on 23 November 1989, the conclusions and recommendations of the meeting were approved by consensus.

III. SUMMARY OF THE DISCUSSIONS

Presentation of the discussion paper

30. One of the UNIDO representatives presented the discussion paper prepared by the Secretariat summarizing the main institutional and organizational constraints confronted by the industry i.e.: lack of strategies and policies regarding the development of the building materials industry as a whole; lack of complementarity between formal and informal sectors; existing standards designed mainly for the modern sector; underutilization of installed production capacity. He also outlined the central issues to be discussed: selection of production priorities, policies and measures to meet social needs, institutional mechanisms, entrepreneurship development, co-operation, transfer of technology. The representative of HABITAT elaborated further on the transfer of technology, pointing out additional relevant key areas that should be discussed at the meeting such as measures required for effective transfer of technology between developing countries, selection and scale of that technology, standards and capabilities in the recipient country and the type of materials to be promoted.

General discussion

31. One participant stressed the importance for a more rational utilization of low-cost building materials. In general elaborate foundations are not required for the construction of low-cost housing or shelter. However, priority materials should be used for 3 main areas, namely: walls, binders and roofing which constitute the expensive elements of a low-cost dwelling. Efforts should be made to select suitable materials: soils, sand, stones, gravel, pozzolana, lime, burnt bricks, clay tiles, timber and fibre-concrete roofing. The selection of these materials should be on a country-to-country basis, according to availability of raw materials and prevailing characteristics of the habitat.

32. Another participant mentioned that in the case of clay and clay products, promotion efforts should be made at small-scale level with appropriate adjustments to labour-intensive production. Ways and means should be considered how best to organize production according to the needs and conditions of the local market and the appropriate technology that must be tailored for the small-scale sector in order to minimize energy and maintenance costs.

33. A number of participants indicated that the production of traditional building materials and components should be implemented with proper strategy and policy at institutional level. The policy should be oriented in such a way that both the formal and informal sectors might benefit from an overall development strategy designed for the building materials sector as a whole. In addition, within a plan of action for the selection, promotion and development of those selected priority materials emphasis should be given to low-cost materials for the housing sector.

34. Other participants stressed that one of the main aspects of a strategy for developing the low-cost building materials sector should consist of centering its orientation towards a coherent production system with the view to encourage complementarity and increase interaction between the formal and informal sectors. This orientation could help to achieve cost-effectiveness, and mastering of technologies and reduce the use of foreign currency reserves. A number of participants expressed the view that these objectives could be achieved through an integrated and co-ordinated approach between relevant government institutions, professional organizations and the main actors involved in the building materials and construction sector.

35. Referring to the programme of integration and development, one participant expressed the opinion that a financial policy with proper regulations and subventional provisions in line with the needs of the sector and available resources of each country would be necessary. He stressed the need for feasibility studies to assess the financial implications of such promotional undertaking. He also mentioned that the programmes advocated in the feasibility studies should be executed in different phases of implementation, each phase having its priority targets.

36. One participant was of the opinion that, depending on the availability of resources, the creation of a central governmental department to co-ordinate activities related to, inter alia, planning, forecasting market needs, production and management, could be a valuable instrument to promote and develop the building materials sector within defined procedures applicable on a country-to-country basis.

37. In addition to the main topics of discussion, one participant expressed the view that in the process of development of the building materials industry account should be taken of the implications on the environment. Uncontrolled exploitation of quarries and forests, he said could generate negative consequences on the environment. He spoke of the co-ordinated efforts that would be needed between government agencies and responsible authorities for a balanced exploitation of the natural resources of a country.

38. The same participant mentioned that the impact of energy requirements on the economy should also be taken into account. Cement, a high energy consumer during its production, is mainly utilized in modern constructions; it is too expensive for the traditional rural construction sector and for the low-income group of the population in many developing countries. He also noted that energy costs constitute a major constraint for the small-scale producers. The promotion of lime as a binder could offer a cheaper alternative in

construction of low-cost housing and shelter mainly for foundations and masonry work for walling. Other participants suggested that alternative materials should be investigated i.e. dolomite-clay and pozzolana-cement the production of which would be less energy-oriented than that of cement.

39. Another participant spoke of the active role played by the informal producers in the production of low-cost building materials in the rural areas where in general there is increasing demand for low-cost housing and shelter. He mentioned the need for training for these small producers at entrepreneurial and manufacturing levels; due to the lack of know-how and the poor quality of their products small producers will always be marginalized by the conventional market demand. He suggested that pilot demonstration and training facilities as well as organized workshops could be a useful mechanism through which the sector could be assisted in order to improve its productivity and increase its commercial capabilities.

40. One participant spoke of the special attention that should be given by UNIDO to investigate possibilities of investment promotion with the view to increase the productivity of existing production units. He noted that similarly a rehabilitation programme could contribute towards increasing the productivity of a large number of production units. Most of the participants were of the opinion that both investment and rehabilitation should be selective. Within this selective context efforts should concentrate mainly on small and medium enterprises which are basically the main providers of low-cost building materials.

41. Many participants expressed the view that the appropriate transfer of technologies was one of the major key elements for the production of low-cost building materials in the developing countries. Other participants referred to the close relation that should exist between the selection of the technology, the capability of the recipient country to adjust the technology to its proper needs, and the existing standardization, if any, of the materials considered for production. It was also pointed out that simple technologies have better possibilities for success, are easier to maintain and, most important, are more adaptable to the small producers' capabilities particularly in the rural areas where the source of energy, if needed, could be a constraint. Many participants expressed the view that the transfer of technology should be not only be made between industrialized and developing countries but should be particularly encouraged between developing countries.

42. Several participants spoke about the support that the developing countries should receive from international organizations to encourage co-operation relating to transfer of technology, research, standardization, quality control and dissemination and exchange of down-to-earth information, and demonstration projects. Many participants suggested that UNIDO and UNCHS (Habitat) should assist in convening workshops on building materials. Topics on standardization, technological aspects and policies could be developed for exchange of views. Some participants mentioned that financial help from international organizations would also be needed to support such initiatives which should be developed on a bilateral or multilateral basis between regional institutions, governments or non-governmental organizations.

43. Many participants suggested that UNIDO and HABITAT should also monitor and co-ordinate co-operation programmes between countries. Upon request by interested countries, the terms of co-operation could be studied by the international organizations and agreed upon by all the parties involved. The participants suggested that co-operation agreements should be extended, among other things, to human resource development and training at different levels.

Regarding the dissemination of information, the participants agreed that in order for the dissemination phase to be more effective it should be channelled through national focal points that should also be responsible for on-the-job training.

44. Based on the conclusions drawn by the meeting, the participants recommended two issues for consideration by the Consultation namely:
1) Strategies and policies for the integrated development of the building materials industry with emphasis on low-cost building materials; 2) Technology development for the production of low-cost building materials.

ANNEX I

Summary of participants' papers

A brief summary of the prevailing situation of the building materials industry in the following countries is given below;

1. Ethiopia. Modern construction methods started to replace traditional use of local materials about 50 years ago. The low-income group of the population continues to use natural materials such as wood, bamboo, straw, stone and mud for the construction of low-cost houses. Other materials i.e. cement, cement-based products, lime, clay and clay products, iron and steel, thermoplastics and wood are not produced in sufficient quantities to satisfy the market demand. In the case of cement, efforts are being made to produce 300.000 tons in 1990 in addition to the current production of 450.000 tons/year, but even so, such an increase will not fully cover the demand. Hollow concrete blocks are widely used and are cheaper than bricks; one major constraint in their production in the remote areas is basically the scarcity of cement. There are abundant reserves of lime-stone but the production of lime is limited to 5.500 tons/year; a plant with the capacity of 120.000 tons is to be commissioned in 1990. As for the production of lime-pozzolana there is great potential for development due to the existence of abundant volcanic materials in the country. Efforts are being made to utilize roofing tiles instead of imported corrugated iron, but appropriate roof structures i.e. trusses, purlins, rafters must be developed accordingly. Iron and steel factories have a total capacity nearing 20.000 tons which is not sufficient to satisfy demand; insufficient production could hamper the development of the construction industry. Eucalyptus is the major source of cheap wood for the construction of houses in both rural and urban areas; if eucalyptus timber is properly treated life expectancy of the construction could be extended. The use of wood is, however, a major cause of deforestation and the writer suggests development of the production of quarry stone and lime-pozzolana as appropriate low-cost building materials.

2. Ghana. There is an annual demand for 70.000 housing units but the current delivery is only of the order of 28.000. The average occupancy per house in 1984, was 13.53 persons in the urban areas as compared to 9.03 persons in the rural areas. In view of this situation, there is great demand for housing, but the production of building materials is expensive and faces many constraints among which are underutilization of installed capacity of the plants, reliance on imports of raw materials due to low level of exploitation of local resources and reluctance of the consumers to select locally-produced materials, costly foreign exchange component of capital and maintenance, and lack of efficient management. The timber industry is export-oriented. Cost of wood on the local market is high and compounded to additional transport costs. The production of cement is about 1.1 million tons; plans are being made to locally produce clinker in order to reduce imports. Mild steel rods are locally produced as are steel sections for the construction of buildings and bridges. In connection with roofing materials, efforts are being made to produce new products such as fibre-cement which is processed from coconut husks, and micro-concrete roof tiles, a mixture of sand cement and quarry dust. The technology for using earth blocks in foundations and walling is being improved. Clay deposits have been identified in most of the country by the Geological Survey Department, but production and utilization of clay bricks and tiles are facing many constraints i.e. efficient kilns and fuel are not obtainable at affordable prices; lack of skilled brick layers; no access road to clay deposits.

Regarding the transfer of technology, a programme is currently underway in Ghana for the dissemination of appropriate production techniques and use of low-cost building materials in selected centres in the rural areas. Stone, timber and stabilized blocks are the basic materials selected for promotion for which equipment and technology at the level of the small production units are within local capabilities. Appropriate standards for compressed earth blocks are also contemplated. The need for greater dissemination of information for the promotion of the transfer of technologies in the sector of building materials in general is also important.

3. India. The outlay on construction activities in India accounts for between 40% and 50% of the national plan outlay during the Seventh Five-Year-Plan 1985-1990. Presently the consumption of building materials is estimated at 3.500 million tons per year; the corresponding raw material requirement is about 5.000 million tons per year. Based on current trends, the projected demand for basic building materials for 1994-1995 will increase significantly as compared to the estimated production for 1989-1990: for example 135 billion brick units will be required in 1994-1995; demand for cement should reach 65 million tons as opposed to 49 million tons estimated for 1989-1990; timber plywood is expected to register a demand for 210 million m² in 1994-1995 as compared to an estimated 115 million m² manufactured in 1989-1990. The demand for materials produced by the petrochemical industries and used for i.e. damp-proofing (low-density polyethylene), insulation (polystyrene), floor tiles (polyvinyl chloride) is also expected to increase beyond local production capacities. It is estimated that about 2.500 million tons of solid waste are generated in India annually. Efforts are being made to produce building materials from these wastes which could be used for fibre board, insulation, aggregates binders, etc.

Various organizations in India at the level of central and state government, academic and private institutions are engaged in R+D on building materials and technology transfer. Regarding transfer of technology it is common to find projects being implemented which use standards which are unsuitable to the socio-economic or environmental character of local conditions. For an effective transfer of technology it is important that the recipient be equipped to assimilate and adapt the technology to meet his own conditions and create linkages for a beneficial transfer of know-how. Technology transfer mechanisms in India were successfully designed and put into application by the Cement Research Institute and the National Council of Cement and Building Materials. Among many projects technology for pre-cast concrete poles was developed by NCB and successfully transferred to the Rural Electrification Corporation. Various projects for vertical shaft kilns were also designed and implemented through CRI. In the Afro-Asian context it is recommended that development of the industry be based on a global framework, so that the transfer of technologies could be addressed in a broader context. Effective co-operation could be established and developed in the Afro-Asian context preferably at the small-scale level in the field of mini-cement plants, bricks and pre-cast concrete plants.

4. Indonesia. The population currently estimated at 170 million is expected to increase to more than 200 million by the end of this century. Due to the rapid population growth there is a large need for housing and one of the major challenges for the authorities is to provide shelter to the urban poor. However public investment in housing is a burden to governments and the public sector is playing a major role in financing and building houses. Priorities in the housing sector are concentrated mainly on 3 sectors: the very low, low, and the moderate income group which constitute 90% of the population.

The industry does not have the capacity to satisfy fully the demand for locally produced low-cost materials for these sectors of the population. The small-scale producers are wide-spread in the rural areas and could play a leading role as the main suppliers of materials for the construction of low-cost housing.

In 1981, there were 1.5 million small industrial units in Indonesia out of which 870.000 units were small producers of building materials and building equipment manufacturers. The workforce of these units was estimated at 54% of the total manpower employed by the small-scale sector. The development of the sector is, however, hampered by weak management, low level of technology, insufficient capital and poor marketing. In view of the potential of the small-scale sector, steps were taken to rationalize the production system. Since 1986, 3.300 units have been organized in small-scale industrial centres among which 600 produce building materials for mass housing construction programmes. Major problems faced by the sector are the timely delivery of large amounts of materials, poor quality and lack of standard dimensions. Materials such as bamboo, bricks, concrete blocks, clay and concrete tiles, dominate the production of these units. Nevertheless, there is great need to improve, among other things, managerial capabilities, production and marketing techniques.

5. Madagascar. The country possesses large quantities of raw materials, but the construction industry in general is heavily dependent on imports particularly of cement. The total installed capacity for cement production is registered at 195.000 tons per year, but the effective production in 1988 was only 32.700 tons whereas 86.433 tons were imported representing almost 73% of the total consumption for the same year. Efforts are being made to promote the production of lime but its use as a binder in construction has not been fully accepted by the population. However, lime is used in various Government housing projects; there is actually one plant producing 7.000 tons per year. The production of clay products i.e. bricks and roof tiles is well entrenched in the country's traditions. Three plants have a total production of 2.25 million hollow bricks and 4.8 million roof tiles; the production of these plants is reported to be at 50% of their capacity. In addition, the small-scale sector produces about 15 million bricks and 1.2 million roof tiles. Materials from quarries i.e. granit, basalt or those from volcanic origin are utilized but there are no specific organized enterprises for the extraction and exploitation of these materials. Timber mainly from pines and eucalyptus is also exploited, but locally-produced plywood is costly.

In view of the lack of housing in Madagascar, the Government has set an objective to build 20.000 housing units each year. Measures were taken at institutional and production levels with the assistance of UNDP and UNIDO for the promotion of the small-scale sector in the production of building materials i.e. lime, stabilized pressed bricks and fibro-cement roofing tiles with local resources. Self-help production and construction of housing are encouraged by the authorities as part of the promotional scheme. Financing is being considered by the authorities through a national fund for housing that will soon become operational. As part of the assistance by UNDP and UNIDO, efforts are undertaken for the acquisition of appropriate equipment for the production process mainly for presses for bricks and tiles. National efforts for promotion of low-cost small-scale building materials are to be increased at regional and interregional levels between developing countries.

6. Pakistan. It is estimated that about 40% of Government expenditure is incurred in construction activities. The local construction industry is mainly oriented towards the housing sector. The economy is basically agriculture-oriented and about 70% of the population live in the rural areas where building materials such as stone, bricks, clay products are used, whereas in the urban areas, cement, steel and wood are mainly used by the modern construction sector. The development of low-cost building materials has been slow basically due to lack of information on deposits of raw materials, lack of data on industrial and agricultural by-products or wastes, appropriate technologies on alternative sources of energy, quality control standards, and the absence of demonstration pilot units. The consumption and forecast demand for materials such as cement is estimated to have doubled between 1982-83 and 1992-93 from 4.5 million tons to about 9 million tons. Timber resources are very scarce as only 3.7% of the territory is covered with forests. The local industry, however, provides 40% of timber needed for construction; imports make up the balance. Bricks are extensively used and constitute about 15% of the construction costs. Production is based on manual methods and due to the large demand for bricks the industry has flourished, albeit with little improvement.

The small- and medium-scale enterprises play an important role in the production of building materials in Pakistan. Many areas have been identified for the promotion and use of local resources and the development of entrepreneurship mainly in the production of clay bricks, lime and cement from industrial by-products and agricultural wastes. In this context there is a great potential for co-operation among developing countries that could be developed as regards exchange of views and formulation of quality control standards and specifications.

7. Thailand. Housing is increasingly in demand in the Bangkok Metropolitan area where it was estimated that between 1987-88 slightly more than 14,000 units of all types i.e. public, private and self-help were built. There is an increasing demand for building materials, but despite efforts by various enterprises to raise their production, the market demand is not satisfied. Shortages of cement steel bars and wood are particularly felt. The production of cement - currently around 14.8 million tons per year - is expected to increase to 15.3 million tons, but by 1997 the production is estimated to double in view of efforts being made for the establishment of new plants and the expansion of existing ones. Major constraints have been in the production and supply of steel and iron bars since 1986. Raw materials are scarce and since the explosion of two kilns in 1988 imports have increased. Local production in 1989 was estimated at over 1.3 million tons against 1.5 million tons required by the market for the same year. Wood is widely used for roof structures, floors and partitions. However, due to severe flood late 1988, franchises for forest exploitations were abolished by the Government. Imports are authorized to solve the shortage, but costs of high-class timber have risen by 50% and that of low-class by 20%. Galvanized iron steel is locally manufactured with raw materials imported from Japan and widely used for roofing and fencing mainly for self-help construction of houses. Due to the shortages it was estimated that for 1988-89 a general cost increase of main building materials could be in the order of 15% to 30%.

ANNEX II

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ANNEX III

List of documents

a) by UNIDO:

Considerations for promotion of the low-cost building materials industry in Africa and Asia and co-operation at regional and interregional levels ID/WG.496/3(SPEC.)

An overview of the building materials industry in Africa and Asia ID/WG.496/2(SPEC.)

b) by UNCHS (Habitat):

Co-operation between developing countries in technologies and standards for local building materials ID/WG.496/1(SPEC.)

c) by participants:

1. A brief outline of the building materials industry in Ethiopia.
2. Housing and building materials situation in Ghana
by Mr. E.S. Yaw, Director, Department of Rural Housing and Cottage Industries
Accra, Ghana
3. Strategic issues relating to development of building materials industry in Afro-Asian region
by Mr. H.C. Visvesvarya, Chairman
National Council for Cement and Building Materials
New Delhi, India
4. Building materials development for low income housing (Indonesian Experience)
by Mr. S. M. Ritonga, Director
Institute of Human Settlements, Ministry of Works,
Jakarta, Indonesia
5. Matériaux de construction à Madagascar
by Mr. Dansou Apéti Pierre, Conseiller Technique Principal de l'ONUDI
Antananarivo, Madagascar
6. Case study related to prevailing status of building materials in Pakistan
by Mr. A. Q. Alvi, Chairman
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7. Building materials for low cost housing industry
by Mr. Narin Sakul Clanuwat and Ms. Sirithip Oun-Anulom, Centre for Housing and Human Settlement Studies, National Housing Authority
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