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UNITED NATIONS INDUSTRIAL DEVELOPMENT  
ORGANIZATION

19602



UNITED NATIONS CENTRE FOR HUMAN  
SETTLEMENTS (HABITAT)

**SECOND CONSULTATION  
ON THE  
BUILDING MATERIALS INDUSTRY**

**Athens, Greece, 4-8 November 1991**

Distr.  
LIMITED

ID/WG.510/3  
27 September 1991

ENGLISH  
ORIGINAL: FRENCH

**NEW DEVELOPMENTS IN THE BUILDING  
MATERIALS INDUSTRY\***

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## INTRODUCTION

The building materials industry is a particularly important sector of the economy of many countries.

This is because building satisfies an essential human need to which man devotes a share of his resources, once he has food and clothing.

However, this industrial sector has so far been marked by two approaches which are only now starting to overlap.

The first approach is based on industry

The cement industry is a good example of heavy industry in the building materials sector. A new cement factory costs at least 500 million French francs (\$US 100 million).

Cement is in great demand in developing countries, but it is expensive because, on top of the production cost, it often costs a lot to transport such a heavy product.

Consequently, it tends to be used for intermediate-quality housing for executives and civil servants.

The other approach is based on local demand

Local craftsmen attempt to satisfy the demand for building materials using the resources available to them.

If they are able to procure aggregates and cement, they manufacture concrete perpendes (binding stone) with small vibrating machines or "spreaders", but such perpendes are often of poor quality.

In countries with a larger clay content in the soil, the manufacture of "earth blocks" is more common. Small-scale Belgian or French enterprises have proposed the use of higher-performance machines but they are yet to be widely accepted. In Cameroon over 100 small manual presses are in use. With UNDP funding, a more efficient press will soon be installed in Yaoundé for the construction of cheap housing made of stabilized earth bricks.

Several larger-scale presses are in service in Algeria. More than a dozen small- and large-scale machines are being installed in Ecuador.

This craftsman approach must, however, gradually assume industrial proportions. One of the first steps to be taken in this direction is to promote quality monitoring within the enterprises concerned. For instance, enterprises could be helped to set up a small laboratory and, by fixing such parameters as size or mechanical strength, to establish manufacturing quality control.

UNIDO is supporting this kind of development in Cameroon with the help of the Yaoundé Polytechnical College, backed up by French technical centres.

It is with the aim of bringing together the industrial approach and the craftsman's approach matching local demand that prompted UNIDO and HABITAT to organize a consultation on building materials in November 1991.

The purpose of the Consultation is to take stock of the experience gained in recent years and to examine the reasons behind the successes achieved and the failures suffered. Consideration will initially be given to setting up new manufacturing units and establishing a building materials industry.

Operating difficulties encountered by factories and in production management will then be the context for examining developments in the industry, with the support, in particular, of the industrial technical centres.

## I. ESTABLISHMENT OF A BUILDING MATERIALS INDUSTRY

The problems of establishing a building materials industry involve:

- Appraisal of requirements;
- Choice of technology and research needed to tailor it to local resources;
- Project funding.

Examples of cooperation between partners will illustrate how these problems should be tackled.

### 1. Appraisal of requirements

The appraisal of building product requirements is dependent on local conditions and housing needs.

Consideration must be given to local climatic and seismic conditions, in particular.

Consequently, in all areas with a harsh climate provision must be made for thicker walls with insulation. Moreover, the building has to be done when the temperature is very low. This led to the use, at one time, of heavy prefabricated elements and the development of the Camus system in the Soviet Union 40 years ago. Nowadays, to take advantage of the wider variety of architectural possibilities and to ensure very high standards of performance, Russia is trying out the open system developed in France in conjunction with the pre-cast concrete industry.

Likewise, in areas of seismic activity, special care must be taken during construction and reinforced concrete must be strengthened to enable the joints to withstand shocks and deformation of the building.

However, in order to satisfy the need for dwellings, formal housing built by construction enterprises or craftsmen is not always enough, while resorting to informal housing requires a large quantity of building material that is often produced by craftsmen themselves.

Once the building requirements have been ascertained, the next task is to identify the materials, small pieces of masonry, prefabricated concrete components for walls, floors, structures, etc. After that, the means of production must be chosen, bearing in mind the various local circumstances, and the size of the workshops and factories must, above all, be tailored to requirements.

Finally, consideration must then be given to ways of distributing the products in the country since this affects the nature and size of the production units.

## 2. Choice of technology, adaptation and research

The choice of building material manufacturing technologies should be based on experiments already tried elsewhere.

Some adaptation is needed, however, since local conditions are never the same.

In addition, this adaptation also frequently requires specific studies in the recipient country in collaboration with the source country of the technology involved.

Three examples of cooperation with French partners may be usefully described:

### (a) Industrial production using the open system in South-East Asia

With ESCAP's technical support, the countries of South-East Asia very soon started working on modular coordination as a way of building faster, more cheaply and with better quality.

Malaysia had meanwhile been working with France to establish a dimensional coordination system for the marketing of mutually compatible catalogue components.

With the aim of sharing this experience, France was asked by ESCAP to make its expertise available to the countries of South-East Asia who wished to develop the production of compatible building components.

CERIB (Centre for Design and Research in the Pre-cast Concrete Industry) joined CSTB (Scientific and Technical Centre for the Building Industry) and SCIC AMO in pinpointing locations for industrial building production in seven countries in the region: Malaysia, Thailand, Viet Nam, Bangladesh, Pakistan, Philippines and India. Other countries were later associated with this initiative: China, Laos, Indonesia and Iran.

A personalized set of recommendations was drawn up for each country and a number of pilot projects were planned:

- Rehabilitation of a factory to make it capable of producing coordinated components;
- Development of a building system tailored to local conditions;

- Establishment of a pilot plant to serve as a model for the other countries.

A seminar has just been organized in France to demonstrate the progress made in industrial building production using both heavyweight and lightweight techniques.

(b) Preparation of reference sheets on timber

Reference files have been prepared in order to utilize timber resources and promote the establishment of local processing enterprises in partnership with French enterprises.

These files describe the manufacturing processes involved, give details of technical and economic project analysis and propose four investment criteria to assist industrial decisions in the following areas:

- Sawn timber and manufacture of building components;
- Manufacture of panels and boarding;
- Preservation treatment and manufacture of wooden posts;
- Newsprint;
- Wood for fuel.

A Franco-African partnership week, organized by UNIDO and CTFT (tropical forest technical centre), in the timber industry took place in Paris at the end of 1990. Fifteen African entrepreneurs submitted their ideas to potential French partners and 10 cooperation declarations were signed.

(c) Rehabilitation of a brick factory using cold brick stabilization in Burkina Faso

The rehabilitation of the Ouagadougou brick factory could not be based on the traditional brick drying and firing process since Burkina Faso does not possess energy and it is no longer feasible to use local timber resources. This is why the Burkina authorities sought a way of stabilizing clay with cement.

It was, however, necessary to develop products of a colour similar to the traditional red. It was also necessary to cut down cement consumption while maintaining minimum product quality. This led to full-size trials involving product manufacturing processes, particularly blending, at the central highways and bridges laboratory in France. This research was conducted at the behest and with the cooperation of specialists from Burkina Faso.

3. Project funding and partnership

There are many ways of financing a project, ranging from direct foreign investment to borrowing. Each system has its advantages and drawbacks.

Consequently, an industrialist who wishes to launch production in his own country would find it safer to ask the foreign partner contributing experience

and expertise to provide part of the capital as well. He seeks to ensure that the foreign partner will do his utmost to see that the operation succeeds.

However, the smaller the project, the smaller the funding capability of the party providing experience and technology. In an extreme case, he may hardly have sufficient capital to keep his own enterprise running. So it is difficult for him to take a holding in a foreign enterprise.

If this is so, the industrialist must make every effort, before starting up production, to ascertain the reliability of the party providing technology. The information that passes from one State to another or via international organizations is often very useful.

There must therefore be confidence between the two partners if they are both to do everything to make the project succeed.

Here are two examples to illustrate what we are saying:

(a) Ceramic sanitary ware industry in Morocco

Two Moroccan industrialists manufacturing household ceramic sanitary ware have taken over 90 per cent of Moroccan consumption with products of a quality competitive with products on the European market.

This is a partnership with two French industrialists that was set up 10 years ago. The French industrialists account for between 30 and 50 per cent of the capital but, more importantly, French engineers stayed in Morocco while the Moroccan engineers finished their training in France.

Research and development connected with new products is carried out jointly by the engineers at the factories in France and in Morocco.

(b) Partnership by franchising a process or with an equipment supplier

Partnership may also take the form of a franchise. A franchise does not involve any financial relationship, but it ensures the reliability of a technology and its progress in conjunction with all partners in the franchise through a network. An example of a successful franchise in Morocco is the manufacture of French industrial prestressed concrete floors.

This requires the establishment, through commercial links, of a relationship of mutual confidence with an equipment supplier, since it is in both partners' interest for the project to succeed. The technical solution proposed, however, might involve more equipment at places where the professional skills could produce a solution.

Numerous brick factories are in operation in this manner in many countries.

## II. OPERATION OF THE FACTORY AND ROLE OF INDUSTRIAL TECHNICAL CENTRES

### 1. Purpose of a technical centre

The main purpose of an industrial technical centre is to provide enterprises with the technical support necessary for the proper operation of their factories. Its function as a research centre is a means of achieving this.

The priorities include:

- Quality control;
- Increased productivity;
- Innovation;
- Energy saving.

#### (a) Example of CERIB

The objectives of CERIB are the same as those of the law governing industrial technical centres in France:

- To promote technical progress and innovation;
- To improve product quality;
- To increase productivity.

With a view to achieving this objective it implements a number of activities, in particular:

- Studies and research to help solve industrialists' technical problems;
- Industrial quality control to check that products comply with specifications established jointly by producers and users;
- Training for people working in the concrete industry;
- Information to assist industrialists in making decisions;
- Direct technical support for firms with particular problems to solve.

Outside France, CERIB may take action for at least two reasons:

- Either to promote the export of French technology, in which case it normally acts in conjunction with the French ministries concerned upstream of the direct commercial activity of the industrialists;
- Or to make its competence available to international organizations, usually for the benefit of developing countries.



(b) Example of the French ceramics industry

The technical centres of the ceramics industry are the following: the Technical Centre for Tiles and Bricks and the French Ceramics Society.

In the ceramics industry raw materials selection and, above all, energy saving are very important.

Since 1975 it has been compulsory for factories that consume large amounts of energy to carry out a periodic audit. These technical centres have been authorized to conduct such audits. However, in addition to the audit, the specialists consult industrialists on improvements to their installations.

Similarly, with the development of rapid firing techniques, raw materials selection is a decisive factor. The specialists at the centres can help industrialists to change their raw materials and make best use of local resources.

(c) Example of the technical centre for building materials in the ceramics and glass sectors in Tunisia

This centre was set up almost ten years ago and has focused on concrete and ceramics, but it also provides advice in the area of energy in cement making and conducts numerous surveys on the raw materials available in Tunisia.

One of its main activities started with the energy audits which have become mandatory for large-scale installations; these have led to contacts with industrialists.

It has also developed quality control activities similar to those of CERIB.

However, its best contacts and its main activities have come about essentially through the basic work done in association with factory technicians.

### III. TOWARDS MUTUAL RECOGNITION BY EUROPE

The technical centres in European countries which specialize in ceramic tiles have established a procedure and a network for mutual test result acceptance. The Greek laboratory CERECO is also part of this network, as are SFC (French Ceramics Society), CTB (Technical Centre for Tiles and Bricks), the Ceramics Centre in Bologna (Italy) or Ceram Research in the United Kingdom.

The aim of CTMCC (Technical Centre for Building Materials, Ceramics and Glass) is to align itself gradually with this procedure, as described in international standards, and to seek incorporation into the network.

### IV. TOWARDS REGIONAL NETWORKS OF TECHNICAL CENTRES OR ANY OTHER COLLECTIVE TECHNICAL STRUCTURE

On the occasion of the seminar organized with the help of UNIDO by the Moroccan Ministry of Industry and APIC (Professional Association for the

Ceramic Industries) in Rabat in September 1991, the idea of a network of the technical centres already existing or yet to be set up was proposed for the Maghreb countries. It would enable the older centres to pass on their experience to more recently established collective structures.

Other networks could also be formed in South-East Asia or South America.

The UNIDO seminar (held in France in June 1991) on the industrialization of building in the Asian region was used by experts from those countries to bring out the need for action at regional level.

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As a contribution to this fresh approach to the System of Consultations which highlights experimental efforts, we could make use of experience in launching new industries acquired by partners in several countries:

- Ceramic sanitary ware in Morocco;
- Cold stabilized bricks in Burkina Faso;
- Prestressed concrete components in Morocco.

The opportunity could also be taken to publicize the technical centres established in France.

These efforts would be shown by poster displays describing the methods used and the difficulties met. There could also be slides or video presentation, either as part of an exchange of views or as part of the plenary session.

Other activities could also be presented at UNIDO's request.