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for Africa and Asia \***

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**AN OVERVIEW OF THE BUILDING MATERIALS INDUSTRY  
IN AFRICA AND ASIA**

**Background Paper\*\***

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\* Organized by UNIDO in cooperation with UNCHS (Habitat).

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## I. BUILDING AND CONSTRUCTION TRENDS

### 1.1. SOURCES OF DEMAND

It may be very useful to outline the various sources of demand and their component segments for the building and construction in the milieu of the economic and social development sectors. Suffice it might to list these at this juncture:

#### HOUSING

- Single or multi-family
- Low, middle or high cost
- Rural or urban  
(Design aspects due to life styles, economic, geographical or environmental aspects)

#### PUBLIC BUILDINGS

- Educational
  - Schools, primary, secondary, tertiary
  - Vocational and technical
  - Professional and higher learning institutions
- Health
  - Hospitals and dispensaries
  - Specialized health establishments
- Others
  - Government offices general
  - Post offices
  - Sports complexes
  - Cultural/arts complexes

#### COMMERCIAL

- Office buildings
- Warehouses
- Industrial buildings
- Hotels
- Others such as shopping complexes/centres

## INFRASTRUCTURE

- Roads, various types
- Bridges/culverts various types
- Irrigation (water resources)
  - Dams
  - Canals
  - Channels
- Ports
  - Air
  - Sea
- Water (human and industrial consumption)
  - Dams
  - Treatment
  - Distribution
  - Recycling (recovery)
- Electricity
  - Generation
  - Transmission
  - Distribution
- Sanitation and drainage
  - Household
  - Commercial
- Information/Communications
  - Radio broadcasting
  - Television broadcasting
  - Telephone communication
  - Other informatics
- Transport
  - Railroad
  - Waterways
  - Bus and truck terminals

The above is obviously presented to outline the true perspectives of the subject which should guide the thinking towards the entirety of the sector even when information on many or most of these were not available. This would be found extremely significant in the identification of the particular issues or problems, and, of course, the planning of the directions of development and/or promotion, particularly with respect to the construction and building materials.

1.2. ROLE AND SIGNIFICANCE OF VARIOUS SECTORS OF DEMAND

In view of the obvious difficulty in obtaining uniform and direct information as to the trends in building and construction industry from various countries for various component segments, while recognizing its singular importance for the subject (its contribution to the GDP and total capital formation ranges from 4 to 10 per cent, and 40 to 60 per cent respectively), we have chosen to rather passively review an array of statistics which would throw adequate light on the trends in building and construction activities in the required components of the economic and social sectors:

These are provided in the tables for the countries surveyed in Africa and Asia. A brief summary is presented herebelow:

In EGYPT all other components of construction demand such as physical infrastructure (railways and roads), social services infrastructure (education, health) and others such as tourism have grown by about 30 to 50 per cent during the past ten to fifteen years, while the housing and commercial building construction seems to have grown by over 600 per cent over the same period.

In ETHIOPIA the education infrastructure appears to have grown by 100 per cent, the health by about 30 per cent, tourism by about 40 per cent, transport and communications by about 60 per cent during the last ten years whereas the housing and commercial buildings only by about 24 per cent during the same period (by numbers). More details may be found from the table showing new building construction authorized.

In KENYA the education infrastructure appears to have grown by about 60 per cent, the health by about 70 per cent, the transport by about 30 per cent, the tourism by about 25 per cent, during the past decade. The construction of housing and commercial buildings had registered a boom showing an increase of about 140 per cent between 1976 and 1980 but have since declined by over 100 per cent by 1985. More details may be seen in the table showing new building construction authorized and completed during the period 1977-1985.

In the case of TANZANIA the statistics appears to be confusing. The general indications seem to point that the trends have been inconsistent and much of the construction appears to have been in the Government and parastatal sectors. Two tables are provided, one indicating UN statistics and the other Government statistics.

PAKISTAN registered a growth of about 60 per cent in road construction, about 90 per cent in telegraph offices, about 25 per cent in post offices, about 20 per cent in health establishments, while about 50 per cent in education infrastructure.

In INDIA there was a growth of about 50 to 70 per cent in the health establishments, about 5 per cent in education and about 10 per cent in the transport and communication infrastructure, while about 60 per cent in the residential and non-residential buildings completed during 1979-85 and about 30 per cent in those authorized.



THAILAND has registered a growth of about 65 per cent in transport, over 250 per cent in travel/tourism, about 15 per cent in education, and, about 33 per cent in health physical infrastructure between 1977 and 1986. Housing and commercial building construction grew by only about 10 per cent during this period. More details are provided in the table showing new construction authorized since then. However, Thailand has witnessed a housing construction boom for the past few years especially in Bangkok Metropolitan Region (BMR) where 53.353 units were built in 1987 and 67.451 in 1988 while the demand was about 50.000 units. There has been a trend towards high rise condominiums. Sixtysix such new projects were undertaken in 1988 and 150 have been taken up during the first three months of 1989.

The PHILIPPINES have seen its transport physical infrastructure grew by about 35 per cent, travel and tourism by about 50 per cent, education by about 5 per cent and health by about 8 per cent during this period. The housing and commercial building construction had gained by about 40 per cent between 1977 and 1983 when it slumped by almost 60 per cent between then and 1985. More details are provided in the table showing new construction authorized. The construction activities have again picked up after 1986 and the country is facing booming conditions.

### 1.3. ECONOMIC SIGNIFICANCE OF THE BUILDING AND CONSTRUCTION SECTOR

The tables in Annex I would help to determine the relative economic significance of the building and construction sector in general and have the significance of the building and construction materials industry with respect to its products and other key parameters, with particular reference to low-cost building materials.

At various points assessments have been indicated by several national authorities of the overwhelming demand in the informal sector ranging from 60 to 90 per cent. The tables indicating the urban percentages of population in the surveyed countries appear to corroborate very closely with that. It is also clear that the statistics pertaining to the informal sector is not available from any source and neither does this generally get reflected in the planning process.

A brief summary is provided here below:

In EGYPT the construction represents about 5 per cent of the total GDP and the gross capital formation has risen from LE 1.838 million in 1977 to LE 10.270 million by 1986. The country has always been comparatively highly urbanized and its urban population represents 46.88 per cent of the total indicating a comparatively small informal sector.

In ETHIOPIA the building and construction constitutes about 4 per cent of the GDP and the gross capital formation has risen from 606 million Birr in 1976 to 1.040 million Birrs in 1985. The urban population is only about 11.60 per cent of the total indicating a large informal sector.

In KENYA the construction and building sector has constituted about 5.2 to 5.5 per cent of the total GDP and its gross capital formation has risen from 290 million KSh in 1976 to 848 million Khs in 1985. The ratio of urban population is indicated at 19.70 per cent indicating a still large informal sector.

In TANZANIA the construction sector appears to be rather small and regressive as it has declined from only about 3.5 per cent to about 1.9 per cent of the GDP while the gross capital formation has risen from 4.456 million TSh in 1976 to 12.141 million TSh in 1985. The urban population stands at 22.30 per cent indicating a still large informal sector.

In PAKISTAN the construction sector has grown from about 5 per cent of the total GDP in 1977 to about 14 per cent in 1987. The urban population stands at 28.3 per cent still indicating a sizably large informal sector. New construction and capital repairs have increased from 19.402 million PRs in 1979 to 37.849 million PRs in 1984, residential and non-residential buildings comprising 56 per cent in 1979 and 61 per cent in 1984.

In INDIA the construction sector has remained somewhat stable at around 5 per cent of the GDP and has slightly declined from 5 per cent in 1977 to 4.6 per cent in 1986. The total value of construction put in place has, however, increased from 131.690 million Rs in 1979 to 340.100 million Rs in 1985 of which residential and non-residential buildings comprised 83 per cent in 1979 and 82 per cent in 1985. The urban population stands at 23.3 per cent indicating still large size of the informal sector.

In THAILAND the contribution of construction to the total GDP was at 4.9 per cent in 1977 and has moved to 5 per cent in 1987. The value of construction put in place, however, has increased from 64.413 million Baht in 1979 to 125.077 million Baht in 1985, residential and non-residential construction comprising 74 per cent of it in 1979 and only 57 per cent in 1985. The urban population stands at 37 per cent indicating a sizable informal sector.

In the PHILIPPINES the contribution of construction to the total GDP was at 7.3 per cent in 1977 and 5.8 per cent in 1984 while only 3.6 per cent in 1987. The value of construction put in place has, however, increased from 727 million pesos in 1979 to 13.393 million pesos in 1984. The urban population is 17 per cent of the total which implies a vast informal sector.

## II. BUILDING MATERIALS DEMAND

It is to be noted at the outset that the very nature of the demand for the building materials is derived from the demand for building and construction for the other economic, social and infrastructure sectors of the economy. In that respect it is a direct function of activity in those sectors of the economy.

It is also to be noted that even when the typology of building materials may remain similar for the various end-use construction, their nature and specifications may greatly vary in accordance with the characteristics and particular attributes required of the structures and functions these were to perform, and, the nodes, methods and designs that were to be adopted for them.

It is, therefore, obvious that the subject, while of immense importance and significance to the economic and social development (and to industrial development) it does not lend itself to a simple treatment, yet a simplified overview is dictated by the very nature of the study.

In the previous chapter, while reviewing the trends in the building and construction field, an effort is made to indicate the typology of the major basic demand segments for the various building and construction sectors required by the different economic and social areas. It would, therefore, suffice to review the subject from the standpoint of the various main building and construction materials.

A. CEMENT

EGYPT

The consumption of cement for the period 1978-88 and a forecast of its supply and demand for the period 1987/88 to 1991/92 are provided in the following tables:

TABLE A - 1

(i) Cement Consumption in Egypt

(QUANTITY IN THOUSAND TONS)

Years	Production	Sales	Import	Export	Local Consumption
1978	3.076	3.077	952	10	4.019
1979	2.951	2.951	1.822	3	4.770
Jan-June 80	1.454	1.455	1.009	1	2.463
80/81	3.452	3.438	5.820	2	9.256
81/82	3.630	3.639	6.954	2	10.591
82/83	3.794	3.776	6.678	-	10.454
83/84	4.600	4.465	8.490	-	12.955
84/85	5.275	5.190	8.700	-	13.890
85/86	7.606	7.374	9.241	-	16.615
86/87	10.217	10.297	5.336	-	15.633
87/88	12.117	12.193	3.377	-	15.570

Source: Building Materials Organization - Ministry of Housing and Reconstruction

TABLE A - 1

(ii) Forecast of Cement Supply and Demand in Egypt

(QUANTITY IN THOUSAND TONS)

Years	Expected production	Average of expected demand	Expected imports
87/88	12.730	18.500	5.770
88/89	14.095	19.800	5.705
89/90	15.967	20.800	4.833
90/91	16.995	21.700	4.705
91/92	17.390	22.700	5.310

(Source: Building Materials Organization - Ministry of Housing and Reconstruction)

ETHIOPIA

The estimated demand for Cement for the period 1977-1986 (based on a consumption rate of 320 tons for every 1 million Birr of works) and its forecast demand for the period 1989/90 to 1994/95 is provided in the following tables:

TABLE A - 2

(i) Cement demand in Ethiopia

(based on a consumption rate of 320 tons for every 1 million Birr of works)

in "000" tons

1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
128.0	144.0	179.0	220.8	319.6	319.6	355.8	397.9	433.7	469.0

Source: Ministry of Construction - Dept. of Planning

TABLE A - 2

(ii) Forecast of cement demand in Ethiopia

in "000" tons

<u>1989/90</u>	<u>1989/90 - 1994/95</u>
816.0	4.827.12

Source: Ministry of Construction - Dept. of Planning

Note: Some disparity has been noted in the consumption and forecast figures which is expected to be corrected soon after recent efforts at rationalization of the building materials sector.

**KENYA**

The consumption of cement for the period 1980-1987 is presented in the table below:

**TABLE A - 3**

(i) Consumption of Cement in Kenya

in "000" tons

1980	1981	1982	1983	1984	1985	1986	1987
691.0	653.0	580.0	517.0	546.5	649.0	689.7	864.0

Source: Ministry of Industry - Chemicals and Minerals Division

**TABLE A - 3**

(ii) Production and Consumption of Cement (1978-86)

in "000" tons

	1978	1979	1980	1981	1982	1983	1984	1985	1986**
Production (Kenya)									
Production (Kenya) .. .. .	1,133.3	1,147.7	1,279.9	1,280.2	1,318.1	1,181.2	1,134.5	1,115.4	1,174.7
Domestic Exportsppp .. .. .	610.1	510.2	590.4	668.0	737.4	739.2	602.9	485.8	495.6
Inter-State Trade .. .. .	—	—	—	—	—	—	—	—	—
From Uganda .. .. .	—	—	—	—	—	—	—	—	—
From Tanzania .. .. .	—	—	—	—	—	—	—	—	—
To Uganda .. .. .	—	—	—	11.8	14.0	13.1	22.3	48.1	39.7
To Tanzania .. .. .	4.3	4.9	2.3	4.3	4.7	6.8	5.6	5.6	15.1
Net Estimated Consumption of E.A. Produce Cement .. .. .	523.2	637.5	749.5	612.2	580.7	442.0	531.6	629.6	678.6
Retained Imports .. .. .	0.7	0.5	0.8	0.4	—	1.9	—	0.3	0.5
Total Estimated Consumption .. .. .	523.3	638.0	750.3	612.6	580.7	443.9	531.6	629.9	679.1

Source: 1987 Statistical Abstract-Central Bureau of Statistics, Government of Kenya

Note: In view of Kenya being a significant exporter of cement no attempt was noted with respect to demand forecasts for coming years.

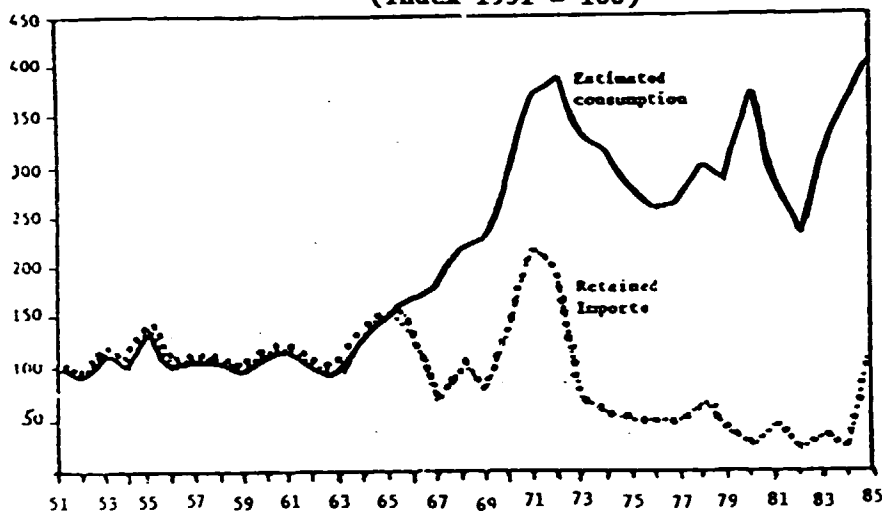
**TANZANIA**

The consumption production and imports of cement for the period 1951-85 is depicted by the following series reproduced from the "Selected Statistical Series" published by the URT Bureau of Statistics (Ministry of Finance, Economic Affairs and Planning) in June 1987 along with a detailed table of production and imports for the period 1970-84 reproduced from the Statistical Abstract published in February 1986.

**Consumption of cement**

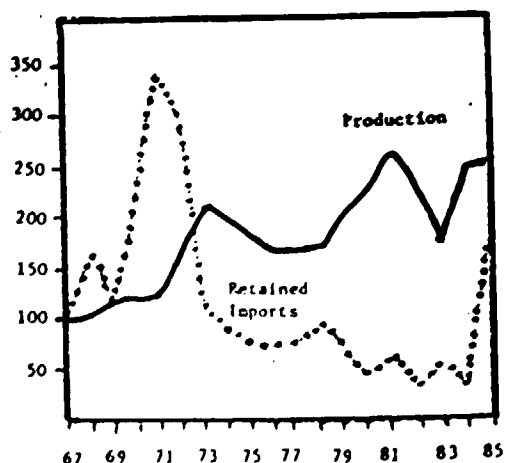
**Estimated consumption of cement**

(Index 1951 = 100)



Up to 1965 Tanzania was not producing any cement. All the cement consumed up to that time was being imported. The supply of cement remained fairly stable over the period 1951-1963. The average supply and therefore consumption over that period was about 116,000 tons. The consumption of cement increased rapidly over the period 1964-1972. In 1972 the quantity supplied was about 452,000 tons which is about 4 times the 1950s level. The supply of cement dropped over the period 1973-1982 to an average of 341,000 tons annually. The supply started rising again in 1984 and the record supply was that of 1985 at 470,000 tons.

**Importation and local production of cement (Index 1967 = 100)**



on the whole importation of cement has dropped. The average quantity imported per year for the period 1951-1963 was 116,000 tons while for the period 1973-1984 the importation was at the level of 54,000 tons. But even with such low levels of importation the country had by 1985 attained self-sufficiency in this important commodity.

PRODUCTION AND IMPORTATION OF CEMENT

(Tonne)

YEAR	RETAINED IMPORTS	FROM KENYA AND UGANDA	TO KENYA AND UGANDA	EXPORTS	PRODUCTION	TOTAL SUPPLY
1970	17206	145374	-	2266	176826	337140
1971	115260	140564	-	5084	177594	426734
1972	165826	60600	1801	9990	236955	451591
1973	72264	10920	-	11147	314002	386039
1974	27060	37553	30	-	296400	360983
1975	18684	38359	-	-	266000	323043
1976	31204	27247	9	1861	243639	300220
1977	54784	-	-	4139	246540	297145
1978	73242	-	-	16256	250065	307051
1979	48365	-	-	3317	298891	343939
1980	29935	-	-	10110	305811	325636
1981	49325	-	-	7750	369953	431528
1982	22131	-	-	18776	333531	336886
1983	41476	-	-	17146	246919	271349
1984	21000	-	-	18600	368644	371044

Source: Statistical Abstract - Bureau of Statistics,  
Government of Tanzania, Feb. 1936

**PAKISTAN**

The consumption and forecast demand is presented in the table below:

	<u>'000' tons</u>
1970-71	2.399
1971-72	2.025
1972-73	2.192
1973-74	2.375
1974-75	2.820
1975-76	3.105
1976-77	3.058
1977-78	3.347
1978-79	3.417
1979-80	4.052
1980-81	3.774
1981-82	5.017
1982-83	4.576
1983-84	5.432
1984-85	5.428
1985-86	5.198
1986-87	6.332
1987-88	6.792
1988-89	7.046
1989-90	7.497
1990-91	8.000
1991-92	8.480
1992-93	9.067

Source: NESPAK Study

**INDIA**

In 1981-82 the installed capacity was about 29 million tons which went up to over 58.8 million tons in 1988-89. The corresponding increase in cement production was from 21 million to over 44 million tons. The demand and supply forecast for the next seven years is depicted by the table below:

<u>Year</u>	<u>Estimated Capacity</u>	<u>Estimated Production</u>	<u>"million tons" Anticipated Demand</u>
1988-89	58.80	44	42
1989-90	61.09	49	44
1990-91	64.30	51	48
1991-92	66.50	54	52
1992-93	70.50	60	56
1993-94	74.90	63	60
1994-95	79.09	65	65

Source: Financial Express, 24 May 1989  
Building Materials Supplement



**THAILAND**

The consumption of cement in Thailand is estimated at 11.46 million tons per year and is expected to increase by 20 per cent in 1990 in line with the trend, i.e.

- 22 per cent increase in 1987
- 19 per cent increase in 1988
- 27 per cent increase in 1989 (first three months)

**PHILIPPINES**

<u>Year</u>	<u>"million tons"</u> <u>Domestic Sales/Consumption</u>
1974	2.72
1975	3.52
1976	3.38
1977	3.28
1978	3.39
1979	3.54
1980	3.65
1981	3.52
1982	3.78
1983	4.40
1984	3.31
1985	2.68
1986	3.13
1987	4.44
1988	5.32
	<u>"million 40 kg bags"</u>
1989	168
1990	193
1991	222
1992	255
1993	293

Source: Consumption (Domestic Sales): Philippines Cement Corporation  
Forecast Demand - Board of Investment

**B. CEMENT BASED PRODUCTS**

In view of the great multitude of cement based products used in building and construction which are produced at various scales and in various locations, sometimes on or near the sites, no organized or comprehensive information could usefully be accumulated. Neither could it serve much practical and useful purpose from the industries' or governments' standpoint to compile consumption statistics or demand forecasts for either the individual products such as: cement concrete, cement lime, cement pozzolana, cement terrazzo blocks, floor tiles, roofing tiles, fencing/partitions, water pipes, basins and fittings, sanitary ware and fittings, kitchen ware and fittings, or in an aggregated form.

It is nevertheless noted that the level of activity in this category of products as to their range, variety and capacity would indicate the depth and breadth of economic activity and enterprise in the domestic industrial scene, particularly due to their nature which would lend itself to production in smaller and medium-scale enterprises.

The available information pertaining to some cement based products from various countries, however, is presented below:

#### EGYPT

Cement based building materials are principally produced in small-scale in the private sector due to low investment and technology requirements. Only four large-scale public sector factories are engaged in the production of some cement concrete products with available capacities as below:

concrete pipes	42.000 tons
concrete posts	8.000 tons
concrete sleepers	400.000 units
concrete blocks	66,000.000 units
concrete products and crushed stone	650.000 m <sup>3</sup>
other concrete products	20.000 m <sup>3</sup>

#### ETHIOPIA

Public sector companies are the principal producers of cement concrete building materials even though several old small-scale produceres which had previously closed down have re-opened along with several new small private plants near the towns, besides several municipalities having established their own production capabilities.

The Ethiopian Construction Materials Corporation which represents 10-14 per cent of the local building materials production and consumption has following available capacities for these products:

cement blocks	1,700.000 pcs.
cement pipes	109.000 pcs.
cement tiles	160.000 m <sup>2</sup>

#### KENYA

The cement concrete products are produced in the private sector. The information on the consumption or demand is not available, but the following would provide an indication of the size and situation of the market:

Cement concrete products manufacturers

Products	<u>Number of manufacturers employing workers</u>					over 500
	5-19	20-49	50-99	100-199	200-499	
Concrete blocks	4	9	6			
Drain pipes/channels						1
Fencing posts						1
Concrete (Ready Mix)	1		3			
Precast concrete elements	1		2			
Concrete pipes	3	1	3			1
Grills (concrete)	1					
Flower pots	1					
Louvres	1					
Pre-stressed concrete elements			2			1
Concrete roofing tiles			1			
Concrete poles		1				

Source: Directory of Industries

- Central Bureau of Statistics 1986

- Kenya Industrial Research and Development Institute 1987

Note: Total number of establishments may be overstated due to several manufacturing more than one product.

TANZANIA

There are two public sector companies for the production of cement concrete products such as blocks and fencing poles. These are Tanzania Concrete Articles Ltd. (TACONA) - a subsidiary of National Housing Corporation, and, Mangnal Prefab. Concrete - a subsidiary of Tanzania Saruji Corporation. Their operations have been irregular and are currently halted.

One private factory is reportedly making cement concrete roofing tiles.

Some small-scale private production of cement concrete products is also reported.

No information is available on their capacities or the demand.

Production (and apparent consumption) of asbestos sheets is recorded as below:

1985	3.598 tons
1986	1.212 tons
1987	2.619 tons
1988	1.563 tons (first two quarters only)

**PAKISTAN**

A large variety of cement concrete products is used in the country which are manufactured in private sector small and medium companies. These range from pre-stressed concrete roofing elements, water supply and sewerage pipes and poles etc. Most of these items are, however, marketed in the surrounding areas only. The most well organized of these is the Asbestos Cement Pipes. Its production and forecast supply situation is presented here below:

**Asbestos Cement Pipes**

<u>Year</u>	<u>Production Pressure Pipes</u>	<u>"Tons" Non-Pressure Pipes</u>
1977	12.100	1.600
1978	12.240	2.480
1979	9.510	2.280
1980	9.000	2.440
1981	18.80)	2.440
1982	16.900	2.500
1983	14.000	2.500
1984	24.000	2.500

**Estimated Supply**

1986-87	70.000	7.000
1987-88	78.400	8.500
1988-89	90.400	9.700
1989-90	94.500	9.700
1990-91	97.600	9.700
1991-92	97.600	9.700
1992-93	97.600	9.700

Source: NESPAK Studies

**INDIA**

A variety of concrete products has become available in the past decade or so which is industrially produced and marketed at small, medium and large scale. These include asbestos cement sheetings, pipes, cellular concrete, concrete door and window frames, and, blocks. Their demand and consumption figures are however not available. Other than the asbestos cement sheets the market for the remaining products is slow to establish.

## THAILAND

A large variety of cement-based building materials has become popular in Thailand and several of them are commercially produced by large industrial undertakings.

- Asbestos Cement - corrugated roofing sheets  
- roofing elements and components, jointing etc.  
- ceiling sheets,  
- screens  
- pipes: pressure and non-pressure  
- pipe joints, bends and components

- Precast Cement Concrete - blocks  
                                  slabs  
                                  piles  
                                  poles  
                                  roofing slabs  
                                  pipes

Ready mix concrete

In view of the Bangkok housing/condominium construction boom prefabricated concrete housing elements are being introduced in the market by the large industrial establishment which has employed sophisticated equipment and technology.

## PHILIPPINES

Cement-based building materials mostly common in the Philippines are:

- Concrete hollow blocks
- Concrete pipes - non-reinforced
- Concrete pipes - reinforced
- Pressure pipes
- Asbestos cement pipes

### C. SAND AND GRAVEL

No organized information on sand and gravel with respect to their consumption and demand forecast was available in any of the visited countries. It was noted that most of the demand for these materials was met through small-scale independent individual contractors who collect sand and gravel from river beds and other sources while in many cases crushed stones are used in place of natural gravel.

The available information is presented as below:

**EGYPT**

**Available production capacity and apparent consumption for crushed stone**

	<b><u>Number of large public sector factories</u></b>	<b><u>capacity</u></b>
crushed stone	1	408.000 tons
powdered and crushed stone	1	16.000 tons

Source: Building Materials Organization  
Ministry of Housing and Reconstruction

**ETHIOPIA**

Sand, gravel, stone and red ash is collected from river beds and Rift valley and supplied to the co-operatives by the Construction Materials Supply Enterprise of the Ministry of Housing and Urban Development besides small independent transporters/contractors and co-operatives.

The gravel/crushed stone is produced by a public sector enterprise of the Ministry of Mines besides small independent private enterprises and municipalities. The capacity of the Ministry of Mines Plant is 200 tons per hour.

**KENYA**

Sand is abundantly available locally through small independent transporters/contractors. No natural gravel is available but crushed gravel/stone is available without any problem.

**TANZANIA**

The supply of sand and gravel is reported to be irregular as this is entirely catered by the informal private individual contractors/transporters. There are no organized production and supply of quarry products. The Ministry of Works and Communications have five crushers for road work maintenance, but their operations are severely hampered by the lack of spare parts.

Some open sand and gravel quarries are available in the coastal regions.

The National Construction Council is of the view that serious shortage and increase of prices will be faced for upcoming Highway Rehabilitation and Rural Roads Rehabilitation projects.

**PAKISTAN**

Sand, gravel and stone are abundantly available throughout the country. Several small companies are operating the stone crushers and the collection and transport of sand and gravel. Transport cost to some areas have been rising more steeply.

INDIA

The demand for sand and gravel is reportedly met quite adequately albeit at occasional increases in costs due to transport. Steel industry slags are being introduced as aggregates.

THAILAND

The supply of sand has adequately matched the demand and is not expected to cause any problem. The availability of aggregate has been dependant upon the crushed stone supplied from a province neighbouring Bangkok which now has been closed for quarrying due to environmental reasons. Alternative sources are far away which will make it extremely expensive to relocate the crushers and transport to Bangkok.

PHILIPPINES

Production/Supply ("Million m<sup>3</sup>")

<u>Year</u>	<u>Sand and Gravel</u>	<u>Rock Aggregates</u>
1979	11.043	8.663
1980	13.251	10.502
1981	13.273	12.340
1982	14.797	14.178
1983	15.093	16.017
1984	14.584	17.298
1985	11.144	18.681
1986	12.481	20.176
1987	13.782	21.790
1988	14.482	23.534
1989	15.216	25.417
1990	15.987	27.450
1991	16.798	29.646
1992	17.649	32.018

Source: Housing and Urban Development Coordination Council

D. LIME

Lime is one of the important and basic building and construction materials which has gotten neglected in the modern era. Its production still exists mostly in the small and medium-scale industry. Much of it is, however, used as an industrial raw material. The available information from the surveyed countries is presented as below:

EGYPT

AVAILABLE CAPACITY (ANNUAL/APARENT CONSUMPTION)

Lime(tons)	92.500
Lime Stone Blocks (m <sup>3</sup> )	150.000

Source: Building Materials Organization

**ETHIOPIA**

**DEMAND**

	<u>1989/90</u>	<u>1989/90-1994/95</u>
Lime (tons)	612	3.560

Source: Ministry of Construction

	<u>1989</u>	<u>1992</u>	<u>1995</u>	<u>1998</u>
Lime (tons)	34.211	61.505	73.057	84.903

Source: Ethiopian Cement Corporation

**KENYA**

**Consumption of Lime**

	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>
Production (tons)			9.000	9.855	10.545	11.283	16.000
Exports (tons)	5.524	5.607	3.840	332.9	453.0		
Imports (tons)	----- negligible -----						
Consumption (tons)			5.210	9.522	10.093	11.283	16.000

Source: Ministry of Industry

**TANZANIA**

Lime is abundantly available in the country but the popularity of cement had subdued its use as a building material except in cement making itself or in rural areas for plastering by the informal sector. Total production (and apparent consumption) is recorded at 3.385 tons, 4.645 tons, 4.976 tons and 2.013 tons respectively for 1985, 1986, 1987 and first two quarters of 1988.

**PAKISTAN**

The usage of lime in Pakistan has reduced drastically so much that it now is highly insignificant compared to that of cement in the urban construction. Some usage may be found in rural and informal construction.

**INDIA**

About five million tons of lime are reportedly produced annually in India (mostly in small scale traditional kilns) of which about two million tons are stated to be used in the building materials in rural areas in some states.



THAILAND

Some lime is used in mortar and plaster in housing construction but due to lime production in only small traditional and cottage units it is below acceptable quality and artificial retarding agents (additives) are used.

PHILIPPINES

It appears that lime has never been used as a building material in the Philippines other than as lime stone and marble.

E. CLAY PRODUCTS

Clay products also constitute a traditional and extensive source of building materials. Bricks and tiles, however, constitute the major products. Available information from the visited countries is presented here below:

EGYPT

	<u>Available capacity</u>	<u>number of units</u>	<u>ownership and scale of units</u>
Bricks (desert clay)	10,000.000 bricks	1.400	private/small
clay bricks	183,000.000 "	3	public/large

Source: 1) Building Materials Organization  
2) General Organization for Industrialization

KENYA

<u>Product</u>	<u>Number of establishments employing</u>					<u>over 500</u>	<u>approx. capacity</u>
	<u>5-19</u>	<u>20-49</u>	<u>50-99</u>	<u>100-199</u>	<u>200-499</u>		
Clay bricks	2	6	1	2		)	
Roofing tiles		3	2	2		)	
Slabs				1		)	35 -
Floor tiles		1	1	1		)	50,000.000
Drainage pipe				1		)	pcs.
Decorative grills				1		)	
Blocks (hollow)	1	1				)	

Source: 1) Directory of Industries  
2) Ministry of Industries

**TANZANIA**

In view of the scarcity of cement availability, the usage of clay bricks is increasing in Dar-Es-Salaam while these are very common in the regions. The available production capacity (and apparent demand) for burnt clay bricks is reported as follows:

- Arusha Plant - 5,000.000 bricks per year  
(currently under trial run)  
(expected to increase to 9,000.000 bricks  
and 6,000.000 roofing tiles)
- Kisarawa Plant - 20,000.000 bricks per year installed capacity  
(plant never reached 50 per cent capacity)
- Dodoma Plant - old plant currently not in operation
- Mbezi Plant - clay tiles factory by private sector

**PAKISTAN**

Consumption of burnt clay bricks and estimated demand is reported as below:

<u>Year</u>	<u>Consumption</u> ("million bricks")	<u>Year</u>	<u>Consumption</u> ("million bricks")
1977-78	4.744	1985-86	9.516
1978-79	5.268	1986-87	10.083
1979-80	6.048	1987-88	11.147
1980-81	6.068	1988-89	11.630
1981-82	6.860	1989-90	12.489
1982-83	6.184	1990-91	13.444
1983-84	7.244	1991-92	14.355
1984-85	8.696	1992-93	15.471

Source: NESPAK Study

**INDIA**

Clay products have been and are the most commonly used building material in India. Burnt clay bricks are still very popular in urban as well as rural construction, and are principally produced by small-scale traditional methods. Their production (and apparent consumption) is estimated at around 500.000 million bricks per year. Quantities of clay roofing tiles and other products are also consumed in several regions of the country.

**THAILAND**

The demand for burnt clay bricks and tiles has been on the increase in Thailand in line with other building materials, but these are principally produced in the small-scale traditional sector. Consumption estimates are not available.

**PHILIPPINES**

It is reported (CIAP) that clay products are not extensively used in the building and construction in the Philippines except for decorative purposes.

It is, however, understood that burnt clay bricks and tiles are more common in some regions of the country.

**F. SANITARY WARE AND CERAMIC TILES**

The consumption and demand for sanitary ware and other ceramic building materials such as floor and wall tiles have notably grown in all countries. The available information is presented as below:

**EGYPT**

Demand forecast

<u>Product</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
Sanitary ware ('000' tons)	23.2	23.7	24.2	24.8	25.4
Ceramic tiles ('000' tons)	10.6	10.6	10.6	10.6	10.6
Ceramic pipes ('000' tons)					

Source: General Organization for Industrialization

**ETHIOPIA**

Demand forecast

	<u>1989/90</u>	<u>1989/90-1994/95</u>
Sanitary ware (mil.Birrs)	11.64	71.75
Tiles ("00")	964.8	6.397.7

Source: Ministry of Construction

**KENYA**

Consumption Estimate

<u>Tiles</u>	<u>1985</u>						<u>Ceramic</u>
	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	
Sanitary ware (tons)	831.9	835.4	859.9	1.048.9	947.0	2.779.1	

Source: Ministry of Industry

TANZANIA

Tanzania Saruji Corporation's Ceramic Plant in Morogoro is designed to produce 680 tons per annum of table ware in addition to sanitary ware, but it had faced serious operating problems. Consequently most of the requirements have continued to be met through imports which are presented below:

Sanitary, Heating, Lighting fixtures (million T.shs.)

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
Direct imports	12	12	26	16	18	50	63	
Less Domestic exports	-	-	-	-	-	2	3	51
Apparent Consumption (excluding local production)	12	12	26	16	18	48	60	

Source: Foreign Trade Statistics, December 1988, Government of Tanzania

PAKISTAN

The present installed capacity for sanitary ware production in Pakistan is about 17.000 tons/year for ceramic, 1.000 tons/year for Duoro-Concrete and 700 tons/year for cultured marble (another plant underway). The exports of sanitary ware have been estimated at around 19,440 tons per year by the end of the Sixth Five Year Plan while an installed capacity of 24.000 tons p.a. has been envisaged by that time.

INDIA

Sanitary ware is exported by India to several countries which implies that domestic production is more than sufficient to meet the local consumption. The combined installed capacity for the ceramic tiles and sanitary ware is reported at 200.000 tons per annum.

THAILAND

High quality sanitary ware is produced in Thailand and is also exported to the neighbouring countries.

PHILIPPINES

High quality sanitary ware and ceramic tiles are used in the Philippines. Information on consumption and projected demand do not seem to have been attempted.

G. IRON AND STEEL PRODUCTS

EGYPT

The consumption for the period 1978-87 and the forecast demand for the period 1989-93 are given in the following tables:

Past demand of RC bars and sections  
(000 tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
RC bars	501	762	1031	996	1359	1363	1501	1560	1646	1622
Sections	129	162	174	242	159	212	162	192	142	188
Total	630	924	1205	1238	1518	1575	1663	1752	1788	1810

Forecast of demand, local production  
and shortfall in RC bars for the period  
1989-1993

	1989	1990	1991	1992	1993
Demand	1890	2075	2180	2290	2310
Local production	1400	1550	1750	1870	1910
Shortfall	490	525	430	420	400

Source: Metallurgical Industries Corporation

ETHIOPIA

Consumption of Iron and Steel Building Materials

Product (000 tons)	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Corrugated Iron										
Sheets	8.0	9.0	11.2	13.2	16.8	20.0	22.2	24.9	27.1	29.3
Reinforcements	19.6	22.1	27.4	33.8	41.2	48.9	54.5	60.9	66.4	71.8
Structural Steel	6.4	7.2	9.0	11.0	13.4	16.0	17.8	19.9	21.7	23.5

Forecast demand

	1989/90	1989/90-1994/95
Re-inforcements "000" tons	102	596.5
Iron Sheets "000" m <sup>2</sup>	104.2	894.5

Source: Ministry of Construction

**KENYA**

Data on the consumption of iron and steel building materials products was not available. Some indirect information is being presented as indicators for this purpose.

Local facilities are available for the production of galvanized steel products, wire rods, nails and rolled steel products having installed capacities of 28.800 tons per annum, and, 60.000 tons per annum, 27.000 tons per annum, and, 296.000 tons per annum respectively. The annual imports of various iron and steel products such as wire rods, galvanized mild steel wire, high tensile steel core, cold rolled steel sheets, hot rolled steel sheets, spring steel flats, alloy steel round and hexagonal bars, channels and angles etc. was reported at about 294.000 tons.

The use of re-inforcing steel bars etc. and structural steel products has been noted to have registered a significant increase in view of the construction of high rise buildings.

**TANZANIA**

**Steel Rolled Products**

<u>Year</u>	<u>Sales by Steel Rolling Mills (tons)</u>
1980	19.173
1981	16.221
1982	13.436
1983	10.194
1984	6.900
1985	11.522
1986	11.215
1987	9.880
1988	11.095
1989	3.146 (up to Feb. 1989)

Source: National Development Corporation

<u>Year</u>	<u>Production (Apparent Consumption) '000' tons</u>		
	<u>Rolled Steel</u>	<u>C.I. Sheets</u>	<u>Steel Sheets and Billets</u>
1985	11.30	21.67	31.40
1986	11.27	8.86	17.45
1987	9.61	16.56	25.40
1988 (first two quarters)	5.56	10.98	13.25

Source: Industrial Commodities, Feb. 1989 (Bureau of Statistics, Government of Tanzania).

**PAKISTAN**

<u>Year</u>	<u>Production</u>	<u>Imports</u>	<u>Exports</u>	<u>Consumption/Demand</u> '000' tons
1977-78	315.30	273.60	24.46	564.44
1978-79	362.40	244.55	4.00	602.95
1979-80	420.90	349.18	1.74	768.34
1980-81	494.70	193.84	0.38	688.16
1981-82	550.80	139.59	0.38	690.01
1982-83	636.70	91.63	0.16	728.17
1983-84	654.20	105.61	1.89	757.92
1984-85	718.50	97.96	10.91	805.55
1985-86	731.70	101.77	11.50	821.97
1986-87				862.00
1987-88				909.00
1988-89				930.00
1989-90				968.00
1990-91				1,011.00
1991-92				1,051.00
1992-93				1,100.00

Source: NESPAK Study

**INDIA**

Separate information on the consumption of construction steel is not available, but it is indicated to be satisfied by the domestic production of about 15-16 million tons per annum.

**THAILAND**

The consumption demand is stated to be around 1.4 million tons per annum. About 30 per cent of it is met through imports. The Consumption is anticipated to increase at the rate of about 12 per cent.

**PHILIPPINES**

<u>Year</u>	<u>Flat Steel/G.I. Sheets</u>	<u>'000' tons</u> <u>Bars/Rods</u>
1980	343	437.50
1981	252	437.50
1982	311	437.50
1983	460	500.00
1984	321	200.00
1985	256	125.00
1986	341	225.00
1987	(G.I. Sheets only)	-
1988	35	371
1989	38	395
1990	40	416
1991	43	440
1992	46	464

Source: Housing and Urban Development Coordination Council

H. WOOD AND WOOD PRODUCTS

EGYPT

Available Annual Capacity

Product

Fibre board	6.000 tons
Wood products L E	500.000
Wooden windows + doors	80.000 units

Source: Building Materials Organization

ETHIOPIA

Consumption

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Wood "000"	32.8	36.9	45.9	56.6	68.9	81.9	91.2	102.0	111.1	120.2
Plywood "000"	2.1	2.4	3.0	3.7	4.4	5.3	5.9	6.6	7.2	7.8

Source: Ministry of Construction

Demand forecast

	<u>1980/90</u>	<u>1989/90-1994/95</u>
Lumber "00"m <sup>3</sup>	204	1.201.8
Plywood "00"m <sup>2</sup>	244.8	1.440.9

Source: Ministry of Construction

KENYA

Number of establishments employing

<u>Products</u>	<u>5-19</u>	<u>20-49</u>	<u>50-90</u>	<u>100-199</u>	<u>200-499</u>	<u>over 500 capacity</u>
Saw mills	103	45	7	3	2	
Windows, Doors, Frames	7	8	6			1
Prefabricated Housing	3	1	5	2		1
Timber Moldings		3	1			
Joinery		3				
Fencing/Poles				2	1	
Flooring		1				
Block Board	1	1	2			1
Hardboard	1					
Plywood	1		1			
Laminated Roofing						1
Wall board	1					
Fibre board						
Chipboard	1		1			

Source: Directory of Industries



Consumption estimates

Sawn timber                    89.1 mil. sq.ft (mainly for tea chests)  
 Particle board                about 6.000 tons (furniture, partitions and ceilings)

TANZANIA

The Tanzanian Wood Industries Corporation has fifteen saw mills and seven wood products factories with following production capacities and actual production:

	<u>Installed Capacity</u>	<u>Actual Production/Apparent Consumption</u>
Sawn Timber	100.000 m <sup>3</sup>	79.000 m <sup>3</sup>
Hard Board	8.000 tons	5.800 tons
Chip Board	7.000 tons	5.000 tons
Plywood	7.000 m <sup>2</sup>	2.500 m <sup>3</sup>
Doors/Windows, Transmission poles)	) as needed	as needed

Source: Tanzanian Wood Industries Corporation

	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u> (First two quarters)
Sawn Timber ('000'm <sup>3</sup> )	52.21	69.08	95.10	47.24
Plywood (m <sup>2</sup> )	1.589.40	1.937.90	2.093.75	1.049.00
Hardboard (tons)	3.535.00	5.347.00	5.010.00	2.281.00
Chip Board(tons)	2.423.00	2.701.00	2.325.30	1.320.55

Source: Industrial Commodities Report, February 1989

PAKISTAN

The production and consumption of wood and wood products in Pakistan is depicted by the following table:

Timber production and consumption

<u>Year</u>	<u>Production</u>	<u>Import</u>	<u>Availability/Consumption</u> ( <sup>000</sup> m <sup>3</sup> )
1977-78	195	338	533
1978-79	367	301	668
1979-80	384	511	895
1980-81	225	366	591
1981-82	231	65	296
1982-83	225	190	415
1983-84	286	225	511
1984-85	275	201	476
1985-86	290	215	505
1986-87			407)
1987-88			380)
1988-89			353)
1989-90			325) projected
1990-91			298)
1991-92			271)
1992-93			244)

Source: NESPAK

INDIA

No figures for the consumption of wood and wood building material products in India could be available. It was, however, noted that due to reduced availability of wood compared to increasing demand of the building materials several re-constituted wood products have been introduced and are becoming widely used.

THAILAND

Timber has been widely used as a building/construction material in Thailand and is still the most common material in rural construction. However, due to the reduced domestic production and consequent shortage the imports have been on the increase even though supply from neighbouring countries has been somewhat irregular. Several reconstituted wood products and press boards have become popular and are being produced on modern scale.

**PHILIPPINES**

Year	Production ('000 m <sup>3</sup> )			
	Lumber	Plywood	Lumber	Plywood
1976	1.609	416	493	261
1977	1.567	489	455	221
1978	1.780	490	573	362
1979	1.626	503	915	324
1980	1.529	553	742	322
1981	1.219	457	546	370
1982	1.200	422	590	242
1983	1.222	459	728	295
1984	1.234	573	540	250
1985	1.062	350	512	241
1986	1.063	350	516	243
1987	1.066	350	520	246
1988	1.068	350	525	248
1989	1.070	350	529	251
1990	1.072	350	533	254
1991	1.074	350	537	256
1992	1.076	350	542	258

Source: HUDCC Study

**I. THERMOPLASTICS**

Thermoplastics have successfully gained acceptance to varying degrees as building and construction materials in the surveyed countries. Most common products used are water and sanitary pipes and fittings, electrical conduits and fittings, and, some wall/floor and roof covering/tiles, doors and window frames, water storage tanks, besides coatings, water proofings and thermal insulations.

Organized information on demand of various thermoplastic building and construction materials was not available in most countries. The information collected is presented here below:

**EGYPT**

It was reported that there was no gap in the production and consumption of thermoplastic building and construction materials in the country. One company produced 1700 tons (per annum) of P.V.C. pipes for electrical conduits and water supply purposes. Another company produced vinyl floor coverings and tiles, while yet another, synthetic fibre floor covering/tiles.

**ETHIOPIA**

The thermoplastic building and construction materials used in Ethiopia cover pipes, tiles, shutters and cables, wires and junction boxes. The production and demand is projected as follows:

Year	Cables + wires tons	Production		Tiles m <sup>2</sup>	Shutters m <sup>2</sup>
		Conduits tons	Pipes tons		
1980	430	81	49	-	-
1981	530	77	36	-	12.000
1982	550	104	61	-	2.000
1983	860	109	125	50.000	9.000
1984	870	141	119	52.000	12.000

Demand Projection

1990	2.710	1.000	338	360.000	79.000
1991	3.020	1.100	376	383.000	88.000
1992	3.360	1.240	420	408.000	98.000
1993	3.710	1.360	458	430.000	107.000
1994	4.090	1.470	495	451.000	115.000
1995	4.500	1.590	536	474.000	125.000

Source: National Chemical Corporation

KENYA

A wide range of thermoplastic building and construction materials is reportedly used in the country covering

- (i) PVC pipes and pipe fittings
- (ii) Formica sheets
- (iii) Doors and window frames
- (iv) Floor tiles
- (v) Electrical conduits
- (vi) Mastics and sealants
- (vii) Adhesives and solvents

Production or demand information, however, was not available except for floor tiles, as follows:

Production of thermoplastic floor tiles

Product	Capacity (m <sup>2</sup> )	Actual Production (m <sup>2</sup> )
Vinyl Asbestos tiles	350.000	185.000
P.V.C. tiles	70.000	37.000
High plastic tiles	70.000	37.000

Source: Ministry of Industry

TANZANIA

The usage of thermoplastic products is limited to pipes for water and conduits only which are produced locally although corrugated sheets have also been popular for roofings.

Production or consumption information, however, could not be obtained.

PAKISTAN

A wide range of thermoplastic products such as water and sewerage pipes and fittings, sanitary ware, water tanks, electrical conduits and fittings (besides coatings, mastics and sealants etc.) are used in the building and construction industry. Reliable and complete production and consumption information, however, was not easily available.

INDIA

The consumption could be indirectly gauged from the fact that the annual consumption of synthetic resins stood at 700.000 tons and 20% of all plastics are reportedly used in the building and construction industry such as electrical fittings and fixtures, floor and wall coverings, piping systems, water storage tanks, and, doors and window frames; besides sanitary fittings and waterproof coatings, etc.

THAILAND

The use of thermoplastic building and construction materials is reported to be expanding considerably (including doors and window frames) due to coming on line of two large resin making plants on the eastern seaboard. The information on production and consumption was not available.

PHILIPPINES

A wide variety of thermoplastic building and construction materials is used. However, information was available only on the plastic pipes which is presented as below:

Total annual production of PVC, PE and PB plastic pipes reportedly stood at 21.500, 6.000, and 1.500 tons respectively. Additionally, the imports and exports of PVC materials such as monofil, rods, seamless tubes, profiles and shapes was reported at

	<u>1987</u>	<u>1986</u>
Import	\$1,036.455	\$940.051
Export	\$ 34.581	\$ 3.765

Source: Board of Investment

J. SHEETGLASS

EGYPT

Demand estimate

	<u>1991/92</u>
Safety glass "000"m <sup>2</sup>	1.470
Mirrors "000"m <sup>2</sup>	784

Source: GOPI

**ETHIOPIA**

**Consumption**

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Glass "000"m <sup>2</sup>	123.6	139.1	173.0	213.2	259.6	308.7	343.6	384.2	418.8	452.9

Source: Ministry of Construction

**Estimated demand**

	<u>1989/90</u>	<u>1989/90-1994/95</u>
Glass ("000"m <sup>2</sup> )	667.2	2.136

Source: Ministry of Construction

	<u>1989</u>	<u>1992</u>	<u>1995</u>	<u>1998</u>
Sheet glass ("000"m <sup>2</sup> )	365.9	521.3	692.5	963.3

Source: Ethiopian Cement Corporation

**KENYA**

**Sheet Glass Consumption (Imports less re-exports)**

<u>Year</u>	<u>m<sup>2</sup></u>	<u>Tons</u>
1975	303.370	2.220.7
1976	529.445	3.875.5
1977	621.013	4.545.8
1978	1,228.168	8.990.2
1979	746.174	5.462.0
1980	711.482	5.208.0
1981	506.943	3.710.0
1982	1,718.700	12.580.8
1983	929.958	6.807.3
1984	1,328.187	9.722.3
1985	1,033.829	7.567.6
1986	602.460	9.440.0

Source: Ministry of Industry

**TANZANIA**

The sheet glass plant of the Tanzania Saruji Corporation has been completed since 1985 but it has not gone in commercial operation for various reasons. No information is available on consumption which is entirely met through imports.

**PAKISTAN**

<u>Year</u>	<u>Production tons</u>	<u>Imports tons</u>	<u>Apparent Consumption tons</u>
1977-78	18.106	414	18.520
1978-79	21.206	1.156	22.416
1979-80	23.000	1.116	24.116
1980-81	24.500	947	25.447
1981-82	27.685	1.890	29.575

The total installed capacity for the production of sheet and flat glass currently stands at 112.300 tons per annum. The demand, however, is projected to rise to 133.500 tons per annum by 1992-93.

**INDIA**

The demand is reported to be adequately met through local production which is well established.

**THAILAND**

The demand estimated at 400 tons per day is more than adequately met by the local production of over 850 tons per day.

**PHILIPPINES**

The demand is reported to be met through local production by the two plants with a capacity of about 90.000 MT/year.

**K. PAINTS**

**EGYPT**

**Forecast Demand in 1991/92**

Paints "000" tons 84.7

Source: COFI

**ETHIOPIA**

**Consumption**

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Paints "000" litres	619.6	697.1	867.4	1068.8	1301.2	1547.3	1722.5	1926.2	2099.5	2.270.4

Source: Ministry of Construction

**Forecast demand**

	<u>1989/90</u>	<u>1989/90-1994/95</u>
Paints ("000" gallons)	912.6	6.312.2

KENYA

Consumption and demand

Paints 9,000.000 litres

Source: Ministry of Industry

TANZANIA

<u>Year</u>	<u>Production (apparent consumption)"000" litres</u>
1985	1.364.30
1986	1.659.00
1987	2.373.84
1988	920.06 (first two quarters only)

Source: Industrial commodities Report, February 1989

PAKISTAN

<u>Year</u>	<u>Availability/Consumption "000" litres</u>
1977-78	7.924
1978-79	8.286
1979-80	8.031
1980-81	9.047
1981-82	9.694
1982-83	9.909
1983-84	12.447
1984-85	12.286
1985-86	13.084
1986-87	14.904
1987-88	16.438)
1988-89	17.134)
1989-90	18.372) projection
1990-91	19.749)
1991-92	21.063)
1992-93	22.672)

Source: NESPAK

INDIA

Information on production or consumption figures has not been available. It was, however, reported that the domestic production more than sufficiently meets the demand.

THAILAND

Consumption figures were not available. It was noted that domestic production more than adequately meets the requirements.



PHILIPPINES

Consumption is met by domestic production by the 29 companies having a capacity of about 50 million litres per annum.

L. OTHER PRODUCTS

EGYPT

Asbestos pipes and fittings  
Asbestos sheets  
Rubber products  
Fabricated gypsum  
Marble and granite  
Marble products  
Gypsum blocks and slabs  
Sand bricks  
Light blocks  
Vinyl tiles  
Synthetic fibre flooring tiles  
Fibre board  
Synthetic resins  
Plastic products

ETHIOPIA

Asbestos  
PKG  
Light blocks  
Marble granite and sandstone

KENYA

Bitumen coated roofing felt  
Stones (marble, granite and travertine)  
Non-ferrous metal sanitary fittings

TANZANIA

Asphalt (imported) Bitumen felt  
Chipboard  
Grasses (thatch)  
Building slate (flooring/roofing)  
Pumice  
Sisal cement tiles  
Ollii stones (lime/sand natural light weight pozzolana)

PAKISTAN

Reconstituted wood/block boards  
Straw boards  
Duoro concrete (sanitary ware)  
Cultured marble (sanitary ware)  
Marble: slabs and tiles, marble chips/marble mosaic/marble terrazzo  
Fly ash bricks/blocks  
Steel doors, windows, grills

INDIA

Fly ash cement/Fly ash bricks and blocks  
Sand lime bricks  
Wood crete  
Polyjute  
Reinforced plastics  
Bamboo  
Cellular concrete  
Marble slabs/tiles/chips/mosaic/terrazo  
Concrete door/window frames  
Gypsum/glass fibre board  
Linoleum flooring  
Red mud plastic sheets

THAILAND

Wood woll cement board (cellocrete)  
Wood chips cement board  
Straw boards  
Gypsum boards  
Thatch roofing materials

PHILIPPINES

Bamboo  
Nipa shingles  
Rattan  
Coconut lumber  
Laterites  
Marble  
Limestones  
Pumice

III. OUTLINE OF THE BUILDING MATERIALS INDUSTRY

A. CEMENT

EGYPT

The cement industry in Egypt comprises of

1. Alexandria Cement Company
2. National Cement Company
3. Asyut Cement Company
4. Suez Cement Company.

The combined production of cement of all the factories is at 13,000.000 tons per annum. About 4,000.000 tons of cement is needed to be imported to fulfil the domestic demand.

A new joint venture cement plant, Aswan Cement Company, is underway, and, Asyut plant is under expansion which would increase the local production to 16,000.000 tons per annum by 1991.

Seven types of cement are currently being produced by the Egyptian cement industry, i.e.

- ordinary portland cement
- blast furnace slag cement
- super creet (rapid-hardening cement)
- low heat cement
- white portland cement
- sea water cement (sulphate resistant)
- blended cement.

### ETHIOPIA

The Ethiopian cement industry comprises of four cement plants:

- Addis Ababa Plant (capacity 70.000 t.p.a.) production 40.000 tons
- Massawa Plant (capacity 70.000 t.p.a.), previously closed down, now producing 30.000 t.p.a.
- DereDawa Plant (capacity 35.000 t.p.a.) - out of production
- Muger Plant (capacity 300.000 t.p.a. portland and 360.000 t.p.a. portland pozzolana).

Only three plants are currently in operation having a combined rated capacity of 440.000 tons per annum. The new Muger Plant is under expansion and is expected to have an additional capacity of 300.000 tons per annum. Another new plant is presently in design phase and is expected to be commissioned by 1993 with a capacity of 600.000 tons per annum which would then raise the domestic production capacity to 1,340.000 tons per annum.

### KENYA

Two cement plans are currently in operation, Bamburi with a capacity of 1.25 million tons per annum and East Africa with 350.000 tons per annum. Both of these plants are planning rehabilitation which would also expand their capacities to 1.4 million and 450.000 tons per annum respectively.

A third plant is currently under implementation (West Pokot) with a capacity of 300.000 tons per annum and should be ready in three years.

Another plant is under feasibility study with a proposed capacity of 1,000.000 t.p.a. in the South Coast.

### TANZANIA

There are three cement plants in Tanzania with a total installed capacity of:

Mwazo (1961)	520.000 t.p.a.
Tanga (1981)	500.000 t.p.a.
Mbeya (1983)	<u>250.000 t.p.a.</u>

1.270.000 t.p.a.

**PAKISTAN**

Fifteen cement plants in public sector with an installed capacity of 5,961.000 t.p.a. and six in private with an installed capacity of 2,175.000 t.p.a. are in operation in Pakistan. Another thirteen new plants are sanctioned in the private sector which are at various stages of implementation. Their particulars are:

<u>Operating plants</u>	<u>Installed capacity (t.p.a.)</u>
Associated Cement (Rawalpindi)	450.000
Mustehkam Cement	660.000
Gharibwal Cement	540.000
Maple Leaf Cement	300.000
Dandot Cement	330.000
National Cement (Jhelum)	50.000
Kohat Cement	330.000
Pak Cement	171.000
D.G. Khan Cement	660.000
White Cement	30.000
Associated Cement (Rohri)	270.000
Zeal Pak Cement	1,080.000
Thatta Cement	330.000
Javedan Cement	600.000
National Cement (Karachi)	160.000
Cherat Cement	300.000
Pakland Cement	300.000
Dadabhoy Cement	300.000
Attock Cement	600.000

New under implementation

Pak China Cement	170.000
Fecto Cement	300.000
Serala Cement	75.000
Thal	300.000
Fatehjang Cement	300.000
Qureshi Cement	900.000
Khairpur Cement	300.000
Fauji Cement	300.000
Kashmir Cement	120.000
Jabbi Cement	300.000
Sird Cement	90.000
Fair Cement	300.000
Waziristan Cement	150.000

Following types of cement are currently produced in Pakistan:

1. Ordinary portland cement
2. Sulphate resistant cement
3. Blast furnace slag cement
4. White cement

## INDIA

The cement industry in India is very vast. The present installed capacity is estimated at about 60,000.000 tons per annum. Over 100 plants are in operation in the country.

India has pioneered in the design, development and manufacture of vertical shaft kiln cement plants of up to 300 tons per day capacity. 68 such plants are currently in operation in various parts of the country while another 55 are under installation.

Many types of cement are produced.

## THAILAND

The cement industry in Thailand comprises of three major companies namely (i) Siam Cement Company, (ii) Jalaprathan Cement Company, and, (iii) Siam City Cement Co. Among them they own several plants having an installed capacity of 13,000.000 tons per annum.

The main types of cement are:

- ordinary portland cement
- high early strength cement
- sulphate resistant cement
- white portland cement
- mixed cement

## PHILIPPINES

The Philippine cement industry is composed of 18 plants and 32 kilns. Eight plants still employ the wet process while the rest are on semi-dry or dry. Some plants have been inoperative or irregularly operating during the past five years.

The installed capacity is at 7.5 million metric tons with actual production at 5.5 million metric tons.

Six (6) plants are managed by a professional management group, two (2) have merged to acquire a multiline plant shutdown since 1985. Six (6) operating plants are heavily indebted; another three (3) have holdings by two (2) foreign cement companies while the others maintain technical collaborations with leading equipment manufacturers and consultants abroad.

('000' 40 kg bags per month)

<u>Plant</u>	<u>Installed Capacity</u>		<u>Actual Maximum</u>	
	<u>Mill</u>	<u>Clinker</u>	<u>Mill</u>	<u>Clinker</u>
Bacnotan	688	609	749	675
Northern	1.375	1.375	1.192	1.921
Central	495	469	608	520
Republic	1.293	797	1.158	1.043
Continental	825	750	700	829
Rizal	779	719	1.149	775
FR	1.361	1.162	1.050	1.042
Solid	1.898	1.625	1.401	1.257
Hi-Cement	825	750	863	846
Fortune	756	750	861	1.038
APO	660	313	467	739
Iligan	880	750	1.039	989
Mindanao	303	500	500	450
Pacific	447	375	290	546
Floro	1.169	938	1.200	1.096
Davao	1.656	1.250	1.500	1.698
<b>Total</b>	<b>15.902</b>	<b>13.131</b>	<b>14.727</b>	<b>15.470</b>

Source: 1) Philippines Cement Corporation  
2) Board of Investment

#### B. CEMENT BASED PRODUCTS

The cement based products industry is noted to be very wide-spread in the visited countries spanning a few large-scale (public sector) enterprises and a large number of widely dispersed private and small-scale enterprises.

In EGYPT three large public sector companies produce a relatively limited variety of cement concrete products. These are:

**Stewart Company:** Concrete pipes 42.000 t.p.a.  
Concrete posts 8.000 t.p.a.  
Concrete sleepers 400.000 units  
Concrete blocks 2,000.000 units

**Mineral Wealth Company:** Concrete products and crushed stone 650.000 m<sup>3</sup>  
Concrete blocks 60,000.000 units.

**Sand Bricks Company:** Concrete blocks 4,000.000 m<sup>3</sup>

Several private small-scale enterprises are engaged in the manufacture of cement concrete blocks and bricks and other items. Most of them use locally made equipment which is produced by three major capital goods making factories and about 30 small engineering workshops.

In ETHIOPIA the public sector "Cement Products Industry" of the Ethiopian Construction Materials Corporation produces 1,700.000 units of cement blocks, 109.000 units of cement pipes and 160.000 m<sup>2</sup> of cement tiles which accounts for 10-15 per cent of the total production in the country.

The "Agency for the Administration of the Rental Houses" has a plant to produce its own hollow concrete blocks and concrete pipes. Several municipalities have their own small plants for the production of hollow concrete blocks.

Several small old plants have re-opened in Asmare area besides some new small private plants near the towns for the production of concrete blocks and pipes. Many private contractors make their own concrete blocks on site.

In KENYA all the production of cement-based building materials products comprising of concrete blocks, drain pipes and channels, fencing poles, ready mix concrete, precast concrete elements, concrete pipes, concrete grills, louvers, prestressed concrete elements, concrete roofing tiles etc. are manufactured by about 40 private sector small and medium companies.

TANZANIA Concrete Articles Ltd., a subsidiary of the National Housing Corporation is the major producer of cement concrete products such as concrete blocks and fencing poles. ASBESCO division of Aluminium Africa, a company associated with the National Development Corporation produces about 3.000 tons of asbestos cement sheets at 50 per cent capacity. The Mwazo Cement Plant of the Tanzania Saruji Corporation has a unit for the production of cement concrete blocks. Cement concrete roofing tiles have also been quite popular for some time. A private sector company has been supplying the market in Dar-Es-Salaam. Several small-scale private producers are also reported to have established facilities for cement concrete products recently.

The major products used in PAKISTAN are R.C. and asbestos cement pipes and are produced by several large and medium private companies. Four major companies have capacity to produce about 55.000 tons per year of asbestos cement pressure and non-pressure pipes. An additional 69.000 tons yearly capacity will be created when four new units come on stream.

Several small private companies produce other products such as cement blocks, R.C. fencing screen, roofing tiles, terrazo and mosaic tiles etc. for localized markets.

In INDIA asbestos cement sheets and pipes, and, R.C. pipes are the major cement concrete products. Cement concrete blocks and tiles are popular only in some regions. Several new products such as cellular concrete (2 factories with capacity of 300 and 4500 m<sup>3</sup> per day) and, concrete doors and window frames (one large factory) are being introduced at commercial scale but acceptability of these products in the market is slow.

Essentially all building materials used in THAILAND are cement-based and the direction is seriously towards prefabrication. These are ready mix asbestos cement, corrugated roofing sheets and assembly components, ceiling sheets and screens, pre-cast concrete slabs, cement concrete blocks, piles, poles, pipes and paving blocks. Several medium and large companies (over 40) industrially produce and market their products.

Several small, medium and large sized companies produce and supply the large variety of cement-based building materials such as concrete hollow blocks, concrete pipes, asbestos cement pipes etc. in the PHILIPPINES.

### C. SAND AND GRAVEL

The sand and gravel industry is also widespread with a few large-scale enterprises and a large number of private small-scale and individual contractors and transporters.

In EGYPT two large-scale public sector companies produce crushed stone, i.e.

Sand Bricks Company: 408.000 t.p.a.  
and Mineral Wealth Company: 650.000 m<sup>3</sup> of concrete products and crushed stones.

The private small-scale and individual contractors and transporters supply the bulk.

In ETHIOPIA the "Authority for the Administration of the Rental Properties" supplies sand, gravel, stone and Red soil for aggregates; and the Ministry of Mines has a 200 ton per hour crushing plant in Addis Ababa. Several municipalities, co-operatives and private transporters and contractors are engaged in this sector.

In KENYA all the business is principally handled by small and medium independent private contractors.

In TANZANIA the Ministry of Works has five crushers which are principally used for supplying crushed stone for their road maintenance work. But these are severely affected by shortage of spare parts. The supply of sand and gravel is principally undertaken by small private individual contractors and transporters.

Over 100 locations and quarries have been extensively used as sources for the supply of sand, gravel and stone in PAKISTAN. Many more small private individual transporters and contractors constitute the supply source for the materials.

In INDIA efforts are underway to utilize industrial wastes such as cindered fly ash for aggregate in addition to the widespread supply sources by small-scale private individual contractors and transporters.

In THAILAND sand is relatively freely available but crushed stone was used for gravel. The existing stone pitches are being closed and crushers asked to relocate.

In the PHILIPPINES sand, gravel and stone aggregates are being supplied through a large number of small and medium companies.

### D. LIME

Lime is not noted to be a highly significant building material used in the visited countries although it is used in varying degrees in different countries.

In EGYPT the public sector Sand Bricks Company produces 92,500 tons of lime per annum and the Mineral Wealth Company produces 150.000 m<sup>3</sup> of limestone blocks. Part of the lime produced would naturally go to other industries such as sugar and rubber etc.



In ETHIOPIA the Ethiopian Cement Corporation has one line with an annual capacity of 6.000 tons. The total production is reported at up to 20.000 tons per annum, but is mostly used in industries and not in construction.

In KENYA three major companies (Homa Lime, Kenya Calcium and Masai Lime), are engaged in the production of lime with a total capacity of about 200 tons per day but almost all of it is used in industries other than construction.

Two old lime factories are available in TANZANIA, one with Tanga Cement Plant and the other in Mvumi (National Housing Corporation). The Mvumi factory has a capacity of 20.000 t.p.a. and produces 12.000 bags of 25 kg each. Two new kilns are being planned. The entire production of lime is consumed industrially. Some construction lime is used in rural informal sector which is produced in the traditional rural kilns.

The lime industry in PAKISTAN has become totally disorganized due to drastic reduction of its usage in the construction to insignificant levels.

In INDIA lime industry appears to have reasonably survived in small scale and lime is used as a building material in several regions of the country.

Lime industry in THAILAND exists only as a traditional small-scale cottage type operation. Quality of their products are non-uniform and are usually below standard, and, must be used with imported plastering additives when used in construction. Efforts are reportedly being made to improve and modernize lime production.

PHILIPPINES is reported to have no building lime industry.

#### E. CLAY PRODUCTS

##### EGYPT

<u>Product</u>	<u>Company</u>	<u>Capacity</u>	
Clay bricks	Stewart Company	68.000.000 units	public sector
Clay bricks	Ghymco	70,000.000 units	public sector
clay bricks	Mineral Wealth Co.	45,000.000 units	public sector

Besides, 1.400 licences have been issued to small-scale (previously informal sector) producers for the installation of mechanical units for manufacturing clay bricks and other clay products.

##### ETHIOPIA

<u>Production</u>	<u>Company</u>	<u>Capacity</u>
Clay bricks	Brick Products Company of the Ethiopian Construction Materials Corporation	18,000.000 units (Public Sector)

The Addis and Asmara plants are newly renovated. Some private plants on small-scale are reported to have come on line; no information, however, is available.

### KENYA

Large manufacturing plants are situated in and around most large cities while small-scale traditional manufacture is common in rural areas. There is no public sector involvement in the clay building materials products industry which is quite extensive (see previous chapter).

### TANZANIA

<u>Product</u>	<u>Company</u>	<u>Installed Capacity</u> <u>pcs/year</u>
Perforated bricks	Kisarawe Brick Factory	20,000.000
Burnt bricks	Kijenge Burnt Brick Factory	9,000.000
Roofing tiles	"	6,000.000
Burnt bricks	Bihawana Burnt Bricks Factory (presently closed - rehabilitation planned)	5,000.000

The use of bricks has picked up recently. Small-scale rural brick production has remained common.

### PAKISTAN

Burnt clay bricks is the most common clay building material product. The industry has adapted negligible mechanization and still pursues largely traditional manual methods for kneading, moulding, open air drying and curing in crude conventional kilns through intermittent firing. The product is non-uniform. However, sharp increases in demand, comparatively low manufacturing cost and lack of quality consciousness has allowed the industry to flourish without demanding any improvements.

### INDIA

The clay bricks and tile industry comprises of about 45,000 small-scale traditional enterprises scattered throughout the country. The quality of products is not uniform and varies from one to another region. Several new mechanized plants were introduced (nine fully mechanized, 30-40 semi-mechanized for bricks) but the market acceptability of their products has not been generated sufficiently. All the fully mechanized plants are closed due to high production costs.

### THAILAND

Small-scale traditional brick making is quite common in central parts of the country. Modern plants for structural bricks and tiles have also been established and are successful.

The PHILIPPINES are reported to have virtually no clay products industry except in some regions where it is being popularized.

F. SANITARY WARE AND CERAMIC TILES

EGYPT

<u>Company</u>	<u>Products</u>	<u>Capacity(tons)</u>	<u>Ownership</u>
Stegwart Co.	Ceramic/Refractories	25.000	public
General Co. for Ceramic and Porcelain	Sanitary ware Floor tiles Wall tiles	7.500 2.000 10.000	public public public
Sornoga ElNasr Co. for refractories and ceramics	Floor tiles	12.000	public
Aracimco	Sanitary ware Floor tiles Wall tiles	5.500 9.000 12.000	private
Lecico	Sanitary ware Floor tiles Wall tiles	17.000 12.000 18.000	private
Misr International	Sanitary ware Floor tiles Wall tiles	2.000 4.000 12.000	private
Graventa	Sanitary ware	4.000	private
Parco	Floor tiles Wall tiles		private
Cleopatra Ceramics	Floor tiles Wall tiles		private

Source: MARIC

**ETHIOPIA**

There is currently no local production of sanitary ware or other ceramic products. There is a very small old plant in Asmara which produces glazed tiles but is running at a loss. The Ethiopian Cement Corporation is currently setting up a ceramic plant which is expected to produce ceramic tiles and sanitary ware starting 1989 as follows:

<u>Year</u>	<u>Product</u>		
	<u>Sanitary Ware</u>	<u>Floor Tiles</u>	<u>Wall Tiles</u>
1989	324	327	1.202
1992	465	406	1.493
1995	577	505	1.855
1998	717	627	2.304

Source: Ethiopian Cement Corporation

**KENYA**

	<u>Product</u>	<u>Capacity (tons)</u>
Ceramic Industry	Sanitary ware	800
	Tiles	800
Kenya Ceramics	Sanitary ware	1.500
	Tiles	1.050

Source: MOI

**TANZANIA**

The Tanzania Saruji Corporation has set up a ceramic factory for the production of table ware, tiles and sanitary ware. The plant was commissioned in 1986 but has had operating problems. Its rated capacity for wall tiles is at 140.000 m<sup>2</sup> per annum and for sanitary ware at 680 t.p.a.

**PAKISTAN**

The ceramic tiles and sanitary ware industry in Pakistan has greatly expanded in recent past and is modernly organized:

<u>Company</u>	<u>Product</u>	<u>Capacity</u>
Swat Ceramics	Sanitary ware	2.000 tons/year
	Tiles	300.000 m <sup>2</sup> /year
Trust Ceramics	Sanitary ware	2.000 tons/year
International Ceramics	Sanitary ware	3.000 tons/year
Karam Ceramics	Sanitary ware	3.000 tons/year
	Tiles	350.000 m <sup>2</sup> /year
Frontier Ceramics	Sanitary ware	3.000 tons/year
	Tiles	500.000 m <sup>2</sup> /year
Dadabhoy Padube	Sanitary ware	1.000 tons/year
Shabbir Tiles	Tiles	1,100.000 m <sup>2</sup> /year
GM. Impex	Tiles	250.000 m <sup>2</sup> /year
EMCO	Tiles	500.000 m <sup>2</sup> /year
Baluchistan Clay	Tiles	500.000 m <sup>2</sup> /year
National Tiles	Tiles	500.000 m <sup>2</sup> /year

Besides the above mentioned large-scale modern plants there are several medium and small sized units operating in the unorganized sector whose cumulative capacity is reported at about 4-5.000 tons of sanitary ware and unspecified amount of tiles.

INDIA

High quality ceramic tiles and sanitary ware are produced in India. There are several modern and high technology plants set up with an estimated capacity of 200.000 tons per annum. Several of their products are also exported mainly to the Middle East and Africa.

THAILAND

Four to five modern plants having foreign joint venture/participation (American Standard, Armitage Shanks, Champion etc.) have been established in Thailand which produce high quality ceramic tiles and sanitary ware. The products are also exported to the neighbouring countries.

PHILIPPINES

<u>Company</u>	<u>Product</u>	<u>Capacity</u>
Sanitary Ware Mfg. Co.	Sanitary ware	17.010 tons/year
Fil-Hispano Ceramics Inc.	Glazed wall tiles	105 million pcs/yr
Mariwasa Mfg. Co.Inc.	Wall tiles	198 million pcs/yr
Pioneer Ceramics Inc.	Vitrified floor tiles	14.4 million pcs/yr

G. IRON AND STEEL PRODUCTS

EGYPT

Iron and Steel Corporation	RC.Bars	300.000 tons	public
Dahila complex		750.000 tons	public
All other private		250.000 tons	public

Production of RC Bars and Sections

<u>Year</u>	<u>RC Bars</u>			<u>Sections</u>	
	<u>Public</u>	<u>Private</u>	<u>Total</u>	<u>Public</u>	<u>Total</u>
			(“tons”)		(“tons”)
83/84	291	210	501	175	676
84/85	229	290	519	182	701
85/86	348	310	658	178	836
86/87	332	1.040	1.372	84	1.456
87/88	331	1.100	1.431	190	1.621

Source: MICOR

**ETHIOPIA**

**National Metal Works Corporation**

	<u>Annual Capacity(tons)</u>	<u>Annual Production(tons)</u>
RC Bars	20.000	14-15.000
Roofing sheets	22.000	22.000
Steel pipes	5.000	3.500
Doors/window profiles	1.000	750

New plant at Asmara has a capacity of 24.000 tons per annum, but it has not come on line yet and is awaiting commissioning..

**KENYA**

<u>Product</u>	<u>Number of establishments</u>	<u>Capacity (tons)</u>
G.I. sheets	4	28.800
Wire rods		60.000
Nails		27.000
R.C. Bars/Sections		200.000

**TANZANIA**

<u>Company</u>	<u>Product</u>	<u>Capacity (tons p.a.)</u>
Steel Re-rolling Mills Ltd. (NDC)	R. Steel bars	10.000 (Single Shifts)
	Wire rods	18.000
	Wire products	12.000
Aluminium Africa Ltd.	Galvanized C.I.Sheets	2.178
	C.I. Pipes	1.525
	Cut Plates	1.410
	G.I. Pipes	1.765

**PAKISTAN**

The construction steel industry comprises of approximately 400 small and medium rolling mills with a capacity of around 800.000 tons per annum producing a variety of products such as mild steel bars (plain, deformed and twisted), flats, angles, channels, rods, T, L and Z sections. In addition to these small private companies Pakistan Steel mills have a capacity of 635.000 tons of flat products and 120.000 tons of non-flat products.

Additionally steel doors, windows and grills have found much more extensive use in all low and medium cost housing and non-residential construction. Rolled Z sections, angles and flats of small sizes are used for this purpose. There are innumerable small manufacturing units/shops scattered all over the country.

**INDIA**

India has a large and world class steel industry producing 15-16 million tons of steel and steel products and machineries. Innumerable small and medium scale manufacturing enterprises scattered all through the country provide the required construction steel and fabricated products for the building and construction industry.

THAILAND

The industry comprises of 10-15 modern manufacturing units producing the variety of iron and steel reinforcing products. G.I and C.I. sheeting pipes and other rolled structural products. There are some smaller companies also producing a narrower range of rolled and fabricated products.

PHILIPPINES

Reinforcement bars manufacturers

<u>Company</u>	<u>Capacity</u> (tons per month)	<u>Actual Production</u> (tons per month)
Metro Metal	2.500	1.400
Filipino Metal	3-4.000	3-4.000
Continental	2.500	2.000
Best Steel	1.800	1.200
Island Metal	3.500	3.200
Pag-Asa Steel Works	6.000	4-5.000
Commercial	1.200	400
Galaxée	4.000	1.500

Source: Board of Investment

Galvanized Iron Sheet (m<sup>3</sup>/yr)

<u>Company</u>	<u>Capacity</u>
Bacnotan	63.000
Davao	24.000
Jacinto	38.000
Mindanao	54.000
Phil. Steel Coating	30.000
Puyat	96.000
Rizal	36.000
St. Christopher	60.000
Southern	57.200
Sugar Steel	18.000
Tower	24.000

Source: HUDCC Study

H. WOOD AND WOOD PRODUCTS

EGYPT

<u>Product</u>	<u>Company(public)</u>	<u>Capacity</u>
Fibre board	Fibre Board Co.	8.000 tons
Misc. wood products	Fibre Board Co.	LE 500.000
Wooden windows/doors	Hard Board Co.	20,000 units
Other wood products	Hard Board Co.	70. ?

**ETHIOPIA**

<u>Company</u>	<u>Product</u>	<u>Capacity</u>
- Ethiopian Chipwood and Furniture Factory	chipwood and related products	5.500 m <sup>3</sup>
- Ethiopian Plywood Factory	plywood	2.600 m <sup>3</sup>
- Ethiopian Hardboard and Softboard Factory	hard and soft board	1.800-2.000 tons
- Wanza Woodworks Industry	joinery products	3.000 m <sup>2</sup>
- Wood Workshop (Factory of the Authority for Admin. of Rental Houses)	joinery products	n.a.

**KENYA**

The wood and wood products industry is relatively sizable in Kenya. The wood based building and construction materials industry appears to comprise the manufacture of windows, doors and frames (22 establishments); pre-fabricated housing elements (12); timber mouldings (4); joinery (3); fencing and poles (3); floorings (1); blockboard (5); hardboard (1); plywood (2); laminated roofings (1); wallboard (1); fibre board (1); and, chipboard (2 establishments). No information was available on their installed capacities or their actual production.

**TANZANIA**

The Tanzania Wood Industries Corporation provides the nucleus of the wood and wood products industry. It has 15 saw mills and seven factories producing hard board (1), chipboard (1), plywood (2) and doors/windows (1) and joinery (2) having following capacity:

<u>Product</u>	<u>Capacity installed</u>
Sawn timber	100.000 m <sup>3</sup> p.a.
Hard board	8.000 t.p.a.
Chip board	7.000 t.p.a.
Plywood	7.000 m <sup>3</sup> p.a.
Doors/windows )	
Flush doors )	
Block board )	as needed
Transmission poles )	
Joineries )	

There are several saw mills and joinery shops in the private sector besides Twico.

**PAKISTAN**

The wood and wood products industry is relatively small in Pakistan. Several companies are manufacturing plywood, veneer board, straw boards and other fibre boards besides innumerable small joinery shops and saw mills scattered all through the country.



## INDIA

There is a relatively large wood and wood products industry in India but the country has an overall deficit in wood. Several modern plywood, veneer board, reconstituted wood boards/products and substitutes have been introduced which are slowly being accepted in the market.

The wood and wood products industry generally comprises of small saw mills and joinery shops.

## THAILAND

Quality wood has traditionally been a highly favoured building material in Thailand. Reconstituted wood and substitutes have been recently introduced into the market. There are three plywood factories. Some more have been established for wood wool cement boards, straw boards, and wood chips cement boards.

## PHILIPPINES

Wood and wood products industry in the Philippines is quite extensive and is export-oriented. Several medium and large companies comprise the industry.

### I. THERMOPLASTICS

## EGYPT

<u>Company</u>	<u>Product</u>	<u>Capacity</u>	
Canaltex Co.	Vinyl tiles	1,500.000 m <sup>2</sup>	public
	Canaltex tiles	250.000 m <sup>2</sup>	
	Synthetic fibre	50.000 m <sup>2</sup>	
Fibre Board Co.	Plastic products	LE. 100.000	public

Several companies also operate in the private sector information on which has not been available.

## ETHIOPIA

<u>Company</u>	<u>Product</u>	<u>Capacity</u>
National Chemical Corporation	Cables and wires	870 tons
	Conduits	140 tons
	Pipes	120 tons
	Tiles	52.000 m <sup>2</sup>
	Shutters	12.000 m <sup>2</sup>

## KENYA

The thermoplastic industry producing the building and construction materials comprise of PVC/PE pipes and pipe fittings; formica sheets; PVC and vinyl floor tiles; insulated cables and wires; and electrical accessories such as plugs, switches and conduits etc.. Available information is presented below:

Floor tiles

Dunlop Kenya Ltd. (vinyl asbestos tiles)	185.000 m <sup>2</sup> p.a.
Sera Coating Ltd. (PVC tiles)	37.000 m <sup>2</sup> p.a.
Ezzi tiles company (high plastics tiles)	37.000 m <sup>2</sup> p.a.

Cables

East African Cables Ltd. (PVC insulated cables)	n.a.
Kenby cables	n.a.

Electrical accessories

Egatube (A) Ltd.	n.a.
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TANZANIA

Tigray Plastics Company, a subsidiary of the National Chemical Industries constitutes the Thermoplastic building material industry producing among other plastic pipes.

PAKISTAN

Thermoplastic building materials products have gradually gained acceptance in the construction industry. Most common among these are the PVC pipes for water supply, drainage, sewers and conduits. PVC doors and windows have also been recently introduced. Vinyl flooring tiles are also produced locally.

<u>Company</u>	<u>Product</u>	<u>Capacity</u>
FCCL	PVC pipes	18.000 t.p.a.
Masood Sons	PVC pipes	?
Equibuilt Ltd.	PVC doors/windows	20.000 doors/30.000 windows
Ataullah Jan	PVC doors/windows	?
Siddique Associates	PVC doors/windows	?

Several small and medium scale producers manufacture small diameter pipes and other products.

INDIA

350.000 tons of plastic resins are produced and consumed in India. An equal quantity is imported for domestic consumption. 20 per cent of all thermoplastics are used in the building materials industry such as: electrical fittings and fixtures, floor and wall covering, piping systems, water storage tanks, doors and window frames. More than a dozen medium and large manufacturers constitute the core of the industry. Two more new plants are under implementation for producing pipes. Sanitary fittings, thermal insulation and water proof coating are also produced.

THAILAND

PVC pipes have been widely used for some time and doors/window frames have been more recently introduced. Modern manufacturing facilities are available.

PHILIPPINES

Major manufacturers of plastic pipes

<u>Company</u>	<u>Capacity (tons)</u>		
	<u>PVC</u>	<u>PE</u>	<u>PB</u>
Atlanta Industries	1.500	500	n/a
Emerald Vinyl Corp.	2.000	n/a	n/a
Philippines Eslon Mfg. Corp.	2.000	n/a	n/a
Freeman Inc.	3.000	n/a	n/a
Italit Const.+ Dev. Corp.	3.000	500	n/a
Liberty Commodities Corp.	n/a	2.000	n/a
Moldex Plastic Prod. Inc.	5.000	-	3.000 -
Meltex Dev. Corp.	5.000	n/a	n/a
Metro Plastics	n/a	n/a	n/a
Polysales Inc.	n/a	n/a	n/a

Source: Board of Investment

J. SHEET GLASS

EGYPT

<u>Company</u>	<u>Products</u>	<u>Capacity</u>
El-Nasr Glass and Crystall Co.		
- Yassin Glass Factory	- figured rolled and wired flat glass	)
	- sheet glass	)
	- sand blasted flat glass	)
		)
- El Hadra factory	- glass fibre	) 37.000 tons
- El Dakki factory	- glass fibre mats	) (public)
	- glass reinforced polyester	)
	bath tubs, corrugated sheets	)
	and water tanks	)
	- toughened glass	)

Another plant with a capacity of 100.000 tons of float glass is expected to start operating by 1992.

ETHIOPIA

No glass industry.

KENYA

No sheet glass production despite other glass production.

TANZANIA

Tanzania Saruji's Sheet Glass Plant was completed in 1985 but has not gone into production.

PAKISTAN

<u>Company</u>	<u>Product</u>	<u>Capacity (t.p.a.)</u>
Khawaja Glass	Sheet glass	9.000
Neelam Glass	"	34.500
Prince Glass	"	15.500
Nowshera Glass	"	13.500
Data Glass	"	3.500
Star Silica Glass	"	10.000
Gung Glass	"	4.500
Sind Glass	"	19.800

INDIA

The industry comprises several plants, six of them very large. Sheet glass is abundantly available.

THAILAND

There are three modern sheet glass factories in the country, one of them very large and latest technology (Asahi). Two third of the installed capacity is used for exports. Another plant for export is under consideration.

PHILIPPINES

Republic Glass I	90.170 tons/yr
II	109.440 tons/yr (on line in 1991)

The new plant is based on the latest Asahi float glass process. It is reported that the old plant will be phased out when the new plant comes on line.

K. PAINTS

EGYPT

Information on the factories not available. The total production in 1986/87 was 54.000 tons. Another 10,000 tons production is expected to come on line by 1991/92. More is needed (about 20,700 tons).

ETHIOPIA

The National Chemical Corporation has been producing 3-4 million litres per annum.

**KENYA**

Kenya's paint industry comprises of the following 14 manufacturers:

1. Berger (Robialac) Paints Ltd.
2. Crown Paints (K) Ltd.
3. Sadolin Paints (K) Ltd.
4. Galaxy Paints (K) Ltd.
5. Wyes Paints (K) Ltd.
6. Iviga Paints (K) Ltd.
7. Sigma Surface Coating Ltd.
8. D.K. Paints International
9. Coral Paint Industries
10. Nalin Paint Works Ltd.
11. Flamingo Paints Ltd.
12. Trobbialac Paints Ltd.
13. Plasco Paints Ltd.
14. Sin Resins Ltd.

A variety of paints is produced by these manufacturers including decorative, vehicle refinish, industrial and automobile, and, thinners. The exact capacities of these plants are not known but their actual production (and consumption) for the period 1977-86 is reported at:

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
<b><u>Production ("000" lites)</u></b>										
Paints	4.041	4.041	5.850	4.706	6.584	4.797	3.481	5.597	4.732	6.111
Distempers	545	362	704	508	559	199	199	293	271	233
<b><u>Consumption ("000" lites)</u></b>										
Paints	2.209	2.385	6.596	4.784	5.748	4.381	3.188	4.724	3.850	5.238
Distempers	265	622	-	-	-	-	-	302	279	242

**TANZANIA**

Good quality paints are reportedly produced and marketed in the country.

**PAKISTAN**

About 150 units in the organized industrial sector have a combined capacity of 75.000 t.p.a. in both dry and liquid forms.

**INDIA**

A large number of well organized manufacturing units are available to cater for the needs more than adequately.

**THAILAND**

More than 100 small and medium sized factories produce the required quantities and qualities of paints.

## PHILIPPINES

There are 29 companies that produce a wide variety of the paints and varnishes needed in the country. Their combined capacity is reported at 50 million litres.

### L. OTHER PRODUCTS

Several other building and construction materials typically used in the surveyed countries (noted in section L of the previous chapter) are produced in the respective countries. Particular information, however, was not available on many of these products.

It would be noted that some of these products are of traditional and indigeneous nature while several are of new and modern character. The traditional type products and some of the secondary newer type products are invariably produced in the small-scale informal sector, while the modern ones are factory produced.

In some instances attempts have been made to introduce modern products of latest varieties with varying success rates. Aluminium profile doors and window frames, thermoplastic blinds, shutters and sheetings, plastic pipes, fibre reinforced plastic water tanks, sanitary ware and fibre boards invariably appear to have been well accepted.

Most of the available information has been covered under the product categories discussed earlier in the chapter.

## IV. INSTITUTIONAL FRAME AND RELATIONSHIP OF PUBLIC AND PRIVATE SECTOR

A clearly identifiable institutional framework appears to have developed with respect to the various facets of the building and construction industry. The planning, development, designing and implementation, and, maintenance of civil engineering, infrastructure, public utilities and services works has been well established. Concentrated development of the geographical regions and areas has led to the evolution of regional/area development organizations, while the need for planned and rational development of metropolitan areas have given rise to similar organizations in several countries.

More recently, however, the need to cope with the provision of housing for newly urbanizing centres/areas has generated many institutions having been created for planning, development and financing of private construction.

The participation of international finance in the realization of the vastly expanded pace of development has had a highly significant impact on the institutional framework that has come about as a result. This has also seen the introduction of newer materials and systems of building and construction. The extensive requirements for the large-scale public projects seems to have greatly influenced the direction of development for the building and construction materials production industry.

More significantly this had a negative impact on the improvement and growth of the previously popular indigenous building materials. Considerable amount of effort seems to have been lately devoted to research and development on the improvement of traditional building materials as well as to develop newer cheaper variations, particularly in reference to the affordable low income housing.

A brief survey of the institutional framework with respect to housing construction and building materials in the visited countries is presented here below:

In EGYPT the Ministry of Housing and Reconstruction is responsible for the planning, development and implementation of the large-scale public housing and construction projects through its subsidiary and associated authorities and organizations. 17 public sector companies undertake construction of public housing programmes in new cities and infrastructure along with innumerable private contractors and sub-contractors.

A Building Materials Organization has been established for the planning, development and production of major building materials. It also acts as a holding company for state enterprises manufacturing cement, bricks, marble, concrete, lime, plywood, gypsum, panels and boards, some in joint venture with private sector. Other public sector corporations are manufacturing several major building materials such as the Mining and Refractories Corporation (sanitary ware, ceramic tiles, sheet glass etc.), Metallurgical Industries Corporation (steel bars, sections and structures), Chemical Organization (thermoplastics, paints).

Several modern large and medium scale private and mixed enterprises have come up for the production of major building materials such as steel bars and sections, ceramic tiles and sanitary ware, thermoplastics and paints, bricks and aluminium products.

In ETHIOPIA the Ministry of Construction is the principal authority for the planning and undertaking of construction in the country. It undertakes the construction of about 90 per cent of the infrastructure works and about 50 per cent of the building construction in the country. The Ministry of Housing and Urban Development is the principal authority for the planning, development and implementation of housing construction in the country directly as well as through the municipalities. It has created a network of production and distribution of building materials for housing construction such as wall blocks, wood products, doors, windows, joinery work, grills, water tanks.

There are four ministries which have overall administrative responsibilities for the production of building materials and two which look after their distribution through respective corporations. Production and distribution are planned annually based on a ten year perspective plan and its implementation followed up by the Office of the National Committee for Central Planning under the Office of the Council of the Ministers.

The Ethiopian Construction Materials Corporation has 13 factories manufacturing chipwood and related products, plywood, hard and soft board, joinery and carpentry work, marble slabs, granite tiles, cement blocks, cement pipes, cement tiles and clay bricks. The Ethiopian Cement Corporation has factories producing cement, ceramics, lime and sanitary ware. National Metal Corporation manufactures reinforced steel bars, sections, roofing sheets, pipes, doors and window profiles. National Chemical Corporation produces thermoplastic materials and paints. The Ministry of Agriculture Corporations produce and distribute sawn timber and lumber. The Ministry of Mines and Energy has lately entered the production and export of marble products.

Distribution of construction materials is conducted through the Ethiopian Domestic Distribution Corporation (wholesale trade) and Ethiopian Retail Trade Corporation (retailing). Imports are handled by the Import-Export Corporation.

The building materials production in the private sector is limited only to the rural informal production and small contracting.

In KENYA the Ministry of Lands and Housing, Ministry of Local Government and Physical Planning, and the Ministry of Public Works have responsibilities relating to regional/area development, physical planning, and, public works and infrastructure policy planning and development. The National Housing Corporation of the Ministry of Lands and Housing is mainly charged with the construction of low-cost income housing. Other than the public works, infrastructure and social services, the building and construction industry is entirely private.

The institutional system for credit and finance is well developed and serves the private sector building and construction industry.

The manufacture of building and construction materials is likewise almost entirely in the private sector and seems to be well developed with respect to the modern building materials required for organized urban construction work.

The traditional building materials are reportedly commonly produced by the cottage scale rural producers.

In TANZANIA the public authorities and corporations attached to the various ministries are responsible for the entire organized construction as well as the production and supply of building and construction materials.

The Tanzania Saruji Corporation has factories for the production of cement, bricks, cement blocks, sanitary ware, ceramic tiles, lime and sheet glass. The National Housing Corporation has manufacturing facilities for bricks, lime, concrete blocks and fencing poles, woodwork and joinery as well as stone quarries. The National Development Corporation is the sole producer of reinforcement steel bars, sections and rolled products, wire rod and wire rod products, aluminium sheets, galvanized C.I. sheets, galvanized iron pipes, Z purlins and trusses, cold rolled steel sheets and asbestos cement sheets. The Tanzania Wood Industries Corporation is the major producer and supplier of sawn timber and joinery products (doors/windows) and sole producer of hard board, soft board, chip board and plywood, while the National Chemical Industry has a plant for PVC pipes and products.

The National Housing Corporation has been responsible for the construction of low income housing. The National Construction Council is responsible for the co-ordination of construction contractors/contracts.



The building and construction activity in the private sector is limited essentially to non-urban and rural areas. The production of building and construction materials in the private sector is recently being allowed and is limited to two to three plants other than the widespread traditional rural cottage production of traditional materials.

In PAKISTAN The Ministry of Housing and Works is responsible for the national planning and policy making while the Provincial Ministries undertake the work in their respective provinces and territories. The planning, development and implementation for the major metropolitan areas is the responsibility of their respective Development Authorities (7).

Public sector participation has been most significant in the manufacture of cement. The other major building materials such as cement, steel rolled products, ceramic tiles and sanitary ware, cement blocks, thermoplastic products, sheet glass, paints, wood and marble products are manufactured and supplied by the modern organized private sector with the exception of lime and bricks which is concentrated in the small-scale industrial sector.

The research and development in building materials is mainly undertaken by the National Building Research Institutes of the Council of Housing and Works Research, the Council for Appropriate Technology Development, Building Research Stations of the Public Works Departments, and Forest Institute.

The industry is well organized through Associations and Chambers of Commerce and Industry.

In INDIA the institutional framework for the building and construction industry is one of the most extensive. The Ministry of Urban Development is responsible for the planning and policy development while the State Ministries undertake the work in their respective states and union territories through State Housing Boards. The planning, development and implementation of work is carried out by the Improvement Trusts and Development Authorities for their several respective urban and metropolitan areas.

The National Housing Bank, Housing Development Finance Corporation, Housing and Urban Development Corporation and Indian Housing Finance and Development Corporation provide the nucleus for the housing development finance by the Central Government.

The National Building Organization (to advance the best use of national resources, manpower and technical knowledge in the public and private sectors of the construction industry), the National Council for Cement and Building Materials (technology development and transfer, and, industrial services on all aspects of cement and building materials industries), and, the Central Building Research Institute (applied research and development work in building science and building materials) provide the central level nucleus for the development and promotion of rational building technology, materials and services.

With the exception of cement and steel the public sector has virtually no participation in the manufacture of building and construction materials. The building and construction materials manufacturing industry is well organized and developed, using, in most cases modern technology, with the exception of the brick, tiles and lime industry.

The National Building Organization maintains 15 extension centres/regional housing development centres; Housing and Urban Development Corporation have established a Human Settlement Management Institute, and, just launched a programme of establishing several Building Technology Centres in various parts of the country. The Central Building Research Institute and its associated centres/stations are active in applied research on the improvement and modernization of several local building materials. The National Council for Cement and Building Materials has successfully developed equipment for vertical shaft cement kilns and other products and has embarked on establishing networks in various parts of the country. The Bureau of Indian Standards has already established standards on several local building materials/products paving the way for their orderly development.

In THAILAND the National Economic and Social Development Board, and, the Ministry of Interior provide the planning and policy framework along with the Bangkok Metropolitan Administration.

The National Housing Authority is the main producer of low income/cost housing in the country.

The Building Technology Department of the Thailand Institute of Scientific and Technological Research and the Forest Products Research Division of the Royal Forestry Department provide the nucleus for research and development on building materials.

The Forest Industry Organization is a state enterprise for the production and promotion of timber-based building materials.

The building and construction materials manufacturing industry is quite well organized and uses modern technology. It is almost entirely in the large private sector. The lime and clay products manufacture is largely in the small-scale rural sector.

An extensive institutional framework appears to be in place in the PHILIPPINES. The Housing and Urban Development Co-ordination Council constitutes the apex body for overseeing and co-ordinating a number of agencies and organizations concerned with the housing and construction. The Construction Industry Authority of the Philippines provides the necessary control and assistance for the development and growth of the construction industry.

Organizations such as the National Housing Authority, Home Development Mutual Fund, National Home Mortgage Finance Corporation, Human Settlements Regulatory Commission, Home Financing Corporation provide an interacting network of housing agencies.

The Department of Public Works and Housing provides the Government planning, implementation and oversight for the construction.

The Bureau of Product Standards has undertaken work in providing standards for several building and construction materials.

The Department of Science and Technology promotes and undertakes the R+D on building materials among others.

The Construction Materials Department of the Board of Investment pays particular attention to the development and growth of the building materials industry.

The building and construction materials manufacturing industry is well organized and uses modern technology. It is almost entirely in the large and medium private sector. Several of these enterprises are joint ventures with foreign companies. Others have licencing or technical and other forms of collaborations with foreign companies.

#### V. ROLE AND SIGNIFICANCE OF FORMAL AND INFORMAL SECTORS

For want of a universally accepted nomenclature for the modern, mechanized or organized industrial operations formally incorporated, recognized or licensed as industrial enterprises, or, those traditionally in existence as cottage, rural, non-mechanized operations not formally incorporated, recognized or licensed as industrial enterprises, the subject terminology of "FORMAL" and "INFORMAL" is used to describe these respectively.

The distinction is of singular importance in the building and construction materials industry in view of the introduction and widespread replacement by new building and construction designs, technologies, systems and materials of old and traditional designs, technologies, and systems, during the past three to four decades, more particularly in the developing countries, besides the creation of newer informal operations to cater for the specific segments of the market. More than anything this, in fact, appears to reflect the market segmentation generally relevant in these countries in the context of the economic, cultural and social structures available therein.

The very fact that the modern formally incorporated, recognized or licensed industrial enterprises are referred to as "Formal" are usually the subject of an organized planning, policy making and formal organizational thrust and development effort in most cases, and, organized information is available on this sector, while those not formally incorporated, recognized or licensed cottage industrial undertakings referred to as "INFORMAL" are more often than not passed-by or overlooked, and, not much organized information is available thereon.

Some other general characteristics are noteworthy.

(a) The major building and construction materials required for the publicly financed construction works and large-scale commercial construction works (usually in urban metropolitan areas) rely on modern (mechanized) factory produced products, whereas those privately/individually financed small individual or rural/non urban construction works using limited quantities of modern mechanized factory produced products would often rely on the construction materials from the localized informally produced materials.

(b) The newer modern building and construction materials such as cement, structural and reinforcing steel, ceramic tiles and sanitary ware, galvanized and corrugated iron sheets, asbestos cement pipes, sheet glass, plywood etc. have become established as mechanized factory manufactured products; whereas, such traditional and indigeneous material as lime, clay bricks and tiles, stone bricks, mud blocks/plasters, timber/bamboo trusses, joinery and panels, and, thatches etc., while still remaining vital and predominant to varying degrees have not accomplished sufficient technological/production system improvements and remained in the manual, cottage and informal sector mostly prevalent in the low income self-financed housing in urban fringes and rural areas.

Some of the secondary and tertiary building material products based upon the modern construction materials such as cement concrete blocks, grills, screens, tiles, steel doors/window frames, grills and gates, water tanks, sanitary ware and tiles, terrazo and mosaic, largely to supply the low income self-financed housing in urban fringes and rural areas, have also joined the informal production ranks.

Organized information on construction and construction materials is available only for the publicly financed construction works and some private commercial construction and formally organized materials. But this invariably does not represent the totality of the picture either with regard to the construction or the materials. There is, however, no way to ascertain to any reasonable degree without launching extensive, long-drawn and expensive surveys in the countries. Such effort is not known to have been made in any of the countries. However, the various authorities do appear to be conscious of it and are mindful of the situation. Some value judgements and questions have been indicated during discussions with authorities in the countries visited. These are mentioned here below.

#### EGYPT

A total of 115 construction projects valued at LE 18.000 million are included in the Five Year Development Plan. Private sectors' participation is expected to be at 50 per cent (75 per cent for housing and 25 per cent for industrial construction). No efforts have been made to estimate the informal sector construction.

Burnt clay bricks had been used as a principal building material traditionally. Innumerable manual cottage enterprises have had existed throughout the country for the production of clay bricks. However, due to shortage of clay after the construction of high dam, the Government had made concerted efforts at promoting the use of desert clays for brick production. The use of clay was legally banned and assistance and incentives were offered for the producers to convert their operations to desert clays. To date about 1.500 small-scale semi-mechanized enterprises have come about as a result.

This effort has also generated the creation of large numbers of small-scale operations for the production of cement bricks and blocks all over the country.

In view of the planned thrust of the Government's programme locally manufactured equipment for bricks and block-making has been introduced and there are three major factories and about 30 small job shops which are manufacturing and supplying these equipments.

#### ETHIOPIA

The private sector, formal or informal, is very limited in Ethiopia either in respect of construction or the production of building materials. Nevertheless, the informal estimates by the Ministry of Housing and Urban Development suggest that about 50 per cent of all housing activity undertaken by the private individuals is in the 15 major towns whereas that in the rural areas is widespread as there are no Government restrictions applied to those areas.

The upcoming Five Year Plan envisages the construction of 42.000 housings by the Ministry of Housing and Urban Development mainly (44 per cent) through the co-operatives. This does not include the construction that would be undertaken by the Government Agencies and Co-operatives for their staff and workers, the industrial construction and private informal construction.

The small private and informal sector plays only a limited role in the production and supply of building and construction materials such as sand and gravel, lime, cement blocks and pipes, clay bricks and terrazzo tiles, some joinery and metal work, masonry stones, and stone crushing.

#### KENYA

The annual requirements of housing is estimated at over 190,000 units in urban areas, about 90,000 in rural areas and about 125,000 for replacements. The National Housing Corporation is the largest producer of low-cost housing in the urban areas. The rest is undertaken by the formal private sector.

The informal sector is understood to enjoy a reasonable share in the construction of housing in urban fringes and greatly in the rural areas.

The production of building and construction materials is undertaken mainly by the organized formal sector. However, small-scale production of traditional building materials such as bricks, lime and others is undertaken in the informal sector in rural areas.

#### TANZANIA

The role and share of the private sector in the construction or building materials industry is limited except in rural areas. The operations of the public sector enterprises have been facing mounting problems for various reasons.

The informal sector is reported quite active in the urban fringes and rural areas and relies heavily on the traditional materials such as bricks, tiles, slate, lime, stone and thatches.

#### PAKISTAN

The informal sector is noted to be quite active in Pakistan and has a large share in the production and supply of some building and construction materials such as bricks; steel fabricated doors; windows and grills; cement grills; terrazzo tiles; wooden joinery work; sand and gravel; mud and stone; and even some traditional sanitary ware and tiles.

The production of bricks appears to be solely undertaken in the non-mechanized informal sector.

#### INDIA

40 to 50 per cent of the development plans' outlays are estimated to go for construction and 60 to 70 per cent of this goes for the building and construction materials. It is also estimated that the requirements of building materials in India amount to about 3,000 million tons per annum for which about 5,000 million tons of raw materials are needed annually (reference NCB-CRI). It is also suggested that the construction industry employs about 50 per cent of all labour force in the country (reference HUDCO). This clearly appears to indicate the size of the construction and building materials industry in the country.

It is also indicated that about 60 per cent of all building materials are produced and supplied by the unorganized (informal) sector in the country. Some building materials such as bricks, lime, tiles, pozzolanas, aggregates are mainly provided by the informal sector besides some very localized products in the rural areas such as mud blocks, stones, bamboo, leaves/grasses/thatches etc.

Up to 40,000 brick making units are reported to exist in various parts of the country. Their combined production is estimated at 500,000 million bricks per annum. The average capacity of these units is estimated at 25,000 bricks per kiln. Those nearer to the metropolitan areas have a capacity of 40-50,000 bricks per kiln while others at 10-15,000 bricks per kiln.

About 6,000 tile making units are estimated to operate in various parts of the country.

Flooring mosaic and terrazo tiles are also reportedly produced mainly in the informal sector.

#### THAILAND

The construction and building materials industry is almost entirely in the modern private sector with the exception of some lime and clay products and wood and metal work. The formal sector controls the entire share of the building materials supply to the organized construction sector.

The informal sector, however, is the main source of lime, clay, bricks/blocks, cement blocks/tiles etc. and wood and metal joinery work in the urban fringes and rural areas.

#### PHILIPPINES

The construction and building materials industry is mainly in the organized private sector.

The 1980 Census of Housing has, however, revealed that the informal housing sector has been more significant than that of the Government and private formal sectors combined, in that, of the annual housing output of 675,000 units during 1976-80 72.8 per cent were made of light materials and 27.8 per cent of strong materials, and, of this total the Government and organized private sector accounted for about 100,000 units.

This clearly established that the informal building materials sector must be widespread. This would apply to all rural housing, makeshift and transitional housing of urban squatters.

Obviously the use of traditional building materials must be widespread such as thatches, bamboo and wood, but no information is available.

## VI. MAJOR PROBLEMS/CONSTRAINTS

In view of the fact that this overview was required to be undertaken with a particular reference to the low-cost building materials in the context of the low-cost housing, some digression may be considered in order to reflect on the situation with respect to the construction needs in general and those for the low-cost housing in particular in some of the countries concerned by the overview in order to be able to consider the problems and constraints pertaining to the production and supply of the building and construction materials in the desired perspective.

From Chapter one it is noted that the construction demand stems from all the major economic and social sectors more noteworthy amongst these being the physical infrastructure such as transport (roads, bridges, waterways, airports and sea ports), irrigation (dams, canals and channels), energy and power, water supply for human and industrial consumption, public health (sanitation and drainage); social services infrastructure such as education, health and community services; commercial and public buildings such as hotels, offices, industrial and warehousing buildings; and, lastly housing.

Almost all of the construction pertaining to the physical infrastructure is undertaken by the Government and most of that pertaining to social services infrastructure likewise, while the commercial and public buildings construction generally falls within the large-scale private or quasi private with some exceptions. That leaves the housing sector which invariably is shared between the Government, large-scale private and individual private sectors.

In other words the entire physical and social services infrastructure; commercial and public buildings; and some part of housing falls within the organized sector with the rest in the unorganized or informal sector of construction industry. In order to follow this analysis through, another distinction may be made with respect to the housing sector. It is noted that the involvement of the organized sector of construction industry (government and private) is generally limited to the metropolitan urban areas, whereas the rural areas, urban fringes and urban and semi-urban slums almost entirely fall into the individual private or informal sector of the construction industry.

At this juncture a passing reference may be made to the urban and rural mix of the population and the income disparity within the two. It would be noted that generally 60 to 80 per cent of the populations are accommodated in the rural areas and their income levels are usually a fraction of those in the urban areas. (Baht 4-600 to Baht 4-6.000 in Thailand).

It, therefore, would appear pertinent to establish a view of the parameters for the construction and building materials and for the low-cost building materials. It would thus be clear that the 60 to 80 per cent of the housing construction, i.e. that representing the rural, informal urban slums and urban/semi urban fringes housing would tend to fall under the low-cost housing. The low-cost building and construction materials would primarily be needed for this segment of the housing sector in addition to other construction at the lower end of the organized construction sector.

At this point it may be useful to also establish a view of the parameters of the building and construction materials for the various segments of the construction industry formal or informal.

It would be clear that the physical infrastructure constructions are to be highly engineered structural construction normally requiring engineering and structural construction materials, i.e. cement, steel structures, piles and reinforcements, and, other specialized materials, of the highest standard of strength and quality in large quantities. The commercial and public buildings would normally be likewise highly engineered and structurally designed constructions requiring strong foundations, super structure (steel, R.C.C. etc), load bearing flooring structures and other modern and engineered walling, ceiling and flooring materials and accessories and equipment such as climate control, water supply, drainage, electrical materials, finishing and decorative materials of high standards of quality and strength with considerable decorative and aesthetic characteristics. The social services infrastructure and housing sectors of construction are highly versatile in that the organized high quality (high and medium cost) housing and specialized social services infrastructure (such as hospitals and other specialized educational etc.) are more like the commercial and public buildings in terms of their needs for the quality and variety of the building and construction materials, while the general ordinary social services infrastructure and low cost housing are not.

The informal construction segment, i.e., the informal housing in rural areas, urban fringes and slums etc. is the one which is not highly engineered and structurally designed and requires materials for foundations, walls, floors, roofs, ceilings and other amenities needed for the living quarters with appropriate strength, quality and decorative or aesthetic standards.

Another important facet or parameter that is worth noting here is the structural and architectural design styles and requirements that would have some bearing on the quality and decorative standards of the building materials. It is noted that those pertaining to the physical infrastructure, commercial and public buildings, social services infrastructure, and, high class housing have become internationally uniform to varying degrees while that for the low-income and informal housing construction still very much remains local tradition and socio-cultural styles despite introduction of modern materials and amenities etc.

This brings us to a point where a somewhat simplified identification of the building and construction materials for the major sectors of the construction industry may be attempted. This should assist in the approximate segmentation of the types and varieties of the different building and construction materials and understanding the interplay amongst these in the perspective of the production and supply of these, as applicable.



Type/sector of construction

Major building/construction  
Materials required

1. Physical infrastructure

- Stone
- Coarse aggregates
- Heavy Structural Steel and others for foundations
- Reinforcement steel
- Cement
- Sand and other fine or medium aggregates
- Asphalt/bitumen and other specialized materials
- Engineered Steel, R.C.C. and other products

2. Commercial/Public buildings

- Foundation materials such as stone, coarse aggregate and structural steel
- Heavy structural steel or R.C.C. for super structures
- R.C.C. for roofing/flooring etc.
- Walling materials
- Structural ceiling materials
- Partitioning materials
- Flooring and decorative floor covering materials
- Decorative wall covering materials
- Sanitary fittings and accessories
- Water supply materials and accessories
- Sewerage and drainage materials
- Electrification materials and accessories
- Climate control equipment and accessories
- Sheet glass
- High class joinery, doors, windows, etc.

3. Social services infrastructure and other organized construction

- Foundation materials such as stone, coarse aggregate, R.C.C. or structural steel
- Structural steel or R.C.C. for super structure
- R.C.C. or other materials for roofing and flooring
- Structural walling materials
- Partitioning wall materials
- Flooring/decorative flooring materials
- Wall covering materials
- Sanitary fittings and accessories
- Water supply materials and accessories
- Sewerage and drainage materials and accessories
- Electrification materials and accessories
- Climate control accessories
- Sheet glass
- Joinery work, doors, windows etc.

4. Informal construction  
(Housing in rural areas,  
urban and semi-urban fringes  
and slums)

- Light foundation material
- Light R.C. for structural elements
- Walling materials
- Flooring and roofing materials
- Joinery work, doors and windows
- Sheet glass
- Water supply materials and accessories
- Sanitary fittings and accessories
- Some sewerage and drainage
- Some electrification materials and accessories

Ideally one would wish to analyse the problems and constraints by material, but in view of the lack of strong commonalities amongst the countries and regions it would impose serious limitations. Therefore, the problems and constraints currently experienced by the countries covered in the overview are presented as such:

EGYPT

The steel re-rolling mills in the private sector are facing the problem of the availability of billets from the local steel plant. The import price for billets was reported at LE 750/ton while the product prices were at LE/900 ton. The billet casters in the local steel plant are planned to be rehabilitated to increase their capacity to 600.000 t.p.a. from the existing 300.000 t.p.a. which should ease this situation.

Some problems with respect to the availability of qualified and experienced middle management cadres in the newly introduced sophisticated technologies were reported by the Building Materials Organization. A research and training centre was being planned to train the middle management personnel including quality control and after sales services for various products in order to compensate the loss of such personnel to the Arab Gulf countries.

The cement and clay factories are facing severe problems of material loss, incomplete burning and corrosion due to salty clays. As a result the heavy consumption of spare parts and filtration of exhausts are big problems aside from the low capacity utilization rates. These problems have been traced to the designs of the plants not having been appropriately modified to suit the local soil conditions.

The problem with respect to the production of burnt clay bricks had been accentuated after the completion of the high dam which resulted in the non-availability of renewed clay sedimentation in the river areas, and, steps were needed to arrest the erosion of top agricultural soils. Successful efforts have been made to stop the use of top soils by the traditional brick makers and instead to convert to semi-mechanized process using desert clays.

The much needed expansion of the cement plants and the setting up of new plants to match the increasing demand for cement is posing serious problems due to increased equipment costs. The extent of the problem may be judged from the fact that the production cost of cement in the new plants is estimated to amount to LE 200 per ton while the market price is LE 80 per ton. At present only about 50 per cent of the cement plant equipment is manufactured within the country.

## ETHIOPIA

There is a considerable gap in the production and demand of building materials. At the peak of the construction in 1983 over 40 per cent of the building and construction materials were imported. The average for the past nine years comes to about 30 per cent imports. Currently the local production amounts to about 200 million Birrs while the imports are at a level of about 58 million Birrs. The imports mainly constitute sanitary ware, timber and electrical materials amongst others.

The major reason for the shortages is reported to be under capacity operations of the existing plants mainly due to shortages of foreign exchange for modernization/renovation of facilities and for importing needed replacement parts and other repair and maintenance materials and inputs. One cement plant is already closed down.

The Co-ordination at the Government level for the production and supply of building materials (among others) is just beginning to emerge through centralized procurement by the Government.

Most of the production facilities need modernization and/or renovation, more importantly the cement plants, the steel rolling mills, steel profile doors and window making plants. With the increased import prices of steel sheets 85 per cent the cost of production for roofing sheets is attributed to the raw materials while for the steel pipes its 65 per cent. Dynamic solutions are being considered.

Forestry has been seriously depleted resulting in the closure of a lot of the saw mills both in public and private sector. Anyway these mills have been antiquated and would need to be replaced when they were to be moved towards Western parts of the country.

The inward transport of the imported materials from the port and the distribution of the locally manufactured building materials is reported as another major problem due to lack of infrastructure and equipment.

Several standards have been instituted by the Ethiopian Standardization Authority to cover even the low-cost and informal production sector, e.g. four grades for bricks, four for the concrete blocks and a number of grades for portland pozzolana cements, hydrated lime, quick lime and others in the draft forms; but they feel that the producers (usually public sector factories) still fail to meet these.

## KENYA

The cement plants have reportedly been making losses successively for the past many years mainly due to shifting exchange rates and designated foreign currency loans (The local price of cement is about \$100/ton while it is exported at about \$40-50/ton).

The rising fuel costs have adversely affected the building materials industry. Also costs of imported inputs in many cases, especially steel products have overwhelmed the production cost which has resulted in the closure of several plants, particularly those producing products whose prices are controlled such as nails, barbed wire and wire mesh etc. while serious shortages are caused in the case of other materials.

As a result the costs of housing in Nairobi has increased so much that people cannot afford it. Part of this increase stems from the high cost of long haulage that is necessary for the majority of the building materials.

Many of the building and construction materials such as sheet glass, sanitary ware, sanitary fittings, aluminium profiles etc. as well as the raw materials for the manufacture of the building materials such as gypsum, ceramic materials (clay, gypsum, kaoline, glazes, decorative paper), steel products like wire rod, sheets, billets are imported.

The National Housing Corporation indicated their serious concern about the situation with respect to high cost of materials and construction, and, their keen interest in developing alternatives.

### TANZANIA

Production and supply of building and construction materials are reported to be facing serious problems in Tanzania.

Cement plants are facing serious operating problems. One under CIDA management is operating at about 60 per cent while the other two new plants operate only at about 30-40 per cent. Major causes of under capacity utilization are stated to be lack of foreign exchange for replacement parts, spare parts for repair and maintenance; transport, plant breakdowns and suspension of aid. Energy costs alone constituted over 60 per cent of the cost of production.

The sanitary ware production plant is reported to be operating at less than 20 per cent capacity ostensibly for similar reasons. Some major technical problems in the plant design and installation are also said to be the reason for these problems.

The sheet glass plant which was completed in 1985 did not get power connection until March 1987 and that's when other problems arose in the furnace bricks and electrical connectors. Likewise Dodoma Brick Factory established in 1978 has not produced a single brick since.

Several other factories are reported to be operating at only between 20 to 50 per cent of capacity and many have technical operating problems while some are closed down.

The prices for building materials especially steel and cement have risen multifold for this and other reasons.

This has resulted in serious slow-down in the construction to a point that the National Housing Corporation's programme has dropped from a peak of about 2,000 housing units per year to just about 50 or so.

Availability of quarry products is also reported to face serious problems and shortages which is expected to seriously affect the upcoming highway rehabilitation as well as rural roads rehabilitation programmes.

The Tanzania Bureau of Standards has been unable to develop standards for the low-cost materials for the reason that the modern materials such as cement and steel are used only in the urban areas while the rural construction was still primarily based on traditional materials based on clay, pozzolanas, grasses, leaves and lime which are not produced on any organized scale and no institutional mechanisms have come about to initiate action with respect to their improvement and development or growth and the determination of national standards for such materials/products.

A view was expressed at the NCC that people seemed to have given up and appear to be relying on traditional products such as clay and bricks etc.

#### PAKISTAN

The cost structure in the state cement factories was noted to be as follows;

Energy/fuel	51% (wet) 35-40% (dry)
Spares/stores	9%
Raw materials	12%
Packing materials	12%
Labour	9%
Depreciation	3% (old) 20% (new)
Administration	3-4%

The capacity utilization was reportedly good and operations satisfactory. Good quality control and R+D capability was stated to be available. Efforts were reported to be underway to develop and market mixed cement in order to be able to overcome the cost pressures, even though cement plants up to 2.000 tons per day capacity were completely manufactured locally.

Research and development work mainly concentrates on developing the local manufacture of new low-cost building materials from industrial and agricultural wastes, such as fly ash from sugar mills, bagasse, slags and other materials such as gypsum, ferrocement, lime, gap grated concrete base white mosaics, mud blocks, parabolic roofing, arches, modular bricks, self-closing doors, Z tile roofing, gypsum, sisal sheets, expanded clays, foam concrete etc. These efforts are directed at generally improving the housing construction in the rural areas and the urban and semi-urban fringes.

#### INDIA

Energy and environment are the major constraints perceived in the further growth of the modern as well as the traditional building materials industries. Energy efficient production and use of industrial, agricultural and other wastes is consuming major attention in the vast research and development and manufacturing establishment in the country, besides the use of traditional materials, and, avoidance of long distance transport of the materials.

To illustrate the magnitude of the problem it is reported that India needs about 3.000 million tons of all types of building and construction materials annually which requires about 5.000 million tons of input materials while about 4.000 million tons of industrial, agricultural, urban, rural wastes are generated which contain varying amounts of basic elements such as calcium, silica, aluminium, ferrous and oxygen, important component of the building materials. Another important factor of significance was stated to be that the component of packing materials and transportation in the cost to consumer of major building materials such as cement was between 20 to 50 per cent.

Several successes have been achieved already more noteworthy amongst these being the popularization of the mini cement plants in the country, slag cement, fly ash bricks etc.

A vast number of standards has been established that cover most building materials of all types and ranges including those suitable for the low-cost housing.

The perspective for this development effort is provided by the planned ceilings for the targetted low-cost housing as:

	<u>Income</u> "RS"	<u>Cost Ceiling</u> "RS"
Economically weaker sections up to	700	5.000
Low-income groups	701 to 1.500	30.000
Middle income groups	1.501 to 2.500	75.000

These efforts, therefore, appear to be directed at the broad base including not just the building materials but also, and very justifiably so, at the architectural design, spatial planning, and construction technologies as well as systems in order to meet the challenge posed by provision of housing to the economically weaker sections as well as the low-income groups equitably.

#### THAILAND

In view of the current condominium boom in the Bangkok Metropolitan region there is strong pressure on the supply of building and construction materials. Severe shortages are felt and are expected to worsen. The exact nature and causes are still not ascertained.

The prices of building materials had gone up by about 20 per cent in 1987 and about 28 per cent in 1988 and are expected to rise another about 20 to 30 per cent during 1989. Some of the reasons are:

- 1) increase in the condominium and other construction projects
- 2) increased prices of imported raw materials
- 3) stock piling by traders
- 4) uncertainty on the part of the producers

Construction steel and wood products have faced crisis situations on the former due to demand greatly outstripping the local installed capacity causing about 30 per cent of the requirements to be imported, while on the latter due to reduced availability of local timber (logging of which has been banned to arrest the further depletion of forest cover) causing the prices to increase by 100 per cent.

The availability of crushed stone is also expected to cause problems as the stone pitches near Bangkok are being closed to protect the environment, and alternative sources are located far away and their quality was uncertain.

The overall increases in the prices are reflected as below:

Steel	100 per cent
Cement	5-10 per cent
Plywood	100 per cent
Wood products	100 per cent
Aluminium products	40-50 per cent
Electrical wiring	40-50 per cent

The forest cover has depleted from 40 per cent to 25 per cent causing concern and leading to the ban on logging. Severe floods in the Southern parts of the country aggravated the supply situation further. Even the availability from the neighbouring countries have been constrained causing shortages and price hikes despite Government measures to lower import duties from 12 to 2 per cent.

The shortage of wood would have created greater problems for the rural areas as the majority relies on wood and other traditional materials.

Transportation has been another major problem. Attempts were made to improve the river transport at a cost of Baht 50 million but it did not succeed. As a result the delivered price of building materials has registered further increases causing greater crunch on supply of materials to the regions outside Bangkok.

The Thai Industrial Standards Institute has prepared and established standards for several building and construction materials but, unfortunately, have not been able to do much on the locally produced indigenous and traditional materials due to lack of their usage in the organized construction.

#### PHILIPPINES

Severe pressure on the supply and the prices of building and construction materials have been felt due to the construction boom during the past couple of years. Increasing quantities of several materials including cement had to be imported in order to meet the shortfall.

The cement industry had been in some disarray for some time. Eight of the 18 plants still employ the uneconomic wet process and several plants have been inoperative or irregularly operating during the past five years. Six of these plants are now managed by a professional management group while two companies have joined together to acquire a multilane plant which has been shut down since 1985. At least another 6 plants are facing serious operating and financial difficulties. The Government has successfully promoted a programme of cement industry rehabilitation and modernization since October 1988 offering incentives to those who would engage in such rehabilitation and modernization that would also increase output or improve energy efficiency by at least 20 per cent. 14 plants have applied to participate.

Shortage of aggregates as well as timber and steel have also been experienced. The constraint on aggregate and steel is obviously due to the sudden increases in the demand and problems with production and transport, while, the timber problem is a more long-term one as the logging had been banned in order to arrest any further decline in the forest cover.

The Department of Works and Housing has pointed out the crucial problem of the non-availability of the properly trained and experienced construction project management personnel which was hampering the implementation of several of their projects while the Construction Industry Authority of the Philippines indicated lack of proper and effective co-ordination amongst the many authorities and agencies dealing with the various facets of the industry as one of the problems causing difficulties in identifying and undertaking the required actions needed to resolve the problems faced by the industry.

Efforts are being contemplated to utilize the vast resources of lumber from the coconut trees which are already overdue to be replaced as well as to find alternative wood products/substitutes.

All this had naturally further aggravated the problems of producing low-cost housing, and, the National Housing Authority, is duly concerned about it. They believe that no determined efforts appeared to have been made in the direction of the production and supply of low-cost building materials despite a very urgent need for it and NHA's keen interest.

The building codes appear to prevent the use of bamboo as a construction material along with some others which are in common use in the traditional rural areas.

The Bureau of Product Standards have prepared and issued several standards for building and construction materials but was not able to do much by way of tackling any of the traditional and indigeneous small-scale products because of their lack of use in the organized sector.

## VII. FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

After having presented the overview in the earlier chapters, it appears highly desirable to make an attempt to analytically synthesize the problems and constraints faced in the surveyed countries into clearly laid out findings of the study out of which conclusions could be reasonably drawn and rational recommendations formulated for consideration in the preparatory discussions for the Second Consultation.

The sources of demand for the building and construction materials, the distinctions between the organized and unorganized, formal and informal, and modern and traditional segments pertaining to the end user market as well as the production and supply system has been dealt with at some length in earlier chapters. An attempt was also made to identify a typology of building and construction materials required for various end use segments of the construction and building industry market, with a view to create as clear a distinction as possible for the variety of product categories and ranges required by the countries' markets.

An attempt would now be made to establish the Findings, Conclusions, and Recommendations.



### FINDINGS

Before setting out to establish any findings with respect to the building and construction materials with reference to the cost categories, it is considered critically important to highlight the cost structure for the building and construction independent of the cost of the materials, or, for factors that subjugate the building and construction costs to those other than of the materials.

It is noted that up to 30-40% of the cost of construction is attributable to the planning and management services such as, surveying, planning, designing, contracting and the like. It is also noted that the land cost may constitute anywhere from 20-60% of the cost of a building and construction project. It is also clearly understood that architectural and structural design considerations and choices could increment anywhere from 10-30% of the cost of construction.

It would thus appear that in the context of the building and construction industry system, with particular reference to the popular, or low-cost, or mass housing and building construction requirements, the cost of the building and construction materials, could at times be a rather minor constituent. Economics of overall cost could more usefully be considered from the building and construction technique and system aspect rather than just the materials.

Another widespread dilemma is noteworthy, that is the introduction and popular use of modern low-cost building and construction materials appears to have created severe distortions without causing the economies originally perceived. This is for the simple reason that these perceptions were ostensibly totally out of context to start with, as these materials were promoted solely on unit costing in a conceptually irrelevant manner and not in tune with the applicable system-wide perspective. Reference is made here to the cost of modern building materials such as cement and cement-based products, steel and steel-based products, thermoplastic and ceramic products, etc., which no doubt are low-cost on unit cost basis; but, in the context of their applications in the subject countries, these appear to have gradually lost their cost competitiveness at end user points of consumption.

The reason for this phenomenon could ostensibly be the fact that the modern materials have been developed with a view towards time and labour saving in an environment where cost structures have been biased toward time and labour (60-70%) and not the materials (30-40%). The parameters in the surveyed countries, however, have been the reverse (materials 60-70%, labour/time 30-40%). To make matters worse the appropriateness of these materials in relation to the climatic conditions (and non-availability of climatic control facilities) have been questionable in most cases.

Additionally the basic element in the cost effectiveness of these modern materials has been their industrialized manufacture on mass or large-scale which has been mitigated in most cases due to smallness of local market size, lack of transport and distributive infrastructure facilities, high cost of fuel and energy, high cost of equipment and imported materials, and general decline in the economies of these countries depriving them of the resources to finance the imported inputs, spares and debt repayments.

This seems to have created a crisis in most situations leading to uneconomic operations of domestic production facilities, shortage of materials and escalation of prices.

In the meantime the traditionally popular local building materials such as clay and clay products, lime and lime products, stone and stone products, wood and wood products etc. have gotten neglected to such an extent that some have simply gone out of use while others have regressed to antiquated production technology and system, and their quality deteriorated to often unacceptable levels.

All this appears to have generated a situation where the affordability of housing and other public building construction has slipped the vast majorities of populations. The ever increasing magnitude of the problem has been posing a mounting challenge to the governments and public agencies dealing with the various facets of the issue.

Considerable work has been done in many countries on analyzing the issues and a somewhat common understanding appears to have evolved indicating the necessity to tackle the subject in its perspective and a system concept whereby the production and availability of building and construction materials would be considered simultaneously with

- new and improved construction techniques
- new and improved architectural planning and design considerations/choices
- new and improved management and construction practices
- new and improved land policies
- new and improved financing and control policies and practices

#### CONCLUSIONS

Important and critical as the above are in the context of the accomplishment of the low-cost housing and construction, these are outside the direct purview of this overview. However, in the perspective of the System of Consultations, and, as the construction system aspects are, both directly and indirectly, the determinants of the building and construction materials in all their facets, characteristics and parameters, a strong note must be taken of such construction system concepts in considering any action plans for the building and construction materials.

Extensive amount of work seems to have been done in many countries on this subject. The primary parameters which cause the difficulties in the availability and the cost effectiveness of the building and construction materials in the first place, and need to be alleviated, are generally stated as:

- Technology and process adaptations to suite local raw materials etc. (e.g., Egypt - cement and bricks)
- Production system and scale adaptations to suite the local transport and distribution infrastructure (e.g., Tanzania - cement)
- Elimination or reduction of external (foreign exchange) costs both for plant and equipment, energy maintenance, and raw material inputs (e.g. Ethiopia, Tanzania and others)
- Increased utilization of locally available and produced materials (all countries)

- Increased utilization of newer materials where appropriate and economical (India, Pakistan and others)
- Increased capacity utilization of existing production facilities through local resources (Ethiopia, Tanzania, Philippines)
- Strengthening of domestic institutional capabilities for co-ordination and promotion of development and utilization of cost effective products and technologies, and, national policies, strategies and programmes therefor (all countries)

Having identified the overall parameters and critical factors governing the resolution of the acute problems with respect to the building and construction materials, it would be useful to identify/outline some elements of the possible action plan that may be considered for further unified actions. The major directions of development offering promise to ameliorate the currently prevailing adverse situations in most countries appear to be indicated as follows:

#### 1. NEW TECHNOLOGIES PRODUCTS

- Development and promotion of modified or mixed cements for conservation of cement and its replacements where applicable such as:
  - Slag-cement
  - Slag-lime
  - Rice husk ash
  - Gypsum plaster
  - Gypsum mortar
  - Lime
  - Lime sand
  - Masonry cement
  - Mud
  - Mud mortar
  - Mud plaster
  - Fly ash
  - Fly ash-cement
  - Natural pozzolanas
  - Calcined clays, shales and other soils
  - Condensed silica fumes
- Development and popularization of techniques, processes, plants and equipments for economic manufacture of such modified cements as feasible in appropriate capacity sizes to suit local production and end use considerations.
- Development and promotion of alternative aggregate materials such as:
  - Light weight aggregates
  - Agricultural wastes aggregates
  - Industrial waste aggregates
- Development and promotion of alternative concretes, such as:
  - Ferrocements
  - Soil cements
  - Lime slag soil
  - Fibre cement

- Development and promotion of alternative reinforcing materials, such as:
  - Asbestos fibres
  - Natural fibres like sisal and reeds
- Development and promotion of alternative (concrete) blocks, such as:
  - Soil cement blocks
  - Sand lime blocks
  - Gypsum blocks
  - Stone blocks
  - Compressed earth blocks
- Development and promotion of modified bricks such as:
  - Modular bricks
  - Soil stabilized bricks
  - Fly ash bricks
  - Slag bricks
- Development and promotion of alternative walling and partitioning materials such as:
  - Wood wool panels
  - Chipboards
  - Reed panels
  - Fibre boards
- Development and promotion of utilization of secondary resources such as:
  - Non-commercial timbers
  - Coconut trees etc.
- Development and promotion of technologies, processes, plants and equipments for an economic manufacture of such alternative materials as feasible in appropriate capacity sizes and technology/processes and forms to suit the local production and end use considerations.

## 2. IMPROVED TECHNOLOGIES/PRODUCTS

In view of the widespread and popular usage of the traditional building/construction materials in the informal, rural and low income urban and semi-urban construction, and, its deterioration and quality situation, a massive effort is indicated towards improvement in this segment of the building materials industry such as:

- Development and promotion of improved economic processes and technologies to generate an enhanced uniform quality upgradation of such traditional products as:
  - Mud bricks
  - Clay bricks
  - Thatches
  - Lime
  - Stones/Shingles
  - Clay tiles
  - Mud blocks
  - Mud/lime plasters
  - Mud/lime mortars
- Development and promotion of improved and economic tools and equipment such as moulds, manual tools, jigs and fixtures, handling equipment, kilns etc. for a more systemized production of such products with appropriate quality improvements.
- Development and promotion of production systems with improved features based on traditionally employed techniques with due considerations towards their ease of application without any significant disruption to the systems or styles currently in use.

### 3. INVENTORIZATION OF MARKET AND MATERIALS RESOURCES

In order to devise appropriate plans and programmes for the development and promotion of new and improved building and construction materials and technologies, it is essential that good and reliable information should be available on such items as:

- Existing manufacturing facilities especially in the small-scale informal and traditional sector.
- Existing building and construction industry demand particularly in the informal sector.
- Existing structure, capacity and systems in the building and construction industry especially with regard to construction techniques and systems and other pertinent parameters of materials supply.
- Inventory and assessment of architectural and design formats and preferences.
- Inventory and assessments of raw materials resources for the production of building and construction materials.

### 4. POLICY SUPPORTS

In order to gain any significant results out of the technology and product developments and improvements, a rational and dedicated set of policy supports would be an absolutely must. Following are some critical elements that would be basic:

- Participation of informal producers in the process of technology/process/product improvement.
- Dedicated technical assistance support to the producers in the development and conversion process.
- Preferential treatment for the production and use of the improved products.
- Financial support for the production and use of the improved products.
- Financial incentives for the producers.
- Non-financial supports in respect to technical assistance, testing facilities, operational assistance, product standardization, building codes etc.

### 5. REGIONAL AND INTERNATIONAL CO-OPERATION

It is noted that several of the technologies have been well developed and in well established use in several countries while others are at advanced stages of development. This raises strong potentials for international co-operation with a view to accelerate the process of technology/process/equipment and product development and promotion. The most important candidate building materials would be:

- Mixed cements
- Modified cements
- Utilization of agricultural and industrial wastes such as fly ashes, slags, condensed silica fumes, etc.
- Pozzolanic binders
- Fibro cements
- Fibre board panels, etc.

## RECOMMENDATIONS

An attempt has been made to sieve out the critical issues pertaining to the availability and supply of the building and construction materials under the sub-chapter of "Findings" while the important determinants of an action plan are identified under the sub-chapter of "Conclusions".

In view of the necessity of finding points of convergence for regional and international co-operation as a keystone of the UNIDO System of Consultations, it is noted that a large potential seems to exist in the form of new and modified materials, technologies and techniques in many countries within and outside of the various regions that could form the basis of common and co-operative endeavours for mutual benefit. UNIDO could obviously have a significant role to play in catalyzing planning and implementation of such endeavours as would be agreed.

A brief recapitulation of key parameters and of main issues may be useful before attempting any recommendations.

- Building and construction constitute a major economic activity and consume a large proportion of national as well as individual private resources.
- Building and construction materials together with the construction techniques and systems, construction planning and management services, and land constitute the major elements of the costs and should be tackled concurrently as a system.
- Sizable proportion of building and construction as well as the production and supply of building and construction materials is undertaken in the informal sector.
- Cost escalations and supply pressures appear to have affected increasing majorities of economically weaker and low income (and some middle income) groups whereby they cannot anymore afford housing construction.
- Cost reduction for housing construction in particular by all means has thus become a common need and a predicament in all countries.

While indications have been made to tackle the cost components due to construction techniques, systems, architectural plans and designs, and construction planning and managements through planned rationalization and relevant innovation, a more detailed treatment is provided with respect to the production and supply of the building and construction materials; key issues therein being:

- Introduction of new and improved indigenous products, production systems, technologies and processes.
- Strengthening of indigenous institutional and technological capabilities.
- Development of appropriate linkages for enhanced indigenous manufacturing capabilities

and thereby,

- Accomplishing enhanced availability of, and, sizeable cost reduction in, the supply of building and construction materials.

In view of the vastness of the building and construction materials sector which covers a large number of industrial branches (such as agro industry (wood, fibres); metallic industry (iron, steel, aluminium, non-ferrous metallic products); engineering (fittings and furnishings); non-metallic minerals (cement, glass, ceramics, clay products); chemicals (plastics, paints, and the like); economic sectors, and segments of population; the desired development and promotion work can neither be perceived to be undertaken in a short span of time, nor by an individual or two. It is therefore imperative that longer term and institutional linkages should be employed for the purposes of planning, programming, implementation, monitoring and co-ordination of the development and promotion work mentioned above.

It is noted that several of the new and improved products, technologies, processes and production systems are well developed and established in several of the countries within and out of the regions; and in case of several modern products such as modified cements, reconstituted particle boards, fibre boards, gypsum boards and blocks etc.; in the industrialized countries, their involvement in any such collaborative and co-operative ventures must be sought at the very outset.

It is therefore strongly recommended that the Consultation Meeting should consider establishing a permanent group to advise on the follow-up of the regional and international co-operation ventures agreed during the meeting from amongst those indicated under Conclusions, or more specifically:

- Development and promotion of modified and mixed cements.
- Development and promotion of energy efficient smaller sized plants for cements, glass, ceramic products etc.
- Development and promotion of energy efficient technologies and processes for smaller sized plants for other alternative building materials such as chipboards, fibre boards, etc.
- Development of smaller sized plants and equipment for alternative products, i.e. lime, light weight aggregates, and agricultural/industrial wastes based building materials.
- Exchange of information and expertise with respect to R+D on new and alternative products.
- Financial and technical assistance for promotion and development work on modified and improved materials incorporating modified construction systems/practices, and architectural design choices.

## EGYPT

TABLE 1.1

(1) RELEVANT INDICATORS FOR VARIOUS COMPONENTS OF CONSTRUCTION

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
<b>EDUCATION</b>													
Total students enrolled in "000"													
- in 1st level	4.145	4.121	4.152	4.211	4.287	4.435	4.663	4.876	5.037	5.341	5.600	5.864	6.138
- in 2nd level	1.983	2.108	2.282	2.408	2.524	2.592	2.929	3.085	3.089	3.202	...	...	...
- in 3rd level	402	455	493	475	486	503	529	567	590	...	...	...	...
<b>HEALTH</b>													
Hospitals and Dispensaries	...	1.454	1.539	...	...	1.457	1.470	1.521	...	...	...	...	...
Hospitals	...	1.238	1.316	...	1.473	1.232	1.239	1.279	...	...	...	...	...
Number of beds in Hosp.+ Disp. in Hospitals	...	79.399	78.994	...	...	80.394	82.827	86.898	...	...	...	...	...
	76.294	78.968	78.454	75.681	81.254	79.990	82.416	82.462	...	...	...	...	...
<b>TOURISM/TRAVEL</b>													
Hotel beds available	43.301	43.701	44.753	45.501	49.173	57.202	61.886	62.355	64.599	64.700	64.780	65.000	65.000
<b>BUILDINGS CONSTRUCTION</b>													
Buildgs. completed	19.797	15.000	19.600	52.536	48.181	90.875	103.558	118.329	...	...	128.662	146.266	...
All dwellings	...	...	...	52.536	115.842	130.027	157.021	151.169	168.577	149.953	...	...	...
<b>TRANSPORT AND COMMUNICATIONS</b>													
Railway track (km)	...	...	...	4.335	4.385	4.667	4.667	4.385	4.385	4.385	5.110	5.110	5.110
Roads - total (kms)	...	...	...	26.596	26.596	26.596	28.620	28.620	28.620	30.079	30.160	30.500	30.950
- paved (kms)	...	...	...	12.424	12.894	13.115	13.350	10.147	10.872	14.112	14.112	14.112	14.128
- principal (kms)	...	...	...	12.130	12.130	12.130	12.660	12.660	12.660	14.119	14.200	14.300	14.450
- secondary (kms)	...	...	...	14.172	14.172	14.172	15.960	15.960	15.960	15.960	15.960	16.200	16.500
- others (kms)	...	...	...	294	294	290	...	...	...	...	...	...	...

Source: 1) African Statistical Yearbook 1986 - U.N.  
 2) UN Construction Statistics Yearbook 1985



## ETHIOPIA

TABLE 1.2.

(1) RELEVANT INDICATORS FOR VARIOUS COMPONENTS OF CONSTRUCTION

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
<u>EDUCATION</u>										
Total students enrolled										
- in 1st level "000"	1.177	1.143	1.377	1.811	2.131	2.374	2.511	2.497	2.632	2.774
- in 2nd level "000"	...	...	...	...	...	237	...	...	...	...
- in 3rd level (nos)	4.971	10.824	13.537	14.949	14.360	14.985	16.117	16.030	...	...
<u>HEALTH</u>										
Hospitals (nos)	...	110	112	...	127	...	131	...	...	...
Dispensaries+Health Centres (nos)	106	84	87	...	86	...	86	...	...	...
Number of beds in Hosp. + Disp. (nos)	8.623	8.746	9.850	...	11.147	...	11.079	...	...	...
<u>TOURISM/TRAVEL</u>										
Hotel beds available (nos)	3.481	3.481	3.481	3.568	3.568	3.568	4.184	4.670	4.700	4.800
<u>TRANSPORT AND COMMUNICATIONS</u>										
Railway track (km)	781	781	781	781	681	681	681	681	681	681
Roads-principal(km)	9.238	10.519	11.491	11.491	11.262	11.897	12.306	12.558	12.724	12.724
-secondary(km)	...	...	...	...	...	...	...	...	...	...
-others (km)	13.762	12.177	25.800	25.800	24.675	23.562	24.085	24.948	24.782	24.782
Total of	23.000	22.696	37.291	37.291	35.937	35.459	36.391	37.506	37.506	37.506
which paved	9.185	9.229	9.323	9.629	11.500	12.283	12.255	12.377	12.390	12.431
<u>BUILDINGS CONSTRUCTION</u>										
Buildings completed	...	...	...	...	...	...	...	...	...	...
Bldg. permits issued	1.193	1.445	3.065	1.704	3.689	1.800	...	...	...	...

Source: 1) African Statistical Yearbook 1986 - U.N.  
 2) UN Construction Statistics Yearbook 1985

## KENYA

TABLE 1.3

(1) RELEVANT INDICATORS FOR VARIOUS COMPONENTS OF CONSTRUCTION

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
<u>EDUCATION</u>										
Total students enrolled										
- in 1st level "000"	2.895	2.975	2.995	3.698	3.927	3.982	4.185	4.324	4.380	4.703
- in 2nd level "000"	289	329	371	394	428	422	450	517	502	...
- in 3rd level (nos)	...	9.146	9.904	11.746	12.986	13.398	...	22.157	...	...
<u>HEALTH</u>										
Hospitals and Dispensaries (nos)	...	...	...	459	459	...	...	504	506	...
Number of beds in Hosp. + Disp. (nos)	17.896	...	...	26.922	26.900	...	...	29.294	30.888	...
<u>TOURISM/TRAVEL</u>										
Hotel beds availabl. (nos)	19.131	19.256	20.158	22.123	23.400	24.050	24.050	24.050	24.100	24.200
<u>TRANSPORT AND COMMUNICATIONS</u>										
Railway track (km)	2.668	2.668	2.568	2.668	2.668	2.668	2.668	2.668	2.652	2.652
Roads-Total (km)	50.091	50.469	50.731	51.368	51.472	54.605	57.945	59.584	65.150	65.260
-paved (km)	4.270	4.376	4.331	5.356	5.542	6.540	6.330	7.944	8.105	8.690
-principal (km)	5.383	5.400	5.490	6.139	6.148	6.380	6.381	6.381	6.400	6.510
-secondary (km)	18.190	18.044	18.044	17.360	17.399	18.295	18.876	18.857	18.900	18.900
-others (km)	26.518	27.025	27.197	27.369	27.925	29.930	32.688	34.346	39.850	39.850
<u>BUILDING CONSTRUCTION</u>										
Buildings completed (nos) ...	...	...	...	...	...	...	...	...	...	...
Bldg. permits issued (nos)	2.262	3.662	4.002	3.726	3.849	5.438	3.385	2.001	2.030	2.294

Source: 1) U.N. African Statistical Yearbook 1986  
2) U.N. Construction Statistics Yearbook 1985

## TANZANIA

TABLE 1.4

## (1) RELEVANT INDICATORS FOR VARIOUS COMPONENTS OF CONSTRUCTION

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
<b>EDUCATION</b>										
Total students enrolled										
- in 1st level "000"	1.956	2.973	2.990	3.212	3.367	3.538	3.513	3.553	3.593	3.633
- in 2nd level "000"	68	...	...	79	79	76	79	82	...	...
- in 3rd level (nos)	3.096	2.534	4.892	4.031	...	...	...	...	...	...
<b>HEALTH</b>										
Hospitals	147	148	148	149	149	149	149	...	...	...
Dispensaries	2.088	2.258	2.487	2.883	80	80	...	...	...	...
Number of beds in										
Hospitals	19.680	19.823	20.847	21.291	21.352	22.350	...	...	...	...
Dispensaries	12.334	12.634	13.130	13.785	...	...	...	...	...	...
<b>TOURISM/TRAVEL</b>										
Hotel beds available (nos)	6.541	6.100	6.470	6.880	7.219	8.093	8.590	5.600	5.690	5.700
<b>TRANSPORT AND COMMUNICATIONS</b>										
Railroad Track (km)	2.600	2.600	2.600	2.600	2.600	2.600	2.600	2.600	2.580	2.580
Roads-total (km)	23.869	35.435	34.665	45.351	45.631	53.613	53.613	67.754	81.895	81.948
-paved (km)	3.134	3.150	3.190	3.220	3.377	2.681	3.217	3.194	3.220	3.360
-principal (km)	4.829	7.230	7.230	9.116	9.381	16.613	16.613	17.175	17.738	17.738
-secondary (km)	9.562	8.870	8.100	7.694	7.750	17.665	17.665	29.833	42.000	42.000
-others (km)	9.478	19.335	19.335	28.541	28.507	19.335	19.335	20.746	22.157	22.210
<b>BUILDING CONSTRUCTION</b>										
Buildings completed	...	...	...	...	...	5.077	3.285	...	...	...
Bldg. permits issued	...	...	...	...	...	...	...	...	...	...

Source: 1) U.N. African Statistics Yearbook 1986  
 2) U.N. Construction Statistics Yearbook 1985

TANZANIA

TABLE 1.4.a

(1) OTHER RELEVANT INDICATORS

	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
<u>EDUCATION</u>										
Public Primary Schools (nos)				9.794	9.897	9.947	10.002	10.015		
Public Secondary Schools (nos)				83	83	83	85	85		
Private Secondary Schools (nos)				69	71	75	82	84		
Technical Colleges (nos)				2	2	2	2	2		
Teacher Training Colleges (nos)				35	35	36	37	38		
Universities (nos)				1	1	1	1	1		
<u>HEALTH</u>										
Hospitals (nos)	147	148	148	149	149	149	149	149	152	152
Health Centres (nos)	161	181	202	235	239	239	239	239	239	260
Dispensaries (nos)	1.847	1.997	2.205	2.568	2.600	2.644	2.644	2.644	2.644	2.831*
<u>COMMUNICATIONS</u>										
Telephone exchanges (nos)	134	138	141	145	146	148	150	151	151	
Telex exchanges (nos)	2	2	2	2	2	3	3	3	3	
Telegraph offices (nos)	135	136	141	148	149	149	151	153	154	
Radio stations (nos)	3	3	3	3	3	3	3	3	3	
<u>TOURISM</u>										
Hotel rooms nights available ('000)						1.597	1.669	1.758	1.687	

\*Excluding parastatal and private dispensaries

Source: Statistical Abstract, Bureau of Statistics, Feb. 1986  
Government of URT

PAKISTAN

TABLE 1.5

(1) RELEVANT INDICATORS FOR VARIOUS COMPONENTS OF CONSTRUCTION

	<u>1977/78</u>	<u>1978/79</u>	<u>1979/80</u>	<u>1980/81</u>	<u>1981/82</u>	<u>1982/83</u>	<u>1983/84</u>	<u>1984/85</u>	<u>1985/86</u>	<u>1986/87</u>
<u>TRANSPORT + COMMUNICATIONS</u>										
Railway track (km)	12.515	12.515	12.515	12.607	12.607	12.607	12.583	12.593	12.620	12.620
Road (km)	36.468	37.279	38.405	40.143	42.535	44.669	46.848	49.457	53.020	59.630
Telegraph offices (nos)	223	231	237	252	278	294	310	341	387	420
Telex Exchanges (nos)	9	9	9	11	11	11	11	11	11	11
Centex exchanges (nos)	8	9	9	9	9	10	10	10	10	10
Post offices (nos)	9.886	10.488	11.088	11.238	11.388	11.528	11.698	11.898	12.006	12.226
<u>HEALTH</u>										
Hospitals (nos)	536	550	602	600	613	626	633	652	670	679
Dispensaries (nos)	3.306	3.307	3.466	3.478	3.459	3.351	3.386	3.422	3.441	3.501
Maternity+Child Welfare Centres (nos)	740	772	812	823	817	794	767	798	773	798
<u>EDUCATION</u>										
Primary schools (nos)	53.802	55.265	57.220	59.168	61.117	63.066	72.758	73.812	77.207	80.757
Middle schools (nos)	5.100	5.194	5.233	5.295	5.362	5.432	5.984	6.132	6.266	6.422
Secondary schools (nos)	3.461	3.544	3.580	3.710	3.844	3.978	4.489	4.630	4.677	4.727
Arts + Science colleges (nos)	430	429	430	434	450	500	469	467	470	473
Professional colleges (nos)	95	99	99	100	102	102	99	99	100	100
Universities (nos)	15	15	15	19	20	20	20	21	22	22

Source: Pakistan Statistics Yearbook 1988

INDIA

TABLE 1.6

(1) RELEVANT INDICATORS FOR VARIOUS COMPONENTS OF CONSTRUCTION

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
<u>HEALTH</u>											
Hospitals (nos)	4.023	4.465	5.445	5.815	6.625	6.670	6.805	6.901			
Dispensaries (nos)	11.295	11.691	12.656	14.828	15.599	15.968	16.754	17.455			
<u>EDUCATION</u>											
Classes I-V ('000')			457	465	475	478					
Classes VI-VIII ('000)			109	110	111	115					
Classes IX-XI/XII ('000)			44	47	48	49					
<u>TRANSPORT AND COMMUNICATIONS</u>											
Railways (km)							61.240	61.230	61.385		
Roads (km '000)							692	725	759		
Major ports (nos)							10	10	10		
Post offices ('000)							139	141	142		
Telegraph offices (nos)							31.457	33.616	35.890		
Telex exchanges (nos)							147	157	170		

Source: Indian Statistical Yearbook 1986

## THAILAND

TABLE 1.7

(1) RELEVANT INDICATORS FOR VARIOUS COMPONENTS OF CONSTRUCTION

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<u>TRANSPORT AND COMMUNICATIONS</u>											
Railroad (km)	3.765	3.735	3.735	3.735	3.735	3.735	3.735	3.735	3.735	3.728	...
Roads											
- Total (kms)	22.882	25.066	27.498	28.151	30.016	31.001	33.148	34.702	36.235	37.725	...
- paved (kms)	17.138	18.972	21.742	22.404	24.715	25.765	28.016	29.738	31.255	33.000	...
- gravel/stone/stabilized soil (kms)	5.744	6.094	5.756	5.747	5.301	5.236	5.132	4.964	4.980	4.724	...
earth graded or drained (kms)	...	...	...	...	...	...	...	...	...	...	...
<u>TRAVEL/TOURISM</u>											
Hotel rooms (nos)	30.058	37.959	41.805	46.072	61.302	73.938	91.389	99.342	110.003	...	...
Beds (nos)	60.116	75.918	83.610	92.144	122.604	147.876	182.778	198.684	220.000	...	...
<u>EDUCATION</u>											
Pre-schools (nos)	3.174	4.230	4.275	5.065	5.105	5.193	7.399	8.804	...	...	...
1st level (nos)	...	32.485	32.588	32.961	33.315	33.268	33.156	33.086	...	...	...
2nd level (nos)	...	3.104	3.131	3.291	3.489	3.496	3.658	3.761	...	...	...
3rd level (nos)	...	23	24	25	25	26	26	30	31	...	...
<u>HEALTH</u>											
Hospitals (nos)	555	630	671	719	747	785	879	916	927	944	...
Beds (nos)	63.353	65.389	68.076	71.762	72.368	74.725	78.438	81.070	82.612	84.438	...

Source: UN Statistical Yearbook for Asia and the Pacific - 1988

PHILIPPINES

TABLE 1.8

(1) RELEVANT INDICATORS FOR VARIOUS COMPONENTS OF CONSTRUCTION

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<b>TRANSPORT AND COMMUNICATIONS</b>											
Railroad (kms)	1.069	1.072	1.072	1.059	1.059	1.059	...	...	...	...	...
<b>Roads</b>											
Total (kms)	119.220	125.136	147.609	151.919	153.528	154.473	155.671	157.139	161.709	...	...
paved (kms)	20.485	21.501	27.445	27.719	27.736	19.461	19.816	20.028	21.238	...	...
gravel/stone/stabilized soil (kms)	51.643	54.205	67.810	70.285	70.582	124.596	125.902	127.531	130.749	...	...
earth graded or drained (kms)	45.266	47.512	52.355	53.915	55.211	10.417	9.953	9.580	9.722	...	...
other roads	1.826	1.917	...	...	...	...	...	...	...	...	...
<b>TRAVEL/TOURISM</b>											
Hotel rooms (nos)	11.055	10.763	10.572	10.434	10.692	18.280	18.375	16.372	16.484	...	...
Beds (nos)	22.110	21.526	21.144	20.868	21.384	36.560	36.750	32.742	32.968	...	...
<b>EDUCATION</b>											
Pre-schools (nos)	...	...	...	2.229	2.243	2.020	2.358	2.310	2.334	...	...
1st level (nos)	31.067	31.519	31.494	31.455	31.729	32.114	32.800	33.074	33.104	...	...
2nd level (nos)	5.486	5.129	5.144	5.156	5.354	5.327	5.430	5.388	...	...	...
3rd level (nos)	1.023	947	1.098	1.084	1.038	1.063	1.157	1.178	...	...	...
<b>HEALTH</b>											
Hospitals (nos)	1.149	1.213	1.500	1.600	1.599	1.713	1.705	1.739	1.814	...	...
Beds (nos)	78.901	81.646	84.138	87.987	84.804	88.250	85.050	90.279	85.008	...	...

Source: UN Statistical Yearbook for Asia and the Pacific - 1988



TABLE 2.2

(2) NEW BUILDING CONSTRUCTION AUTHORIZED

Items	Unit	1979	1980	1981	1982	1983
<b>GENERAL INDICATORS OF ACTIVITY</b>						
Value added *	10 <sup>6</sup> birr	229.4	295.6	320.8	325.6	346.0
<b>NEW BUILDING CONSTRUCTION AUTHORIZED</b>						
<b>All buildings:</b>						
Number	No <sub>3 2</sub>	1 704	3 700	1 800	1 294	2 108
Floor area	10 <sub>3 m</sub>	143.6	211.6	194.3	110.4	204.6
Tender value	10 <sup>3</sup> birr	32 636	55 403	37 369	31 983	65 886
<b>Non-residential buildings:</b>						
Number	no <sub>3 2</sub>	67	85	61	83	92
Floor area	10 <sub>3 m</sub>	20.8	42.3	32.3	19.8	46.9
Tender value	10 <sup>3</sup> birr	6 067	12 516	8 603	6 355	25 482
<b>Industrial buildings:</b>						
Number	No <sub>3 2</sub>	...	7	1	...	11
Floor area	10 <sub>3 m</sub>	...	2.1	0.2	...	5.4
Tender value	10 <sup>3</sup> birr	...	571	10	...	2 271
<b>Commercial buildings:</b>						
Number	No <sub>3 2</sub>	26	36	51	76	44
Floor area	10 <sub>3 m</sub>	11.1	18.0	24.9	17.6	12.0
Tender value	10 <sup>3</sup> birr	1 884	3 387	5 236	6 082	7 003
<b>Educational buildings:</b>						
Number	No <sub>3 2</sub>	6	4	6	5	5
Floor area	10 <sub>3 m</sub>	1.9	2.9	1.9	2.0	6.9
Tender value	10 <sup>3</sup> birr	372	1 620	336	213	820
<b>Other buildings **</b>						
Number	No <sub>3 2</sub>	35 ***	38	3	2 ***	32
Floor area	10 <sub>3 m</sub>	7.8 ***	19.3	5.3	0.2 ***	22.6
Tender value	10 <sup>3</sup> birr	3 811 ***	6 938	3 021	60 ***	15 388
<b>Residential buildings:</b>						
Number	No <sub>3 2</sub>	1 637	3 615	1 739	1 211	2 016
Floor area	10 <sub>3 m</sub>	122.8	169.3	162.0	90.6	157.7
Tender value	10 <sup>3</sup> birr	26 569	42 887	28 766	25 628	40 364

\*Fiscal year ending 7 July of the year stated.

\*\*Including health buildings.

\*\*\*Including industrial buildings.

Source: UN Construction Statistics Yearbook 1985

## KENYA

TABLE 2.3

(2) NEW BUILDING CONSTRUCTION AUTHORIZED AND COMPLETED

	1979	1980	1981	1982	1983	1984	1985
<u>NEW BUILDING CONSTRUCTION AUTHORIZED</u>							
<b>All buildings:</b>							
Number .....	No <sub>3</sub>	3 726	3 849	5 438	3 385	2 007	2 294
Tender value .....	10 <sup>3</sup> pounds	96 497	125 965	121 495	111 537	75 818	83 475
<b>Residential buildings:</b>							
Number .....	No <sub>3</sub>	2 699	3 145	4 608	2 343	1 351	1 458
Tender value .....	10 <sup>3</sup> pounds	48 907	67 025	72 976	63 337	33 006	28 655
<b>Non-residential buildings:</b>							
Number .....	No <sub>3</sub>	1 027	704	830	1 042	650	572
Tender value .....	10 <sup>3</sup> pounds	47 590	58 940	48 519	48 200	42 812	54 820
<u>NEW BUILDINGS COMPLETED</u>							
<b>All buildings:</b>							
Number .....	No <sub>3</sub> <sup>2</sup>	3 061	2 078	1 624	1 699	1 870	695
Floor area .....	10 <sup>3</sup> m <sup>2</sup>	436	1 224	798	343	267	155
Value .....	10 <sup>3</sup> pounds	30 992	43 849	41 360	35 594	43 745	25 787
<b>Residential buildings:</b>							
Number .....	No <sub>3</sub> <sup>2</sup>	2 953	1 946	1 549	1 592	1 778	648
Floor area .....	10 <sup>3</sup> m <sup>2</sup>	350	306	613	252	148	118
Value .....	10 <sup>3</sup> pounds	24 418	25 269	23 355	26 562	24 599	20 195
<b>Non-residential buildings:</b>							
Number .....	No <sub>3</sub> <sup>2</sup>	108	132	75	107	92	47
Floor area .....	10 <sup>3</sup> m <sup>2</sup>	86	918	185	91	119	37
Value .....	10 <sup>3</sup> pounds	6 574	18 580	18 014	9 032	19 146	5 592

Source: UN Construction Statistics Yearbook 1985

INDIATABLE 2.6.(2) NEW BUILDING CONSTRUCTION AUTHORIZED AND COMPLETED

	1979	1980	1981	1982	1983	1984
<u>NEW BUILDING CONSTRUCTION AUTHORIZED</u>						
All buildings:						
Number ..... No.	97 848	97 500	104 645	117 213	121 173	127 936
Residential buildings:						
Number ..... No.	84 721	82 413	90 344	101 589	105 300	111 312
Non-residential buildings:						
Number ..... No.	13 127	15 087	14 301	15 624	15 873	16 624
<u>NEW BUILDINGS COMPLETED</u>						
All buildings:						
Number ..... No.	53 627	57 631	56 137	78 352	78 270	87 637
Residential buildings:						
Number ..... No.	44 702	46 957	46 493	66 207	65 839	73 729
Non-residential buildings:						
Number ..... No.	8 925	10 674	9 644	12 145	12 431	13 908

<sup>1</sup>Including residential construction of public sector enterprises and private corporate enterprises.

Source: UN Construction Statistics Yearbook 1985

THAILAND

TABLE 2.7.

(2) NEW BUILDING CONSTRUCTION AUTHORIZED

	1979	1980	1981	1982	1983	1984	1985
All buildings:							
Floor area ..... $10^3 \text{ m}^2$	10 610	10 288	8 836	8 620	9 600	11 332	10 259
Residential buildings:							
Floor area ..... $10^3 \text{ m}^2$	2 804	2 977	4 040	4 535	5 463	5 997	5 391
Non-residential buildings:							
Floor area ..... $10^3 \text{ m}^2$	7 806	7 311	4 796	4 085	4 137	5 335	4 868
Industrial buildings:							
Floor area ..... $10^3 \text{ m}^2$	198	143	114	79	85	75	71
Commerical buildings:							
Floor area ..... $10^3 \text{ m}^2$	7 222	6 570	4 099	3 377	3 483	4 334	3 928
Other buildings: <sup>1</sup>							
Floor area ..... $10^3 \text{ m}^2$	386	598	583	629	569	926	869

<sup>1</sup>Including educational and health buildings.

Source: UN Construction Statistics Yearbook 1985

PHILIPPINES

TABLE 2.8.

(2) NEW BUILDING CONSTRUCTION AUTHORIZED

	1979	1980	1981	1982	1983	1984	1985	
<b>All buildings:</b>								
Number <sup>1</sup> .....	No. <sub>3</sub> 2	26 447	26 861	28 758	29 954	36 728	30 996	23 051
Floor area .....	10 <sub>6</sub> m <sup>2</sup>	5 471	5 353	5 182	4 907	6 849	5 043	4 294
Tender value .....	10 <sup>6</sup> pesos	4 531.5	5 049.1	5 706.2	5 379.6	7 656.0	6 416.0	7 595.0
<b>Residential buildings:</b>								
Number <sup>1</sup> .....	No. <sub>3</sub> 2	21 753	21 966	23 922	26 352	32 883	28 094	20 244
Floor area .....	10 <sub>6</sub> m <sup>2</sup>	2 689	2 554	2 477	2 748	3 575	3 131	2 124
Tender value .....	10 <sup>6</sup> pesos	2 107.2	2 339.1	2 496.5	2 967.7	4 114.6	4 153.7	3 101.3
<b>Non-residential buildings:</b>								
Number <sup>1</sup> .....	No. <sub>3</sub> 2	4 694	4 895	4 836	3 602	3 845	2 902	2 807
Floor area .....	10 <sub>6</sub> m <sup>2</sup>	2 782	2 799	2 705	2 159	3 274	1 912	2 170
Tender value .....	10 <sup>6</sup> pesos	2 424.3	2 710.0	3 209.7	2 411.9	3 541.4	2 262.3	4 493.7
<b>Industrial buildings:</b>								
Number .....	No. <sub>3</sub> 2	...	...	992	805	661	559	559
Floor area .....	10 <sub>6</sub> m <sup>2</sup>	...	...	719	494	1 534	400	335
Tender value .....	10 <sup>6</sup> pesos	...	...	852.5	427.9	1 568.0	526.7	401.7
<b>Commercial buildings:</b>								
Number .....	No. <sub>3</sub> 2	...	...	1 651	1 466	1 652	1 336	1 241
Floor area .....	10 <sub>6</sub> m <sup>2</sup>	...	...	1 259	1 047	1 053	698	1 208
Tender value .....	10 <sup>6</sup> pesos	...	...	1 638.4	1 368.6	1 356.8	827.4	3 212.9
<b>Educational buildings:<sup>2</sup></b>								
Number .....	No. <sub>3</sub> 2	...	...	1 873	1 123	1 319	847	825
Floor area .....	10 <sub>6</sub> m <sup>2</sup>	...	...	562	522	575	761	577
Tender value .....	10 <sup>6</sup> pesos	...	...	594.5	559.6	547.7	847.7	828.8
<b>Other buildings:<sup>3</sup></b>								
Number .....	No. <sub>3</sub> 2	...	...	320	208	213	160	182
Floor area .....	10 <sub>6</sub> m <sup>2</sup>	...	...	165	96	112	53	50
Tender value .....	10 <sup>6</sup> pesos	...	...	124.3	55.8	60.9	60.5	50.3

<sup>1</sup> Number of permits.

<sup>2</sup> Educational, health, religious, residential, welfare and charitable buildings.

<sup>3</sup> Agricultural buildings.

Source: UN Construction Statistics Yearbook 1985

## EGYPT

TABLE 3.1.  
(3) CONSTRUCTION INDUSTRY INDICATORS

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
<b>COMPOSITION OF GROSS CAPITAL FORMATION AT CURRENT PURCHASER'S VALUE (in £E millions)</b>													
	--	--	--	1838	2610	3346	4655	4930	5367	6721	7755	9610	10270
<b>By type of goods</b>													
Buildings	--	--	--	--	--	--	--	--	--	--	--	--	--
Other construction	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>GDP by kind of economic activity</b>													
Construction	--	--	--	357	517	647	761	828	1281	1466	1619	1875	2231
Total	--	--	--	7400	6854	11911	15930	19561	23059	27836	32092	38555	45004
<b>NUMBER OF ESTABLISHMENTS</b>													
(numbers)	--	--	--	--	--	2705	2956	3102	--	--	--	--	--
<b>VALUE OF TOTAL OUTPUT</b>													
(£E million)	--	--	--	--	--	1249.4	1206.4	1863.5	--	--	--	--	--
VALUE ADDED (£E million)	--	--	--	--	--	475.5	581.9	521.7	--	--	--	--	--
<b>INDEX OF CONSTRUCTION ACTIVITY</b>													
	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>PRICE INDEX NUMBERS (1970=100)</b>													
General	128.0	138.1	141.9	155.7	184.9	194.5	256.8	260.8	--	--	--	--	--
Building Materials	138.0	166.3	169.9	185.3	233.8	296.5	385.7	413.6	--	--	--	--	--

Source: UN Construction Statistics Yearbook 1985.

EGYPT

TABLE 3.1.a  
(3) TOTAL AND URBAN POPULATION

	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Total mid-year population in "000"	36.220	36.997	37.841	39.041	40.095	41.177	42.289	43.465	44.673	45.915	47.191	48.503	49.609
Urban (percentage)	43.60	40.70	41.00	44.00	44.30	44.50	44.70	45.00	45.38	45.72	46.06	46.40	46.88

Source: UN Construction Statistics Yearbook 1985.

**ETHIOPIA**

**TABLE 3.2.**  
**(3) CONSTRUCTION INDUSTRY INDICATORS**

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
<b>COMPOSITION OF GROSS CAPITAL FORMATION</b>												
<b>AT CURRENT PURCHASER'S VALUE (in million "BIRR")</b>												
Total	--	--	606	545	498	881	854	922	1082	1119	1327	1040
<b>GCF by type of goods</b>												
Buildings	--	--	--	--	--	--	--	--	--	--	--	--
Other construction	--	--	--	--	--	--	--	--	--	--	--	--
<b>GCF by kind of economic activity</b>												
Construction	--	--	5	22	--	--	--	--	--	--	--	--
<b>GDP by kind of economic activity (at current factor cost)</b>												
Construction	--	--	239	211	229	301	296	321	326	346	386	354
Total	--	--	6146	6490	7087	7629	7625	8100	8299	9068	8997	9715
<b>NUMBER OF ESTABLISHMENTS</b>												
(numbers)	--	--	--	--	--	--	--	--	--	--	--	--
<b>VALUE OF TOTAL OUTPUT</b>												
(million birr)	--	--	--	--	--	--	--	--	--	--	--	--
VALUE ADDED (million birr)	--	--	--	--	--	229.4	295.6	320.8	325.8	346.0	--	--
<b>INDEX OF CONSTRUCTION ACTIVITY</b>												
	--	--										
<b>PRICE INDEX NUMBERS (1970=100)</b>												
General												
Building Materials												

Source: UN Construction Statistics Yearbook 1985.



ETHIOPIA

TABLE 3.2.a  
(3) POPULATION

	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Total mid-year population in "000"	--	--	34.978	35.660	36.355	37.064	37.787	38.845	39.932	41.051	42.200	43.382
Urban (percentage)	--	--	9.70	9.90	10.10	10.30	10.50	10.72	10.94*	11.16*	11.38*	11.60*

Source: UN Construction Statistics Yearbook 1985.

KENYA

TABLE 3.3.  
(3) CONSTRUCTION INDUSTRY INDICATORS

	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
<u>COMPOSITION OF GROSS CAPITAL FORMATION AT CURRENT PURCHASER'S VALUE</u> (in ten thousand Kenyan pounds)										
	29040	39000	51400	54045	62253	72541	66833	72089	76540	84846
<u>GCF by type of goods</u>										
Buildings	7596	9084	11611	16244	19520	22136	22106	19967	--	--
Other construction	6576	7667	8611	8467	11439	13870	14379	13296	--	--
<u>GDP by kind of economic activity (at current factor cost)</u>										
Construction	6708	7993	9780	11445	14674	16860	16954	20269	21893	22628
Total	127810	164065	178841	197487	223241	258345	294462	331663	365454	412620
<u>NUMBER OF ESTABLISHMENTS (numbers)</u>										
	--	--	--	105	107	115	139	144	172	166
<u>VALUE OF TOTAL OUTPUT ('000' pounds)</u>										
	--	--	--	109868	154576	190789	191641	182190	176290	199406
<u>VALUE ADDED ('000' pounds)</u>										
				30283	42235	52294	58136	62559	56749	61211
<u>INDEX OF CONSTRUCTION ACTIVITY</u>										
<u>PRICE INDEX NUMBERS (1970=100)</u>										
General										
Building Materials										

Source: UN Construction Statistics Yearbook 1985.

KENYA

TABLE 3.3. a.  
(3) POPULATION

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Total (mid-year) in "000"	14249	14848	15471	16121	16798	17436	18098	18786	19580	20241
Urban (percentage)	13.54	14.14	14.78	15.54	16.10	16.82	17.54	18.26	18.98	19.70

TANZANIA

TABLE 3.4.  
(3) CONSTRUCTION INDUSTRY INDICATORS

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
<u>COMPOSITION OF GROSS CAPITAL FORMATION AT CURRENT PURCHASER'S VALUE</u> (in million T. shillings)										
	4456	5159	6337	7723	8388	9377	10251	8894	9643	12141
<u>By type of goods</u>										
Buildings	956	1105	1295	1565	1835	2447	2416	2154	--	--
Other construction	--	1021	762	1132	1775	1868	1075	2997	--	--
<u>GDP by kind of economic activity (at current factor cost)</u>										
Construction (million T. shillings)	712	866	921	1129	1498	1614	1863	1252	1721	1895
Total	20645	26569	29557	32579	37454	43906	52546	61035	74608	97767
<u>NUMBER OF ESTABLISHMENTS (numbers)</u>										
	--	--	--	--	--	--	--	--	--	--
<u>VALUE OF TOTAL OUTPUT</u> (million T. shillings)										
	--	--	--	3399	4194	4319	5108	3282	4583	5037
<u>VALUE ADDED (million T. shillings)</u>										
	--	--	--	1229	1498	1614	1863	1252	1721	1895
<u>INDEX OF CONSTRUCTION ACTIVITY</u>										
<u>PRICE INDEX NUMBERS (1970=100)</u>										
General										
Building Materials										

Source: UN Construction Statistics Yearbook 1985.

TANZANIA

TABLE 3.4.a  
(3) POPULATION

	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Total (mid-year) in "000"	16443	17005	17587	18188	18868	19535	20230	20954	21710	22499
URBAN (percentage)	11.38	12.66	13.92	15.22	16.50	17.66	18.82	19.98	21.14	22.30

Source: UN African Statistical Yearbook 1986

PAKISTAN

TABLE 3.5.  
(3) CONSTRUCTION INDUSTRY INDICATORS

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<u>GDP IN CURRENT MARKET PRICES</u>											
Total (million rupees)	149748	176419	195109	234528	277961	321840	362165	418201	477982	539537	602188
Construction (million rupees)	7573	8074	9667	11906	11449	12247	14567	19325	26464	30421	85261
<u>GENERAL INDICATORS OF ACTIVITY</u>											
Value constr. put in place (10 <sup>6</sup> rupees)											
New constr. & cap. repairs (10 <sup>6</sup> rupees)			19402	23194	28921	31270	33995	37849			
Buildings (10 <sup>6</sup> rupees)			10874	13548	15412	17237	21202	23069			
- Residential			4052	4697	5710	7112	7673	8490			
- Non-residential			6822	8851	9702	10125	13529	14579			
Civil Engineering			8528	9646	13509	14033	12793	14780			
Value added			11906	11449	12247	14567	19325	20397	22929		
<u>FIXED ASSETS</u>											
Gross additions to fixed assets			97	145	228	485	322	493	655		

Sources:

- 1) Un Statistical Yearbook for Asia and the Pacific 1988
- 2) UN Construction Statistics Yearbook 1985.

INDIA

TABLE 3.6.  
(3) CONSTRUCTION INDUSTRY INDICATORS

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<u>GDP IN CURRENT MARKET PRICES</u>											
Total (billion rupees)	898.5	977.5	1074.4	1358.1	1594.2	1775.9	2072.7	2295.4	2617.3	2927.9	--
Construction (million rupees)	45.4	46.6	47.0	61.1	70.0	80.8	88.8	102.3	118.0	135.8	--
<u>GENERAL INDICATORS OF ACTIVITY</u>											
Value constr. put in place (10 <sup>6</sup> rupees)			131690	156989	185823	220788	251356	292467	340100		
New constr. & cap. repairs (10 <sup>6</sup> rupees)			109550	130152	153412	182177	207006	240610	278011		
Buildings (10 <sup>6</sup> rupees)			54126	67534	78174	94751	108985	130848	155034		
- Residential			34526	40872	50933	61758	74886	86606	102167		
- Non-residential			19600	26662	27241	32993	34099	44242	52867		
Civil Engineering			55424	62618	75238	87426	98021	109762	122977		
Current repairs and maint.			22140	26837	32411	38611	44350	51857	62089		
Value added			46990	56713	62560	76294	85733	100404	116295		
<u>FIXED ASSETS</u>											
Gross additions to fixed assets			3664	4039	4985	5447	5274	6334	--		

Sources:

- 1) Un Statistical Yearbook for Asia and the Pacific 1988
- 2) UN Construction Statistics Yearbook 1985.

**THAILAND**

TABLE 3.7.  
(3) CONSTRUCTION INDUSTRY INDICATORS

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
<u>GDP IN CURRENT MARKET PRICES</u>											
Total (billion baht)	403.53	488.23	558.86	658.51	760.20	820.00	910.05	973.41	1014.4	1099.54	1223.22
Construction (billion baht)	19.72	24.39	27.00	34.76	38.14	41.50	47.98	56.09	56.82	56.56	62.09
<u>GENERAL INDICATORS OF ACTIVITY</u>											
Value constr. put in place (10 <sup>6</sup> baht)											
New constr. & cap. repairs <sup>1</sup> (10 <sup>6</sup> baht)				64413	87549	93497	96398	109288	121816	125077	
Buildings (10 <sup>6</sup> baht)				47383	56747	64876	58736	65277	70329	71163	
- Residential				17484	19269	26524	29685	37549	39754	39052	
- Non-residential				29899	37478	38352	29051	27728	30575	32111	
Civil Engineering				17030	30802	28621	37662	44011	51487	53914	
Value added (10 <sup>6</sup> baht)				29240	39865	42008	43040	47129	52772	54373	

Sources:

- 1) UN Statistical Yearbook for Asia and the Pacific 1988
- 2) UN Construction Statistics Yearbook 1985.



PHILIPPINES

TABLE 3.8.  
(3) CONSTRUCTION INDUSTRY INDICATORS

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
<u>GDP IN CURRENT MARKET PRICES</u>											
Total (million Pesos)	155631	178603	220477	266008	305274	340585	384095	540466	609459	626717	--
Construction (million Pesos)	11356	12525	17769	21311	26268	29302	30730	31209	27506	22685	--
<u>GENERAL INDICATORS OF ACTIVITY</u>											
Number stat. units (estab.)											
Value of total output (10 <sup>6</sup> pesos)			8311.3	10257.1	11579.0	11178.3	14316.0	14888.5			
Value constr. put in place (10 <sup>6</sup> pesos)			7270.8	8486.8	10596.5	10188.9	13142.5	13393.2			
Value added (10 <sup>6</sup> pesos)			4586.7	5439.6	5950.3	4955.6	6522.9	6257.7			
<u>FIXED ASSETS</u>											
Gross additions to fixed assets (10 <sup>6</sup> pesos)			619.9	710.6	739.9	490.8	535.5	215.8			
New fixed assets acquired (10 <sup>6</sup> pesos)			583.2	501.7	507.9	430.8	330.8	191.5			

Sources:

- 1) UN Statistical Yearbook for Asia and the Pacific 1988
- 2) UN Construction Statistics Yearbook 1985.

ANNEX IV

LIST OF PERSONS MET

I. CAIRO

A. UNDP/UNIDO

1. Mr. T. Sabri, Senior Programme Officer, UNDP
2. Mrs. O. Gamaa, Regional Officer, UNIDO

B. MINISTRY OF INDUSTRY AND MINERAL WEALTH

1. Engr. Hosni M. Ismail, Chairman, Mining and Refractory Industries Corp.
2. Chemist Abdalla Darwish, Technical Director, Mining and Refractory Industries Corporation
3. Dr. Engr. Yusuf Mazhar, First Under-Secretary, Ministry of Industry
4. Mr. Saad E.I. Iman, First Under-Secretary and Technical Director, Public Corporation for Chemical Industries
5. Mr. Adel A. Danaf, Chairman, Metallurgical Industries Corporation
6. Engr. Fathallah Kamal, Technical Director, Metallurgical Ind. Corp.
7. Engr. Mahmood, Manager, Metallurgical Industries Corporation
8. Dr. Engr. A. Mongi, Chairman, General Organization for Industrialization
9. Dr. Engr. I. Ismail Abdel Latif, General Director, Chemical Building Materials and Refractory Industries, General Organization for Industrialization
10. Engr. Lily, Specialist on Building Materials, G.O.F.I.
11. Engr. Ibrahim, Specialist on Paints
12. Engr. Jehan Safwat, Specialist on Building Materials
13. Engr. Handy, Deputy General Director, Engineering Dept. GOFI

C. MINISTRY OF HOUSING AND RECONSTRUCTION

1. Mr. Mohy-al-din Al Naggar, First Under-Secretary, Ministry of Housing and Reconstruction
2. Engr. Ahmad Fakhar-El-Din El-Daly, Chairman, Building Materials Org.
3. Mr. Esam Zedan, Chief, Development Administration Sector, Building Materials Org. (Director Development)
4. Mr. Ismail Mohamed Gharib, Chief, Economic Affairs Sector, Building Materials Org. (Director Economic Affairs)
5. Mr. Ahmad Ahmad Bakr, Chief, Financial and Commercial Affairs Sector and Member Board (Director Finance and Commerce) TARAH Portland Cement Company
6. Mr. M. Yosri Hassen Osman, General Manager, Costing and Balance, Building Materials Organization
7. Mr. Mohamed El Ashri, Manager Projects, Building Materials Org.

II. ADDIS ABABA

A. UNDP/UNIDO/ECA

1. Mr. K. Vencatachelum, SIDFA
2. Mr. J. Brissan, JPO
3. Mr. G. Dossi, Junior Expert, UNIDO/Italy Marble Industry Rehabilitation Project
4. Mr. O. Laye, Physical Planner, Human Settlement Division, ECA

**B. MINISTRY OF CONSTRUCTION**

1. Comrade Gebre Admassu, Vice Minister
2. Ato Aberra Wolde-Sadik, Head, Planning and Programming Department
3. Ato Abraham Workneh, General Manager, Ethiopian Construction Materials Corporation
4. Mr. Tedla Getachew, Head, Planning Department, Ethiopian Construction Materials Corporation
5. Ato Berekat Mazengia, Manager, P.K.G. Plant (Pumice Lime Blocks)

**C. MINISTRY OF INDUSTRIES**

1. Ato Akberom Tedla, General Manager, Ethiopian Authority for Standardization
2. Mr. Johannes Afework, Manager, Technical Services, Ethiopian Authority for Standardization
3. Ato Asrat Bulbula, Head, Planning and Programming Services, National Chemical Corporation
4. Ms. Shoatseheye Belehu, Head, Planning Dept., Ethiopian Cement and Ceramic Corp.
5. Mr. Amare Mergia, Head, Project Study and Prep., Ethiopian Cement and Ceramics Corporation
6. Mr. Yeheyés Aseffa, Deputy General Manger (Dev.), National Metal Works Corp.
7. Mr. Solomon Gebreab, Deputy General Manager (Operations), National Metal Works Corp.

**D. MINISTRY OF HOUSING AND URBAN DEVELOPMENT**

1. Comrade Akale Kifle, Head of Planning Department

**E. CENTRAL PLANNING ORGANIZATION**

1. Comrade Kebede Tesezma, Head, Construction and Urban Dev. Dept.

**III. NAIROBI**

**A. UNDP/UNIDO**

1. Mr. Graisse, UNDP RR (Tel.con. only)
2. Mrs. Salome, SIDFA Secretary
3. Mrs. Josiah Leah UNDP Programme Assistant
4. Mr. A. Pagani, SIDFA (courtesy call only)

**B. MINISTRY OF INDUSTRY**

1. Mr. G. H. Okello, Director of Industries, Ministry of Industry
2. Mr. S.O. Ongango, Senior Industrial Development Officer, Division of Cooperation, Office of the Director
3. Mrs. I.B. M'rabu, Industrial Development Officer, International Co-operation Division
4. Mr. Nzomo, Engineering and Construction Division
5. Mr. Fred K. Mungai, Projects Engineer, Engineering + Construction Div.
6. Mr. J.R. Murungi, Engineering + Construction Division
7. Mr. Charles G.M. Omas, Chemicals and Minerals Division
8. Mrs. Kalui, Small Industries Support Services Division

**C. MINISTRY OF LAND AND HOUSING/NATIONAL HOUSING CORPORATION**

1. Mr. E.M. Andwati, Managing Director, N.H.C.
2. Majda Povoden-Nginga, Technical Manager

**D. MINISTRY OF PUBLIC WORKS/KENYA BUILDING RESEARCH CENTRE**

1. Mr. Godfrey Mwaura, Building Materials Show Room

**E. U.N.C.H.S./HABITAT**

1. Mr. Frank Tackie, Building and Infrastructure Technology Section, Research and Development Division

**F. CONTRACTORS**

1. Sheikh Bashir, Private Contractor

**G. FINANCING**

1. Mr. A.J. Kidwai, Country Manager, Bank of Oman, Kenya

**IV. DAR-ES-SALAAM**

**A. UNDP/UNIDO**

1. Mr. Jens Rasmussen, UNIDO JPO
2. Mr. I. Akim, UNIDO Programme Assistant

**B. MINISTRY OF INDUSTRY AND TRADE**

1. Mr. Wilfred L. Nyachia, Director Investment and Implementation
2. Mrs. E. Mangesho, Senior Economist, International Cooperation
3. Mr. A. Kanyilili, Director Heavy Industries
4. Mr. Adiel A. Nyiti, Head, Building Materials Industries

**C. TANZANIA SARUJI CORPORATION**

1. Mr. I.K.L. Mwasale, Group Planning Manager

**D. MINISTRY OF WORKS AND COMMUNICATIONS**

1. Mr. Karatta H. Mwemba, Chief Engineer Buildings
2. Mr. Kedmon A. Sekvao, Chief Designer

**E. NATIONAL HOUSING CORPORATION**

1. Mr. N.K.S. Malisa, Research and Planning Manager
2. Mr. Aziz H. Kuchimba, Acting Chief Engineer

**F. NATIONAL CONSTRUCTION CORPORATION**

1. Mr. Kesogukewelle M.I.M. Msito, Acting Executive Secretary and Head, Contracts and Arbitration Dept.
2. Mr. Ngadia, Chief, Information Centre

**G. TANZANIA BUREAU OF STANDARDS**

1. Mr. B.L. Mwobahe, Director

**H. BUILDINGS RESEARCH UNIT, MINISTRY OF LOCAL GOVERNMENT**

1. Mr. A.L. Mtui, Director
2. Mr. E. Kwanama, Research Engineer
3. Mr. J. Hingira, Research Engineer

**I. NATIONAL DEVELOPMENT CORPORATION**

1. Mr. Ernest E. Mnzava, Senior Operations Analyst
2. Mr. S.A. Njare, Senior Project Implementation Engineer

**J. BUREAU OF STATISTICS**

1. Librarian

**K. TANZANIA WOOD INDUSTRIES CORPORATION**

1. Mr. Mushi, General Manager
2. Mr. Karinge, Planning and Development Manager

**V. PAKISTAN**

**A. UNDP/UNIDO**

1. Mr. Jan Holten, SIDFA
2. Mr. Aftab Akhtar, Senior Consultant, UNDP/UNIDO
3. Mr. M. Talib Hussain, UNDP Liaison Officer, Karachi

**B. MINISTRY OF PRODUCTION (ISLAMABAD)**

1. Mr. Abdul Raof Malik, Deputy Secretary (Engineering Industry)
2. Mr. Reza Sabir, Section Officer (Engineering Industry)
3. Mr. Mohamed Reza, Section Officer (Cement Industry)
4. Mr. Mushtaq Ahmed, Section Officer (Ceramics and Chemicals Industry)

**C. LAHORE CHAMBER OF COMMERCE AND INDUSTRY (LAHORE)**

1. Mr. M. Latif Chaudhry, Secretary
2. Mr. Anis-ul-Haq, Joint Secretary
3. Dr. Khalid bin Yousaf, Deputy Secretary (Research)
4. Mr. Parvez Hasan, Information Officer

**D. BUILDING RESEARCH STATION LAHORE (DEPT. OF PUBLIC WORKS)**

1. Mr. S.M. Yunus Shami, Director

**E. STATE CEMENT CORPORATION (LAHORE)**

1. Mr. Mobashar A. Malik, General Manager (Operations)
2. Mr. Mansoor Toor, Deputy General Manager (Operations)

**F. COUNCIL FOR WORKS AND HOUSING RESEARCH (MINISTRY OF SCIENCE AND TECHNOLOGY) (KARACHI)**

1. Dr. A. Q. Alvi, Chairman
2. Mr. Suleman Kalhoro, Senior Accounts Officer

**G. NATIONAL BUILDING RESEARCH INSTITUTE KARACHI**

1. Dr. A.Q. Alvi, Chairman and Director General
2. Dr. Ataulah Maher, Principal Scientific Officer, Structures I
3. Mr. Saifuddin Ahmed, Principal Scientific Officer, Materials I
4. Mr. S.B.A. Qadri, Principal Scientific Officer, Materials II
5. Mrs. R. Rahooja, Principal Scientific Officer, Structures II
6. Mr. S. Faiz Ahmed, Senior Research Officer, Materials I

**H. COUNCIL FOR APPROPRIATE TECHNOLOGY DEVELOPMENT**

1. Mr. M. A. Shah, Director, Regional Office, Karachi

**I. FEDERAL CHEMICAL AND CERAMIC CORPORATION (KARACHI)**

1. Mr. Naveed Ahmed, General Manager Production and Planning

**J. FEDERATION OF PAKISTAN CHAMBERS OF COMMERCE AND INDUSTRY (KARACHI)**

1. Mr. Aziz y Siddiqui, Secretary General
2. Col.(Ret.) Khurshid Afridi, i/c Protocols and Exhibitions

**K. ASSOCIATION OF BUILDERS AND DEVELOPERS (KARACHI)**

1. Mr. Farooq Hasan, Chairman

**VI. NEW DELHI**

**A. UNDP/UNIDO**

1. Mr. Gamil M. Handy, Resident Representative, UNDP
2. Mr. M. Islam, SIDFA

**B. BUREAU OF INDIAN STANDARDS**

1. Mr. G. Raman, Director,
2. Mr. C.S. Sen, O-i-C, Documentation

**C. CENTRAL BUILDING RESEARCH INSTITUTE**

1. Dr. R. K. Bhandari , Director General
2. Mr. J.S. Sharma, O-i-C New Delhi Office

**D. CENTRAL PUBLIC WORKS DEPARTMENT**

1. Mr. Harish Chandra, Director General (Works)
2. Mr. S.S. Kaimal, Deputy Director-General

**E. NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS**

1. Dr. H.C. Visvesvaraya, Chairman and Director General
2. Dr. A.K. Mullick, Director
3. Dr. C. Rajkumar, Joint Director
4. Mr. S. Chatterjee, General Manager
5. Dr. Saksena

**F. HOUSING AND URBAN DEVELOPMENT CORPORATION**

1. Mr. D.K. Sharma, Chairman and Managing Director.
2. Mr. Vishwanathan, Director and Chief, Building Technology
3. Mr. A.D.R. Swamy, Chief, Personnel and Administration
4. Mr. J.P. Shrivastwa
5. Mr. B.K. Chatterjee

**G. HUMAN SETTLEMENT MANAGEMENT INSTITUTE (HUDCO)**

1. Mr. Mulkh Raj, Executive Director
2. Senior staff member
3. Senior staff member

**H. BUILDING TECHNOLOGY CENTRE**

1. Mr. Anil Laul, Chairman and Chief Consultant
2. Technical staff (several)

**I. NATIONAL BUILDING ORGANIZATION**

1. Mr. J. Sen Gupta, Joint Director
2. Mr. O.P. Ratra, Ass. Director (Plastics)
3. Mr. A.G. Dhougale, Sr. Technical Officer (Materials)

**J. COMMITTEE ON SCIENCE AND TECHNOLOGY IN DEVELOPING COUNTRIES:  
HUMAN SETTLEMENTS, ENVIRONMENT AND YOUTH CENTRE**

1. Mr. N. R. Bheda, Secretary

**K. INSTITUTE OF MATERIALS MANAGEMENT OF INDIA**

1. Mr. P. G. Menon, Executive Director

**L. CONSORTIUM OF INDIAN SCIENTISTS FOR SUSTAINABLE DEVELOPMENT  
ECO-REGENERATION OF PUSHKAR LAKE VALLEY SYSTEM**

1. Mr. P. E. Bhatnagar, Convenor and Principal Investigator

**VII. BANGKOK**

**A. UNDP/UNIDO**

1. Mr. F. Ossella, DRR UNDP
2. Mr. R. T. Kortas, UNIDO JPO

**B. ESCAP**

1. Mr. A.S.H.K. Sadique O-1-C, Division of Industry, Human Settlements and Environment
2. Mr. Rahmatullah, Chief, Section of Human Settlements
3. Mr. J. Overgaard, Section of Human Settlements

**C. BANGKOK METROPOLITAN AUTHORITY**

1. Khun Paradorn Thanyapan, Dept. of Public Works

**D. THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH**

1. Khun Ekachai Suntornpong, Director, Building Technology Department
2. Khun Suddhisakdi Samrejprasong, Director, Building Materials Laboratory
3. Khun Kitti Huapanichyout, Head, Building Construction Technology
4. Khun Witaya Wuddi Chamnong, Head, Architectural Laboratory

**E. NATIONAL HOUSING AUTHORITY**

1. Khun Narin Sakul Clanuwat, Director, Centre for Housing and Human Settlement Studies
2. Khun Sirithip oon-Anulom, Policy and Planning Division
3. Khun Nartwibha, Policy and Planning Division

**F. THAILAND INDUSTRIAL STANDARDS INSTITUTE**

1. Khun Tongchai Kittikul )
2. Khun Suthon Nikomkate ) Building Materials
3. Khun Surapong Iemvarapong ) Standards Group
4. Khun Kitto Yousin )

**G. THE SIAM CEMENT GROUP**

(THE FEDERATION OF THAI INDUSTRIES)

1. Khun Opas Phrom-Ratanapongse, Coordination Division, Construction Materials Group

**VIII. MANILA**

**A. UNDP/UNIDO**

1. Mr. C. Newman, SIDFA

**B. HOUSING AND URBAN DEVELOPMENT COORDINATION COUNCIL**

1. Ms. Lilia Casanova, National Shelter Programme - RENAS
2. Mr. Alistair Bvunt, Consultant

**C. BUREAU OF PRODUCT STANDARDS**

1. Ms. Shirley Botor, Acting Chief



**D. NATIONAL HOUSING AUTHORITY**

1. Mr. Antonio A. Fernando, Ass. General Manager
2. Ms. Gloria Pagulaya, Monitoring and Evaluation Officer

**E. UNIVERSITY OF THE PHILIPPINES - NATIONAL ENGINEERING CENTRE:  
BUILDING RESEARCH SERVICE**

1. Dean Geronimo Manahan, Dean
2. Ms. Lavon Mary G. Abis, Research Assistant
3. Ms. Lourdes J. Bugayong, Research Officer

**F. CONSTRUCTION INDUSTRY AUTHORITY OF THE PHILIPPINES**

1. Ms. Alicia Tiongson, Executive Director

**G. INDUSTRIAL TECHNOLOGY DEVELOPMENT INSTITUTE  
MATERIALS SERVICES DIVISION**

1. Mr. Severino Bernardo, Chief

**H. PHILIPPINES COUNCIL FOR INDUSTRY AND ENERGY  
RESEARCH AND DEVELOPMENT**

1. Mr. Benjamin Damian, Executive Director

**I. DEPARTMENT OF PUBLIC WORKS AND HOUSING**

1. Dr. Ernie de Castro, Under-Secretary

**J. BOARD OF INVESTMENT  
CONSTRUCTION MATERIALS DEPARTMENT**

1. Mr. Jesse G. Samiento
2. Ms. Teresa Tome

11 April 1989

TERMS OF REFERENCE FOR THE REGIONAL STUDY ON THE  
BUILDING MATERIALS INDUSTRY IN AFRICA AND ASIA

Objective

As a preparatory work for the Second Consultation on Building Materials, the regional study for Africa and Asia, shall identify the possibilities for a coherent integrated development of this sector at national level with the view to increase its productivity with local resources. Emphasis shall be equally given to the identification of areas of complementarities and common interests within the regions that could encourage regional and inter-regional co-operation in the field of building materials.

General Framework

A comprehensive profile of this sectoral industry shall be carried out in the following African countries namely Egypt, Ethiopia, Kenya and Tanzania.

In Asia the regional study shall cover Pakistan, India, Thailand and the Philippines.

The industry shall be analysed taking into account (a) the demand for building materials by the construction industry and the origin of the demand (Government, private sector); (b) the structure of production; (c) the possibilities of co-operation and complementarities.

Moreover, the participation of and the relationship, if any, between both the formal and informal sectors in the production and supply process shall be looked into so as to address the possibilities to reinforce the role of the small producers with the view to satisfy more efficiently the demand for low-cost materials for low-cost housings for urban and rural areas.

The products, minimally processed or manufactured by the formal and informal sectors and those imported or exported by the formal sector shall be covered in the study. Tentatively, the main line of products to be considered shall be: cement, cement-based derivatives, sand and gravel, lime, clay, tile, sanitary equipment, steel, iron and iron derivatives, aluminium, wood, plywood, thermoplastic, glass and paints and other products locally relevant.

Areas of considerations for the study

Based on above framework the analysis of the industry shall focus on:

A. Demand and trends influencing the demand for building materials with special emphasis on the low-cost types. The analysis should cover if possible the past ten years with foreseeable projection for the next five years.

B. Production with due considerations for the:

1. - Production levels and installed capacity.
2. - Level of technology used in the fabrication process, machinery and equipment, origin of the technology, possibilities of adapting/improving the technology to local needs that would reduce reliance on imports.
3. - Type of products for local uses or exports, and marketing.
4. - Cost structure of production: raw materials, administrative, labour, transport, energy.
5. - Type of ownership of the enterprises i.e. private, national, government and/or foreign participation, joint-venture.
6. - Financial structure (equity/debt etc.)
7. - Type of organization, managerial qualifications and labour skills.
8. - Investment possibilities and areas for rehabilitation and expansion of existing plants.
9. - Policies and measures for the promotion of the building materials industry.

C. Supply with due considerations for the:

1. - Origin and type of inputs for the producers of building materials.
2. - Trends in supply of raw materials, import implications;
3. - Type of enterprises, ownership management and labour force.
4. - Transport of raw materials and
5. - Delivery of finished building materials products.

D. Organization of the formal and informal sectors, their linkages and market share.

E. Institutional frame and the relationship between public and private sectors.

F. Areas of complementarities to be identified where regional and inter-regional co-operation could be encouraged and developed.

#### Final considerations

With the above background the study shall provide guidance for the formulation of proposals for an integrated development programme within feasible infrastructural and institutional framework necessary to strengthen local capabilities.

Co-operation shall be encouraged in areas of mutual interests between Governments, professionals and professional associations, entrepreneurs, contractors and research institutions.

Finally, the study shall provide guidance regarding the feasibility of integrating the building materials industry in the economic planning mechanism of the nation bearing in mind, among other things, the close relation with the construction industry the combination of which with the building materials industry would provide more rational approaches to the demand for low-cost housing in the developing countries.