THE BUILDING INDUSTRY IN SRI LANKA AND PROBLEMS OF COMMON INTEREST TO DEVELOPING COUNTRIES

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1 Current State of Sri Lanka's Construction Industry

In developing countries value added in construction typically varies from 3 to 7% of gross domestic product (GDP), but new construction output accounts for 45 to 65% of gross domestic capital formation. The corresponding figures for Sri Lanka are roughly 5% and 60%, Construction is a key *capital input* to almost any sector in the national economy. For example, any effort to increase agricultural output has to be supported by an expansion of irrigation facilities. Improved communication often requires increased investment in road construction. Table 1 gives data on variation in GDP, in construction output, etc. during 1963 - 74. Fig. 1 indicates the positive relation between national product and construction output. Fluctuation in recent years in the consumption of steel and cement can also be seen in this diagram. One must, however, bear in mind that estimates of construction output and most other data in Table 1 are crude and therefore be cautious in making any conclusions.

1.1 Principal inputs to construction—building materials

Construction, like any common production process, is concerned with the best possible use of various inputs to produce a desired output. Among these inputs are—

(1) Building materials
(2) Plant and Equipment
(3) Labour
(4) Services of design and construction agencies.

The principal indicators for the construction process in Sri Lanka during 1973 are given in Table 2. Building materials, excluding trade and transport, account for nearly 45% of the value of construction output. Almost all building materials are produced locally. Cement, steel products, asbestos-cement products are some of the materials that are produced in modern industrial factories. Items such as paints, varnish, distemper, roofing tiles, electrical fittings, etc. are produced in modern medium scale production units mostly in the Colombo District. These number about 200. Indigenous building materials are produced in the traditional or small-scale units in the private sector. The total number of such establishments was around 5,000 in 1971. The largest groups were bricks (3,000), timber saw mills (650), lime kilns (600), brassware (300) and roofing tiles (150). Almost 45% value of the building materials consumed in the country is provided by the modern industrial sector while the traditional sector provides around 35%. The balance is provided by the medium and small scale units. The building materials sector (including production and supply of raw materials) provides employment, a substantial part of which is seasonal or temporary, of the order of 3 - 4% of all employment in the country. Bulk of this employment (nearly 70%) is provided by the traditional sector.

Table 1—Data on gross domestic product construction output etc. during 1963 - 74

Year	Gross domestic product (1963 prices) Rs. Million	Construction output in 1963 prices Rs. Million			Cement consumption (local) 1,000 tons	Steel (1) 1,000 m. tons
		dwellings and buildings	Other construction	All construction		
1963 ...	6,886.5	420.0	196.0	616.0	273	n..a
64 ...	7,186.5	364.9	203.5	568.4	266	n.a.
65 ...	7,393.8	512.5	201.6	714.1	331	n.a.
66 ...	7,567.8	512.5	217.4	729.9	357	n.a.
67 ...	7,948.0	547.3	222.1	769.4	373	n.a.
68 ...	8,504.9	614.8	231.7	846.5	414	26
69 ...	8,955.9	738.7	232.0	970.7	423	22
70 ...	9,717.9	842.2	244.5	1,086.7	432	25
71 ...	9,743.7	950.0	142.2	1,092.2	413	27
72 ...	10,228.9	997.1	87.1	1,084.2	382	30
73 ...	10,751.6	1,142.8	123.7	1,266.5	417	28
74 ...	11,178.6	885.7(2)	142.9	1,028.6	413	21(3)

Sources: Department of Census and Statistics.

Data on cement provided by B. M. A Kodippily, Ministry of Planning and Economic Affairs.

(1.) Rolled products only sold by the Ceylon Steel Corporation.

(2.) But, estimates of all construction output made by the Central Bank for 1974 show an increase of about 7% over 1973 output (at constant 1959 factor cost prices). In view of this uncertainty, construction output data for 1974 given here are not plotted in Diagram 1, but 1974 construction output is assumed to be equal to 1973 output, since cement consumption in both years is roughly the same.

(3.) Ribbed tor steel was introduced to the market in 1974. On account of its higher tensile strength and better gripping properties, this product can contribute to a saving of approximately 35% in comparison with mild steel bars for reinforcement.

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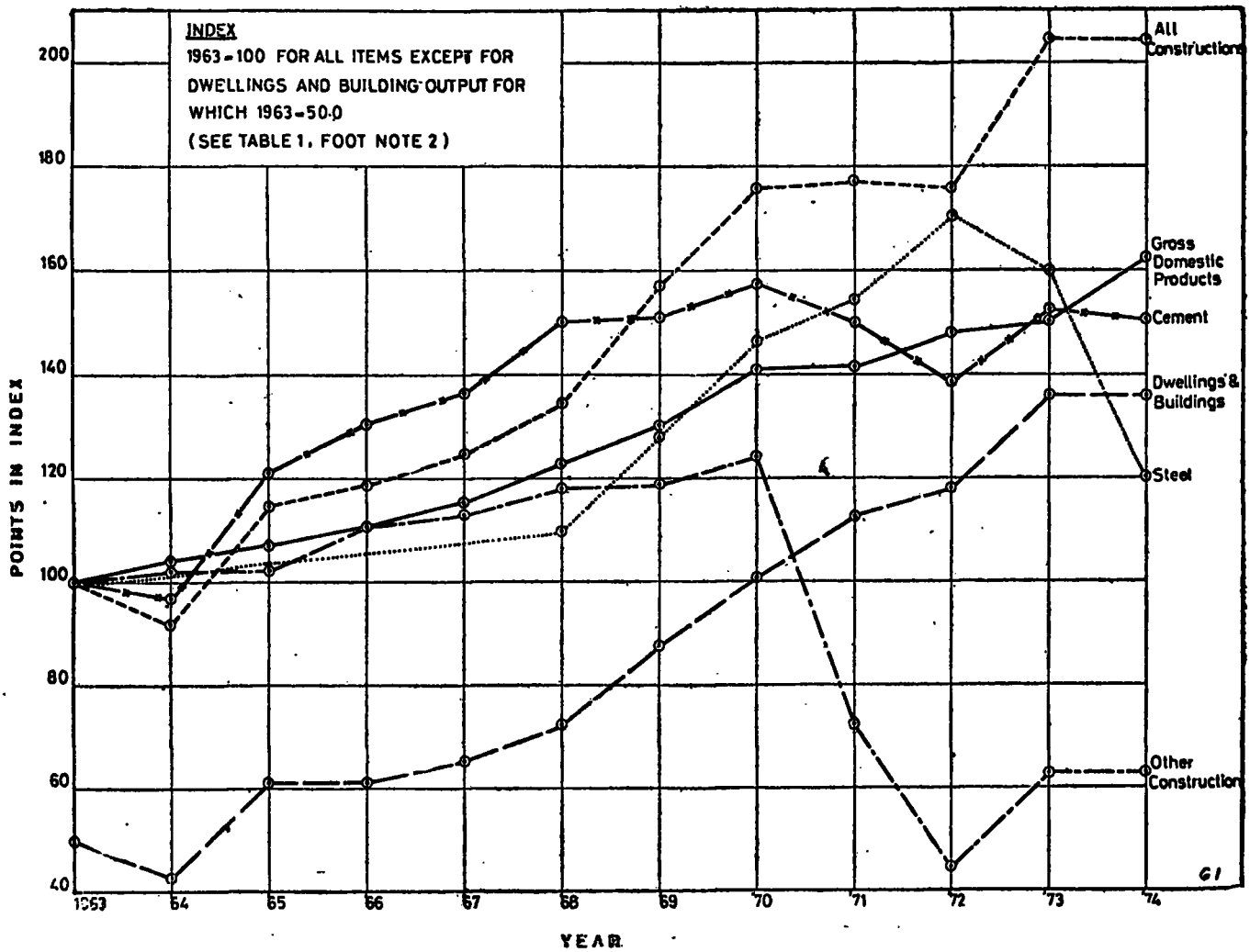

Fig. 1 Relation between National Product and Construction output

Table 2 Principal construction indicators 1973.

No.	Item	New housing %	Non-residential buildings %	Other const. work %	All const. %
1	Cement consumed[1] ...	10	6	6	8
2	Steel products consumed[1] ...	2	7	6	5
3	All materials consumed[2] ...	53	45	29	44
4	Total intermediate inputs[3]	66	54	35	54
5	Plant and equipment used ...	(0.15)	5	12	5
6	Value added by labour[4] ...	30	24	32	28
7	Total value added[5] ...	34	46	65	46
8	Share in all construction (1969)	45(6)	30	25	100

1. Includes trade and transport margin of about 10%.
2. At ex-factory price.
3. Includes trade and transport margin of around 18% of the delivery cost of building materials in all construction.
4. Excludes normal overheads on labour.
5. Includes value added in consultancy, overheads, profits, etc.
6. Consists of: new dwellings — 31%; repairs, additions and improvements — 14%

1.2 Resources used in building materials production

Different building materials absorb different resources in their production. These are shown in Table 3. Wide differences are noticeable in labour employed, in machinery and tools used per worker, in foreign exchange content, etc. Figure 2 illustrates the significant relation between labour absorbtion in production and foreign exchange utilisation. Generally the higher the foreign exchange content, lower is the labour requirement in production. The statistical co-relation is represented by a continuous curve in the figure. Almost a quarter of the cost of production of building materials is in foreign exchange. It is noteworthy that the bulk of this expenditure is on account of (a) imported raw materials and (b) oil based energy consumption, and only a small fraction is due to depreciation on imported machinery and imported spare parts.

1.3 Wages and productivity in building materials

Substantial differences in wages (or in annual income) as well as in productivity exist in the different building materials production units (Table 4). The labour productivity figures for sand, country tiles and traditional bricks given are particularly low. Data for sand represent

Table 3 — Labour, capital and foreign exchange resources used in production of selected building materials (1973)

		No. of establishments surveyed	Employment (direct) in Rs. 1 m worth of production (No. of persons) (1))	Total employment in Rs. 1 m. production (No. of persons) (2)	Gross capital assets per worker (market value) Rs.	Machinery and tools per worker (market value) Rs.	Foreign Exchange content in production cost (3) %	Capacity utilization %
	Traditional and small-scale units							
1.	Bricks	37	1,120	1,220	700	10	0	67
2.	Sand	13	850	980	400	13	0	44
3.	Country tiles	4	850	960	500	6	0	63
4.	Cadjan (thatch)	5	800	1,140	400	1	0	44
5.	Aggregate							
	(a) Manual quarry	2	560	—	1,300	110	10	81
	(b) Mechanical crusher	6	110	440	8,400	4,000		14
6.	Lime	17	240	530	1,600	40	0	50
7.	Brassware	19	140	210	1,400	700	25	53
8.	Flat tiles	5	140	500	6,400	2,500	10	65
9.	Drainage fittings	15	100	n.a.	7,300	3,700	40	65
	Modern Industrial Units							
10.	Paint, varnish, distemper, etc.	9	14	n.a.	26,000	14,000	60	31
11.	Steel	1	16	22	59,000	29,000	55	41
12.	Asbestos cement products	2	16	23	12,000	5,100	40	68
13.	Cement	1	26	29	93,000	46,000	20[4]	67
14.	Hardware (modern industrial sector)	1	100	n.a.	25,000	20,000	50	35

1. Includes seasonal and temporary labour in the case of traditional materials. Only employment in the building material production unit is included.

2. Covers employment (permanent, seasonal and temporary) in—

   (a) production and supply of raw materials and other services to (b), and
   (b) building materials production units.

   These estimates are very crude, as they are based on a few establishments only in each case.

3. Approximate.

4. For the year 1974, foreign exchange (without feecs) in furnace oil contributes most. This percentage would have gone up in 1975, with further increases in price of furnace oil in late 1974 and in 1975.

Note: Most of the data were obtained from a Survey of the Building Materials Industry in the Colombo district in 1973. This survey was organised by the Programming Division of the Ministry of Housing and Construction, and financed by the Building Materials Corporation.

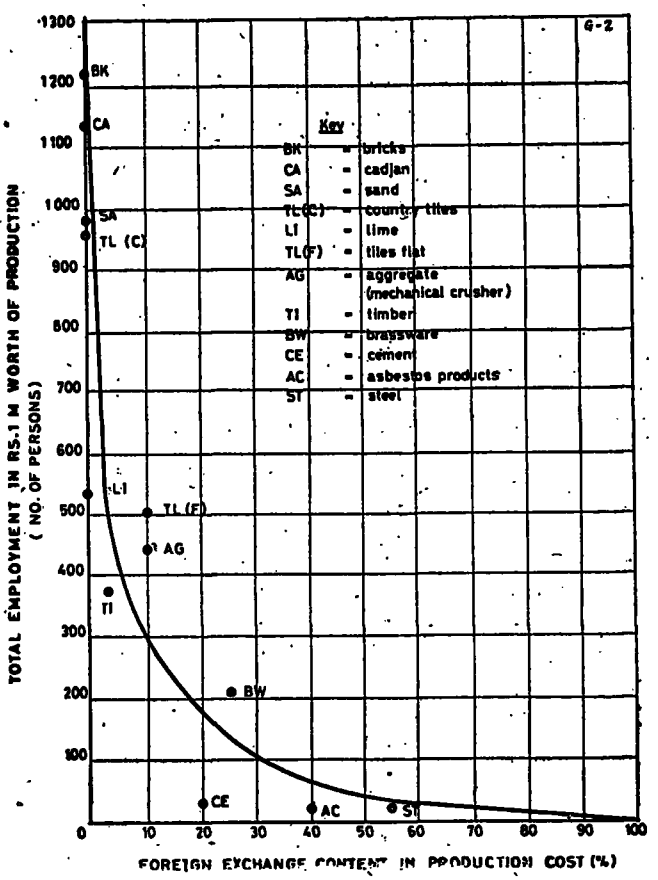

Fig. 2 Relation between labour absorption and foreign exchange utilisation

only work done for about 6 months of the year, due to poor weather during the balance period. If the effect of seasonal or part-time employment is eliminated the productivity (per man-year) in bricks and country tiles moves upto Rs. 2,000/- (1973); the average income for a "permanent" employee was Rs. 1,000/-.

1.4 Construction plant and labour

The average input of plant and equipment (equivalent hire charges) was estimated to be around 5% (Table 2) but this percentage varies between the different construction sectors as shown in Table 5.

Most of the construction plant and equipment are imported and with the aggravation of the foreign exchange situation since 1973, these percentages may be lower today.

Construction site labour is estimated to be in the region of 200,000 persons although a high degree of fluctuation in this employment from year to year would be normal. Published estimates often ignore seasonal and temporary employees who find work for only part of the year. The ILO Mission to Sri Lanka (1971) estimated the average value added per person employed to be somewhere in the range of Rs. 1,600 to Rs. 1,800 per year with a minimum of Rs. 1,000 to Rs. 1,200 for the traditional sector and a maximum of Rs. 2,000 to Rs. 2,500 for the modern sector. Today, the average value is probably in the region of Rs. 2,500 to Rs. 3,000, with a range of Rs. 3,000 to Rs. 4,000 for the modern sector, covering both the private and public sector institutions. These increases are mainly on account of over 50% wage increases during 1971 - 76. Technical progress has had little to do with this. Value added per person is a measure of wages, plant use, over-heads, profit, etc. Productivity (value of construction output, including cost of building materials, per worker) in the public sector building institutions with little plant input, is now in the range of Rs. 30 to Rs. 40 per day, or around Rs. 7,000 per year with 200 working days.

Table 4 — Income and Productivity in Building Materials Production (1973)

	Item	*No. of establishments*	*Annual income (Rs.)*	*Productivity (value of output) (Rs. per worker per annum)*(1)
1	Steel	1	5,600	63,900
2	Asbestos cement products	2	6,100	62,700
3	Cement	1	5,200	37,900
4	Drainage fittings (small scale)	15	2,650	10,300
5	Hardware (industrial corporation)	1	3,100	9,800
6	Aggregate (a) Crusher ...	6	1,700	8,700
	(b) Manual quarry ...	2	800	1,800
7	Brick and tiles (flat) ceramics corp. factories	1 (2)	2,900	7,600
8	Brassware (small scale)	19	1,800	7,200
9	Lime	17	1,150	4,200
10	Sand	13	950	1,200
11	Tiles (country) ...	4	550 (3)	1,200 (3)
12	Bricks (traditional) ...	37	400 (3)	890 (3)

1 At ex-factory price.
2 Six separate factories.
3 Average for permanent and seasonal employees.

Table 5

Plant and Equipment Used in Different Construction Sectors (1973)

Item	*Hire charges (equivalent) as percentage of total construction cost*
Housing	0.2
Non-residential buildings ...	2
Major irrigation works ...	24
Hydropower works ...	18
Bridges	9
Roads	7
All construction	5

1.5 Construction agencies

Construction agencies in Sri Lanka fall mainly into two categories.

(1) Public sector organisations—Government departments and Corporations.

(2) Private sector establishments and individual contractors or builders.

Probably between a quarter and a third of all construction output is handled by the public sector organisations. Some idea of the structure or shape of the building contractors in the private sector is obtained from the figures of those who registered with the Public Works Department during the period 1965 to 1970. Any contractor registered for a capacity of above Rs. 450,000/- was required to have a qualified engineer on the staff.

Capacity	*Number*
Below Rs. 450,000	328
Rs. 450,000 to Rs. 800,000	17
Rs. 800,000 to Rs. 1.5 m.	10
Above Rs. 1.5 m.	12
Total ...	367

In addition, there were probably 15 - 20,000 labour contractors or "own account workers" doing private housing work. The current position on the number of private contractors is not known, consequent to the changeover to the direct labour system in the public sector since 1970.

2 Questions regarding development of the construction sector

2.1 Fluctuation in output is a normal feature of the construction sector in many countries, both developed and developing. This may arise on account of Government's fiscal and credit policies, seasonal factors, etc. However, stagnation or slow growth in the building sector both in short-term and long-term, may result from incorrect policies or *misallocation of available resources* which impose certain constraints on development. National planners associated with the construction sector in developing countries must identify and remove such constraints. The basic planning objectives must be (a) to ensure an increasing output every year through the development of a correct technological framework, together with meaningful institutional and financing arrangements and (b) to improve overall industrial productivity. A number of issues in this connection which merit the attention of planners in developing countries are discussed below.

2.2 The evolution of correct policies for this sector must start with the recognition of the importance of construction to national development and with the setting up of correct institutions. There is not always a Ministry, for instance, to deal with *the construction industry* in many developing countries. In Sri Lanka the setting of the Ministry of Housing & Construction in 1970 was the first step in this direction. The Ministry-in-charge of the industry must endeavour to place the construction and the associated building materials and distribution industries on a sound industrial footing. Policies must be developed towards expanding the capacity of local building organisations and towards improving industrial productivity in the indigenous building material sector. Major construction works are sometimes handed over to foreign contractors for the sake of "speedy" execution. But, the period of gestation associated with foreign participation (say 2 - 4 years if the project is financed through foreign aid) is often ignored in this calculation. To some extent, the development of the State Engineering Corporation has fulfilled a vacuum left in this country by foreign contractors, but we are still far away from the achievement of the tasks mentioned above.

2.3 Developing countries must avoid *misguided investment policies* with regard to the housing sector. Housing accounts for nearly 45% of construction output in Sri Lanka and probably a similar percentage in most developing countries. Many developing countries including Sri Lanka have witnessed in the past ad hoc and essentially temporary policies on housing financing. For instance, little has been done towards the setting up of a housing finance bank, with equal resources as other leading banking institutions. Such a bank is a key to successful generation of savings and other monetary resources required for increased investment. The case of the economist against increasing investment in housing hinges on alternate and possibly more beneficial use of scarce resources. The housing sector *can* and *should* be developed making use of local resources that are not scarce, namely, labour and local raw materials. This should be true for every developing country. Incorrect and inconsistent policies in regard to investment in the housing sector cause major fluctuation in construction output, and thereby seriously affect the healthy development of the building sector.

2.4 The need for an *appropriate technology* for a developing country is obvious. An appropriate technology must be a function of *increasing output*. It has to make optimal use of the resources available. Building materials comprise the largest input (45%) in construction. The overall technology of a construction product e.g. a house, a building, a bridge, a dam, etc., is influenced to a considerable extent by the technology adopted in the production of the building materials used in the design of the particular product. For example a house built out of cement, steel, asbestos roofing sheets, etc. has a higher technology than one built with timber, bricks, tiles, lime, etc. In Sri Lanka, we have (a) an abundance of labour, (b) a scarcity of foreign exchange (c) unused capacity in all capital intensive production units (Table 1) and (d) unused capacity in all traditional production units (Table 1). Unused capacity is by itself a resource. For developing an appropriate technology, we must:

(1) Integrate production resources from both capital intensive and labour intensive units in the building materials sector, and

(2) Maximise the productivity of scarce resources such as foreign exchange, capital, etc.

If the building sector is to grow at the required 6%, such an *integrated technology* is essential. It is practically feasible. It will mean increased utilisation of indigenous building materials or *relatively* greater expansion of production in the indigenous sector. The effect of this will be a net increase in labour absorption into the overall building process. Many engineers often mistakenly confine their considerations of technology to the development of capital saving or capital using techniques at construction sites while ignoring the potential for wide technological choices at the design stage.

The price structure to be adopted must reflect on the scarcity value of resources and be an effective instrument to promote a suitable technology. In Figure 3, AB is a typical constant expenditure line for a developing country. The cost of OB units (8) of labour equals the cost of OA units (6) of capital. Any point on AB represents different combinations of capital and labour resources, the total cost of them being constant. AB is tangential to the constant output curve XY, at X. XY represents the loci of points representing different combinations of the two resources that will produce a given output O. A developing country can achieve the required output O at minimum cost at point X. X represents the optimal technology point for a developing country (6 units of labour + 2 units of capital). However, often, on account of incorrect pricing of foreign exchange, due to subsidies to capital equipment, etc., the cost of capital resources to a producer is lower than what it should be. CD is a constant cost line reflecting the new (relative) prices of labour and capital in such a case. Production now takes place at Y (a point appropriate to a developed country with different factor endowments). The product is marketed cheap, but, in the process, more scarce resources are made use of (2 units of labour + 6 units of capital) which will in the long run curtail the growth of the industry. To cite one example, until very recently, in our country, asbestos roofing was cheaper than tile roofing, partly on account of incorrect pricing of foreign exchange and due to concessions on capital investment given to manufacturers of asbestos sheets which were denied to tile producers earlier. This argument holds good despite the reduced amount of roofing timber required by asbestos sheets.

2.5 Every effort should be made to increase *industrial productivity*, both labour and *capital productivity*, in the construction and building materials sectors. Low productivity is not always the result of inadequate capital resources. It can be the result of under-utilised capital resources. Table 1 shows poor capacity utilisation in many industries including capital intensive industries. In other words, a substantial part of the installed capital assets are idle. Two reasons for the low capital productivity particularly in the modern industrial sector are:

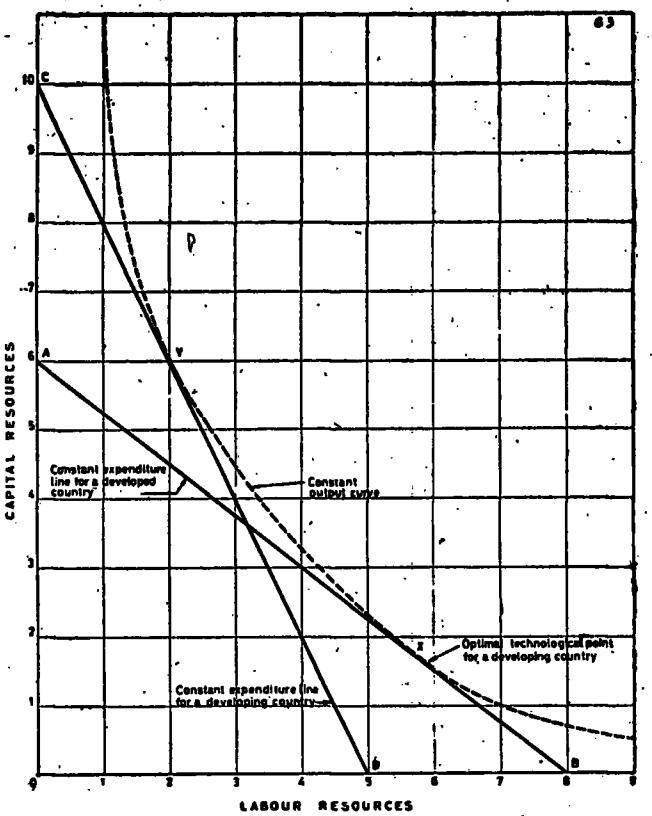

Fig. 3 Variation of capital resources with labour resources

(a) Inadequate foreign exchange for the purchase of raw materials, spare parts, etc.

(b) Lack of demand for the finished products.

This situation can be remedied only through an integrated resources planning approach covering both the buildings materials and construction sectors. It is not possible to sustain a higher capital intensity in production or higher labour productivity in the building materials sector, unless the construction industry which absorbs these products grows at a significant rate.

2.6 Selected capital intensive operations e.g. production of cement, steel, transport, etc. are essential and are complementary to large scale labour utilization in the building sector. Such operations can be combined with a mass of labour intensive activities. Capital intensive activities that are not *complementary* to employment generation should not be contemplated in the present state of Sri Lanka's building industry.

2.7 Investment in plant and equipment in both the building materials and construction industries is a significant determinant of *labour productivity*. In a developing country's early industrialisation strategy adequate emphasis should be given for the manufacturing of a construction plant, equipment and tools and engineering equipment for the building materials industries. Sri Lanka's failure in this regard (partly on account of her earlier emphasis on "confectionary industrialisation"–a reference to consumer goods manufacturing) is a lesson for other

developing countries. The result is that low labour productivity threatens to be a permanent feature in the building sector particularly with our increasing difficulties in earning foreign exchange.

2.8 A significant contribution to labour productivity is made through *technical progress* in the form of advanced scientific and engineering knowledge, better management techniques, better organizational efforts, training of labour, etc. This can be considered as technical progress not embodied in capital equipment, which has to be purchased with foreign exchange. It is claimed that more than 50% of the increase in labour productivity in the United States may be on account of this type of technical progress. This emphasises the need for a concerted effort to develop a study programme of construction planning and management in this country and also in other developing countries. Such a programme should be multi-disciplinary, covering the fields of (a) engineering (b) accountancy, and (c) modern management techniques. A course along similar lines is now offered to the M. Eng. degree programme at the University of Sri Lanka (Katubedda), but an immediate need is to develop the present curricula through research on the problems of the local industry. Summarising, where capital equipment is in short supply, one of the alternatives is to enhance the quality and capacity of *human capital.*

2.9 Principal *research* needs in this country are for:

1. Rationalisation of the production systems for indigenous building materials e.g. bricks, tiles, lime etc. and technological innovations which do not, adversely interfere with the basic labour intensive nature of the production processes;

2. Development of a local equipment and tools industry, ancilliary to building and associated activities;

3. Development of integrated planning and management systems for the building sector.

Often emphasis is misplaced on the development of a new building material or of a technique which will have only a very limited impact on the entire industry. Recent efforts in this country to develop a chemically treated more durable cadjan and bamboo reinforced concrete members can be cited as examples of this (when one considers the limited research resources and personnel available). However, the development of cement based roofing sheets that use substantially less foreign exchange than asbestos sheets and which can be used in long span or industrial buildings, as well as sun burnt clay bricks can be regarded as important areas of research. The brick industry in Sri Lanka is near ruins as far as the strength and quality of the traditional kiln made bricks are concerned. The development of brick technology is an urgent task. Upgrading of different timber species and development of timber engineering have also been suggested.

2.10 *Construction statistics and documentation* are in a primitive stage in this country, and probably in a worse state in many other developing countries. For instance, architects and design engineers who have an option to design low rise or high rise buildings, often do so without vital data on cost implications of their design choices (the difference in sq. ft. cost between a single storey building and a multi-storey R.C. building can be up to 100%). For a site engineer, reliable norms for labour productivity, plant utilisation, etc. are essential.

2.11 Planners who want to create *more employment* in the construction sector often limit their concern to the development of a few capital saving building techniques and tools. The building sector in a developing country is already fairly labour intensive. A steady increase in employment is possible only through a sustained *growth* of the building industry. For this to be achieved, a shift in technology further in a labour intensive and foreign exchange minimising direction is also essential, at least for a limited period, in countries where the current technology has too high a foreign exchange component. This can be achieved to a large extent by regulating the final product mix in construction output through proper design options, as briefly referred to in paragraph 4 above.

3 Areas of co-operation between developing countries

Construction products are not normally manufactured for international exchange. However a great deal of information and expertise on policy making as well as on technology can be exchanged between developing countries. Some of the areas where such an exchange will be useful are:

1. Know-how in the modernisation of the indigenous building materials sector,

2. Research and manpower training,

3. Policy formulation for the housing and construction sectors,

4. Growth strategies including financing mechanisms.

Developing countries often face similar problems. We have much to learn from one another not only in areas of success but equally from the numerous areas of failure.

Acknowledgement

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ඉදිකිරීම් නිමැවුම්වල අලුත්ම ප්‍රවණතාවන්, ගොඩනැගිලි ද්‍රව්‍ය නිෂ්පාදනයෙහි හා ඉදි කිරීමහි ලා පාවිච්චි කර ඇති සම්පත් වර්ගය. ශ්‍රම නිෂ්පාදකතාව යනාදිය ආශ්‍රයෙන් ශ්‍රී ලංකාවේ ඉදිකිරීම් කර්මාන්තයේ වර්තමාන තත්ත්වය පිළිබඳව 1 වැනි කොටසින් සාකච්ඡාකර ඇත. දෙවැනි කොටසින් දැක්වෙනුයේ සංවර්ධිත රටවල ඉදි කිරීම් සැලසුම් කරුවනට මුහුණ පාන්නට සිදුව ඇති ප්‍රධාන ප්‍රශ්නය. ආයතනික විධි විධාන සම්පත් වලින් ඉතා හොඳ අයුරින් ප්‍රයෝජන ගැනීම, මූල්‍ය සම්පාදන විධි විධාන මිනිස් බලය පුහුණු කිරීම යනාදියට ලිවා සම්බන්ධව ඇත්තේය. සංවර්ධනය වන රටවල් අතර සහයෝගතාව ඇති කළ හැකි ක්ෂේත්‍රයන් පිළිබඳ මනා විස්තරයක් ඉදිරිපත් කිරීමෙන් පසු ලිපිය සමාප්තවේ.

இலங்கையில் கட்டிடக் கைத்தொழில்

எஸ். கணேசன்

பொழிப்பு

நிர்மாண உற்பத்தியில் சமீபத்திய போக்குகள், கட்டிடப் பொருட்கள் உற்பத்தியிலும் நிர்மாணத்திலும் பயன்படுத்தப்படும் மூலவளங்களின் வகைகள், தொழில் உற்பத்தித் திறன் போன்றவற்றின் தொடர்பு களோடு; முதலாம் பகுதியில் இலங்கையின் நிர்மாணக் கைத்தொழிலின் தற்போதைய நிலை ஆராயப்பட்டுள்ளது. அபிவிருத்தியுறும் நாடுகளில் நிர்மாணத்திட்ட வியலாளர்கள் எதிர்நோக்கும் பிரதான பிரச்சினைகள் 2 ம் பகுதியில் இனம் காணப்பட்டுள்ளன. இவை கொள்கை வகுத்தல், தாபன முறை ஒழுங்காற் றுப்படுத்தல், மூல வளங்களை கூடியளவு பயன்படுத்தல், நிதியிடும் பொறி முறை மனித சக்தி பயிற்சி போன்றனவுடன் தொடர்புடை யனவாகும். அபிவிருத்தியுறும் நாடுகளுக் கிடையே ஒத்துழைப்பு ஏற்படக்கூடிய சாத்தியமான துறைகள் பற்றி மூன்றும் பகுதியில் ஒரு விமரிசனத்துடன் கட்டுரை முடிவடைகிறது.