OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

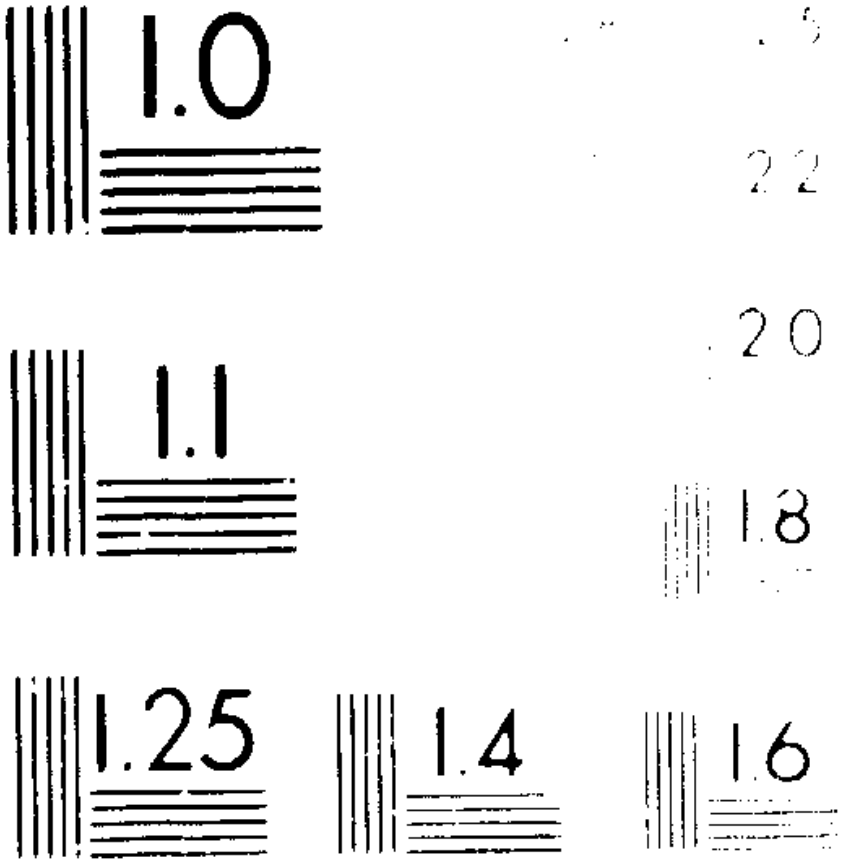
FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2

F. MOAVENZADEH
October 1983

13493

SYNTHESIS: Construction, Building Materials, and Capital Goods in the Strategy for Revitalization of Industrialization in Developing Countries

1. The Context of Development

In the United Nations Third Development Decade, the optimism of earlier decades has faded. Following upon a period of sustained progress in the 1960's, when developing countries easily surpassed the United Nations 5 percent annual growth target, development faltered somewhat in the 1970's. While certain middle-income countries did achieve higher real economic growth rates than the industrialized countries (thereby earning the label "Newly Industrializing Countries"), most low-income countries fell farther behind, and collectively, developing countries were not able to fulfill the objectives of the International Development Strategy for the Second Development Decade. Increasing the share of the developing countries in world industrial production to 25 percent by the year 2000, a goal set in the Lima Declaration and Plan of Action in 1975, is very much an active goal and development priority today, though recently lost ground has meant that attaining this target will be more difficult. In order to meet the Lima objective, the LIDO model[1] estimates that developing countries would

[1] The LIDO (Lima Development Objective) model was developed by UNIDO to aid the analysis of the Lima target. Its purpose is to formulate, for the period up to the year 2000, scenarios reflecting the achievement of the Lima target on the basis of different hypotheses, regarding the future state of the world economy. It is described in UNIDO, Industry and Development, No. 6. United Nations, New York, 1981, pp. 1-17.

TABLE 1

GROWTH OF GDP, 1960-82
(average annual percentage change)

Country Group	1960-73	1973-80	1980	1981	1982
All developing countries	5.8	4.6	4.0	2.2	3.9
Low-income	4.1	4.5	5.9	3.9	3.9
China	4.7	5.3	6.8	3.0	. .
India	3.5	3.8	6.5	5.6	. .
Other	3.8	3.1	2.9	4.3	. .
Africa	3.8	1.3	0.4	2.7	. .
Asia	3.8	5.2	5.5	5.9	. .
Middle-income	6.4	4.7	3.5	1.7	3.8
Oil exporters	6.4	4.4	3.0	3.3	4.6
Oil importers	6.3	4.8	3.7	1.0	3.5
East Asia & Pacific	8.2	7.5	3.5	7.2	. .
Latin America and Caribbean	5.9	5.4	5.6	-2.5	. .
Sub-Saharan Africa	4.4	3.3	4.2	1.7	. .
Middle East and North Africa	5.0	3.6	4.7	-0.5	. .
Southern Europe	7.0	3.4	1.4	2.0	. .
High-income oil exporters	8.6	8.3	4.5	-11.3	-1.0
Industrial market economies	5.1	2.5	1.4	1.2	0.2
Industrial nonmarket economies	. .	. .	2.7	1.8	3.0

Source: World Bank, World Development Report 1982, p.8.

have to achieve growth rates of 7.4 percent in the 1980's and 8.4 percent in the 1990's, and that their share of world investment must rise to over 30 percent by 1990 and close to 40 percent by 2000.

The challenge confronting developing countries in their quest to industrialize has been complicated by changing global economic conditions, which have imposed a new series of constraints on development for the poorer countries. Recession and high interest rates in the industrialized economies have depressed the export earnings of developing countries, which has contributed to severe liquidity problems for many of them in at least two ways. First, protracted stagnation in the developed countries has caused a contraction of export markets for the manufactured goods of developing countries. Secondly, exacerbating the lull in absolute levels of world trade has been a deterioration in the terms of trade for developing countries: most commodity prices are at their lowest levels in three decades. Moreover, threatening developing countries even further has been a surge in calls for protectionism in the industrialized economies, signalling that trade constraints may likely worsen before they improve.

The repercussions of the adverse terms of trade and liquidity problems have been felt most acutely by developing countries in their need to service their foreign debts, forcing in many cases a postponement or even reduction of domestic growth. In the 1970's, faced with sharply increased prices for their imports of fuel and manufactured goods, developing countries borrowed in international capital markets. Debt subsequently spiralled largely because of the shortening of the term of debt maturities, particularly by private commercial banks in the advanced industrial countries, and the rise in real interest rates

(about one-half of total developing country medium- and long-term external debt carries variable interest rates, and where fixed, interest rates are set high to incorporate expectations about future inflation).[2] Today, the current accounts deficits of both oil importing and oil producing countries have skyrocketed, and their external public debts have grown exponentially. The debt service ratio of 21 major borrowing countries has soared from 50 percent of exports in 1979 to 75 percent during 1982.[3] In response to their high indebtedness, developing countries have been forced to pursue austerity policies restricting domestic spending, investments, and imports, and instead divert capital which could otherwise underwrite development programs and projects toward debt service. These reductions in capital investment directly undermine efforts to reach the Lima target, which calls for increases in investment to fulfill developmental goals. Future prospects for commerical borrowing are gloomy. The curtailment of the ability to borrow will impact severely on the capacity of developing countries to import critical inputs needed for the industrialization process. While external finance accounts for only 13 percent of the total investment in developing countries, it permits the importation of machinery, transport

---

[2]World Bank, World Development Report 1982, p. 1.

[3]Debt service includes interest on total external debt plus all maturing debt, including amortization of medium- and long-term debt and all short-term debt. The 21 countries include: Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Peru and Venezuela in Latin America; Indonesia, Korea, Malaysia, Philippines, Taiwan, and Thailand in Asia; and Algeria, Egypt, Israel, Ivory Coast, Morocco, Nigeria, and Turkey in the Middle East and Africa. Data are from World Financial Markets, Morgan Guaranty Trust Company of New York, February, 1983, pp. 5-6.

equipment, materials, and technology by developing countries.[4]

While new issues have surfaced posing new challenges for development, others which characterized previous development decades persist unresolved. Developing countries have long been left the unenviable choice of pursuing development strategies which promote growth at the expense of social welfare or those which redistribute income at the expense of the expansion of assets. It is possible, however, to identify an alternative to this long-standing dilemma: developing countries can in effect stand this dilemma on its head, devising instead an industrialization strategy which simultaneously permits both redistribution and growth.[5] The crux of distributional growth strategies which would not sacrifice capital accumulation is to make poor groups more productive. While various measures such as a general redistribution of income, redirecting investment, or transferring assets to the dispossessed would all constitute steps in that direction, ultimately, the central element in making the poor more productive is to provide them with full employment. In this sense, not only is the need for a tradeoff between growth and equity eliminated, but a strategy for industrialization can be formulated based on the

---

[4]World Bank, World Development Report 1982, p. 3.

[5]These arguments, and their supporting evidence, are derived from Hollis Chenery, Montek S. Ahluwalia, C.L.G. Bell, John H. Duloy, and Richard Jolly, Redistribution with Growth, which has been summarized as a World Bank Publication Summary, IBRD, 1974; and Syamaprasad Gupta, "A Summary of a Model for Income Distribution, Employment, and Growth: A Case Study of Indonesia," A World Bank Staff Occasional Paper, Number Twenty-Four, 1977. Both stress that there is no firm empirical basis for believing that the objectives of rapid growth and equity need conflict, and that any tradeoff between the two really depends on the specific policies adopted to redistribute.

expansion of employment opportunities. Alleviating the chronic unemployment and underemployment endemic to developing countries, itself exacerbated by population expansion which has outstripped the growth of new employment opportunities, is, and should be, a priority target of national and international policy.

Unemployment is particularly acute in rural areas. The issue of rural development, neglected in practice in previous development decades, has been brought to the fore in the International Development Strategy for the Third Development Decade. Integrating the poor into the national economy would expand domestic market bases which often critically constrain industrial development. For many developing countries, rural to urban migration, caused by the abysmal lack of opportunity in the countryside, will continue to constitute a major development problem, leading to overcrowded cities, which requires massive investments in urban infrastructure, inflates urban land prices, and otherwise produces diseconomies of scale. Development experts have proposed that the most effective strategy for stemming the cityward migration may well be to invest in rural areas. The International Development Strategy calls upon governments in developing countries to strike a better interregional balance between rural and urban development through the promotion of rural industrialization, the establishment and strengthening of agroindustrial complexes, and the modernization of agriculture.[6]

These standing developmental needs require solutions, yet emergent constraints have made them all the more difficult to redress. Declining

---

[6] UN A/35/464, paragraphs 95 and 159.

export earnings and rising debt service have led various international agencies and researchers to revise downward growth projections for the 1980's. If no concrete steps are taken to halt the disturbing slide in economic growth rates in developing countries experienced in the first years of the 1980's, developing countries will not even be able to meet these less ambitious targets, let alone rekindle the optimism of the 1960's and 1970's, and revitalize industrialization to reach the Lima goal. Past strategies in the current world economic context will simply not do: it is now widely recognized that a strategy for industrialization in developing countries based on an indefinite expansion of export markets in the more advanced economies is doomed to failure. Rather, the revitalization of industrialization in the future will depend fundamentally on new approaches and solutions to the problems in sustaining economic development.

Constraints imposed by reductions in trade and diminishing capital flows point to the need for developing countries to increasingly rely on indigenous resources as the basis for their future growth strategies. Yet, because those resources, especially material, are often insufficient to supplant the capital and markets of developed countries, the success of such an approach is predicated upon wider economic and technical cooperation amongst developing countries themselves. While economic cooperation among developing countries has been advocated by the international community since the original declaration calling for a New International Economic Order, its promotion assumes greater urgency in the context of the current world recession. Recently curtailed trade

between developing and developed countries could in principle be redirected by developing countries toward each other, to both consolidate export markets for their manufactured goods and to overcome constraints imposed by limited domestic market bases, thus even improving upon current export levels. Regional collaboration, in the form of economic integration or simple technical collaboration, is a promising avenue for facilitating technological and industrial development. Above all, coherent strategies which adequately plan for realistic yet sustained growth in each developing country according to its factor endowments must be elaborated.

2. A New Basis for Growth: The Role of Construction, Building Materials, and Capital Goods Industries

Any strategy to revitalize industrialization must establish priority sectors in order to be effective. The argument advanced in this paper is that the construction, building materials, and capital goods industries have enormous potential to foster economic growth and development, which warrants a full-fledged study of their contributions, both realized and potential. If the arguments presented herein are correct, these industries would become the logical priorities for national, regional, and international promotion in any future industrialization strategies.

Why base a blueprint for industrialization on the construction, building materials, and capital goods industries? These industries are suited to fulfilling the International Development Strategy for the Third Development Decade in at least three broad ways. First, construction and capital goods together normally constitute practically

the entirety of capital formation in any economy (often reaching levels in the vicinity of 98 percent). If the Lima target is not to become a forsaken developmental goal, then investment must rise in developing countries, according to the LIDO model, from a 23.4 percent share of GDP in 1975 to 32.7 percent in 2000 for developing countries collectively. To accomplish this, investment must grow at an annual average rate of 6.8, 9.2, 10.8, and 8.5 percent respectively in Africa, Asia, Latin America, and the Middle East.[7] Construction and capital goods are the obvious and appropriate vehicles to translate domestic and externally-mobilized capital into investment. Secondly, developing indigenous capability in these industries, especially building materials and capital goods, would slash import bills and even in principle diversify exports, thereby improving upon what in many developing countries today are deteriorating balance of payments positions. And third, while these industries favor capital accumulation and investment, they also attend to the provision of basic needs, generate employment, and are integral to the success of rural development programs.

Investment. The soundest reason why a strategy to revitalize industrialization in developing countries should accord priority to the construction and building materials sector and the capital goods industry centers on their fulfillment of investment and the multiplier effects which this investment exercises on other sectors of the economy.

Construction and capital goods play a decisive role in the process of capital accumulation and figure as key capital inputs to all other economic sectors. Construction output constitutes anywhere from 40 to 70 percent of gross fixed capital formation in most developing countries

---

[7] UNIDO, Industry and Development, 1981, p.8.

(see Table 2). In this role, the construction sector not only produces the infrastructural facilities required for transportation, water and power supply, communications, and waste treatment and disposal, but also produces housing and other buildings to shelter various social and economic activities, and the plants and process facilities required to provide productive capacity for a wide range of industrial activities. Where construction is not the leading sector in capital formation, capital goods is. In the industrially developed countries, machinery and equipment constitute about 60 to 65 percent of fixed capital value in manufacturing activities, while in new investments their share is even higher, up to 75 percent.[8] In Korea, the products of the machinery sector in 1977 constituted the single most important component of gross fixed capital formation (41%)[9] and in Kenya in 1976, machinery together with transportation equipment accounted for nearly half (49%) of capital formation.[10]

Capital formation is stressed here because industrialization is dependent upon its level and efficiency; if the output of construction

---

[8]UNIDO, "Issue I: Potentialities and Possible Progress of the Capital Goods Industry Development in the Developing Countries Including the Small and Medium-Size Developing Countries," prepared by the Secretariat of UNIDO for the First Consultation on the Capital Goods Industry, Brussels, Belgium, 21-25 September, 1981 (3 July 1981), p.2.

[9]Jayati Datta Mitra, "The Capital Goods Sector in LDCs: A Case for State Intervention?" World Bank Staff Working Paper No. 343, July, 1979, p.2.

[10]CMT, Incorporated, Role and Contribution of the Construction Industry to Socio-Economic Growth of Developing Countries, Prepared for United Nations Centre for Human Settlements, November 1980 (Revised April 1982), Cambridge, Massachusetts, p. II-48.

TABLE 2

GROSS FIXED CAPITAL FORMATION BY CONSTRUCTION[1]

AS A PERCENTAGE OF TOTAL GROSS FIXED CAPITAL FORMATION

	GDP PER CAPITA 1980 DOLLARS a	1960	1963	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Bolivia	570	48	41	35	49	51	53	47	50	50	48	45	47	43	-	-
Greece	4,390	68	65	65	-	-	-	63	61	61	62	62	57	59	59	61
Honduras	560	55	51	49	46	52	56	52	49	55	56	51	53	53	-	-
Ivory Coast	1,150	-	-	-	-	-	-	-	-	-	-	59	59	64	63	61
Kenya	420	-	-	46	-	-	51	51	47	49	54	54	56	54	49	42
Malaysia	1,620	43	50	51	-	-	-	49	44	46	-	-	-	-	-	-
Mexico	2,090	55	57	52	-	-	-	55	54	54	56	57	59	59	57	59
Pakistan	300	-	-	-	-	-	-	67	70	64	74	81	57	74	70	71
Syria	1,340	-	58	63	60	49	55	53	64	66	57	57	59	52	51	48
Tunisia	1,310	-	68	58	-	-	-	64	62	59	57	55	58	58	58	57
Yemen	430	-	-	-	-	-	-	81	82	83	75	78	68	66	59	-

1. GFCF by construction defined to include Residential Buildings, Non-Residential Building, and other construction. However, figures for Ivory Coast, Mexico, Syria, and Tunisia also include Land Improvement and Plantation and Orchard Development.

SOURCE: CMI, Incorporated, Role and Contribution of the Construction Industry to Socio-Economic Growth of Developing Countries prepared for United Nations Centre for Human Settlements, November 1980 (Revised April 1982), Cambridge, Massachusetts II-22.

and capital goods were to lag, so too would economic growth. To illustrate this relationship, we may examine the impact of investment in construction and overall economic output.

In at least three separate studies, it has been demonstrated that levels of construction activity tend to rise faster than per capita income growth. In a 1972 study,[11] it was estimated that the elasticity of investment in construction was 1.2, implying that each change of one percent in per capita GDP is accompanied by a 1.2 percent change in per capita value added by the construction sector. A 1980 study, examining time series data for 11 developing countries,[12] found that construction's share of GDP increased in the years from 1960 to 1977, reflecting a higher rate of growth than the economy as a whole. Finally, a 1982 study,[13] fitting a regression model to time series data for 53 countries over an 18 year period, demonstrated that during the intermediate phase of development the construction share of GDP rises rapidly, from approximately 7 percent at $200 per capita to 13 percent at $3100 per capita (in 1979 US dollars). National accounts statistics since 1965 for all developing countries confirm the findings of these studies: construction sector growth has increasingly outpaced overall economic growth, by as much as 3.7 percent in the period from 1975-1978. Due to this relatively high growth, the construction sector's share in developing countries' GDP increased from 5.3 percent in the early 1960's

---

[11] University College Environmental Research Group, Construction and Development: A Framework for Research and Action. A paper prepared for the IBRD, London, May, 1972.

[12] CMT, Incorporated, Role and Contribution.

[13] David Wheeler, "Major Relationships Between Construction and National Economic Development," Center for Construction Research and Education, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1982.

to 6 percent in the mid-1970's.[14] (The same is not true for developed economies, where construction growth lagged behind that of GDP). Thus, as a country moves through its crucial development phase, there occurs a very substantial characteristic diversion of national resources into construction. Construction accordingly assumes a steadily increasing role in the economy, with contributions to GDP typically in the range of 3 to 8 percent.

How does investment in these sectors induce overall economic growth and promote industrialization? The potential stimulus of construction to economic growth is substantial. However, forward linkages, or the consumption encouraged by the production of intermediate goods, are difficult to establish for construction output. This task is somewhat further complicated by national accounting practices which treat construction as a final demand product, thereby failing to record construction deliveries to other sectors in national input-output tables. A recent econometric model testing the productivity of investment in infrastructure by a Cobb-Douglas production function with data for four countries, Singapore, Israel, Malawi, and Zambia,[15] suggests a strong impact of infrastructural change on national output in the cases of Singapore and Israel, the two countries at the higher end of the income scale for developing countries. The most pronounced effects register after a lag of approximately two to three years. In the cases of the two poorer African economies, Malawi and Zambia,

---

[14] Jurgen Riedel, "Global Prospects for the Development of the Construction and Building Materials Industry," Munich, June 1983.

[15] Wheeler, "Major Relationships Between Construction and National Economic Development".

however, the available data suggest that at best the net result of infrastructural investment during the past two decades has been negligible.

One obvious difference between the two sets of countries is their per capita income levels, suggesting perhaps that infrastructure can be more productive at later stages of development when other economic sectors are better able to take advantage of newly installed facilities. However, another explanation for the discrepancies in the results which cannot be discounted is the efficiency of planning in Singapore and Israel. Indeed, if superior planning can be credited with the strongly positive effects of infrastructural construction on economic production, then a clear forward linkage between construction and economic growth in other sectors can be established. Moreover, planning should not pose an insurmountable constraint for less developed countres. National planning could easily be improved with cooperation among developing countries, especially on a regional basis.

Similar arguments can be presented for the capital goods industry, which represents approximately one third of world manufacturing value added. As we have seen above, capital goods complements the contribution of construction to gross fixed capital formation, a share which rises in relation to construction as industrialization progresses. Yet there is another reason why the capital goods industry is of central importance to industrialization. The fixed investment which expenditure on capital goods represents is the embodiment of the means of production and the core of a national technology; without them, no developing country can pretend to embark upon a course of self-reliant industrialization. Capital goods fulfils an important role as a

catalyst for technological progress. A significant correlation has been demonstrated to exist between an existing capital goods industry and national invention, as measured by the requests for registration of patents in a country by a national of that country.[16] Thus the establishment of indigenous capability in capital goods manufacture would favor considerably the process of industrialization in that it is the most effective way to fully master and adapt technology.

Other "forward linkages" or inducements to generalized economic growth center on the externalities which capital goods can provide to other sectors of the economy, principally in the form of increased efficiency of client industries. One means by which domestic capital goods production could accomplish this is in training skilled labor proficient in repair work, which would reduce downtimes and accommodate the purchase of second-hand equipment, therby allowing LDC's to gain access to a wider spectrum of available techniques. Another is through matching equipment norms to indigenous manufacturing conditions and capabilities.

Related to these arguments for developing indigenous capability in capital goods production is the "deepening" of industrialization. In many developing countries, where the first "easy" stages of industrialization, in the establishment of, for example, textile factories and food processing plants, have already been achieved (largely through import substitution policies), in order for the process to continue, it becomes necessary to venture beyond these traditional,

---

[16] UNIDO, "Issue I", p.3.

consumer goods industries. One fruitful avenue for countries at this impasse is to diversify the production structure through "backward integration", and undertake the domestic manufacture of capital goods. The prospects for the viability of this strategy are enhanced by the ready market for basic industrial machinery and equipment provided by existing industries.

Derived demand, or "backward linkages" are critical to the industrialization process. Development economists have pointed out the importance of backward linkages in stimulating industrialization through the provision of a guaranteed market. Construction is one such sector which creates a market for other industries. Derived demand in construction represents a value which in most instances exceeds the value added by the construction sector itself. The average value of intermediate inputs as a percentage of the total value of construction output in a study of eleven developing countries was 55 percent.[17] Sectors typically benefitting most from construction purchases are metal-machinery and non-metallic products. These sectors are precisely those in which building materials and capital goods are concentrated.

Thus far attention has been focused on the contribution which construction and capital goods can make to capital formation and investment. Why, then, should a strategy to revitalize industrialization accord priority to the building materials industry, which makes little direct contribution to capital formation, over other industrial sectors which, too, do not have the capacity to transform savings into investment, but which on the surface should have equal claim to promotional considerations? The answer to this important

---

[17] CMT, Incorporated, Role and Contribution.

question begins with the contribution of building materials to construction, which amounts to approximately one-half of construction output. The vitality of the building materials industry is as essential to the smooth functioning of the construction industry as the latter is in turn to the performance of the overall economy. As the major source of intermediate consumption, the industry would be the major stimulus or bottleneck to the construction sector as a whole. It also would contribute to an indigenous capital goods industry, through the provision of steel and other material inputs. Thus building materials would form an integral element in an overall strategy to revitalize industrialization. In itself, this secondary contribution would be sufficient justification to foster indigenous building materials industries in developing countries. Yet, there exist other sound reasons for assigning priority to this industrial sector.

Building materials hold significant potential for redressing imbalances in global industry. It may not be possible for developing countries to achieve equal capability in all manufacturing sectors. Energy and capital constraints may pose insurmountable obstacles to the development of certain manufacturing activities; to compensate for underachievement in these areas, even more progress must be made wherever natural, material, and human resources permit. Building materials is one such sector where capacity for such achievement has already been demonstrated. Developing countries have performed admirably in the production of building materials. For virtually every significant material, collectively they improved upon their percentage of global production by substantial margins during the decade of the 1970's, in many key categories, such as cement, having achieved or fast

approaching the 25 percent benchmark set as the overall manufacturing target in the Lima declaration. Also, manufacturing capability has been installed in many developing countries in sectors where previously there had been none, and prospects had been gloomy; while developing countries still produce only 12 percent of the world's crude steel, 60 developing countries today have, or are on the verge of acquiring this manufacturing capability.[18] Thus developing more extensive and advanced capability and attaining higher production levels in the building materials sector may enhance the prospects of meeting the overall Lima target. Moreover, import-export data suggest the persistence of an unacceptable trade pattern whereby developing countries export raw materials and import those same materials at higher stages of processing. And finally, building materials can be initiated in most developing countries, regardless of stage of development. As we shall see below, they translate directly into the service of basic human needs.

Other compelling reasons for proceeding with the establishment of the indigenous building materials manufacturing capability directly address the crucial constraints on development identified in the first part of this paper.

Trade Imbalances. The central role which the building materials, as well as capital goods industries play in economic growth and industrialization does not alone justify a development strategy which is predicated upon their local manufacture. Indeed, considerations of comparative advantage might suggest instead that these goods be

---

[18] UNIDO, The World Iron and Steel Industry (Second Study), prepared by the Sectoral Studies Section, International Centre for Industrial Studies, 20 November, 1978, p. 71.

imported, and that developing countries concentrate on the manufacture of other, less complex goods, consistent with their resource bases. What does argue for the development of indigenous capability in these sectors is the urgent need for developing countries to scale down import bills, in many cases to generate an export surplus to service astronomical debt, and in others to compensate for diminished aid flows which normally fund the importation of the products of these industries. In other words, as the capability to import is curtailed, an inability to manufacture domestically at least a share of their current imports would pose a bottleneck to the further advancement of industrialization in developing countries.

Capital goods constitute a large portion of the import bills of developing nations, and one which is rising as industrialization proceeds. On the whole, the imports of machinery and equipment by developing countries increased from $7 billion in 1964 to $62.3 billion in 1976, and were estimated to surpass $80 billion in 1981. To put this in perspective, capital goods represented 22 percent of total imports in 1970 and about 30 percent by the late 1970's.[19] Even among "newly industrializing countries" with indigenous machine tool and equipment plants, there persists a need to import capital goods in substantial quantities. In Korea, in 1977, 27 percent of all imports consisted of machinery and equipment, and in India, capital goods contributed 49 percent to the import of manufactures in 1976.[20] These elevated

---

[19] P.N. Agarwala, "Entry Into and Development of Capital Goods Industries and its Implications for New International Cooperation," New Delhi, June, 1983, p. 2.

[20] Mitra, "The Capital Goods Sector in LDCs," p. 2.

percentages make the capital goods industry a prime and logical focus for import-substituting activities in less developed countries. Similarly, while building materials contribute only 3 to 5 percent to GDP in developing countries, they account for 5 to 8 percent of the total value of imports. The disproportionate share of imports channeled to the building materials sector has been decried for many years. Despite some gains in exports in recent years, developing countries remain dependent to a very large extent on building materials imports from the developed world. Almost all developing countries import some amount of essential materials and products: while in a few instances import levels are as low as 5 to 10 percent (as in Mexico), they are often far higher, in some cases reaching 60 percent and more, representing a foreign exchange drain of considerable magnitude. Therefore substituting imported building materials with indigenous goods is a realizable goal consistent with the constraints on and broad outlines of the strategy to revitalize industrialization.

To this primary consideration has been added another motivating factor for the development of capital goods manufacturing capability in developing countries in the context of the current world economic context: the need for developing countries to diversify their export baskets to counter protectionist trends among the industrialized countries.[21] Servicing foreign debt will continue to require substantial export earnings at the same time that protectionist measures are restricting markets for precisely those goods in which developing

---

[21]This argument is made by Mitra, "The Capital Goods Sector in LDCs," pp. 2-4.

countries had built up comparative advantage.[22] Capital goods have registered one of the fastest growth rates of LDC non-traditional exports in recent years. There are at least two reasons favoring capital goods as a non-traditional export item for less developed countries: first, mechanical engineering goods exports are not yet subject to trade restrictions, and secondly, LDC machinery exports by virtue of their relative skill intensity do not pose a threat to the continued employment in developed countries of unskilled labor. However, a more likely outlet for the surplus production of capital goods by middle-income developing countries is the market of regional trading partners, which would foster economic cooperation among industrializing countries.

Basic Needs. The construction sector, and therefore also indirectly the building materials industry, should occupy the center of any redistributive growth strategy. Investment in construction has the potential to enhance both industrial growth and the productivity of the poorest segments of the population, largely through the provision of employment opportunities. On average, the sector accounts for approximately 5 percent of total employment: 3 percent in Africa, 4 percent in Asia, and 6 percent in Latin America. Wage rates in the sector tend to vary commensurate with the skill levels of the bulk of the workforce: as the economy develops, the sector becomes more

---

[22]For an illustration of tariff barriers in the developed countries see Deepak Lal, "Market Access for Semi-manufactures from Developing Countries," World Bank Reprint Series Number 130 (originally appearing in Commercial Policy Issues, No. 5, Leiden: Sijthoff, for the Graduate Institute of International Studies, Geneva, and the Trade Policy Research Centre, London, 1979).

sophisticated and its skill composition is upgraded. In industrialized countries, wage rates for employees in the construction sector tend to be higher than those in many other sectors.

Given the structure of wages and state of production technologies employed in most developing countries, construction is a logical employer of the unskilled and semi-skilled; it has great absorptive capacity, particularly when labor-intensive methods are adopted. The use of labor-intensive construction techniques, demonstrated in a preliminary study by the World Bank to be feasible in at least 60 developing countries, should and can be designed to absorb excess labor without sacrificing productivity or squandering resources. In various countries, it has been demonstrated that the construction sector plays the most important part in absorbing farm labor from the agrarian sector. In fact, construction has been characterized as an industry which serves as a bridge between the unskilled workers of the informal labor market and the skilled laborers of the formal sector. It can be argued that construction activities contribute a significant externality for the rest of the economy by training entry-level workers in the fundamental skills and discipline of industrial activity. It is even reasonable to believe that construction is superior to competing economic activities in producing these skills, and such a hypothesis should be investigated. Finally, when evaluating the potential contribution of construction to alleviating unemployment and underemployment, job opportunities in other economic sectors generated indirectly by the construction industry's intermediate consumption, as in the building materials industry, should also be taken into consideration.

Capital goods industries, while not to the same extent as construction, can be an important source of productive employment for labor in developing countries. The capital goods sector is generally not as heavy as other non-traditional industries such as petrochemicals. The ratio of investment per worker in the machine tool industry for simple metal cutting machinery could range from $15,000 to $20,000, and for machinery for metal forming from $40,000 to $45,000 and $55,000 to $65,000 respectively. In the USA the average cost of creating a job in the capital goods industry also ranges from $40,000 to $60,000.[23] The relatively small amount of fixed capital investment per job created as compared with other industries may favor, and at least does not militate against, the introduction of the capital goods industry as a source of employment in the developing countries.

The construction industry, somewhat uniquely, also contributes to the provision of basic needs directly. It is responsible for supplying shelter, one of the longest-standing and yet most pressing problems on the agenda of the developing countries, as well as water and sanitation, a priority set in the United Nations Water Decade. In choosing among industrial sectors for promotion, it should be borne in mind that the most disadvantaged segments of the world's population are in more critical need of housing, schools, and hospitals, than of many non-durable consumer goods, which in many cases they are too poor to afford, and production of which generates less employment than comparable investments in construction. These basic needs, in turn,

---

[23] UNIDO, "Issue I", p. 8.

will also make the poor more productive. Improved health and sanitation made possible by constructed facilities would improve the productivity of labor. Small farmers, too, can be made more productive by the construction of rural roads.

In fact, the success of any rural development scheme hinges on the participation of all three sectors whose promotion is advocated here. Supplies of agricultural credit alone cannot solve the problems of rural areas. The rural poor need rural infrastructure, including irrigation facilities as well as roads, which can be supplied only by a flexible construction industry, as well as farm machinery, which could be manufactured by a domestic capital goods industry to suit the needs of the rural sector. Even this alone would not be sufficient, since all rural dwellers will be increasingly unable to derive a livelihood from the soil. Rural industries will be an important element of any program to revitalize the countryside; building materials plants, which in themselves would reduce the cost of vital construction projects by cutting freight costs, could be viable in such a context.

One final point should be addressed. Construction has been dealt with here as an industry whereas normally "industry" is limited to manufacturing activities. Yet, construction is an industrial sector, albeit a unique one. Its product is immobile, long lasting, and relatively expensive. Production takes place primarily on site; there is no possibility to inventory products; production often is highly seasonal and subject to climatic uncertainties; and an element of risk is introduced by the standard practice of owners entering into

agreements prior to the start of projects. In developing countries, construction labor is transient, often en route from agriculture to manufacturing; some workers even divide their time between construction and agriculture. While these distinguishing features must be recognized in any treatment of construction as an industrial sector, the enormous developmental potential of the construction industry should be exploited.

3. Meeting Demand for Construction, Building Materials, and Capital Goods

3.1 Demand

If the arguments presented above for the role the construction and building materials, and capital goods industries can play in stimulating industrialization are accepted, the next, logical question is: "Does a sufficient demand exist for these goods and services that will make an industrialization strategy based on their promotion viable?" In fact, the demand is overwhelming.

New shelter must be erected on a truly grand scale to meet the projections for world population growth by the year 2000. By any account,[24] total world population is expected to rise to over six

---

[24] Global models which were reviewed in the preparation of this paper are: (1) The Global 2000 Report to the President: Entering the Twenty-First Century, A Report prepared by the Council on Environmental quality and the U.S. Department of State, 1981; (2) Wassily W. Leontief, "The World Economy of the Year 2000," Scientific American, September 1980; (3) UNIDO, "The Unitad System" 1981 Report, UNIDO/IS.337, September 1981; (4) World Bank, World Development Report, 1979; (5) OECD, Interfutures: Facing the Future, Paris, 1979; (6) Bela Belassa, "Prospects for Trade in Manufactured Goods Between Industrial and Developing Countries, 1978-1990", World Bank Reprint Series Number 156 (originally appearing in Journal of Policy Modeling, vol. 2, no. 3, 1980, pp. 437-55); and (7) UNIDO, "Modelling the Attainment of the Lima Target: The LIDO Model," Industry and Development, No. 6, 1981.

billion persons by the end of the century. Global models agree that nearly 79 percent of this population will be concentrated in the less developed regions of the globe. Urien[25] estimates that in the next 25 years, as much building will have to be done as has ever been done before. In India, where the shortage of urban and rural dwellings is colossal, the National Buildings Organisation has estimated the housing deficit at the beginning of 1983 to be 22.5 million units. And, over the next 20 years, the housing requirement is estimated to rise by 20.4 million units in the urban areas and 30.6 million in the rural, merely to absorb the population growth.[26]

To place this demand in context, it should be understood that the proportion of demand for construction taken up by residential dwellings only begins to rise in the later stages of development. In the early phases, it has been demonstrated that proportionally greater demand is exercised by the infrastructure and civil engineering sectors, followed in a middle phase by industrial facilities. Wheeler[27] has found that infrastructure fades from approximately one-half of all construction activity in the first stages of development towards 30 percent in higher-income societies, while the share of residential construction

---

[25]Rene Urien, "Preparing a World Study of Building Techniques and Materials," Preliminary Report, UNIDO Ad-Hoc Expert Group Meeting on the Building Materials and Construction Industry, Vienna, Austria, 15-17 December, 1982. UNIDO/PC.57 (8 October 1982) V.82-31168.

[26]G.C. Mathur, "Development and Promotion of Appropriate Technologies in the Field of Construction and Building Materials Industries in India," 1983.

[27]Wheeler, "Major Relationships Between Construction and National Economic Development."

rises almost as quickly as infrastructure falls, from around 28 percent at $200 to nearly 40 percent at $2000 per capita. The non-residential share, which begins near the residential share in poor societies, climbs slowly but more steadily than the residential share, moving from around 23 percent at $200 to about 28 percent at $3,100. The two converge in societies with incomes around $10,000.

We have established that as development proceeds and GDP increases, the demand for construction can be expected to rise at even higher rates. Future growth in population, gross national product, and per-capita income, among the most important factors demonstrated to shape demand, will result in an increase in demand for construction in the final decades of this century. Global models diverge somewhat over what the magnitude of this increase will be, depending on the overall economic growth rates projected by the models and the elasticity attributed to each sector. In one forecast based on the projections of the UNITAD system (see Table 3), the demand for investment, construction, capital goods, and basic products (which would include building materials), can all be expected to grow substantially through 1990 for all developing regions.[28] Demand for capital goods will be especially acute in Northern and Western Africa, where projected sectoral growth rates exceed 13 percent.

---

[28]These projections should be approached with caution. They are based on optimistic growth forecasts of 7 percent per annum (most models place this estimate at nearer to 5 percent), and on a pessimistic view of demand for construction, an elasticity of .9 which, according to all available evidence of past performance, is probably too low.

TABLE 3

THE UNIDO SYSTEM: AVERAGE ANNUAL GROWTH RATES OF WORLD CONSTRUCTION, CAPITAL GOODS, AND RELATED SECTORS UNDER IDS SCENARIO CONDITIONS

	BASIC PRODUCTS		CAPITAL GOODS		CONSTRUCTION		INVESTMENT	
	1975-90	1980-90	1975-90	1980-90	1975-90	1980-90	1975-90	1980-
DEVELOPING REGIONS								
- Latin America	5.7	6.3	6.3	7.0	5.7	6.3	5.7	6.3
- Tropical Africa	2.9	3.3	6.5	7.4	2.9	3.3	2.9	3.3
- North Africa/West Africa	7.4	8.8	10.9	13.4	7.0	8.4	7.4	8.8
- Indian Sub-Continent	5.0	5.6	4.5	5.0	4.5	5.0	5.0	5.6
- East and South East Asia	4.9	4.8	6.0	5.8	7.0	6.8	6.7	6.5
DEVELOPED REGIONS								
- North America	2.6	...	3.3	...	2.9	...	3.2	...
- Market Economies Europe	2.6	...	3.2	...	3.5	...	3.5	...
- Japan	5.3	...	4.7	...	6.5	...	6.5	...
- Other Developed	4.5	...	5.4	...	5.0	...	5.0	...
- Centrally Planned Economies Europe	4.0	...	4.4	...	5.6	...	6.0	...

SOURCE: Jurgen Riedel, "Global Prospects for the Development of the Construction and Building Materials Industry" Munich, June 1983, p. 35.

The challenge facing developing countries to supply construction, building materials, and capital goods to satisfy this demand is urgent. For developing countries without indigenous industries who must import these capabilities in the form of finished goods and technical services, reductions forced in imports by balance of payments deficits will inevitably frustrate growth. To avoid this least desirable future scenario, developing indigenous capability in these target sectors must be accorded priority.

Is a goal for developing countries to meet this mushrooming demand indigenously feasible? While self-sufficiency in building materials production by the year 2000 for developing countries remains an active goal, and the achievement of 25 percent of the world's output a realistic possibility, far more modest goals have been formulated for the capital goods sector. Self-sufficiency in the machinery and equipment industries will not be possible in the foreseeable future, and 15 percent can be taken as a more realistic target figure for the sectoral share of world production to be manufactured in the developing countries by the end of this century.[29] The LIDO model estimates in both minimum and maximum growth scenarios that local production of capital goods in developing countries would be sufficient to cover only about 55 percent of their consumption needs in the year 2000 (as compared to 45 percent in 1970).

---

[29]This target was set in the LIDO model. The model estimates that the developing countries' share in world population should reach between 16.7 and 16.9 percent by 2000. This range in fact corresponds to that obtained by UNCTAD, and is close to the OECD "interfutures" scenarios, where the developing countries' share in world production of capital goods amounts to 12 percent (16-18 percent when China is included). UNIDO, "Issue I", p. 11.

This production shortfall will need to be supplemented by imports from the developed countries. Thus, even as developing countries foster local industries to begin the process of import substitution, the need to import will persist. Projected rates of growth in consumption of capital goods (9 - 10.5 percent per annum) imply the emergence of a huge market for the industrialized economies, rising from 20 percent of their production in 1970 to between 42 and 60 percent by the year 2000. Under these circumstances, the relationship between the developing and the developed countries would not be one of competition, but would suggest mutual gain from cooperation.

3.2 Patterns of Development and Constraints on Supply

While the need to develop indigenous sources of supply for these key industries is apparent, achieving this goal will be difficult for many developing countries, critically constrained by lack of capital, skilled labor, and other resources. In order to overcome or ease constraints on development of local industries, which in itself will require new channels of capital and technology transfers from developed to developing countries, and the active intervention of international organizations and national governments, it is necessary to set forth the current situation and emerging obstacles to the development of these industries.

3.2.1 Capital Goods

In 1977, developing countries contributed only 6 percent of total world production; even when China is included, the poorer countries' share still reached only 8.5 percent. Developing countries supplied only 2.5 percent of world exports, whereas their share in imports reached 30 percent; and while developing countries

import 92 percent of their capital equipment from the market economy developed countries, and about 5 percent from the centrally planned economies, they import only about 3 percent from each other. Finally, per capita consumption of capital goods in developing countries, which in 1977 averaged $60 to $65, was 24 and 21 times less than the market economy developed countries and the centrally planned economies respectively.[30]

Stepping up production capabilities will be a more onerous task for some developing countries than for others. While some have a firm base in the business of producing capital equipment and machinery, such as Argentina, Brazil, India, the Republic of Korea and Turkey, who contribute between 40 and 45 percent of the developing countries' production (excluding China), a second group of countries are at the embryonic stage in the capital goods industry;[31] and a third set of 110 countries and territories (50 with less than one million inhabitants) have no capital goods industry whatsoever. Among this third group, the poorest, agriculturally-based countries collectively by 2000 would still not account for more than 3 percent of the developing countries' production and only 8 percent of consumption, and their own production would cover only 20 percent of the consumption needs.[32]

---

[30]UNIDO, "Issue I", p. 4.

[31]These include Algeria, Chile, Colombia, Indonesia, Iran, Malaysia, Pakistan, Peru, the Philippines, Thailand, Venezuela, the Central American countries, Egypt, Iraq, Ivory Coast, Sri Lanka, and to a lesser extent Bolivia, Cameroon, Ecuador, Ghana, Nigeria, Tanzania, and Zaire. UNIDO, "Issue I,", p. 4.

[32]UNIDO, "Issue I", pp. 11-12.

It has been demonstrated that indigenous capability in capital goods industries originated in many developing countries in their repair industries. In Argentina, machine tool production started out as an offshoot of repair activities in small workshops. The precursors of the capital goods production activities now evident in Batala (Punjab, India), Coimbatore and Madras (in Tamil Nadu, India), or in Incheon (near Seoul, Korea) were in fact facilities for the repair of machinery and of consumer durables.[33] It has been argued that on this basis the beginnings of a skill base required for the production of capital goods may already be available in certain LDCs which have relatively proficient repair industry enclaves.[34]

Another manner in which countries with capital goods industries have developed that capability is through licensing. It has been suggested that India, whose dependence on imported technology in the manufacture of machine tools has steadily come down from 80 percent in the early 1970s to around 20 percent at present, gained its technology mainly in this fashion.[35]

3.2.2 Construction

In contrast to capital goods, all countries have some form of construction industry. In less developed countries, the construction industry is divided crudely into a modern, formal sector, dominated by foreign firms which use advanced technologies responsible for the construction of major infrastructure works, and an informal

---

[33] Mitra, "The Capital Goods Sector in LDCs."

[34] Ibid.

[35] Agarwala, "Entry into and Development of Capital Goods Industries" p.5.

sector, which is comprised of a mass of very small non-industrial enterprises operating in rural areas or on the periphery of cities. The informal sector exists to satisfy the real need for construction where either clients cannot afford the formal market prices, or where the formal market has not penetrated. In the absence of official statistics, fragmentary evidence from several developing countries suggests that the informal sector is responsible for the construction of the vast majority of residential dwellings, especially in medium and small-sized cities and in rural areas; contributes approximately 30 percent of the value added by the entire construction sector; and may even employ more construction workers than the formal sector.

Indigenous construction firms skilled in performing various types of construction of varying degrees of technological complexity are an important resource for a developing country, regardless of which technology may be more appropriate at any given stage in development. Domestic capability in various methods allows a country greater flexibility in choosing from among competing technologies where an objective is to refrain from relying on foreign firms. The development of a construction industry in a developing country generally proceeds in five stages. First, foreign firms handle most of the construction of the larger projects, particularly in civil engineering. Next, as a result of subcontract work on the first stage projects, indigenous subcontracting firms develop. In the third phase, small local contractors execute the smaller projects. This is followed by local contractors taking over most local work, regardless of magnitude, forming joint ventures with foreign firms as necessary. Finally, local contractors may go abroad.

For the construction industry, the most important resource constraints are labor, financing, and building materials. Construction labor forces in developing countries are generally less skilled than their counterparts in the developed nations. While there is an obvious need for skilled craftsmen, they are frequently in short supply. Constraints on the supply of qualified labor, including the semi-skilled and supervisory personnel, in turn impinges on the ability of the construction sector to provide an adequate supply of construction facilities. Financing also presents a serious constraint for indigenous contractors, especially given the underdeveloped capital markets in most developing countries. Exacerbating this structural difficulty, many commercial banks are simply unwilling to lend to domestic construction firms, especially those without established records. The indigenous construction sector in developing countries fulfills almost 100 percent of its need for construction equipment through importation. The cost of importing this capital equipment in both absolute terms and the expenditure of foreign exchange is high indeed. Moreover, the effects of carrying too much equipment can be detrimental. Too much or too large equipment, purchased for a grand-scale job, may have little use thereafter. The underutilization of construction equipment in developing countries constitutes a major problem.

3.2.3 Building Materials

The industrialization of building materials unfolds in stages. Walling materials are among the first to be produced industrially, followed by roofing and flooring materials, and finally by auxiliary materials, including fittings, finishes, and equipment. The

high investment in civil engineering works in the early stages of construction also tends to encourage the establishment of a local cement industry. Though steel is a primary input for civil engineering construction, the installation of steel industries are not easily undertaken in these early stages of development.

One means by which developing countries have successfully established local building materials industries is through import substitution. Mexico's relatively advanced building materials industry (Mexico imports only from 5 to 10 percent of its building materials needs) has been ascribed to just such a long-term industrialization strategy which provided for the imposition of import quotas to protect indigenous manufacturing industries. Substantial scope for import substituting policies still exist, especially with respect to secondary and auxiliary industries. Plumbing fixtures, windows, electrical equipment, and tiles, currently in short supply in many developing countries, could all be produced locally more extensively than at current levels, given a stimulus and a margin of protection.

While the need and desirability for firmly establishing a series of building materials industries in developing countries is apparent, many constraints seriously challenge the capacity of developing countries to satisfy their construction sector's demand for building materials. The first is the constraint imposed on foreign trade by mounting debt service, contracting markets in the developed countries, and reductions in aid flows from the developed to the industrializing economies. This foreign trade constraint not only is the prime motivating factor behind the need to establish indigenous capability in building materials manufacture, but also applies to national resource and energy inputs for

these production operations. While the non-availability of certain natural resources would not in itself pose a decisive constraint, foreign trade limitations render impractical any plans for establishing an industry based on an option to import necessary raw materials. Similarly, the energy consumed for the manufacture, transport, and use of building materials is a limiting factor of primary importance. While research continues into alternative energy sources and energy saving production technologies, those countries who import a significant share of their energy requirements will continue to suffer a serious constraint on the ability of the building materials industry to satisfy demand locally.

Another major constraint on establishing indigenous building materials industries is transportation. The low value/weight ratio of many building materials renders transportation costs a more serious constraint on building materials than on virtually any other industry. Where transportation is difficult, as in mountainous terrain, or roads are poor and even unpaved, transportation costs can be higher than the production costs of certain goods.

The constraint of transport costs varies inversely with the size of the consumer market for building materials. Were there a large enough market to sustain an economy of production scale within a reasonable distance from the manufacturing site, the constraint imposed by transport costs would be eliminated. A market sufficiently limited by the absolute size of the population, its density, or its purchasing power constitutes a serious constraint on the viability of many building materials industries.

In many cases constraints are imposed on the development of otherwise sound building materials industries by the absence or inadequacies of local support industries. The most obvious of these are those capital goods industries which supply the equipment necessary to install various manufacturing plants. This is an increasingly relevant constraint as foreign exchange scarcities exacerbate the difficulty of developing countries in obtaining capital equipment at a price which they can afford. Spare parts and the replacement of depreciating equipment can be as critical to maintaining operations as the initial manufacture of these goods is to establishing operations.

In contrast to many constraints described above which are direct outgrowths of the current context of development, the underutilization of capacity presents a long-standing constraint on supply. The major cause for underutilization of capacity appears to be a lack of sufficient demand to support full capacity production, or alternatively, the uncertainty of that demand. Others may be difficulty in getting materials, a lack of operating capital, and labor problems. Given the expense of starting up manufacturing operations in developing countries in many major building materials industries, this constraint represents a serious waste of precious resources.

Finally, the capital costs in initiating and maintaining industrial operations are perhaps the most critical constraint in developing countries on building materials industries. For steel, the price is exorbitant, and escalating rapidly. The capital required to establish a cement industry is considerably less than that for steel, yet, still high in absolute terms for developing countries when the production units involved are large. The high cost of installing production

capabilities in many lines of building materials, especially steel and cement, contributes to a pattern of state ownership of industrial capability, in many cases approaching 100 percent of the production capacity of steel, and from 65-70 percent of cement. Moreover, these same characteristics also give rise to concentration in the private sector. The inflated price of energy has only exacerbated this difficulty. Many countries are too heavily in debt to generate any additional external sources of financing either from international lending agencies or private banks, and domestic capital markets are too poor and undeveloped. Added to this basic constraint, the price of installing plants in many product lines is escalating more rapidly than the ability to plan for them.

4. Promoting Industrialization: Issues and Recommendations

Issue I: The Development of Indigenous Capabilities

A recurring theme of this paper has been the need for developing countries to engender indigenous capability in the key industrial sectors of construction, capital goods, and building materials. Substituting domestic for imported products and services would mitigate an increasingly onerous debt service for many developing countries. Moreover, a policy which supports continued reliance on the capabilities, materials and equipment imported from industrialized countries is in direct conflict with other development policies which are attempting to promote self-reliance within and among developing countries.

How might indigenous capability evolve in developing countries in these industrial sectors? Clearly, considerable scope exists for national promotion and regional cooperation. The following are recommended:

1) Planning for Industrialization.

Both construction and capital goods industries in developing countries could profit greatly from a comprehensive system of national industrial planning. In construction, what is most needed is the capacity to determine future requirements, including materials and other resources, assess the ability of the construction and building materials sectors to meet these requirements, and on the basis regularly formulate specific plans for providing for any shortfalls in requirements versus capacity of adjust the schedule for construction projects to permit a more orderly build-up of needed capacity. For this purpose, a national planning body for construction is recommended. Similarly, in the capital goods industry, an understanding of future demand might lessen the need to import machinery and equipment which may already be produced domestically.

2) Organizing to Meet Demand.

Unlike national planning which attempts to adjust short and medium term demand so as to better accommodate the anticipated growth of existing supply capabilities, the intent of this strategic priority is to actively promote specific supply capabilities commensurate with both current and future priority needs as identified in national development plans. Depending upon what those priorities are, quite different capacities will be needed; in construction, for instance, building rural residences requires the development of skills, equipment, and materials quite distinct from those used in erecting major civil engineering works. The promotion of indigenous capability as a whole should take into the account the diversity of demand in order to assure that the direction of growth is consistent with overall social and economic development plans.

3) Expanding Indigenous Professional Capability.

Indigenous industries require indigenous professionals. Until now, the need for native planners, engineers, architects and managers has been an understated one which has not received the attention it deserves. Foreign professionals cannot be expected to grasp fully the nature of local resources and requirements when designing industrial plants or rural road networks. Yet, in virtually all developing countries, there exist shortages of substantial proportions of native planning, design, and managerial talent. The development of these sophisticated professional skills is not achieved by the type of short-term training which can in most instances elevate unskilled workers to a productive, semi-skilled status in many industries. Rather, professional labor and manpower development will require long-term educational efforts and opportunities to gain practical experience. Developing countries would be prudent to offer incentives to professional expatriates, and initiate the lengthy training for future cadres of indigenous professionals.

4) Upgrading Existing Capability.

- In promoting indigenous industries, a logical place to begin is to upgrade existing capability, however rudimentary. In construction, the informal sector is primarily responsible for erecting housing for the vast majority of the population in developing countries. The flexibility of the sector, its use of unskilled labor and indigenous materials, and its demonstrated ability to satisfy the needs of the population where the informal sector has failed, suggest that the sector holds real potential for bridging the gap between real need for and the supply of construction in developing countries. Yet, little is known about its organization and operations. A better understanding of its role and ways in which its output might be upgraded and integrated into national planning and development are needed.

- To meet the challenge of developing capital goods industries in the smallest, least developed countries, special attention might be accorded to repair shops. By first training laborers skilled in repairing imported capital goods may grow domestic manufacture of replacement parts, which in turn may form the embryo of a machinery and equipment industry. As a first step, when importing capital goods, their characteristics should be carefully examined for this kind of potential.

5) State Promotion.

States can use their considerable involvement in the economy to the advantage of fostering indigenous firms. In construction, in its role as regulator, the government of a developing country should establish policies and procedures for making adjustments to building codes, standards, and regulations so they reflect conditions and resources which exist in the country; and, in its role as client, the government should develop and use contract clauses and other contracting methods which either require, or provide for preferential treatment of, the use of domestic materials and products.

6) Regional Cooperation.

To facilitate the growth of indigenous building materials industries, developing countries should standardize requirements and codes for building materials, which would permit the exporting of these materials to each other, thereby expanding the market base for these products, as well as increasing trade among developing countries.

Issue 2: The Need for Productivity and Technological Flexibility - A Case for Small-Scale Industry

The emergent pattern of constraints on industrialization in developing countries suggests a strong need for resource productivity and technological flexibility. In the current context of scarcity of resources for development, total factor productivity, and not merely the

more commonly measured labor productivity, assumes paramount importance. The optimal use of all factors of production and the achievement of maximum efficiency, while not a sufficient, is a necessary step in revitalizing industrialization in the Third Development Decade. Attaining efficiency, in turn, is impossible without the technological flexibility which permits effective adjustments to be made during the production process for any number of reasons, such as changes in the quality and prices of available materials and other inputs. A resolution of this issue can be sought in downscaling industrial production.

Small-scale industry can ameliorate many obstacles to industrialization through its ability to make use of technologically flexible production methods. In an era of rapidly changing technology, small plants may therefore afford the best opportunity to remain competitive. Computer assisted manufacturing, coming into increasing use in developed countries, enables a far wider variety of final product design than would a comparable investment in fixed machinery. Thus, reprogrammable machines with a capacity to limit production runs and manufacture several different products may offer a solution to the long-standing problem of limited market bases in the less developed countries, both in those with small populations and in those where low per capita income levels restrict the consumer market. Arguments against the introduction of automation because of a "labor-saving bias" can easily be dispelled; computer assisted manufacturing would not reduce existing jobs (as perhaps it might in advanced industrial countries), but rather the need for highly skilled labor which is in short supply in key industries such as capital goods, and which thereby poses a serious constraint on production. In fact, from the point of

view of the entire economy, automated production can be highly efficient in its use of labor: the savings resulting from lower operating costs could in principle be reinvested elsewhere, such as in construction, which is highly labor absorptive and which accordingly would create jobs for the reservior of unskilled and semi-skilled workers. Moreover, the industries in which the developed countries are introducing computer assisted manufacturing are precisely those in which developing countries had built up comparative advantage in recent years. Thus their competitive edge would be threatened if they were to become locked into technologies which are fast becoming obsolete.

Small-scale industry also enhances capital productivity and reduces the need for capital investment. The underutilization of capacity in large-scale, modern industrial oprations has diminished their capital productivity and offset the savings which (large) scale economies were once believed to net. The operation of small plants near full capacity lessens this waste of precious capital resources. They also alleviate the constraint of investment capital shortages in at least two ways. First, because the gestation period is low for a smaller plant, the potential for quick returns on capital investment is greater. This could conceivably enhance the willingness of entrepreneurs and banks to invest in this type of manufacturing operation, and may even open up new sources of financing previously unsuitable because of the prohibitive length of repayment terms. Secondly, because financing costs are substantially reduced, investment opportunities will be accessible to small entrepreneurs. Thus the total capital and entrepreneurial pools available to indigenous industries may be augmented. Small industries also have the important effect of breeding indigenous entrepreneurial talent.

Another significant means by which small scale plants enhance total factor productivity is by making maximum use of locally available resources and energy, both of which represent serious constraints on industrialization in those many developing countries whose ability to import has been severely curtailed in recent years. Finally, they may also contribute to propelling industrialization by reducing the market base necessary to sustain a profitable manufacturing operation, which carries with it the secondary benefit of easing the constraint on transport costs which is especially valuable to industries with low value/weight ratios such as building materials. The scaling down of plant size would enable the installation of building materials industries in rural areas which would remove the long-standing difficulty of locating manufacturing operations at a reasonable distance from both the sources of their raw materials and their consumer markets.

The following priority areas should be explored to promote small-scale industry:

1) Reorganizing Production.

- o The building materials industry already boasts many viable manufacturing processes for small scale plants. From direct reduction methods in steel-making to vertical kilns for firing cement, cost-effective production technologies have already been developed which represent dramatic improvements over earlier, artisan-type operations. Plans should be formulated to step up the installation of these kinds of industries, while research continues in ways to refine these methods and discover new ones.

- o Construction, like manufacturing industry, can benefit from down-scaling operation. Even construction activities face increasing costs per unit of volume under conditions of increasing size, as in high-rise buildings, and strain, as in civil works. Breaking down construction jobs

into smaller component parts may facilitate the entry of more domestic construction firms, which would not have the capacity to undertake, for example, major infrastructural works now handled most often by foreign contractors. In the near future, a reorganization of production could result in the upgrading of many firms in the informal sector, which as we have already seen perform the bulk of residential building in developing countries at this time.

- o Subcontracting, apparently a standard practice in developed countries, might be encouraged as a source of demand for the products of small industrial plants. Mammoth public sector firms might be encouraged to subcontract operations to private small and medium industries. This would also discourage heavy capital investment.

- o Because small plants are normally more labor-intensive than their large scale counterparts, labor-based production methods should be encouraged wherever they are feasible and competitive with capital-intensive manufacturing techniques. Labor-intensive methods save capital, often in short supply, and obviate the need to import sophisticated equipment. They also benefit the development of the local construction industries and certain support industries such as the manufacture of tools, simple equipment, and indigenous construction materials. Most importantly, labor-based production enhances technological flexibility: labor can be redeployed far more easily than capital equipment.

2) Making Resources Available.

- o Increasing the capital available to small firms is the best beginning for facilitating their growth and potential contribution to development. Yet, documented difficulties which small construction firms and those in other sectors have had with the commercial banking systems in several countries suggests that to truly make financing accessible to worthy borrowers, some

decentralization of banking services may be desirable. Also, qualified representatives of industry could be invited to participate in banking decisions.

- o Much needs to be done in the area of human resources. New ideas for labor training programs should be given a chance, given the high failure rate of many attempted to date. Some form of apprenticeship in small firms could be one fruitful avenue for further study.

3) Reforming Regulatory and Fiscal Policies.

A review of existing legislation in many developing countries would likely turn up evidence that bureaucratic requirements and tax systems may contain serious and systematic disincentives to growth for small industry. As a start in translating these into positive inducements to growth, the scope of bureaucratic intervention in the life of small industry could be narrowed, and tax systems could be reformed to create incentives for expansion.

4) Protecting Nascent Small-Scale Industry.

Incentives alone are often not enough to induce investment in a competitive world market. In order to create the kind of secure climate for growth in which private investors will come forward, states need to afford some degree of protection to nascent small scale industrial plants. Import tariffs, quotas, or other mechanisms may be employed to provide a protective shield behind which new and newly expanding small firms could grow. Other positive measures might be adopted to similarly protect small firms against their larger, firmly entrenched, domestic competitors. Ideally, these measures should be temporary and adopted for pre-fixed terms to avoid subsidizing inefficiency by eliminating competition altogether.

Issue 3: Resources for Industrialization

Vital to the success of the strategies for industrialization and the development of indigenous capability elaborated in this paper is the upgrading of the quality and assuring the flow of the resources needed in the manufacturing and construction operations being promoted. As briefly alluded to above in the recommendations for issue 2, the two more prominent resources needed are capital and labor. The shortage of adequately trained labor has constituted a long-standing constraint on the development of construction and capital goods industries in industrializing countries. Traditional training methods and institutions have not made significant progress in resolving the need for an increased supply of skilled and qualified manpower at several levels including management and supervisory personnel and skilled and semi-skilled labor, nor are there any signs of any near term breakthroughs.

The reduction of capital investment brought on by the current global economic context threatens to strangle economic growth. There is an urgent need to develop new mechanisms for assuring a regular flow of capital to developing countries with which they can plan an orderly importation of capital goods, which will still be required even if optimistic targets for domestic manufacturing are fulfilled. Institutionalizing a system for channeling this type of assistance to developing countries, rather than the current lurching from crisis to crisis, is in the obvious interest of all parties involved.

All actors in the development process have an important role to play in easing this critical constraint. The following paths are suggested:

1) Internationally, there is an urgent need for understanding on the part of the developed countries of the real resource needs of the poorer countries, especially for capital. Various proposals offered recently in many forums to deal with some pressing international financial issues should be explored if stability is to be achieved in the international monetary situation. One recommendation is for an International Bank for Industrial Development. The problems confronting developing countries in revitalizing industrialization stemming from resource shortages are formidable. International cooperation is the beginning of the solution.

2) Nationally, developing countries should look seriously into ways in which they might develop better their own capital markets. The potential for new financial instruments, regional development banks, and other mechanisms to make capital available to public and private sector industry should be researched and evaluated. Moreover, some means must be devised for upgrading the skill levels of the labor force for the next phase of industrialization.

3) Governments of developing countries should also encourage the participation of local communities in industrialization. The location of small scale building material industries in rural areas, for instance, would go far toward achieving the balanced spatial development needed to expand markets and re-ignite industrialization.

Issue 4: The Need for Collaboration Among Developing Countries

Economic cooperation among developing countries has been advocated by the international community since the first calls for a New International Economic Order. Expanding bilateral and multilateral agreements among developing countries assumes greater urgency today than ever before. Constraints imposed on industrialization by recent reductions in trade and diminishing capital flows to the less developed countries cannot be overcome with indigenous resources alone. Wider

economic and technical cooperation amongst developing countries can stretch the scarce resources of developing countries which in most cases is insufficient to supplant the capital and markets of developed economies. Moreover, for the tens of small and medium sized countries with primarily agriculturally-based economies who have only the most rudimentary construction industries and often no capital goods industry whatsoever, collaboration with their neighbors, both large and small, is perhaps the most promising avenue to advance the cause of their industrialization in the near future.

To promote such cooperation, the following five strategic areas are recommended specifically for further exploration.

1) Promoting Trade Among Developing Countries.

Promoting trade among developing countries is important in addressing several challenges facing developing countries today with significant implications for industrialization. First, fledgling industries in developing countries are unable to weather the economic slowdowns that their firmly established counterparts can in the advanced industrial economies. Organizing new trading networks among developing countries could help to insulate poor nations from the business cycles which are today crippling industrialization efforts. Secondly, markets in developed economies have recently contracted, thereby depressing badly needed export earnings which in turn constricts the ability to import critical inputs such as capital equipment. Increased trade within the developing world would consolidate export markets for developing countries. Third, trade among developing countries would expand the market base for those industries previously constrained by too few domestic consumers. This would have the effect of both enhancing the viability of these industries and improving upon current export levels.

2) Developing Complementary Industrial Bases.

Given the difficulties for all developing countries but especially the smallest and poorest to establish industries in all lines necessary to service even one major industry, such as capital goods, a sensible strategy which is already being put in practice in Southeast Asia and on the Indian Sub-Continent is one which plans for complementary industrial bases on a sub-regional level. That is, neighboring countries undertake distinct industries on a non-competitive basis which assures a pattern of a complementary growth of industries consistent with the natural factor endowments of each nation. Differing from earlier formulations of 'comparative advantage' which served to reinforce the existing international division of labor, such a stragegy fosters the conditions under which many developing countries can enter the club of manufacturers of capital goods and building materials.

3) Sharing Technological Know-how: Technical Cooperation Among Developing Countries.

Some orderly exchange of information, especially of technological and engineering know-how, is crucial to achieving the goal of collective self-reliance. The learning experiences of developing countries should be pooled in order to eliminate the need for each country to discover anew the successes and failures of novel ideas and the ways in which they were implemented. Negotiations with developed countries for the transfer of technology, experiences with national planning, and indigenous engineering designs are but a few examples of the wide gamut of items which could be included on an agenda for collaboration.

4) Regional Research and Development Centers.

To facilitate the use of indigenous resources and energy in an attempt to revitalize industrialization, regional research and development centers are recommended. The introduction of laterite soil in West Africa or husk and bamboo in several Asian countries as building materials depends fundamentally on research, experimental programs, and promotional efforts, all of which could be

conducted in these centers. Similar testing could be pursued for capital goods appropriate for small-scale agriculture or labor-intensive construction, which are unlikely to be developed in the industrialized countries where there exists no demand for these products.

5) Regional Financial Markets.

While investment capital is obviously scarce in the developing world, it is nonetheless worthwhile to consider the establishment of regional financial markets. These could be patterned after the Arab Development Fund; minimally, even if they were to play a small role in industrialization initially, with such an infrastructure in place an important basis would be laid upon which future growth might proceed.