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Investment Requirements in the Non-fuel Mineral Sector in the Developing Countries

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(continued on inside back cover)

INVESTMENT REQUIREMENTS IN THE NON-FUEL MINERAL SECTOR IN THE DEVELOPING COUNTRIES

KENJI TAKEUCHI, GERHARD E. THIEBACH, and JOSEPH HILMY

Concern over the financial requirements for the long-term expansion of the world non-fuel minerals industry has led to growing interest in estimates of the magnitude of the requirements. The authors focus on the requirements in the developing countries for nine major minerals and deal with the most important among these, copper, in an appendix.

1. Introduction

A number of developed countries depend on imports for their requirements of a variety of fuel and non-fuel minerals. This is especially true of Japan, several Western European countries and also, to a lesser extent, the United States. A substantial portion of their mineral imports originate in the developing countries, although imports from such high-income countries as Canada, Australia and the Republic of South Africa are also significant. A number of developing countries, in turn, depend heavily on minerals as a major source of export earnings.

Expanding mineral production and exports in developing countries depends on, among other things, expanding the flow of new investment, a large portion of which has traditionally come from the developed countries. The level of such investment, or of commitments for mineral exploitation projects, has been relatively low in recent years. This may be attributed to the low prices which have prevailed for most minerals and to the uncertainty of the market outlook for many of them. At the same time, the fear that the availability of financing for mineral development is drying up has been voiced in various quarters. Ferguson and Haclin summarize the concern as follows:

> First, difficulties arise from the fact that mining companies and groups will be competing for massive volumes of scarce capital in an increasingly capital-hungry world. Second, the rise in the physical scale and cost of individual projects has outstripped the growth rate of the companies which intend to mine the ores. Third, technical and operating risks have risen sharply. Fourth, the floating of major currencies has introduced a new dimension into calculations of prospective returns in terms of the companies' home currencies. Fifth, and most serious of all, the perceived risk of political action in the host country, to renegotiate contracts or even expropriate the mining company's assets in that country, has grown.[1]

This paper presents the results of a preliminary attempt we have made to estimate (a) the order of magnitude of the capital investment requirements of the developing market-

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economy countries in the non-fuel mineral sector between 1976 and 1985; and (b) how much of this investment is likely to be financed from foreign sources. In view of the broad coverage attempted, the estimates are based, inevitably, on a set of common and therefore general assumptions and on a relatively simple approach, as explained in Sections 2 and 3 below, with the aid of tables. The findings are summarized in Section 4.

The paper is accompanied by an appendix on copper, giving the projections of investment requirements for this commodity in greater detail. Copper is the second largest export earner of the developing countries after petroleum. The copper industry is in a process of structural changes; in traditional copper exporting developing countries state ownership – part or whole – has become the rule while in high income countries the traditional practice of self-financing of mining projects by mining companies is giving way to new financing arrangements. It is in this context that even a rough estimate of future investment needs is of interest, and that a somewhat more detailed treatment of copper is justified.

2. Coverage and Approach

The investigation excluded energy minerals and concentrated on the major non-fuel minerals exported by the developing countries. These are: bauxite (as well as alumina and aluminum), copper, iron ore, lead, manganese ore, nickel, phosphate rock, tin, and zinc. In 1973 and 1974, exports of these commodities from the developing countries grossed close to 7.5 and 11.6 billion dollars, respectively (Table I), accounting for some 80% of total non-fuel mineral exports of these countries.

TABLE I Export earnings of developing countries from major minerals and metals, 1960, 1970, 1973 and 1974 (in million U.S. dollars)

Commodity	SITC	1960	1970	1973	1974
Bauxite	283.3	111	206	249	351
Alumina	--	57	244	296	574
Aluminum	684	22	109	168	247
Copper	283.1/682.1	960	2887	3749	5411
Iron ore	281	475	1053	1250	1666
Lead	283.4/685.1	92	133	169	216
Manganese	283.7	121	99	127	194
Nickel	283.2/683.1	20	149	150	(293)
Phosphate rock	271.3	138	216	339	1063
Tin	283.6/687.1	445	617	754	1265
Zinc	283.5/686.1	79	174	199	284
Total: Non-fuel minerals		2520	5887	7450	11565
Petroleum	331/332	7128	15863	42009	129858

Source: IBRD, *Commodity Trade and Price Trends* (1976 edition), Report No. FC-166/76, except for nickel; data for nickel estimated from OECD, *Trade by Commodity* for 1970 and 1973, and U.S. Bureau of Mines, unpublished estimates for 1974.

Capital investment requirements were estimated commodity by commodity, following the approach described below, with some variations for individual commodities, as appropriate.

The first step was to project consumption, production and prices for each commodity, assuming that the market will [illegible] in some sort of medium-term equilibrium[2] in the mid-80's. After allowing for net trade with the centrally planned economy countries (CPEs) and scrap utilization, these projections led to estimates of production in the bench-mark years of 1980 and 1985, as well as of production capacity on the assumption that capacity would be just large enough to provide the projected production at normal capacity utilization rates. The degree to which increases in metallurgical processing capacity (smelting and/or refining), as distinct from mining capacity, were taken into account varied from commodity to commodity as follows:

Bauxite	– mining, alumina refining and aluminum smelting;
Copper	– mining, smelting and refining;
Iron ore	– mining and pelletization;
Lead	– mining and refining;
Manganese ore	– mining;
Nickel, tin and zinc	– mining and smelting
Phosphate rock	– mining including beneficiation.

The second step was to estimate the capital investment required per annual ton of capacity, for mining and metallurgical processing, as appropriate. Where capital investment per annual ton of capacity varied between new capacity and replacement of old capacity, these were treated separately. The estimates of capital investment allowed for investment in infrastructure in most cases. All estimates were made in constant 1975 U.S. dollars.

The third step was to estimate total capital requirements for projected capacity increases during the projection period by multiplying the tonnage increases by the estimated capital cost per ton of capacity. This was done with varying degrees of precision for different countries and stages of processing and for different commodities. Capital requirements for maintaining the level of capacity existing at the beginning of the period were similarly estimated.

3. Major Assumptions

For the minerals selected, the most important determinant of demand growth is the growth of real income in developed countries because a predominant part of consumption takes place in these countries. There is, in fact, a strong relationship between income growth in developed countries and demand for mineral commodities exported by developing countries, expressed by the income elasticity of demand, which tends to be relatively high for most of the commodities chosen. The real GNP of the developed market-economy countries was assumed to grow at a rate of 5.0% per year in 1975–1985,

TABLE II Non-fuel minerals: production by economic region, 1960, 1975, and projections for 1980 and 1985

Commodity	Unit	Economic region	Actual 1960	Actual 1975	Projected 1980	Projected 1985
Bauxite	' 000 M.T.	World	22 492	68 973	101 000	155 000
		Developed	6 425	31 558	42 000	62 000
		Developing	16 068	37 415	59 000	93 000
Alumina	'000 M.T.	World		21 489	32 860	47 000
		Developed	n.a.	16 533	26 080	35 500
		Developing		4 957	6 780	11 500
Aluminum	'000 M.T.	World	3 618	9 903	15 430	23 000
		Developed	3 529	9 060	13 480	19 000
		Developing	89	842	1 950	4 000
Copper	'000 M.T.[a]	World	3 605	5 674	7 290	9 090
		Developed	1 784	2 805	3 520	4 350
		Developing	1 821	2 868	3 770	4 740
Iron ore	Million M.T.	World	340	593	760	990
		Developed	261	350	470	620
		Developing	79	243	290	370
Lead	'000 M.T.	World	1 810	2 491	2 955	3 300
		Developed	1 145	1 845	2 000	2 150
		Developing	665	646	955	1 150
Manganese ore	'000 M.T.[a]	World	2 793	5 950[b]	8 200	10 500
		Developed	683	2 210[b]	3 200	4 000
		Developing	2 110	3 740[b]	5 000	6 500
Nickel	'000 M.T.[a]	World	269	560	790	1 150
		Developed	211	357	510	730
		Developing	57	204	280	420
Phosphate rock	'000 M.T.	World	32 803	76 751	107 019	137 214
		Developed	18 401	47 009	58 156	66 935
		Developing	14 402	29 742	48 863	65 279
Tin	'000 M.T.[a]	World	138	167	220	211
		Developed	7	18	22	21
		Developing	130	150	198	190
Zinc	'000 M.T.[a]	World	2 562	4 410	5 750	7 400
		Developed	1 850	3 318	4 100	5 300
		Developing	713	1 092	1 650	2 100

[a] = metal content
[b] = estimates
n.a. = not available

(continued on following page)

TABLE II *(continued)*

Sources: *Data for 1960 and 1975:*

Bauxite, Alumina, Aluminum, Copper, Tin and Nickel:
Metallgesellschaft, A.G. *Metal Statistics* 1960-70 and 1965-75.
Lead and Zinc: ILZSG (International Lead and Zinc Study Group):
Monthly Bulletin (for 1960);
ILZSG, Statistical Committee, Twentieth Session Geneva,
November 1976 (for 1975)
Phosphate Rock:
1960: ISMA (International Superphosphate and Compound Manufacturers' Association)
1975: The British Sulphur Corporation Ltd., *Statistical Supplement*, May/June 1976.
Iron Ore: 1960: U.N., *The World Market for Iron Ore, 1950-1960*, 1968.
1975: Eisen und Stahl, 1st Quarter 1976; cited from Japan Steelmakers' Federation, *Tekko Tokei Yoran* (Steel Statistics Summary) 1976 edition.
Manganese Ore: U.N., *Statistical Yearbook*, 1968.
Projections: IBRD, Commodities and Export Projections Division, Economic Analysis and Projections Department.

compared to 4.8% per year in 1960–1970, and at 2.7% per year in 1970–1975.

The production projections derived from the individual commodity analyses and projections of demand, supply and price are shown in Table II. They indicate that the share of developing countries in world production will increase in six commodities, sharply in nickel, and moderately in bauxite, copper, iron ore, lead, and phosphate, but will not change significantly in the remaining three commodities – manganese, tin and zinc.

The assumptions with respect to the representative cost of capital per unit of annual capacity for each commodity by processing stage (mining, smelting, refining, pelletization, etc.) are summarized in Table III. There are a number of difficulties in estimating the 'average' cost of investment per unit of capacity. For each commodity and activity involved (mining, beneficiation, processing) there are usually alternative technologies, each with varying capital intensities. Similarly, infrastructure costs can vary enormously from case to case. Neither the cost of infrastructure nor the cost of maintaining the existing capacity could be included or estimated uniformly. Therefore, the figures in Table III should be considered only as indicative. Finally, the breakdown of investment requirements between foreign and domestic sources was estimated on the basis of an analysis of the financial arrangements for recent projects.[3]

4. The Findings

Table IV summarizes the estimates of investment requirements for the world (excluding CPEs) and the developing countries, by commodity, for 1976–1980 and 1981–1985, separately.

World (excluding CPEs) investment requirements for the non-fuel mineral industry amount to some 73 billion U.S. dollars in 1976–80, and some 106 billion U.S. dollars in 1981–85. For the developing countries the requirements come to some 38.5 billion dollars for the first 5-year period, and 57 billion dollars for the second 5-year period

(1981–1985). Of these totals, well over 80% are for three commodities alone, namely, bauxite (including alumina and aluminum), copper, and iron ore. With nickel added, the four commodities account for over 90%. Foreign financing requirements are estimated at about $23 billion, or $4.6 billion a year, for 1976–80 and at about $36 billion, or $7.3 billion a year, for 1981–1985.

The estimates of annual investment in the non-fuel mineral sector of the developing countries from foreign sources for the 1976–80 and 1981–85 periods would be equivalent to 11.6 and 18.3% respectively, of total foreign capital flow from developed to developing countries in 1975.[4] As total capital flow from developed to developing countries in the coming years is expected to increase in constant dollar terms, the share of foreign investment in the non-fuel mineral sector in the developing countries in total capital flow should stay well below the above-mentioned percentages.

It must be emphasized that what has been estimated in each case is the amount of capital needed to increase capacity from the level existing at the beginning of the period to the level projected for the final year of the period, without presumptions on when the funds would actually be spent. A significant part of the capital needed for the capacity increase projected for the 1976–1980 period has already been spent, and it seems likely that a large part of the investment for the expansion of capacity in 1981–1985 will be spent or committed by 1980. Similarly, it is obvious that a large portion of the capacity increases required after 1985 call for financial commitments during 1976–1985. These have not been included in the calculations.

Although it would be interesting to estimate the role of private direct foreign investment in meeting these total requirements, this is not an easy task. In several important mineral-rich developing countries national corporations have taken over the mineral sector. A substantial part of the financing requirements will have to be met out of export earnings, but export earnings are also needed to cover imports of essential capital goods for general development purposes. As it is generally easier to borrow in international capital markets for exploitation of known, well-defined mineral deposits, these countries are likely to continue to use mineral export earnings for general development purposes and to borrow in international capital markets for mineral development. A further difficulty in estimating the share of private direct investment in total foreign borrowing arises from the changing practices of the transnational corporations active in mining. An increasing share of mineral projects is being financed with small equity participation, combined with loans from banks and other lending-institution consortia. The increasing scale of mineral projects is one reason for this trend, but there are other reasons. Concession agreements defining the host country's share of mineral earnings and resource rent taxes are generally on a 'cost plus' basis. While interest rates are a pre-tax cost, returns to equity would be taxable. Developing countries are ambivalent about the use of intra-corporate borrowing as a substitute for equity investment. Low equity gives a better chance for sharing control, but increases balance of payment vulnerability and reduces the resource rent base. Transnational mining corporations on the other hand now tend to favour loan financing arrangements, which reduce their risk exposure and create a psychological climate of modest profitability. Governments of Western European countries and Japan have been helpful to corporations organizing this type of financing, and the

TABLE III
Non-fuel minerals: capital cost per metric ton of annual production capacity (in 1975 US dollars)

Commodity-activity	Capital cost per ton of capacity
Bauxite mining	85
Alumina refining (integrated)	510
Alumina refining (non-integrated)	750
Aluminum smelting (integrated)	1900
Aluminum smelting (non-integrated)	2800
Copper mining	3000–5000
Copper smelting-refining	2000
Iron ore mining	65–115
Iron ore pelletizing	20–35
Iron ore mining-pelletizing	75–125
Lead mining-refining	790–1400
Manganese ore mining	235–400
Nickel mining	
Nickel laterite ore	19 500–31 000
Nickel oxide ore	11 000–22 000
Phosphate rock mining	50
Tin mining (dredging)	15 000
Tin mining (gravel pump)	10 000
Zinc mining–smelting	800–1400

Notes: i Where a range is given it represents variations on capital cost due to location of major projects, differing infrastructure requirements, differences in production methods and whether the project involves the construction of new capacity or the replacement of existing capacity.

ii Capital costs for bauxite, copper, phosphate rock and tin do not include investments needed for related infrastructure.

iii Capital cost for phosphate rock of $50 per ton of capacity relates to 1975 and it is assumed that the cost will increase by 3% annually thereafter.

Source: The authors' estimates based on information provided by industry sources.

national and international financial markets appear to have been able to handle it so far.

It is difficult to discuss the long-run trends in private direct investment. First, the financial transfers of transnational corporations are not always recorded in national balance of payments accounts; thus, the role transnationals are playing tends to be underestimated. Second, the mining industry seems to be undergoing structural changes; cash-liquid oil companies seem to be diversifying their activities into the non-fuel mineral sector. This is likely to restore the self-financing capability of the industry to some extent. In sum, the present pause in mineral investment plans seems largely to result from low mineral prices. When prices improve, investment, particularly from Western Europe and Japan, is expected to be resumed at levels required to ensure adequate supplies.

TABLE IV
Projected investment in the non-fuel mineral sector in the developing countries, 1976-80 and 1980-85
(in billions of constant 1975 US dollars)

	1976-80				1981-85			
	World	Developing countries			World	Developing countries		
	(except CPEs)	Total requirements	Foreign sources	Domestic financing	(except CPEs)	Total requirements	Foreign sources	Domestic financing
1. Copper	13.00	8.70	6.60	2.10	17.00	11.50	8.90	2.60
2. Lead	0.87	0.50	0.27	0.23	0.82	0.52	0.22	0.30
3. Zinc	2.50	1.00	0.53	0.47	3.75	1.09	0.57	0.52
4. Bauxite/alumina and aluminum	13.40	6.67	4.36	2.31	25.40	18.00	12.90	5.10
5. Iron ore	32.60	16.45	8.55	7.90	47.30	18.50	9.50	9.00
6. Phosphate rock	1.55	0.64	0.30	0.34	1.20	0.87	0.41	0.46
7. Tin	0.45	0.42	0.10	0.32	0.11	0.11	0.03	0.08
8. Nickel	7.40[a]	3.30	1.85	1.45	9.05[a]	5.35	3.15	2.20
9. Manganese	1.20	0.81	0.60	0.20	1.40	1.00	0.75	0.25
Total	72.97	38.49	23.16	15.32	106.03	56.94	36.43	20.51

[a] Including CPEs
Source: See text.

Notes

[1] Nicholas Ferguson and Graham Haclin: 'Is There Enough Money in Mining? ', *The Banker*, September 1976, p. 1011.
[2] In the short term, a commodity market would always be in equilibrium, in the sense that supply and demand would always match *at a price*.
[3] For example, for lead, zinc, iron ore, manganese ore and nickel, the shares of foreign sources (both private and public) in total investment requirements were estimated at 80% of the investment directly related to productive processes and 50% of the investment for infrastructure in the case of new capacity and at 85% of required investment for maintaining existing capacity. For copper, see the Appendix on Copper.
[4] Total official and private net flow of financial resources to the developing countries from the OECD countries amounted to 39.9 billion U.S. dollars in 1975 (OECD, *Development Co-operation, the 1976 Review*, November 1976).

Appendix on Copper

1. *Capacity Projections*

Recent projections of future copper consumption, based either on extrapolations of past trends or on projected growth of industrial output with which copper consumption is closely correlated, indicate that primary (newly mined) copper consumption may be on the order of 8.9 million tons in 1985, implying a growth rate of 3.5 to 4.0% per year, depending on the base year.

Annual average mine production is usually calculated as 93% of capacity existing at the beginning of each year plus one-third of scheduled new capacity coming into production during the year. The 7% discount is no more than a rule-of-thumb and is only a rough estimate of 'normal' disruptions. (The 1956–1969 average was 91.5%.) Applying the 93% rule, required copper mine capacity in 1985 can be estimated at about 9.6–9.8 million tons (Figure 1). Smelting and refining capacity are projected partly on the basis of available surveys. Mine and smelter capacities are expected to increase, on the average, at 3.9 and 2.9% per annum respectively during the 1976–1985 period. Table A shows the likely breakdown of capacity increases by country and regions.

2. *Capital Requirements*

Capital requirements consist of three categories: (a) new capacity to meet new demand; (b) new capacity to replace depleted ore bodies; and (c) replacement of equipment in existing operations. Since equipment replacements are generally being financed out of cash flow, it has been ignored in this exercise.

Investment costs of capacity expansion were estimated on the basis of data relating to recently completed greenfield mines as well as expansions of existing mines. New mines of 100 000 tons per year with an ore grade of 0.5 to 1.0% would cost $3000 to $5000 per annual metric ton of capacity including cost of infrastructure. Approximately $2000 per metric ton is required for smelting and refining facilities excluding infrastructure. In practice, investment costs for new mines as well as those for expansions of existing mines

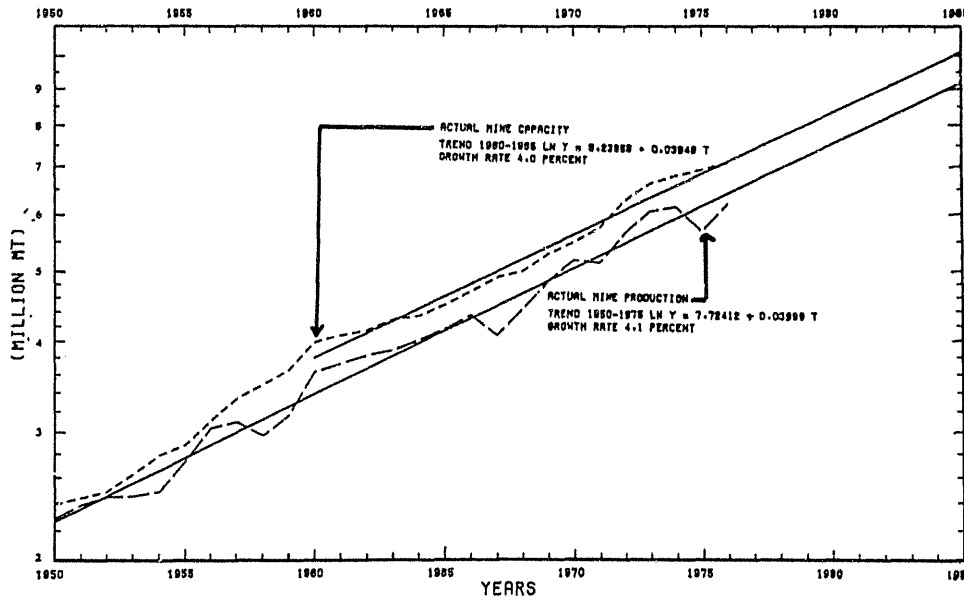

Fig. 1. Copper – mine capacity and mine production, World (excluding CPEs) (1950–1985).

vary widely, depending on location, infrastructure, composition of output (by-products), ore grades, size of capacity, type of mine and process (underground or open pit), etc. Furthermore, published data on capital costs are not always clear on how much is allowed for contingencies and anticipated inflation. In the present exercise, capital requirements per annual ton of capacity have been estimated on a country-by-country basis (Table B).

There are several other factors which could affect the level of investment, the cost of investment or the distribution of investment between low and high income areas. Among these are:

(a) the cost of pollution control measures which may add some 20–25% to domestic capital costs in the U.S.;

(b) the cost of energy which affects underground and open-pit operations differently, as open-pit mining of low-grade ores is energy intensive and sharp rises in energy costs could drive copper mining underground and raise investment costs;

(c) copper price movements which presumably influence investment decisions and, therefore, have a long-term impact on primary production;

(d) political risk, which seems to influence investment decisions. In the last two decades political factors rather than copper prices may have been responsible for the timing of investment in several developing countries (Chile, Peru and some African countries, where high world copper prices alone did not provide sufficient incentive). Sharp rises in copper prices might even promote investment in high-income countries.

No precise assumptions could be made on the above imponderables. Therefore, it was assumed that no major changes would occur during the period concerned.

With regard to the sources of finance, it was assumed that 75% of the total investment

TABLE A
Copper – projected mine and smelter capacity, 1985
(in thousand metric tons)

	Mine capacity			Smelter capacity		
	Existing capacity 1975	Projected increase	Projected capacity 1985	Existing capacity 1975	Projected increase	Projected capacity 1985
Developing countries	3227	2198	5475	2791	1877	4668
Africa	*1405*	*395*	*1800*	*1425*	*300*	*1725*
Zaire	530	270	800	520	225	745
Zambia	770	80	850	807	0	807
Others	105	45	150	98	75	173
Asia/Oceania	*592*	*593*	*1185*	*166*	*577*	*743*
Indonesia	65	0	65	0	0	0
Iran	7	163	170	0	145	145
Papua New Guinea	180	120	300	0	0	0
Philippines	240	210	450	0	214	214
Others	100	100	200	166	218	384
Latin America	*1230*	*1210*	*2490*	*1200*	*1000*	*2200*
Chile	900	350	1250	855	270	1125
Mexico	90	280	370	123	254	377
Panama	–	140	140	–	136	136
Peru	220	230	500	218	210	4[illegible]
Others	20	210	230	4	130	134
(Argentina)	–	(90)	(90)	(0)	(?)	
(Brazil)	–	(100)	(100)	(4)	(96)	(100)
Industrialized countries	3535	925	4460	4909	685	5594
W. Europe	340	170	510	870	215	1085
Australia	250	50	300	206	0	206
Canada	900	300	1200	610	(a)	610
Japan	90	–20	70	1100	0	1110
U.S.	1775	325	2100	1923	440	2363
South Africa	180	100	280	190	30	220
Total	6762	3123	9935	7700	2562	10262

(a) Included under U.S.

TABLE B
Copper – estimated investment cost [a] of capacity expansion 1976–1985

Project location	Cumulative 1976–85		US dollars per ton of annual capacity
	Total	Foreign sources	
	Billions of constant 1975 US dollars		
Developing Countries	13.42[b]	10.03	6400[b]
Africa	*2.81*	*2.08*	6800
Zaire	2.03	1.50	7000
Zambia	0.56	0.42	7000
Others	0.22	0.16	5000
Asia/Oceania	3.07[b]	2.30	5800[b]
Indonesia	–	–	–
Iran	–[b]	–	(3500)
Papua New Guinea	0.60	0.45	5000
Philippines	1.47	1.10	7000
Others	1.00	0.75	5000
Latin America	7.54[b]	5.65	6000[b]
Chile	2.93	2.20	6500
Mexico	1.96	1.47	7000
Peru	0.37	0.27	6000
Others[c]	2.28	1.71	6500
Developed Countries	6.48	–	7000
World (excl. CPEs)	19.90[b]	n.a.	6400[b]

[a] Cost of maintaining existing capacity is not included.
[b] Exclude Iran (Sar Chesmeh – 163 000 t) and Peru (Cuajone – 154 000 t) where projects are already financed.
[c] Mainly Panama, Brazil and Argentina.
Source: Estimates by Gerhard Thiebach, based on information provided by industry sources.

requirements would be financed from foreign sources. Half of the investment was assumed to consist of expenditures on imports, which would be financed entirely from foreign sources. Financing the other half, consisting of local expenditures, would be divided equally between foreign and domestic sources.

3. *Findings and Caveats*

Capital requirements for the expansion of world (excluding CPEs) copper capacity are on the order of U.S.$30 billion, excluding the cost of investments in refining capacity and of equipment replacement. Of the U.S.$30 billion about U.S.$20 billion will be invested in developing countries and about 75% or U.S.$15 billion will have to be in the form of foreign investment (Table C).

Given the magnitude of the estimated investment requirements and the uncertain short-term prospects of the copper industry, further work is required to refine the estimates. It would be helpful if more light could be thrown on the relationship between the

TABLE C
Copper – projected investment requirements 1976- 1985
(in billions of constant 1975 US dollars)

	Africa	Asia/ Oceania	Latin America	Total LDCs	Developed	Total
Investment in mine capacity	3.2	3.9	8.3	1[illegible].4	7.5	22.9
To maintain capacity	1.1	0.5	1.2	2.8	2.8	5.6
To expand capacity	2.1	3.4	7.1	12.6	4.7	17.3
Investment in smelter capacity	0.8	1.5	2.5	4.8	2.3	7.1
Total of which:	4.0	5.4	10.8	20.2	9.8	30.0
from foreign sources	3.1	4.1	8.3	15.5	–	15.5

lead time for commitments and the size of project. The complex interrelationship between market developments and investment decisions also requires much more study, for, while it is obvious that there is a certain relationship between copper prices and investment in new capacity, much more needs to be known about this relationship. Finally, it has been assumed here that the financing required for new capacity will be forthcoming. This would hold only if 1985 is viewed not as a target year, but is understood to mean 'the mid-1980's'. Only in this rather general, vague sense can one conduct a meaningful discussion on the prospects for copper, as all apparently solid data lose their solidity at close inspection.

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