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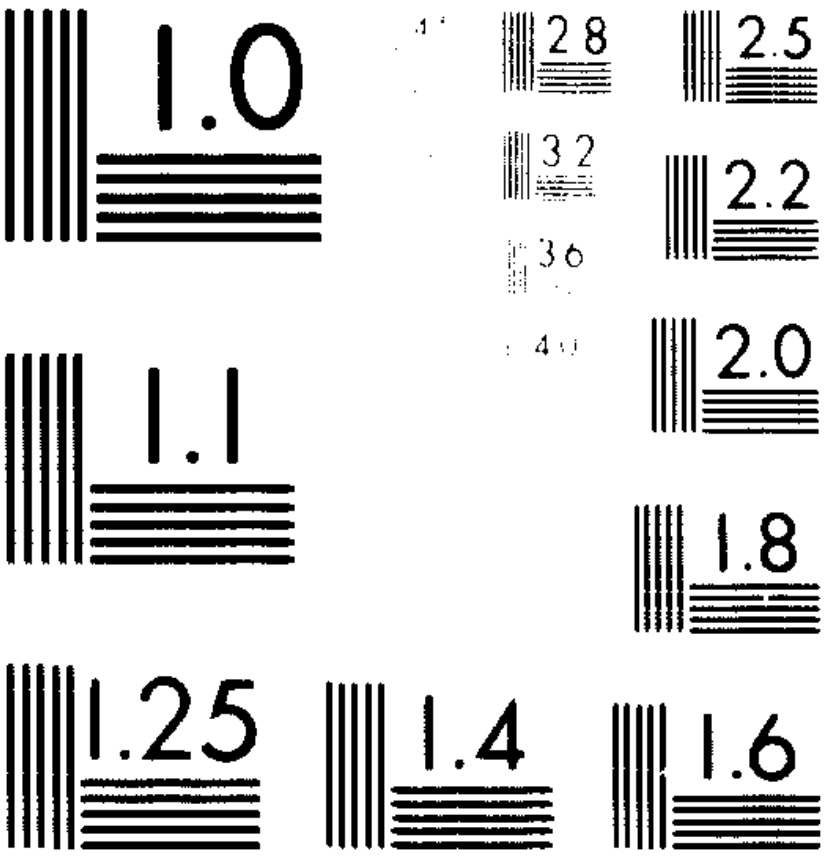

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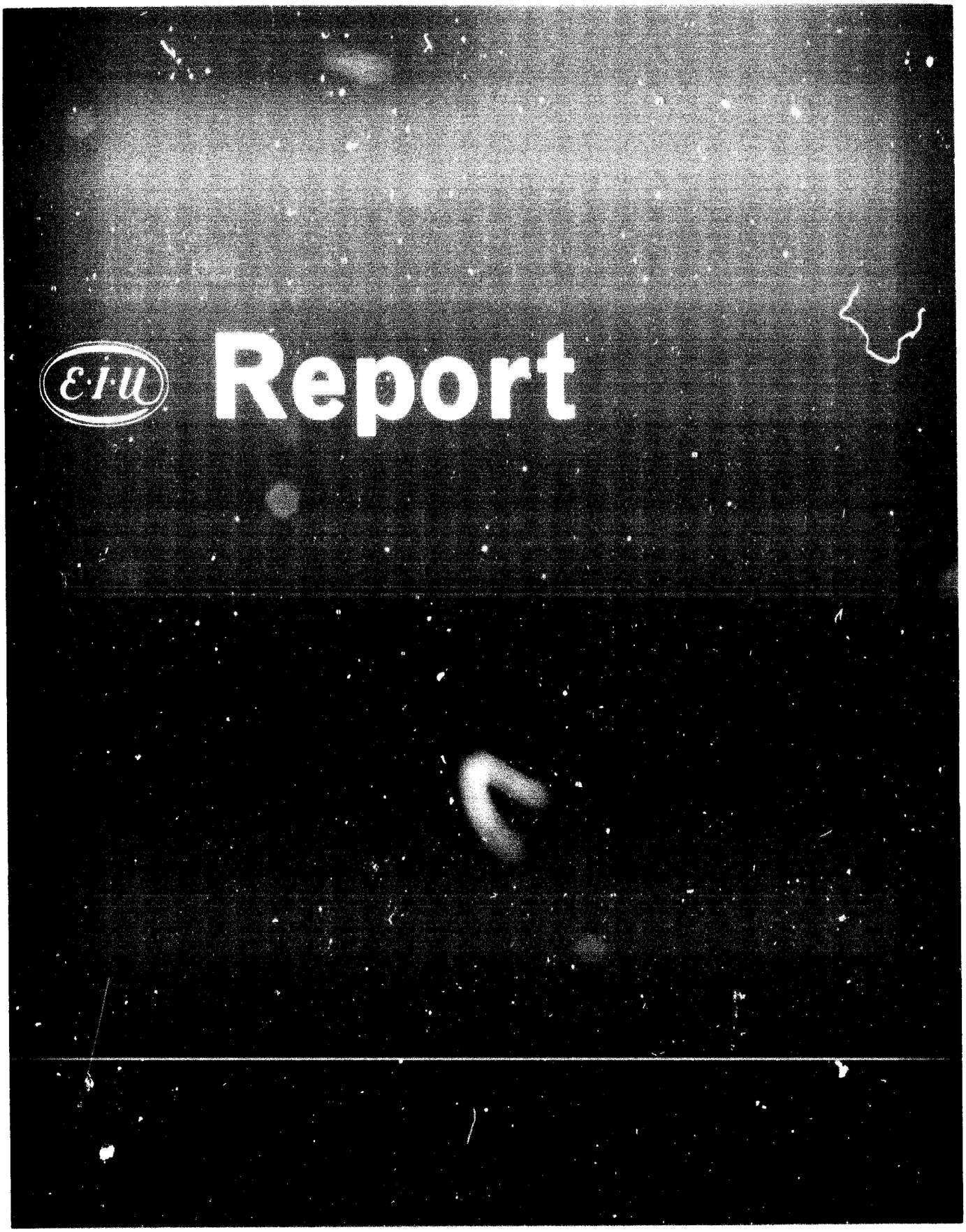

The Economist Intelligence Unit

INDUSTRIAL DEVELOPMENT SURVEY

NON-METALLIC MINERALS INDUSTRIES

June, 1971

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INDUSTRIAL DEVELOPMENT SURVEY

NON-METALLIC MINERALS INDUSTRIES

CONTENTS

INTRODUCTION

Non-metallic minerals, for the purposes of this report, are those materials included in the former I.S.I.C. classification 33. (The new classification 36 does not apply for the period to which data refer,) Figures in some cases - notably on trade - refer to the most closely related S.I.T.C. classification. While both classifications cover broadly the same ground, viz. pottery, china and earthenware, glass and glass products, structural clay products, lime, plaster and similar fabricated building materials, gypsum, mineral wool, cut stone, abrasives, asbestos and other non-metallic minerals, there will inevitably be differences in marginal cases, in addition to the most significant single difference, which is that pearls and precious and semi-precious stones, which are not included in I.S.I.C. 33, are included under S.I.T.C. 66 provided they are not set or strung. While this is not a large category on a quantitative basis, in any discussion based on value it is clearly a significant source of distortion.

Another difference in the coverage is that optical glassware, included in S.I.T.C. 66, was excluded from the non-metallic minerals grouping and classified with other photographic and optical equipment under the I.S.I.C. classification.

A high proportion of structural materials falls within the non-metallic minerals group. Its fortunes are therefore closely tied to those of the construction industry, which has been shown[1] to constitute 45-60 per cent of capital formation, increasing with per capita national income, a proportion virtually independent of the stage of economic development reached in a particular country. Materials and components as a whole constitute more than half of the value of construction output. Although that figure includes major categories that are not within the non-metallic minerals sector, such as steel, timber, paint and plastics, this is clearly a dynamic sector in all but the most difficult economic conditions.

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1 UNIDO monograph on Building Materials Industry.

There is scarcely a major project in the plans of developing countries, whether for industry, health, education or infrastructure, which does not require non-metallic minerals, and the need to prevent them becoming a drain on foreign exchange fosters local extraction, facilitated by the fact that many of these materials are of fairly wide distribution and bulky in relation to their value. More developed economies maintain their demand with various types of renewal and modernisation (e.g. of housing, industrial building, transport facilities).

The only interruptions to the upward trend of consumption are likely to be major wars or local and temporary restriction of resources of sufficient intensity to reduce investment. The pattern of trade, on the other hand, must be expected to change except in those instances where geological distribution is a major factor.

It has been found useful to deal separately with fertiliser raw materials in some instances, because the end-product is associated with agriculture, not construction, and particular technological developments are affecting the trade pattern.

The various regions are considered as such except where useful comment can be made on individual countries.

In considering trends, the most recent available three-year run of figures has not always been the same: production figures were available to 1969 and these have been used, but in most other cases the available data was comprehensive only to 1967.

The terms of reference, together with definitions of regions, are included in the volume "General Industrial Review". Because of the requirement to follow these regions, basic data used in this report is most frequently that assembled by U.N.I.D.O. Where other sources are involved, this is indicated by footnotes.

INDUSTRIAL DEVELOPMENT SURVEY

NON-METALLIC MINERALS INDUSTRIES

ASIA

Economic Trends

Output. Appendices I and II show output by area. In the latter half of the 1960s Asian output of non-metallic minerals rose by just over 10 per cent per annum - a dynamic-sounding average, rather higher than the comparable rate for the earlier part of the decade, but owing much to unusually fast growth in 1969. Indeed the three preceding years (1966, 67 & 68) represented something of a setback, with expansion rates of only 3.8, 8.7 and 5.2 per cent respectively.

As a result of the strong recovery in 1969, Asia produced in that year nearly 4 per cent of total world output of non-metallic minerals, compared with 3.5 per cent in 1966. Its expansion in this field has been larger, in quantitative terms, than in any other sector of the developing world, so that it now produces over 51 per cent of the total output of these products in developing countries, compared with 48 per cent in 1966.

By far the largest individual producer is India, accounting for around 40 per cent of the total output of this group, although all forms of mining and quarrying still contribute little more than 1 per cent of total Indian[1] output from all industries and this industry is of greater internal significance in Iraq[1] and Pakistan[1].

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1 On the basis of official economic data produced by the countries concerned, as used in the E.I.U.'s Annual Supplements to Quarterly Economic Reviews: e.g. in the case of India, Reserve Bank of India Bulletin; Central Statistical Organisation.

Employment. Employment opportunities are considered here: productivity receives additional consideration under technological trends.

There has been a steady increase in the employment provided by the non-metallic minerals industry in Asia during the 1960s (see Appendix III), the average rate of increase in the most recent three years being a little under 6 per cent. As a result of this growth, and the very large population of this area, Asia accounts for over 84 per cent of the labour employed in the non-metallic mineral industries of the developing world. The high growth rates here, of course, reflect an earlier stage of industrial development than in Europe and the other developed markets, where modernisation has actually tended to reduce employment even though output may be growing. In Asia, new exploitation of mineral resources still normally has the corollary of new expansion in numbers employed, though productivity is rising (see below).

Trade[1]. Asia does not play a leading part in world trade in this sector, contributing only some 8 per cent of world trade in non-metallic minerals. The value of Asian exports on the stated basis, using the most recent available average of 3 years (1965-67), was US$500 million f.o.b. At that period the total output (see Appendix) was just over US$1,600 million. Although these figures are in no way directly comparable, their relationship, compared with the equivalent in the case of Africa, for example, does underline the relative unimportance of the export element in the case of the Asian section of this industry.

Many of these products are of high bulk in relation to their value, and tend to be produced for local use. Moreover, there is a strong demand for both fertilisers and construction materials on home markets.

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1 It should be noted that the trade figures used are based on U.N. publications The Handbook of International Trade and Development Statistics, 1969 (UNCTAD E/F.69.11/D.15) and Commodity Trade Statistics, 1965-67 (ST/STAT/SER.D) and use the S.I.T.C. classification. They are therefore subject to the provisos set out in the Introduction.

Trade within the developing areas of Asia, which formed only a little over 10 per cent of total trade in 1965, shows signs of falling away even from that level, as trade with more developed economies continues to offer much-needed exchange, as well as greater market opportunities for the producers in developing areas.

There is a marked divergence between trade in fertiliser materials (crude or manufactured), for which even the poorest country finds resources for imports as part of its development programme, and other non-metallic minerals, which figure much less widely in the import trade. Further, where an exportable supply of these materials does exist, they tend to be regarded as valuable currency-earners, which exerts considerable influence on the pattern of markets to which they are sold.

Technological Trends

Productivity, as measured in terms of value added per person engaged in the industry, is set out in Appendix IV. These figures show how far behind all other groups Asia falls in this aspect of its performance. Nevertheless there has been some gain during the 1960s, although the momentum of the first half of the decade was later lost. Asian productivity remains less then 60 per cent of that of the developing world as a whole, and less than 10 per cent of the world average.

In the most significant producing areas of Asia, government involvement in mineral development is considerable. Mineral royalties provide a valuable source of income, but there is also a consciousness that mineral deposits are a diminishing and irreplaceable asset and they are unwilling to allow control to pass, as it often did in the past (e.g. in South America), into the hands of expatriate companies. At times this policy results in the rejection of assistance from international companies able and willing to provide it. The centrally planned economies have shown an equal willingness to help, however, and since there are less tangible "strings" attached to these offers, are in many cases doing so, providing technical advice, trained staff to set developments in motion, and assistance with financing, where this is desired. Governments

may, however, refuse practical aid for the reasons indicated, while accepting technical assistance. For example, the government of Iraq announced its firm intent to develop its rich sulphur deposits without outside finance, but accepted technical aid from Poland[1]. India has received Russian assistance. Short-cuts into the latest technology of the more developed areas are not without their problems, however. The need to provide abnormal supplies of kyanite for the refractories demanded by Russian technicians working on the Bokaro steel plant placed great strain on the refractory manufacturers' supplies in 1968 when they could ill afford to leave openings in their export markets for synthetic competition[1].

Exploration, proving and development of new mineral deposits in Asia is, however, going ahead as rapidly as resources and political considerations will allow. In one sector alone (phosphates) Syria, Jordan, Israel and India are all expected to launch new or extended operations in the next five years[2]. The technological aspects of development in phosphates are considered in more detail in the section on Africa, and are particularly relevant to Israel and Iran.

Investment Trends

The implications of what has been said above are clear: potential outside capital has, in some cases, been rejected, and investment slowed down because of governments' fears of losing control of irreplaceable mineral resources. The pattern, however, varies widely from country to country. While those countries, such as India and Iraq, who are a little wary of their centrally-planned neighbours, tend to strike a delicate balance in their efforts to obtain the maximum technical assistance and financial help from outside without deep political commitments, other areas such as Taiwan are deeply committed to a particular power for capital as well as technical assistance. Virtually the whole of Asia is investment-hungry, with a low basic level of investment acting as a constraint upon potential (and much-needed) growth. To the extent that non-metallic minerals assist with the provision of basic necessities - as

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1 Reports in "Industrial Minerals", the trade magazine of the non-metallic mineral industries. 2 Special E.I.U. study of phosphates markets.

phosphate exploitation with food production, construction materials with housing - the industry is fairly well-placed on the list of priorities. Nevertheless there is a constant battle between the investment requirements of this industry and those of, for example, agriculture.

Future Trends

Technological trends suggest that growth in this sector in Asia may go ahead marginally more rapidly in the coming decade, but the true potential is unlikely to materialise because of the constraints of investment, coupled with social and political problems. A pattern not dissimilar to that of the past decade is probable: uneven development amounting to an average growth rate of around 9-10 per cent is regarded as the most that can be expected, and it would be all too easy for even this level to be missed.

LATIN AMERICA

Economic Trends

Output. Output data is set out in Appendices I & II. Latin America's share of total output of non-metallic minerals has been static during the past decade, chiefly because expansion of as much as 9.5 per cent in some years has been offset by growth rates as low as 2 per cent in others. A relatively good run during 1966-1968 ended abruptly in 1969. As a result of this erratic progress, this area's share of the output of all developing areas has fallen back, from over 44 per cent in 1966 to something over 41 per cent in 1969. The overall average rate of growth has been 5.5 per cent.

The most significant contributors to Latin American output are Brazil, Argentina and Mexico. The latter, though still some way behind, is catching up fast. Significant smaller contributions are made by Colombia, Venezuela and Chile, while Puerto Rico has an importance more related to the special factor of its access to U.S. investment resources than to its diminutive size.

Employment. The erratic nature of Latin American progress shows up again clearly in this sector: average annual increases in employment in the early 1960s were small. In 1965 there was an actual decline of 3 per cent. The next two years, on the other hand, saw sharp increases in the numbers employed by the industry, and the percentage of the total world labour force represented by Latin American employment in this industry remains around 5-5½ per cent. The relatively sparse population of this great land mass is reflected in the fact that it has only 12 per cent of the developing countries' employment in the sector, compared with well over 40 per cent of their combined output. The implications in terms of value added per man are clear, though they are set out in detail in a later section.

Trade[1]. Latin America's non-metallic mineral industry is much more outward-oriented that that of Asia. In 1965-67 average exports were equal to a little over 85 per cent of the value-added in production. Nevertheless, in value terms it contributed only just over 12.5 per cent of total world trade in this sector. In some parts of the industry, e.g. cement, all but a very small proportion of production is closely related to home market consumption.

Only some 2 per cent of Latin America's trade in non-metallic minerals is done within the region, and only 4 per cent with other developing economies. The needs of the area for foreign exchange, coupled in this case with the proximity of several more developed markets, have resulted in a trading pattern again strongly linked with the developed economies.

Technological Trends

This area has the highest level of productivity among the developing areas, as may be seen from Appendix IV, almost four times the average for the developing countries as a whole, and about half of the level prevailing in Europe. This is due at least in part to the influence of international companies which have brought North American practices and equipment to bear on industries in South America and Mexico. An example is the production of talc in Mexico by the Cyprus Mines Corp. of the U.S., whose range of finished products includes some of the most advanced micronised talcs used in many industries for preferential absorption of organic materials in the presence of water. Nor are North American influences the only ones involved: long-standing links between Europe and the South American territories also provide technical expertise. In Brazil, asbestos, which is mined on only a small scale in Central and South America, is produced in association with the French Pont-a-Mousson group, selling to Brazilian producers of asbestos cement sheet and products, which include another associate of the same French group.

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1 It should be noted that the trade figures used are based on U.N. publications The Handbook of International Trade and Development Statistics, 1969 (UNCTAD E/F.69.11/D.15) and Commodity Trade Statistics, 1965-67 (ST/STAT/SER.D) and use the S.I.T.C. classification. They are therefore subject to the provisos set out in the Introduction.

Mexico is taking advantage of technological advances to convert some of its sulphur deposits into the acid products now used in complex high-grade fertilisers. (See the technological trends section under Africa for more on this subject.)

With oilfields in South America, the Caribbean and the U.S., and 70 per cent of world output of barite going into drilling muds, it is not surprising that the two largest barite companies - the Baroid division of National Lead Co. and Dresser Industries' Magcobar division - have been active in Latin America. Brazil has been a major source, but production costs have risen as the more accessible deposits were exhausted and alternative sources known in the interior may now have to be developed. Peru and Mexico have supplied crude barite to the U.S. Gulf and Caribbean grinding plants, but sales depend on drilling activity. The amount of new drilling in the Caribbean and in Venezuela has been declining in more recent times, exploratory work being further afield, so that new barite mining and grinding operations are being set up. Thus, although world demand remains large, some of the Latin American plants are likely to be under-utilised[1].

In general, governments of developing countries in Latin America have recognised the value of associating international companies closely with the development of their own industries, and have so far tended to concentrate on controlling the overall operations or ensuring adequate returns for the country from them, rather than expropriating them completely, as has happened in some parts of the world.

Investment Trends

Latin American governments' tendency to insist on 51 per cent or more of the financial control of major mineral operations has featured in the news more in relation to metal and oil operations but has not failed to influence non-metallic mineral operations. In Mexico, which first exported phosphorus in the 1920s and is now the world's largest producer, the U.S. funds poured into exploration

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1 See various accounts in issues of "Industrial Minerals", published by Metal Bulletin Ltd., London W.I.H. OBJ.

and development of this and other minerals, especially during the war years when more distant sources were at risk, have greatly assisted development. More recently, however, the Mexican government has sought to control sales of, for example, sulphur, lest outside control should mean the selling of the country's self-reducing assets at less than maximum prices.

Smaller South and Central American territories find difficulty in financing the exploitation of deposits which may in some cases be isolated and lack local markets. In Bolivia, where high grade crocidolite (asbestos) fibre has been mined sporadically, local interests, with a 30 per cent contribution from the Corporacion Boliviano de Fomento, may need United Nations funds to establish milling facilities, if the current small pilot project is successful. Peru is developing deposits of phosphate rock, and is expected to reach the productive phase in 1972-73, with output of 2 million tons of phosphate by 1975. Brazil and Colombia have rather smaller projects in the same field.

Future Trends

While those territories, such as Mexico and Puerto Rico, which have made advantageous use of U.S. technological and investment resources, are likely to find the development of their non-metallic mineral industries going ahead, much of the region has problems in finding finance and markets equal to the potential development which could take place. Growth is likely to continue to be irregular, though a level of productivity which is relatively high for developing areas should be maintained.

Political uncertainty has been one of the major factors in causing hesitation among potential foreign investors with regard to Latin America. Recent developments, such as the election of Allende in Chile - which caused a flight not only of potential expatriate investment interests but also of more wealthy nationals - and the Andean bloc's Investment Code, have been described as likely to restrict investment within the area. The Investment Code, as originally drawn up, required foreign interests to divest themselves of majority control of companies

in the Andean Pact states (Colombia, Ecuador, Peru, Bolivia and Chile) within specified time-limits, which in many sectors were to be only three years (or six in the case of less-developed Bolivia and Ecuador), and at the longest would have been 10 years (15 in Bolivia/Ecuador).

Although these time-limits were relaxed in later revisions of the Code, its provisions removing foreign firms' supposed "restrictions" in the form of patents and control of know-how remain, and are regarded as a disincentive to new-product development within the area by many authorities in industry. The official starting date for the agreement was January 1, 1971, but not all member governments are equally keen to implement it, the Colombians, in particular, having been in a position where they were at last receiving increased resources from foreign investors in 1970, a position which is as valuable from the economic standpoint as it is troublesome from the political angle. Moreover, no Andean suthority has yet offered really adequate indications as to the way in which national finances are to raise sufficient capital to buy out the foreign investment which it is proposed to fade out. Private resources certainly do not appear to exist in adequate quantity, so that increasing state ownership is an unescapable concomitant of increasing participation by Andean nationals, and a further potential deterrent to private investment from outside, especially to many U.S. companies.

AFRICA

Economic Trends

Output. The average annual growth rate of output in the non-metallic minerals industries of Africa rose to 7.9 per cent in the latter years of the decade, compared with the earlier level of 6.8 per cent per annum. Although the share of total world output in 1968, deriving from Africa (apart from S. Africa, which is included among developed areas), was still little over $\frac{1}{2}$ per cent, therefore, it did increase over the period. In relation to the activity of other developing areas, however, it actually lost ground very slightly - from 7.4 to 7.3 per cent.

In terms of the value added by various sectors of industry, the non-metallic minerals industry is of the greatest internal significance in Zambia (where it has provided over 12 per cent of total value added in manufacturing), Nigeria (7 per cent) and Algeria (nearly 10 per cent).

In terms of contribution to the output of the area as a whole, however, the North African countries have dominated. The whole of Africa apart from the South African Republic produces only about as much as that one territory, and around half of this comes from the Mediterranean litoral countries, with the U.A.R. the largest single contributor. This pattern is only partially the result of geographical distribution of the minerals concerned and the nature of the surface topography, although mineral use had a historical head start in bare territory such as the Saharan fringes and the veldt, compared with areas of heavy jungle cover in tropical Africa. Clearly, however, it has also been affected by the technological and investment resources available in different areas. Although clay products and glass remain virtually the preserve of North African territories, some of the other areas are now beginning to develop their non-metallic minerals. Nigeria and Congo have cement industries and in 1967 Ghana produced 15,000 tons of cement and 381,000 cubic metres of concrete[1].

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1 U.N. "Growth of World Industry", 1968, Vol II. (1970) ST/STAT/SER.P/6, Vol II.

Employment. Employment in this sector grew strongly in Africa throughout the past decade, and there were resulting increases in the percentage of all developing countries' employment that the area could claim and in the percentage of total world employment coming within developing Africa, although both remain small in absolute terms (a little over 1 per cent of the world total and 2.6 per cent of all developing countries' total in 1967).

The internal pattern is similar to that of output, though reflecting the higher productivity of the Republic of South Africa compared with the developing areas of the continent: employment in developing Africa is twice that in S. Africa for roughly equal output, and within the developing area about one-third of labour is in the U.A.R., with Nigeria, Morocco and Algeria each employing around 10 per cent. The largest Nigerian employer in this sector, the cement industry, grew vigorously from 1960 to 1966 and is likely to show a strong resumption of this trend which was interrupted by the Biafran conflict. Indeed, reconstruction works should add impetus to the growth.

Trade[1]. The trade of the African non-metallic minerals industry has even closer ties with the developed economies than that of other developing areas - only a very small proportion of its exports (some 6 per cent in 1967) going either within the region or to other developing areas. Exports to the developed areas do represent a significant business for the area - their value in 1967 was equal to over 70 per cent of the value-added in production. In part this is a reflection of traditional connections with Europe, especially those established by the North African territories, whose access to European markets is facilitated by the relatively simple Mediterranean crossing.

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1 It should be noted that the trade figures used are based on U.N. publications The Handbook of International Trade and Development Statistics, 1969 (UNCTAD E/F.69.11/D.15) and Commodity Trade Statistics, 1965-67 (ST/STAT/SER.D) and use the S.I.T.C. classification. They are therefore subject to the provisos set out in the Introduction.

Technological Trends

Africa has particular problems in respect of technology which have been at least partly political. Study of Appendix IV shows that, in contrast to all other areas, African productivity, in terms of value added per person engaged in the non-metallic mineral industries, has actually been declining since 1963, and there is no evidence to suggest that this was a purely temporary phenomenon.

Part of the explanation lies in the reaction of newly-independent states against their past economic domination by expatriate companies. This has led in many cases to the ousting of experienced operators and "Africanisation" of industry under conditions of capital-shortage which have tended at times to substitute man-power for unavailable equipment. There is, too, the factor of the establishment of industries in new areas. Because of their association with European organisations and the length of their experience in their particular sections of the industry, the North African territories had a fairly high standard of efficiency and capital investment, and the extension of activity to new areas is bound, for some years at least, to cause apparent dilution of these standards in any study of the overall statistical position.

In the fertiliser section, while expansion of established producers will continue,[1] the Rio de Oro territory is expected to become a major new source of phosphates by 1975, when its planned output of 5 million tons would be equal to one third of the Moroccan output, even allowing for the latter's planned growth. Angola, too, is expected to enter this market, though output by 1975 will still be small.

Competition from producers such as Rio de Oro, whose production costs will be low, is intensifying the pressure on traditional North African producers to attempt to substitute trade in phosphoric acid for the older movement of phosphate rock. This change, which involves more advanced technology in production and transport, has already taken place in the U.S. and Europe, and the traditional

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1 Special E.I.U. study of fertiliser industry.

suppliers of phosphate rock fear that further capacity may be installed in Europe on the basis of imported rock, to the advantage of the lowest-cost producers. In turning their attention to acid production, particularly for the export trade, however, they face considerable increases in the economic size of production units.

On the building materials side, in the early 1960s the shortfall in supply for the continent as a whole (including those materials, such as metallic, plastic or timber products, not in the non-metallic mineral category) required imports of 50-60 per cent of the value of total consumption, and the figure for many sub-regions and individual countries was markedly above this average[1]. This pattern did not improve appreciably during most of the decade. For cement, the proportion was down to 23 per cent, but for asbestos cement, concrete products, clay products and flat glass it was around 30 per cent.

It is not the small size of the market, but the historic organisation of African territories primarily for outward movement of raw materials, which has given rise to this pattern. Transport and communications networks are only now beginning to take into consideration intra-African movement. This very fact has helped to hold back development of industries within the continent which might otherwise have become viable by serving more than one of its smaller national or regional markets. Only in the case of bulky materials such as bricks, concrete blocks, sand and aggregates, for which long-distance movement between manufacture and use is uneconomic, has there been widespread development of local industries. Even for these, production processes in many areas are still rudimentary, characterised by poor quality material, low productivity and seasonal output from small artisanal or inefficient semi-mechanised units. In some cases, geological distribution has also presented problems: West African development of cement production lagged behind because of the inadequacy of local supplies of basic materials.

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1 The Building Materials Industry in Africa. The Economic Bulletin for Africa, Vol II, I and II, published by U.N. Economic Commission for Africa in E/CN.14/406, 1968.

Investment Trends

Governments have been fully aware not only of the strains imposed by existing levels of imports, but also that the demands of accelerating economic development imply large-scale construction activity, for the whole range of structures, from dwellings, communications facilities, and public utilities to industrial buildings. Calculations of the Economic Commission for Africa estimated growth of expenditure on building materials of all types at 8.5 per cent per annum compound, to a level of $4.7 billion by 1980 (1960 price basis), assuming a 5.5 per cent growth rate for the economy as a whole. Unless African industry can maintain a similar pace, the drain on foreign exchange for the level of imports implied would be serious. Up to 1963, only cement production had succeeded in holding down the rising trend of imports, but it was noteworthy that on the whole new materials, such as plywood and board, had achieved higher growth rates than cement, crude steel and other older materials.

As indicated in the preceding discussion, however, investment will continue to act as something of a curb on growth in the next few years, for political as well as economic reasons. Few of the newly independent territories have resources of their own sufficient to support the growth they seek, and many are unwilling to become heavily involved with private capital from the developed world. In some cases the centrally planned economies are helping to fill the resulting gap, other international agencies have been found to assist, but this is likely to remain a problem, particularly for those countries outside the Mediterranean seaboard which are trying to establish new mineral industries.

One of the major problems in this industry is that where prevailing prices are high, because of the cost of transportation, development of a wide range of building materials in small units would be favoured by governments, but advancing technology has made such units obsolete from the capital equipment stand point. Research efforts are being directed to the development of efficient small production units. Economies of scale do not offer the advantages here that they do in more developed economies and the right choice and design of production units will be critical to the healthy development of the industry at the present stage.

Future Trends

It is probable that output of non-metallic minerals will continue to grow in the next few years at an increasing pace - perhaps as much as 9.0 per cent per annum - unless major political upheavals intervene. Employment, too, is likely to go on growing, since there are still reserves of under-employed labour in most of the areas concerned, and the capital-supply situation is likely to remain tight. The continuing introduction of new extractive enterprises will also tend to hold back the level of average productivity (e.g. phosphate). The market no longer constitutes any hindrance tc growth, demand urgently requiring expansion of building materials productivity, and local imbalances in supplies of raw materials represent a large potential for the growth of intra-African trade as the necessary transport systems develop.

DEVELOPING COUNTRIES - SUMMARY

Economic Trends

Output. Output has been growing in all parts of the developing world at an average of 5-10 per cent per annum, and in most areas it showed a tendency to gain momentum as the decade progressed, although this progress was not without setbacks. These industries, although in many cases contributing only a small percentage of total national output, hold key positions in the economies of developing countries because of the importance of fertilisers to agriculture and of construction materials to housing and industrial building.

Employment. The developing countries have had the highest rate of increase in employment - at over 4½ per cent, well above the world average and very different from the marginal increases or positive decreases of the developed world. Only the centrally planned economies have been in a similar situation. This reflects at once the development of new and extended production and the relative abundance of labour rather than of capital or skills for less labour-intensive modes of operation.

Trade. The high bulk in relation to value of many non-metallic minerals is one reason why they figure much less prominently in trade than some other categories of goods. For the developing world they tend to feature either as unavoidable imports - such as fertilisers to boost agricultural production - or as currency earners, such as cement, phosphate rock, barites - which can be sold to the developed economies. Trade with the centrally planned economies is expanding, but trade within the developing areas is a small and in some cases declining proportion of the total. Except where geological distribution is a limiting factor, developing countries will tend to increase their self-sufficiency in these products as far as possible, so that there may well be changes in the trade pattern in the future. Exports of currency-earning minerals will continue, although the added-value element may be increased (e.g. by switching from exports of phosphate rock to exports of phosphoric acid).

Consumption. The continuing importance of non-metallic minerals in all stages of economic development has been pointed out in the Introduction. It maintains its proportion of increasing per caput national income by changing the nature of its contribution at different stages. In early development, much of non-metallic minerals usage will be in fertilisers and in materials used for road building and major constructions such as runways, harbours. Later demand will swing more towards materials used in industrial plant and housing construction, and finally to those required for industrial processing (e.g. talcs, industrial ceramics) and domestic use (e.g. household ceramics for decoration and use, glass for containers).

Technological Trends

There are wide divergences in the state of technological development in the developing world. At the present time Latin America has the lead in overall productivity, but seems in the latter half of the decade to have lost its earlier impetus. Even within the region, however, there is a technological gulf between, for example, Mexico and some of the less-developed states of Central and South America and even between different parts of the industry group within single states. Asia is making strong, if unsteady growth from its very low starting point. African development in this respect is the least certain, productivity having actually fallen away over most of the decade, and being very uneven as between the countries of the northern seaboard and the rest of developing Africa.

Investment Trends

A perpetual shortage of investment funds, coupled with the lack of those skills which would enable limited resources to be employed to best advantage, is the problem common to all developing areas and their industries in varying degrees. Insofar as major schemes of capital development - such as ports, highways, power stations, industrial plant, educational building - have priority in the allocation of available resources, construction materials have an assured outlet, and many be able to obtain the development funds they themselves need. In general, however, investment problems are a major constraint upon development in this, as in other sectors of the developing economies.

Future Trends

If the developing world can avoid political upheavals and make the maximum use of technological advances, the rate of growth of their non-metallic mineral industries should continue to average a little under 8.0 per cent during the next decade. In some individual cases, however, growth will continue to be limited by the availability of finance for investment, particularly where the amount of external capital used is limited for extraneous reasons. In those countries and industries where capital is available, growth is likely to accelerate.

EUROPE AND OTHER DEVELOPED MARKET ECONOMIES

Economic Trends

Although there have been differences in some aspects of recent trends between the older developed economies of Europe and the other, and in many cases, newer developed economies, such as Japan, the overall picture for the developed world has sufficient similarities to be most usefully considered together.

Output. Both groupings showed increased output by an average of between 4.5 and 5.0 per cent annually in the latter half of the decade, although growth suffered a check in 1967. Earlier in the decade the average growth rate was in both cases higher than this, and the drop was more marked in Europe than in the overall grouping (from 6.4 per cent to 4.8 per cent compared with all developed areas' slowing from 5.8 to 4.6 per cent). As a result of these growth trends, the share of total world output has declined slightly in both cases. Despite this, the developed areas produced 49 per cent of total output in 1969. Appendix I gives the detailed figures.

Employment. It is in the sphere of employment, however, that the most striking features emerge. In Europe, the level of employment in non-metallic mineral industries has actually declined since 1965: in that year, which saw the turning point after annual increases of only just over 1 per cent, the position was static. Since then, there has been an average annual decline of just under 1 per cent, but there was a larger than usual drop in 1967 which is related more to the drop in output already noted than to the technological trends reviewed below.

Except for a temporary check in 1968, however, the number of employees in the remainder of the developed economies continued to increase, although at an average of no more than 2.5 per cent.

Trade. Despite the efforts made by developing countries to increase trade with non-traditional markets, the developed market economies continue to take the greater proportion of developing countries' exports in this, as in so many other sectors, since they alone can offer the technologically advanced goods and services which developing countries require in return, or have the purchasing power to absorb exportable surpluses of crude materials. The part played by developing areas as suppliers, is much less significant as a proportion of the recipients' trade, since developed economies trade heavily between themselves from the much more varied selection of products they have available. In some cases, also, technological advance in the processing or extraction of non-metallic minerals has enabled the developed market producers, for example in the U.S. phosphate industry, to sell more cheaply than developing-area competitors. In the case quoted, while certain areas have close commercial or institutional links which guarantee them a market (such as Mexican producers in the U.S., Pacific Island producers in Australia and New Zealand), Europe has been a field for open competition and has seen the primary place as supplier lost by North African producers to the U.S.

Moreover, where the geological raw material is widely distributed (e.g. clay based industries), the developed economies have old-established, highly organised and technologically advanced home industries, and self-supply reduces the importance for trade of markets which, in terms of the volume consumed, may appear attractive.

There are, however, features which offer more promise for developing areas than this analysis might suggest - such as the licensing and technological know-how agreements which are in some cases taking the place of expensive purchases of finished goods from developed economies. The increasing number of float-glass plants being built under licence from the European originators provides an instance. The result of these trends is to provide scope for development of local use of materials in place of trade in finished products many of which were basically uneconomic to transport.

Technological Trends

With a few exceptions, the raw materials of the non-metallic minerals industries are widely distributed over the erath's crust. Apart from the more obvious and easily obtained of them, however, the capital and technological resources behind exploration, proving and development are, for modern operations, on a very large scale. It is not surprising, therefore, that the percentage of total output deriving from the developed economies should be so high (see output section). Partly because of the great areas involved (e.g. in the U.S., Canada and Australia), the non-European developed economies' share of this total is gradually increasing, that of the older industries of Europe slipping from 59.3 per cent of the combined figure in 1960 to 56.1 per cent in 1969. This does not mean, however, the European producers are falling out of the race, since an increase in absolute output of 64 per cent has been achieved over the period notwithstanding the drop in numbers employed that has already been noted. Value added per employee in Europe rose from the equivalent of 2,645 U.S.$ in 1960 to 4,022 U.S.$ in 1968, an increase of 52 per cent. In the other developed economies, although the level was, and remains, much higher (5,036 U.S.$ in 1960 and 6,318 U.S.$ in 1968), it did not rise so strongly during the decade - only by 25.5 per cent, so that the European productivity level had risen, by the end of the decade from 73 per cent of that of all developed areas to virtually 80 per cent. In these industries, however, the Centrally Planned economies are also well ahead of other European developed economies in productivity, a situation which differs from that in some other areas of production.

One important aspect of the highly developed economies' advanced technology which is impossible to quantify or to predict the effects of in value terms is the tendency, and ability, to make swift and sweeping changes in the technical composition of products, with consequent drastic alterations to requirements of crude materials. An example is the current swing of official pressure against phosphates in detergents. One estimate[1] already suggests that by mid 1972 major detergent producers in the U.S. will eliminate 700 million lb. per annum

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1 U.S. trade magazine quoting estimates from company sources.

from their phosphate requirements, leaving producers a considerable problem of reorientation. For the total non-metallic minerals industry this will not appear so significant, however, since an increase of several 100 million lbs. of silicate will be required in replacement formulations.

Another factor likely to complicate the development of the non-metallic as well as other minerals industries in the next decade is the growing emphasis, especially in the U.S. and parts of Western Europe, on environmental and pollution damage. Already extraction and processing projects are encountering opposition from official bodies or being delayed by the need to argue cases against local or national protection societies, and in some cases these will be abandoned, or operated in a way which will increase their calculable costs.

Investment Trends

Despite periodic difficulties frequently arising from government action to avoid the build-up of undesirable economic pressures, there is no basic shortage of investment resources in the developed areas, particularly since this industry consists largely of very big national or international companies with large reserves of their own and a very large capacity for raising capital for new development on the exchanges.

Indeed, in some respects the change of climate as regards outside capital in some parts of the developing world has helped to foster increased interest in mineral extraction in the older developed areas. Investment has in this respect been assisted by the technological progress in, for example, extracting marketable products from the tailings of earlier operations, and working lower-grade deposits once not considered commercially viable. The whole field of extractive industry has taken a new lease of life in recent years in Europe. In the newer developed areas there is a similar relative ease of access to investment funds coupled with technical progress in exploration, proving and processing, and strongly growing demand to increase the rate at which extensive untouched deposits of non-metallic minerals are exploited.

Future Trends

Apart from checks administered by temporary deteriorations of the overall economic climate, the industries' growth in these areas is likely to continue at a level close to the average for the latter part of the last decade. There may well be further declines in the numbers employed, however, as productivity is pushed upwards by a combination of technological development and economic pressures on the profitability of operations. One significant factor in cost increases has tended to be rising wage rates.

CENTRALLY PLANNED ECONOMIES

Economic Trends

Output. The growth rate has decreased in the non-metallic mineral industries of these countries, from an average of 9.6 per cent in the early part of the decade, to just under 8 per cent from 1966 onwards. Moreover individual years' figures show the relative decline as growing steeper each year from that date. Nevertheless, because of the trends in other areas and the varying scale of the different areas' output, the percentage of total output derived from these countries has actually increased to a small extent (41 per cent to 43 per cent) since 1966.

Employment. In the realm of employment opportunity offered by the industries, this sector has more in common with the developing than with the developed economies, having experienced an increase on average of 3.3 per cent even in the latter half of the decade, when some of the developed economies were experiencing a drop in actual numbers employed.

Trade. Although these areas share with developing countries a need for fertilisers, and have also been increasing their involvement with developing areas in providing various types of aid and alternative markets, the overall pattern of trade between developing areas and these economies is still on a relatively small scale. Intra-group trade is of considerable importance to the centrally-planned economies.

Technological Trends

It is in this area of development that the most impressive results have been achieved in centrally planned economies, with output per man higher than in any other of the standard groups, and approaching twice the world average by 1967. This lead was taken in 1965 and held from then on. While keeping informed of latest developments in the technology of the developed economies, the industries' specialists in these countries have also been providing technical assistance to the governments of developing countries. While the pace at which they have

pushed ahead on limited resources has necessairly produced uneven technological development, the output per employee is evidence of overall success.

Investment Trends

Investment priorities in these economies are determined by governments as part of an overall plan. Most of the products of the non-metallic mineral industries, and in particular construction materials and fertiliser raw materials, are among those which gain from this system (at the expense of consumer goods), being considered basic to the sound development of the economy as a whole. Nevertheless, in countries which are aiming to develop fast and far over a very wide range of activities, total resources are rarely equal to the sums of the demands made upon them, and there are times when the level of permitted investment is below what the industry could use.

Future Trends

Since some, at least, of these economies are now reaching a stage when internal political pressures, if not also the general stage of development, are dictating higher priorities for consumer goods' production, there may be some shifting of the balance which has so far favoured basic industries. Growth rates more in line with the recent world average (between 6 and 7 per cent) are probable between now and 1975, although further productivity gains may to some extent offset the retarding influences.

WORLD SUMMARY

Economic Trends

Output. Despite the healthy growth rates in the non-metallic minerals industries of the developing world, flagging dynamism in more developed areas, including the centrally planned economies, has resulted in a lowering of the average annual growth rate for the world as a whole from the first to the second half of the 1960s. The developed economies are as yet, however, still producing the largest individual part of world output in this sector.

Employment. The average annual growth rate of employment in the non-metallic minerals industries has been a little over 3.0 per cent, with actual declines among the more developed economies being offset numerically by the substantial increases in Africa and Asia.

Trade. In this, as in so many markets, the developed countries play the greatest role in trade. Intra-regional trade among developing areas is small, since many of the commodities in this group are produced for local use, and where exportable quantities are produced they are seen primarily as a means of obtaining financial or technical requirements from developed countries, although centrally planned economies have been increasing their involvement in this trade.

Technological Trends

Although manpower productivity in the developing world as a whole is only one-tenth of that in developed market economies - a smaller percentage than at the beginning of the decade - there are wide variations in progress within the developing areas of the world, so that some are failing to keep up, to an extent greater than the overall figures (in Appendix IV) would suggest while others are progressing much more favourably. Many of the developing territories need to provide employment even more urgently than they need funds for technically advanced plant, and at that

stage of development may find that higher output may most usefully be achieved by using more labour in this sector. Technical assistance is, however, being used in many instances by developing countries, and is playing a major part in boosting both output and productivity.

Investment Trends

In most areas this is an industry which has a reasonably high priority for available capital resources, because it provides basic elements in the economy, such as construction materials and fertiliser raw materials. This factor may be slightly less favourable in the centrally planned economies in the next decade. Investment in increasingly large units is required to meet modern technological requirements for economic operation in extraction and processing.

In some instances political factors are limiting the supply of acceptable capital, where developing countries, anxious to avoid domination of their industries by expatriate companies, are making investment unattractive to those very large international companies which might be able to provide funds. There are instances in which such capital is finding alternative opportunities in the developed economies, where investment is to this extent being "assisted" in a way which is, from the purely economic standpoint, artificial, in these areas. They are in any event already the best endowed with capital resources.

Future Trends

The balance of trends in different areas suggests that the world growth of the non-metallic minerals industries to 1973 will proceed at a rate slightly below that of the late 1960s - an estimated annual average of 5.7 per cent compared with a little over 6.0 per cent. This would give an output in 1973 of close on 45.5 million U.S. dollars (See Appendix V).

While the importance of this sector may be most far-reaching in the early stages of development, its products are so basic to both agriculture and construction that the type and complexity of products tends to change as economies develop, maintaining the overall sector in a growth condition even though individual industries may lose some impetus.

Appendix I. Output by Region and Socio-Economic Grouping in Non-Metallic Mineral Industries

(million U.S.$)

	1960	1963	1964	1965	1966	1967	1968	1969
1. Asia	638	853	935	1,021	1,060	1,151	1,210	1,416
2. Latin America	717	787	861	905	976	1,036	1,124	1,146
3. Africa	111	121	133	154	163	163	170	203
4. Developing Countries[a] (Adjusted total)[c]	1,466	1,761	1,930	2,078	2,199	2,350	2,504	2,765
5. Europe	4,878	5,844	6,612	6,758	6,958	7,102	7,577	8,006
6. Developed market economies	11,239	12,992	14,374	15,016	15,659	17,862	16,864	17,929
7. Centrally planned economies	5,399	9,578	10,484	11,435	12,526	13,674	14,670	15,708
8. World[b]	20,104	24,331	26,788	28,529	30,384	31,886	34,038	36,402

a Total of 1+2+3. b Total of 4+6+7. c Including estimates for countries for which data is unavailable.

Source: U.N.I.D.O.

Appendix II. Indices of Production of Non-Metallic Mineral Industries

(1963=100)

	1966	1969	Annual Average Growth Rate, 1966-1969
Asia	124	166	10.2
Latin America	122	149	6.8
Africa	135	168	7.5
Developing countries	124	157	8.1
Europe	119	137	4.8
Developed Market Economies	120	138	4.8
Centrally Planned Economies	131	164	7.7
World	125	150	6.2

Source: U.N. Monthly Bulletin of Statistics.

Appendix III. Industrial Employment in Non-Metallic Mineral Industries by Region and Socio-Economic Grouping
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	1960	1963	1964	1965	1966	1967	1968
1. Asia	2,891	3,345	3,526	3,678	3,939	4,172	n.a.
2. Latin America	498	504	524	508	538	598	621
3. Africa	59	83	96	107	125	132	n.a.
4. Developing Countries[a] (Adjusted total)[c]	3,482	3,970	4,190	4,335	4,647	4,950	n.a.
5. Europe	1,844	1,913	1,946	1,946	1,935	1,888	1,884
6. Developed Market Economies	3,107	3,253	3,322	3,392	3,397	3,346	3,354
7. Centrally Planned Economies	2,250	2,422	2,450	2,550	2,560	2,672	n.a.
8. World[b]	8,839	9,645	9,962	10,277	10,604	10,968	n.a.

a Total of 1+2+3. b Total of 4+6+7. c Including estimates for countries for which data is unavailable.

Source: U.N.I.D.O.

Appendix IV. Value Added Per Person Engaged in Non-Metallic Mineral Industries by Region and Socio-Economic Grouping

(U.S.$ per person)

	1960	1963	1964	1965	1966	1967	1968
1. Asia	221	255	265	278	269	276	n.a.
2. Latin America	1,440	1,562	1,643	1,778	1,814	1,732	1,810
3. Africa	1,881	2,051	1,385	1,439	1,304	1,234	n.a.
4. Developing countries[a]	421	444	461	479	473	475	n.a.
5. Europe	2,645	3,055	3,398	3,473	3,596	3,762	4,022
6. Developed Market Economies	3,617	3,994	4,327	4,427	4,610	4,741	5,028
7. Centrally Planned Economies	3,288	3,962	4,279	4,484	4,892	5,116	n.a.
8. World[b]	2,274	2,523	2,689	2,776	2,865	2,907	n.a.

a Total of 1+2+3. b Total of 4+6+7.

Source: U.N.I.D.O.; E.I.U. estimates.

Appendix V. Forecast Output by Region and Socio-Economic Grouping Non-Metallic Mineral Industries

(million U.S.$, constant prices)

	1970	1973	Annual Average Growth* Rate (Compound) 1970-73
Asia	1,545	2,035	9.5
Latin America	1,215	1,415	5.4
Africa	215	285	9.0
Developing countries	2,975	3,735	7.8
Europe	8,390	9,657	4.8
Developed Market Economies	18,755	21,465	4.6
Centrally Planned Economies	16,790	20,285	6.6
World	38,520	45,485	5.7

* 1973 estimates reflect averages, subject to rounding: 1970 figures in some cases are modified to take account of trends or known special factors.

Source: E.I.U. estimates.

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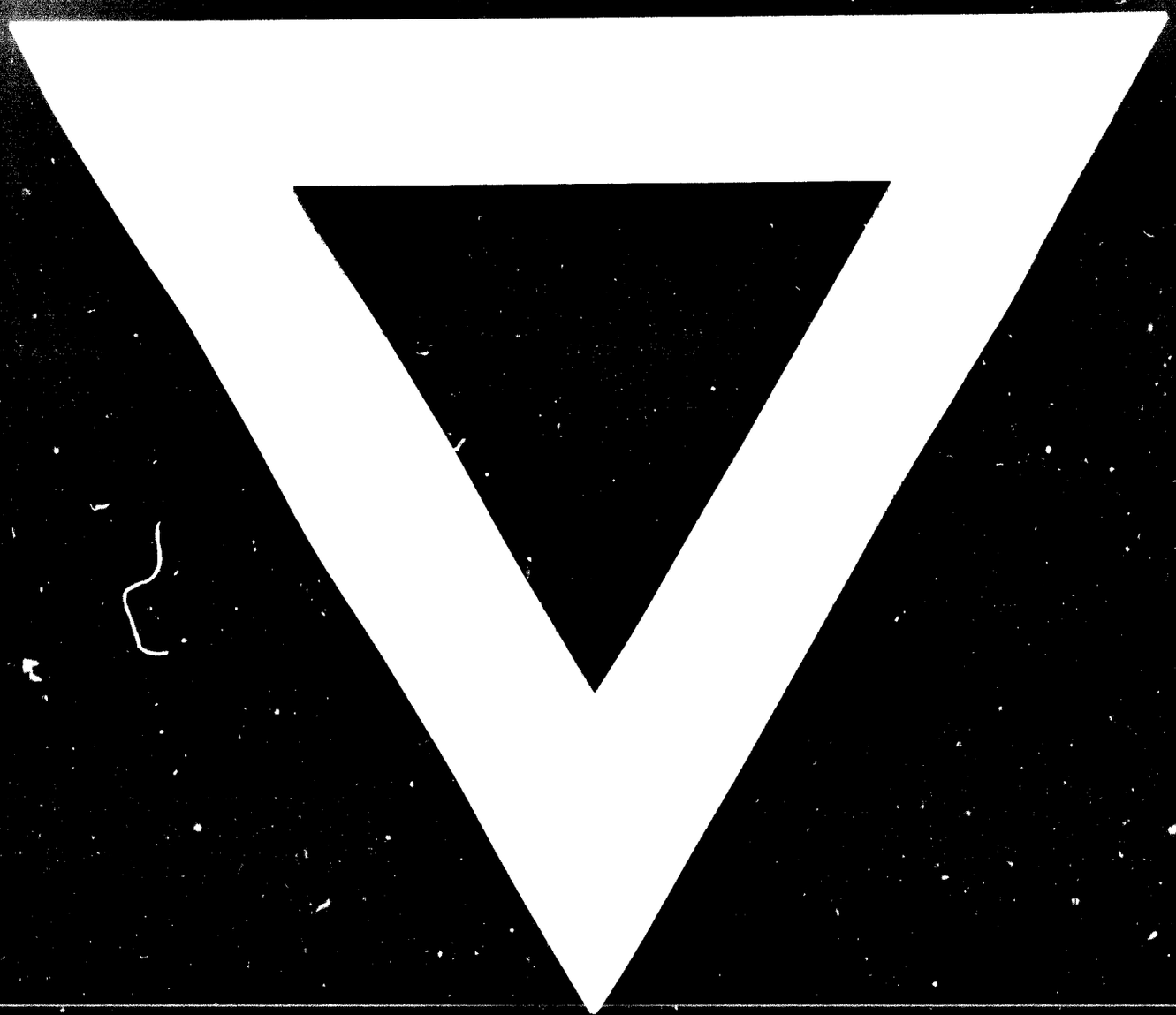

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