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LATIN AMERICAN SUPPLY AND MAJOR WORLD MARKET DEMAND FOR THE
PRINCIPAL METALS, 1970-1990: ALUMINIUM, COPPER,
IRON, NICKEL, LEAD, ZINC, TIN

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CONTENTS

	<u>Page</u>
SUMMARY	1
A. LATIN AMERICAN SUPPLY	1
1. General behaviour of the regional supply of the selected metals from 1970 to 1980	1
2. Supply of the selected metals in the principal producer countries of Latin America	4
3. Exports of mining and metallurgical products: principal metals and principal countries	6
4. The evolution of the metallurgical stages involving the highest value added	7
5. Prospects for the supply of metals from Latin America in the 1980s	8
B. MAIN WORLD MARKET DEMAND	11
1. General characteristics of world demand	11
2. Supplies of metals from the developing countries and Latin America in the supplies of the principal world consumers	12
3. Hypotheses on future world demand for metals	12
4. Prospects for future supplies from Latin America, with respect to projected world demand in 1990	13
I. Reserves of the principal Latin American metals	
II. General aspects of the Latin American supply of metals	
III. Latin American supply of metals, by principal producer countries	
IV. Exports of the principal Latin American metals to countries inside and outside the region	
V. Share of the developing countries and of Latin America in the supply of metals to the principal world consumers	
VI. Prospects for Latin American supply of metals in the 1980s	
VII. World demand for the principal metals between 1970 and 1980	
VIII. Comparative evolution of the world consumption of metals during the decade 1970-1980	
/IX. Various	

These chapters will appear in document E/CEPAL/L.269 (in preparation)

- IX. Various hypotheses on future world demand for the principal metals
- X. Situation of the future supply of metals from Latin America and their relationship to world demand
- XI. Prospects for future supplies from the developing countries and from Latin America, compared to prospects for world demand

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SUMMARY

A. LATIN AMERICAN SUPPLY

1. General behaviour of the regional supply of the selected metals from 1970 to 1980

The report deals with the behaviour of the Latin American supply of 7 metals selected as those of greatest production value in the mining and metallurgical activity in the region both in the past decade and in the prospects for the coming decade.

An important general event had an impact on this supply during the 1970s: the crisis in the prices of oil in 1973/1974 and its recessive repercussions on the uses of energy, and consequently on world industrial activity and its demand for metal. This critical phenomenon, which was preceded in the years prior to 1973 by a greater demand for these raw materials, determined the behaviour of the Latin American supply of metals, whose general features were evident in fluctuating periods of higher and lower demand, with almost the same characteristics for the majority of metals in question:

- a first, short period of expansion of demand and production of ores which developed from 1970 and 1974, with a maximum supply in the latter year;

- a second period with a falling trend in the demand and production of ores to different degrees for each metal, which began, according to the individual cases, between 1973 and 1975;

- a later peak of slight recovery in the demand and production of ores after 1975, which occurred in a different year for each metal, viz., in nickel (1979), zinc (1977), tin (1977) and lead (1976); for other metals, and at the same time as the previous phenomenon, there was a generalized drop from 1974 to 1980 for bauxite, an even more definite and specific decline in iron ore, and the reverse phenomenon of a clear recovery trend in copper ore, at least until 1979.

In the supply and demand of metals in the decade we are describing, the behaviour was different from that of ores: with varying levels of activity - less for primary iron, more for tin and aluminium, and moderate for copper- the tendency for these four metals was generally towards a growth in supply and demand; after 1976, zinc and lead tended to fall, although they showed signs of recovery at the end of the decade.

/In brief,

In brief, the two ferrous metals of the group being analysed, iron and nickel, were the most affected by the industrial recession; four of the non-ferrous ones -copper, aluminium, tin and zinc- maintained their growing supply as a result of a demand that was less recessive at times; lead was demanded and supplied with downward fluctuations after 1974.

A detailed examination for each metal reveals, in summary, the following diagnosis for each one:

Bauxite-alumina-aluminium

The bauxite reserves of Latin America, located mainly in Brazil, Jamaica, Guyana, Suriname and Venezuela, constitute approximately one-third of world reserves, a slightly larger share than that of production which, although it amounted to 40.7% of world production in 1970, in 1980 was only 27.5%.

In 1980, the share of these countries in regional production was: Jamaica, 51.5%, Suriname 21.2%, Guyana 15%, Brazil 7.3%, Haiti 2.9% and Dominican Republic 2.3%.

In the following production phase of this metal, the production of alumina, the region's current share is only 13.3%, having dropped in recent years.

While this was happening in our region, the developed market economy countries and those with centrally planned economies increased their share in the world supply of alumina.

The regional supply of metallic aluminium went through a process of dynamic growth, increasing 5 times between 1970 and 1980. In this regional production of metal, in addition to two of the countries producing bauxite and alumina (Suriname and Brazil) three more countries of the region were incorporated which produce aluminium without having yet developed the two previous steps: Argentina, Mexico and Venezuela. Despite this regional growth in the supply of primary aluminium, its share in the world supply was and still is insignificant: in 1970 it represented 1.6% and in 1980 only 2.2%.

Certain factors further accentuate this phenomenon of delay or backwardness in the development of aluminium metallurgy in the region: Africa participates in a quantitatively similar way to Latin America, and Asia has a greater share than Latin America in the world production of primary aluminium, although both continents have a lower share than our region in the production of bauxite and alumina.

/Copper

Copper

Proven reserves of copper in Latin America amount to 31% of the total world reserves of this metal. Chile and Peru possess 80% of the regional total.

The Latin American supply of this metal is a much lower share of world supply than the ratio we indicated for reserves: in 1970 it was 19.9% of ore, 17.9% of smelted metals and 12.2% of refined metals. At all events, the progress of Latin America in its share of the supply of copper in the 1970s was positive: in 1970 these percentages were 15.5%, 14% and 7.5%. Asia, although it increased its share in these ten years, continues to be a region with low participation, and Africa decreased its participation at the world level in the three products; Latin America, however, maintains an outstanding position among the developing regions.

Tin

Proven reserves of tin in Latin America, with 1.6 million tons of metal content, constitute 16% of the world total, with only two countries, Bolivia and Brazil, accounting for almost all of it (99.2%).

The supply of tin ore in the region in 1980, which amounted to 36 300 tons of refined content in ore and 27 200 tons of metal smelted, has a similar share to that in total world reserves: 15.5% and 10.8%, respectively. Latin America is thus the second largest developing region in the supply of this metal, being substantially exceeded by Asia, which has a 57.2% share in the world supply of ore and 56.6% of the supply of smelted tin.

Although there are five countries which together produce the regional supply of tin -Argentina, Bolivia, Brazil, Peru and Mexico- the second and third primarily sustain this supply: in 1980, in the production of ore, Bolivia's share was 75.2% and in metal smelted 64.7% of the regional total; Brazil's share was 18.7% and 32.3%, respectively, in the same year.

Nickel

Nickel reserves in Latin America, classified as "economically exploitable resources" and "additional resources", amount to 8.85 and 19.85 million tons of refined content, respectively, with which tonnages the regional share is 13.8% and 15.9% in the same categories of world nickel reserves.

Although there are reserves of this metal in six countries of the region, five of them have the most potential: Cuba, Brazil, Colombia, Guatemala and the Dominican Republic. The first has been the classic producer of nickel in the /region, although

region, although in the past eight years the Dominican Republic has increased its supply of this metal so dynamically that it has become the second largest producer; a similar phenomenon has occurred with Guatemala, which rose from being a small producer in 1976 to being the third largest in Latin America in 1980.

The regional supply in production of ore and refined metal was 63.1 and 39 thousand metric tons in 1980, representing 8.3% and 5.3% of the world supply respectively, or a lower proportion than that corresponding to nickel reserves.

During the 1970s these proportions were exceeded in some years, particularly in 1973, when the region's supply was 10.2% of the world production of ore and 7.7% of world production of refined metal; while our region decreased its share in world supply, other developing regions such as Africa and Asia increased theirs, the former moderately (1970 = 1.3% and 0.8%; 1980 = 4% and 2%) and the second significantly (1970 = 1.6% and 0.0%; 1980 = 11.3% and 3.6%).

Lead and zinc

These metals are usually found in association and are thus treated together in this summary.

In both cases, Latin American reserves are scanty: in lead, the region has only a 4.2% share of the world total; in zinc, the share is 9.6% of world reserves.

The supply of these metals in the last year recorded, however, presents a different situation: in 1979, the share of lead ore and metal was 32.6% and 11.3%; in 1980, zinc's share was 14.4% and 5.0% respectively.

Although there are seven Latin American countries which produce lead and zinc ore, only four produce smelted lead and another four metallic zinc. Most of the production, however, is based on two or three countries of the region: Mexico and Peru for lead, and Mexico, Peru and Brazil for zinc.

In brief, since there are not any major reserves of these ores in Latin America, the region as a whole could tend to have a smaller share in the future world production of lead and zinc.

2. Supply of the selected metals in the principal producer countries of Latin America

A brief categorization of the principal mining countries of the region would include Chile, Brazil, Peru, Jamaica, Venezuela, Bolivia, Cuba, Mexico, Suriname, Guyana and the Dominican Republic, in decreasing order according to

/the value

the value of their exportable production of the seven metals selected for the years 1970 to 1977, measured in 1975 dollars.

The situations of the supply of these metals vary in these countries, and may be summarized as follows:

- countries with an exclusive or basic preponderance of one metal in their supply of metals: Chile, Brazil, Jamaica, Venezuela, Cuba, Suriname and Guyana;
- countries with some degree of diversification in their mining and metallurgical production, such as Bolivia and the Dominican Republic;
- countries with diversified metals industries such as Peru and Mexico.

This characteristic, which we might call "specialized production", means that the supply of the various metals is supported by countries in separate areas: thus, copper is covered mainly by Chile and Peru, and to a lesser extent by Mexico; iron is produced by Brazil and Venezuela, and secondarily by Chile and Peru; tin by Bolivia and, supplementarily, by Brazil; nickel by Cuba and the Dominican Republic, with Guatemala and Colombia being included as new producers; lead and zinc by Mexico and Peru, followed by Bolivia. Finally, in the case of bauxite-alumina-aluminium, the exploitation of ore is carried out in a well-defined tropical geographical area which includes Guyana, Jamaica, Suriname, the Dominican Republic, Haiti and Brazil, although only some of these countries produce alumina: Guyana, Jamaica, Suriname and Brazil. The production of primary aluminium in the region, on the other hand, occurs primarily in Latin American countries where the production of bauxite or bauxite-alumina is just beginning or does not exist, such as Argentina, Venezuela and Mexico, which together accounted for 55.3% of the production in 1979, as well as Brazil with 35.7% and Suriname with 9%.

Brazil is presently the only Latin American country whose production of bauxite, alumina and aluminium is destined for domestic consumption alone. The other tropical countries mentioned (Jamaica, Suriname and Guyana, followed by the Dominican Republic and Haiti) supply the external markets with exports of bauxite and alumina, including the countries of the region which produce only aluminium.

3. Exports of mining and metallurgical products: principal metals and principal countries

There is some domestic consumption of the metals produced by the countries of the region, but it is obvious that the main proportion of mining and metallurgical production is eventually destined for export. Except in rare cases, the highest production of metals occurs in the countries with the highest relative industrial development of the region, such as Brazil with its iron production. Thus, the development of the mining and metallurgical exports of the region has largely followed the development of this activity in general.

In order of importance by value at constant prices, the accumulated exports of various types of mining and metallurgical products during the period under consideration (1970-1977), in millions of dollars at 1975 prices, are the following: copper 14; iron 9.3; aluminium 5.9; zinc 2.1; nickel 2; lead 1.3; and tin 0.6.

During this period, the total value of exports of the seven metals, at constant prices, has generally shown a tendency to fluctuate, as already seen in the tonnages demanded and supplied; the 1970 value declined around 1972, grew between that year and 1974, reaching a peak which was not exceeded in the entire period and after which the values decreased in general, although in 1976 there was a slight recovery; in 1977, at the end of the period, the total export value was lower than the first year (1970).

The crisis caused by the oil prices in 1973-1974 obviously influenced the general behaviour of metal exports in Latin America, particularly the exports of ferrous metals (iron and nickel), and to a lesser extent those of non-ferrous metals such as zinc, aluminium and tin, which made a better recovery than copper and lead.

It is interesting to observe that while this was occurring in total exports of mining and metallurgical products, intra-regional exports, i.e., those destined for other Latin American countries, generally grew: they doubled their values at constant prices between 1970 and 1977 and, in percentages, rose from 4.1% to 9.5% of the total exports to the region.

It may be concluded from an examination of the behaviour of the exports of each metal to the region that the export of bauxite-alumina-aluminium products decreased, whereas those of copper, iron, tin, lead and zinc grew, some of them dynamically (such as copper, tin, lead and zinc); iron grew only moderately and nickel was not exported at all to countries of the region.

/In respect

In respect of exports during the period 1970-1977 from the countries of the region which are the principal exporters of mining and metallurgical products, the following countries and amounts exported are the most outstanding, in round figures.

(a) Chile, with 11 764 million dollars at constant prices accumulated in this period, amounting to 32.3% of the total exports of the period;

(b) Exports by Brazil and Peru, which exceeded 5 000 million dollars and represent respectively 15.1% and 15.0% of the total;

(c) At the middle level, Jamaican, Venezuelan and Bolivian exports amount to 3 600, 2 400 and 2 200 million dollars, or 9.9%, 6.6% and 6.0%, respectively;

(d) Finally there is Cuba (1 400 million dollars and 3.8%); Mexico (1 300 million dollars and 3.6%); Suriname (1 200 million dollars and 3.3%); Guyana (900 million dollars and 2.5%) and the Dominican Republic (780 million dollars and 2.1%).

The particular phenomenon of exports of mining and metallurgical products to other countries of the region by the principal exporting countries, shows that Chile had a share of 48.4%, followed by Brazil (16.4%), Peru (13%), Mexico (9.1%), Bolivia (6.8%), Guyana (3.5%) and Venezuela (2.8%), with incomplete information for Jamaica and lack of exports to the region by Cuba, the Dominican Republic and Suriname. The cases of Chile, Peru, Bolivia and Mexico were examples of dynamic increases in intra-regional exports between 1970 and 1977. However, exports from Brazil dropped and those from Guyana and Venezuela remained stable.

4. The evolution of the metallurgical stages involving the highest value added

In the type of evolution of metal mining shown by the historical development of incorporating greater value added into metallurgical and mining production, Latin America gradually integrated its extractive activity during the past decade, with new metallurgical advances, moving towards greater production of smelted and refined metals in relation to ore production.

This phenomenon has evolved differently for each metal and each country; in some cases metals such as copper had already progressed at such a rate that later advances had a smaller quantitative impact at the regional level, although at the national level this occurred in the case of copper in Peru.

/In other

In other metals, advances have been significant in Latin America. In regional terms, between 1970 and 1980, for all the metals under consideration except lead, more progress was made in metallurgical production than in ore production; the greatest increases occurred in the production of aluminium (alumina-aluminium phase) and in the production of tin.

If a comparison is made between Latin America and the rest of the developing regions, it may be observed that, while our region presently shows higher development in the metallurgy of nickel and copper, and slightly higher in the case of lead, countries in some other regions have an advantage over us in aluminium (alumina-aluminium phase), zinc and tin.

Finally, in the market-economy developed countries, for all the metals, both in 1970 and in 1980, the volumes of smelted and/or refined metals were higher than those mined as ores; moreover, in three of them (nickel, copper, zinc) the situation in those years was a progressive one, in one case (aluminium) it was stable, and in two (lead and tin) it decreased, which indicates the persistence of primitive characteristics in the production process of the supplier countries, including those of Latin America.

The socialist countries are characterized by few and slight variations between the two extremes of the decade, with their principal feature being a balance between ore production and the production of metals.

5. Prospects for the supply of metals from Latin America in the 1980s

Although there is a certain degree of imprecision in the data available on the new mining and metallurgical projects already being developed or to be developed in our region in this decade, it would appear that out of a world total of some US\$ 76 667.2 million in investments, those of Latin America would amount to US\$ 25 681.2 million; this amount is 33.5% of the total world investments in the sector, for all types of minerals, both metallic and non-metallic.

The proportion mentioned is very significant if we observe that on the one hand it is estimated that the total investments of the United States and Canada will amount to some US\$ 9 679 million, or 15.6% of total world investment; while on the other hand, the sectoral investments which the developing countries of Asia, Africa and the South Pacific are projected to make in the same period, together amount to some US\$ 19 598.2 million, or 25.6% of the world total.

/Only the

Only the total investment planned by the developed countries -Western Europe, Canada, the United States, Australia, New Zealand and South Africa- would amount to a higher total than that planned for Latin America: US\$ 31 387.8 million, or 41% of the world total.

From another point of view than a merely regional one centering on Latin America it is estimated that mining and metallurgical investments which will take place in the developing countries as a whole (Latin America, Africa, Asia and the countries of the South Pacific) during the coming decade will total US\$ 45 279.3 million, or 59% of the world total for the sector.

This tendency to centre most mineral and metallurgical investments on the developing countries and especially on Latin America, would accentuate the role of our region as suppliers of certain strategic metals such as copper, aluminium and nickel, without necessarily meaning an increase for the developing countries in the following phases of industrialization. Indeed, 49% of the mining and metallurgical investments in Latin America, which amount to US\$ 12 573 million, is dedicated to projects which do not involve metal production proper: they are designed for ore production, or in some cases reach the stage of production of concentrates or, in the case of bauxite the production of alumina. The rest, or 51% of these investments, involve phases of extraction, smelting and/or metallurgy for various minerals.

This situation is reflected in the indexes of the degree of progress in the phases of higher value added, since if the anticipated installed production capacity of 1990 in all minerals is added, to the 1980 production, the indexes show that in three of them -copper, iron and tin- the situation would deteriorate, as against four where it would improve: aluminium, nickel, lead and zinc.

5.1 Investments in Latin America by metals and by countries

The metals which will receive the highest investments in Latin America will be copper, aluminium and iron, although in the latter case it has not been possible to establish precise details of the corresponding investments.

Following these three metals would be the deposits of lead-zinc, nickel (and ferro-nickel) and polymetals. Among the non-metallic minerals some investment importance would be given to deposits of phosphoric and potassic minerals. There would also be projects for gold, tin and finally uranium.

/Mining investment

Mining investment by country will be as follows: Brazil (26.4%), Chile (20.6%) and Peru (12.6%), followed by Colombia (9.3%), Panama (7.8%), Venezuela (6.2%), Argentina (5.5%), Jamaica (4.1%), Mexico (2.6%), Guyana (1.9%), and Bolivia (1.8%).

Of much less importance in terms of investment are Guatemala (0.8%), Ecuador (0.02%) and Honduras (0.06%).

5.2 Physical goals of regional production for each metal

Although the information available recently has been imprecise, an attempt has been made, based on each concrete project, to make a general summary of the physical goals of production of each one of the seven selected metals for the entire region; the tonnage capacity expected to be installed with the annual expansion of the installed capacity for the whole decade was then added for each metal.

In this summary the projected average annual growth rate between 1980 and 1990 was then calculated; in the case of ores the fastest-growing items are copper, iron, bauxite and to a lesser extent tin; the growth of nickel, lead and zinc would be almost nil.

The greatest growth rates would correspond to copper, nickel, aluminium, zinc and lead; the data obtained indicate smaller increases in the future production of iron and tin.

The share of the countries with respect to each metal in the new projects, in brief, would be as follows:

Nickel: Cuba, Colombia, Guatemala.

Lead-zinc: Bolivia, Brazil, Guatemala, Mexico, Peru and Venezuela.

Aluminium: Republic of Argentina, Brazil, Colombia, Dominican Republic, Guatemala, Guyana, Jamaica, Mexico, Suriname and Venezuela.

Copper: Republic of Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Panama, Peru and Venezuela.

Table 1

INCREASES IN THE METAL PRODUCTION CAPACITY OF LATIN AMERICA
BETWEEN 1980 AND 1990, ACCORDING TO ANNOUNCED PROJECTS

(Thousands of metric tons)

	Production in 1980	Increase in production capacity 1980-1990
Aluminium	5 500	1 680
Copper	1 610	1 890
Iron	82 800	9 650
Nickel	63	72
Lead	423	157
Zinc	895	425
Tin	36	4

B. MAIN WORLD MARKET DEMAND

1. General characteristics of world demand

Like supply in Latin America, world demand during the decade 1970-1980, after a period of dynamic growth from 1970 to 1974, suffered a sudden setback in 1975 due to the impact of the international price crisis. After this date, although there was a certain recovery in some metals, growth of demand was slower than the average observed before 1975 and there was a differential between the metals according to their specific demand.

Geo-economically, the different groups of countries showed the following characteristics during the decade:

The developed countries, which had accounted for a large share of world demand -between 60% and 75%- decreased the growth rate of their demand during the decade, and in some metals there were negative rates.

The developing countries, which account -depending on the metal involved- for between 5% and 15% of world demand, showed relatively dynamic rates for the majority of metals, with a maximum of 16.6% for nickel down to 2.5% for tin, iron being the only case of a negative rate (-0.3%).

/The countries

The countries with centrally planned economies, which generally have a 20 to 30% share of world demand, recorded moderate but sustained rates in all metals, from 5.2% for aluminium to 2.1% for tin, with no negative rate observed.

At the individual metal level, it was observed that aluminium had the most dynamic demand, followed by copper; zinc and lead had a small demand and tin, besides being the least demanded in absolute terms, was the metal with the slowest-growing demand, with a world rate of -0.1%; iron had a negative rate in the developing countries; iron and tin were the two metals with the lowest rate for the decade.

2. Supplies of metals from the developing countries and Latin America in the supplies of the principal world consumers

By comparing two years of the 1970-1980 decade, 1970 and 1977, we can see the evolution of the imports of mineral and metal products by the developed countries from Latin America, whose principal characteristics in 1977 were:

(a) The developing countries were important suppliers of aluminium, copper, tin and iron to the developed countries; Latin America had a predominant share in the first two and iron, and Asia in tin.

(b) In the evolution between these two years, while Latin America gained markets in iron and nickel as well as moderately in zinc and copper, it lost in aluminium, lead and tin.

3. Hypotheses on future world demand for metals

From a series of hypotheses on possible future demand for metals at the world level, alternatives were selected which were considered to be the most congruent with the evolution of past demand in the last ten years, which, although there was an abrupt drop in the middle of the period, would probably most closely approximate to the possible behaviour in the coming decade.

The reasoning is that we are presently in a period of recessive demand at the world level (a phenomenon which was already present in the previous decade), and that the effects of the oil prices will still have an influence on the rate of industrial production for many years to come. This phenomenon may be attenuated or accentuated for short periods, but it appears to have been incorporated as an almost permanent element of economic development in what has been called the "transitional stage" in the redesign of the supply and demand of energy.

/Based on

Based on these selected hypotheses, possible world demand figures were reconstructed for the year 1990, as indicated in the following table:

Table 2

WORLD DEMAND FOR METALS IN 1990: PROGNOSIS BASED ON VARIOUS HYPOTHESES
(Thousands of tons of metal content)

	World demand 1980	Prognosis of world demand 1990	Rate %
Aluminium	19 680	31 700	4.9
Copper	9 550	13 400	3.4
Iron	492 780	580 000	1.6
Nickel	725	970	2.9
Lead	5 310	7 200	3.1
Zinc	6 100	8 100	2.9
Tin	224	230	0.3

Source: Developed from hypotheses from different sources.

According to these data, each metal is likely to behave differently: aluminium and copper will have the highest demand rates, followed by three metals with more moderately increasing demand: lead, nickel and zinc; iron would have even lower demand than those metals, and tin would continue with stationary consumption rates.

4. Prospects for future supplies from Latin America, with respect to projected world demand in 1990

In 1980, among the developing countries, Latin America is an important supplier of most of the above metals to the developed countries.

First among these are aluminium and iron, followed, with similar shares, by copper, zinc and lead; at another level, with a smaller share, are tin and nickel.

The prospects for supplies in 1990 cannot be evaluated on the basis of the estimated supply from Latin America because of lack of data on the degree of self-sufficiency of the developed countries and, consequently, of their need to import.

/However, it

However, it is interesting to compare Latin American production with world demand, based on available data for 1980 and projections for 1990. This comparison shows a steady relationship between the production of Latin America and the world demand for four of the metals: iron, lead, zinc and tin; an unfavourable relationship in the case of aluminium, and a significantly favourable relationship in the case of copper and nickel.

Since the projects which will expand the supply capacity of Latin America include sizeable undertakings in aluminium, it may be observed that in this case the region will expand the phases of greater value added in alumina and metallic aluminium production.

In conclusion, Latin America, with a high percentage of mineral and metallurgical projects which, in terms of investments, represent 36% (copper 70%, tin 56% and nickel 44%) of the total of world investments in these metals, maintains its role as world supplier. In addition, although world demand for metals might slow down in the coming decade, the demand of the region itself will compensate in part for this slowdown, consolidating the predominantly supplier process of the past, which is now beginning to develop in terms of industrial processing in the future.

