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RAW MATERIAL REQUIREMENTS OF THE NATO COUNTRIES AND OF THE USSR, DEGREES OF SELF-SUFFICIENCY AND THE INTERNATIONAL REPERCUSSIONS OF THESE REQUIREMENTS

Note by the Secretary General

This report deals with the dependence of the Allied countries and the Soviet Union on outside supplies of certain industrial raw materials of major economic-strategic significance. It was drawn up by the Economic Committee mainly in the light of the conclusions of a reinforced meeting with national experts.

2. The meeting in question was exploratory and mainly concentrated on reviewing, in broad terms, the present or likely future problems connected with the supply of raw materials to NATO countries and the USSR. Because the question is one of some scale and complexity the Economic Committee is of the opinion that its study should be pursued at further reinforced meetings.

3. The Council is requested to take note of this document.

(Signed) Joseph M.A.H. LUNS

NATO,
1110 Brussels.

This document includes: 3 Annexes

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RAW MATERIAL REQUIREMENTS OF THE NATO COUNTRIES AND THE USSR, DEGREES OF SELF-SUFFICIENCY AND THE INTERNATIONAL REPERCUSSIONS OF THESE REQUIREMENTS

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RAW MATERIAL REQUIREMENTS OF THE NATO COUNTRIES AND THE USSR, DEGREES OF SELF-SUFFICIENCY AND THE INTERNATIONAL REPERCUSSIONS OF THESE REQUIREMENTS

eport by the Economic Committee

SUMMARY

(i) The NATO countries taken as a whole do not possess - at least in adequate quantities - certain raw materials vital to meet their basic civil and military needs and for which few or no substitutes are generally available in the current economic and technological conditions. Although world resources of these basic commodities seem unlikely to run out in the foreseeable future, the reliance of the Allied countries on outside supplies gives cause for concern as there is little diversification in the sources of supply which tend to be limited to a few third countries. In the event of political, economic or social difficulties in these countries, the security of Allied supplies could be affected.

(ii) As a first step, the Economic Committee reviewed the position of the Allied countries with respect to seven particularly important industrial raw materials: asbestos, cobalt, chromium, manganese, platinum, titanium and vanadium. The following conclusions in particular emerged from the study:

- Zaire and Zambia account for approximately two-thirds of world cobalt production; in the short term, it is supplies of this commodity which might be most at risk.

- South Africa has a complete monopoly for the most important types of asbestos; it also supplies between 40 and 60% of Allied imports of chromium, platinum, manganese and vanadium.

- For chromium and platinum, the Soviet Union is the other main source of supply for the Alliance, covering about 20% of its needs. Overall, the same holds true for vanadium, but to a much smaller extent; moreover, Soviet exports are diminishing.

- The USSR still meets a large part of Allied titanium needs, although sales have dropped sharply over the last few years.

(iii) The Economic Committee carried out a preliminary study concerning the establishment of stocks as a means of alleviating risks occurring in the event of an interruption of supplies. The United States has stocks of 93 commodities sufficient to cover its

military and civil requirements in times of conventional war on two fronts for three years (plus one year's mobilization). Other countries (France, Federal Republic of Germany, Italy) are in the process of increasing or establishing stockpiles, but the levels and duration are limited due, in particular, to the high cost and the difficulties involved in building up and administering stocks, given fluctuations in world prices for raw materials.

(iv) The Soviet Union has traditionally been one of the world's leading producers of most industrial raw materials and holds plentiful reserves of a wide range of products. In recent years, however, production growth has increasingly failed to keep pace with domestic demand for certain commodities. This is partly explained by the exhaustion - or lower quality - of ores from the deposits which are the most readily accessible in current economic and technological conditions and by the shifting of supply sources to remote and inhospitable areas.

(v) To cover its industrial requirements, the Soviet Union is at present heavily dependent on external sources for aluminium raw materials, baryta, cobalt, tin, molybdenum, tungsten and fluorspar. It also relies on outside sources for mica and antimony, though for a smaller proportion of its domestic needs. Lastly, it is now becoming slightly dependent on imports for its supplies of lead, zinc, phosphates and sulphur. In the medium term (up to 1985), it is most likely that the Soviet economy will be a net importer of all the above commodities except antimony, for which it may become self-sufficient.

(vi) The USSR undoubtedly maintains sizeable stockpiles of strategically important metals and minerals. However, little precise information is available on the variety of materials, the size of the stocks, their location, the plans for acquisition or the possible rôle of other Warsaw Pact countries in the build-up of additional stockpiles. In view of the importance of these questions for the Alliance, the Economic Committee has agreed to study them more closely and exchange views as part of its future work in the raw material field.

(vii) In the case of certain commodities (cobalt, baryta, fluorspar), a large proportion of Soviet import requirements are provided for, or will be in the medium term (molybdenum), by other Communist countries. The USSR is also seeking to secure some of its requirements through long-term contracts with Third World countries. In particular, agreements have been signed with Guinea (bauxite), Bolivia (tin) and Morocco (phosphates). As things stand at present, such bilateral agreements have a marginal effect on the world supply of the products concerned and do not conflict with the economic interests of the NATO countries.

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RAW MATERIAL REQUIREMENTS OF THE NATO COUNTRIES AND THE USSR, DEGREES OF DEPENDENCE AND THE INTERNATIONAL REPERCUSSIONS OF THESE REQUIREMENTS

INTRODUCTION

1. The present document was drafted following the meeting of the Economic Committee with Experts on 15th and 16th November 1979. It draws extensively from the comments and conclusions formulated during the discussion, as well as from information contained in documents provided by certain delegations at the time of, or since, the meeting(1).

2. This report studies successively certain aspects of NATO countries and Soviet reliance on external supplies of raw materials. A detailed analysis of dependence on external supplies on a product by product basis is presented in two Annexes: one for members of the Alliance and the other for the Soviet Union. A third Annex contains statistics compiled by the Industrial Planning Committee.

I. THE DEPENDENCE AND VULNERABILITY OF NATO COUNTRIES FOR THEIR SUPPLIES OF RAW MATERIALS

3. The Economic Committee selected seven products for its initial study of NATO country reliance on outside sources of supply: asbestos, cobalt, chromium, manganese, platinum and associated metals, titanium and vanadium. The criteria applied in this choice are as follows: the materials are essential to civil and military production; they have few or no substitutes and are not produced (at least in sufficient quantity) by the NATO countries as a whole; reserves - and consequently production - are concentrated in a limited number of third countries(2); there is little diversification of NATO import sources, a situation which could affect security of supply in the event of political, economic or social disturbances in these countries.

(1) In particular, AC/127-D/607, dated 6th July 1979; AC/127-D/614(Revised), dated 22nd October 1979; contributions from the French Delegation entitled "French strategic raw material requirements: manganese, platinum, chromium, vanadium" and "Soviet production, consumption and marketing of certain rare metals: manganese, platinum, chromium, vanadium"; contributions from the United States Delegation entitled "USSR: outlook for minerals trade" and "Change in Soviet metals trading pattern"; AC/127-D/628, dated 29th January 1980.

(2) These materials are examined individually at Annex I

4. Consumption of the selected materials is not large in terms of volume, but is essential in the development of advanced technology, particularly in the metallurgical and chemical sectors. For example, manganese, cobalt, chromium, titanium and vanadium are indispensable in steel production and particularly for special alloys (the production and requirements of which are growing rapidly), whereas platinum is of paramount importance in the chemical field. In addition, these materials are generally used in the primary production stages and consequently are strategically important both in military and civil spheres.

5. The outside dependence of NATO countries on the materials under review is virtually total. The only producer countries among them are the United States for vanadium (60% of internal consumption) and titanium(1), Canada for cobalt and platinum (6% of world production) and asbestos (chrysotile 30%), and Turkey in the case of chromium (7%). The last two countries export to some of the Alliance countries (in particular the United States) but in quantities insufficient in relation to their needs and in any case marginal in comparison with total Alliance consumption(2).

6. This dependence on imports is disturbing in so far as there is little diversification in sources of supply and given the limited number of producer countries, most of which are located in Africa south of the Sahara, (South Africa being the main supplier) and the Soviet Union(3). Although there are often a number of secondary producers which represent a significant part of the world market for certain products (cobalt, chromium, manganese), the latter is dominated by:

(i) Zaire which, together with Zambia, accounts for two-thirds of world cobalt production;

(ii) South Africa, which is a leading supplier to the NATO countries of all the materials under review, with the exception of cobalt and titanium. South Africa has an absolute monopoly in two types of

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(1) The United Kingdom also produces titanium
(2) Except in the case of chrysotile
(3) See details at Annex I

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asbestos (amosite and blue asbestos) and, in general satisfies about 40%-60% of Western needs for chromium, manganese, platinum and vanadium(1)(2);

(iii) the Soviet Union covers a substantial proportion of titanium consumption in the West European countries though recent sales have been lower. She ranks second as a supplier to NATO countries of chromium and platinum (approximately 20%-25% of their requirements). Soviet deliveries of vanadium are generally of lesser importance whereas those of manganese are nil or very low. It is also worth noting that overall Soviet ore exports have been declining significantly since 1975: by over 50% for vanadium, 30% for chromium and 15% for manganese. It is probable that Soviet exports of manganese and vanadium ore will diminish again in the future, while those of chromite could be maintained and even increased slightly. Moreover the Soviet Union could increase its deliveries of more sophisticated products (ferro-manganese and ferro-chromium). On the other hand, if Soviet spot sales of platinum fell significantly since the end of 1977, its exports on contractual basis increased to the extent that its total supplies were maintained and even increased slightly in 1979.

7. The Economic Committee has not systematically classified the materials under review according to the degree of NATO country reliance on their supply. It has been noted, however, that cobalt could become a serious problem in the short term (12-18 months), particularly in view of the tight world market situation, and that some European countries might find themselves short of titanium sponge, following the cutback in Soviet deliveries. In the case of chromium, the risks of shortages are in the longer term, resulting from the fact that reserves - which are plentiful - would then be located almost exclusively in South Africa and in Rhodesia.

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(1) The situation can admittedly vary significantly from one NATO country to the other. Some of them are able to spread their purchases more effectively by buying from second-line producers. For example, the United States obtains manganese ore from Gabon and Brazil and is hardly dependent at all on South Africa for this commodity. France too, has reduced its dependence on South Africa for chromium by importing, for example, a quarter of its requirements from Madagascar.

(2) More precise percentages would require additional information taking account, inter alia, of the growth of world trade in more sophisticated materials (ferro-chromium, ferro-manganese and ferro-vanadium) which are processed both by South Africa and by certain Western consumer countries. This also applies to supplies from the Soviet Union.

8. While the concentration of certain commodities in a few third countries represents a potential threat to the NATO countries, the true implications of this situation need to be evaluated. Several possible scenarios come to mind: production cartels, political embargoes, the suspension of deliveries due to increased requirements within the producer countries themselves, the interruption of production (or shipment) following disturbances in these countries.

(i) Creation of cartels

The purpose of production cartels is essentially to maximise overall earnings by manipulating supplies and prices rather than suspending exports. In this type of situation, NATO would therefore be faced with scarcity (and higher prices) rather than with a fundamental shortage of the commodities concerned. In theory, a cartel can be created when several producer countries corner a sufficient portion of the market(1) in a product for which demand is inelastic(2). This understanding implies, however, that those concerned have converging economic and political interests. Certain producer countries (particularly developing countries) could be reluctant to jeopardize their overall economic (or even political) relations with certain consumer countries for the sake of obtaining some advantages from the latter in a limited sector. Politically speaking moreover, it is inconceivable that South Africa could come to an agreement with the USSR and unlikely that it would do so with developing African countries.

(ii) Political embargoes

A political embargo would entail an abrupt and total interruption in the supply of one or more commodities to certain or to all the NATO countries and could thus damage their economies in varying degrees depending, inter alia, on the importance of deliveries from the

(1) This implies that the "cartel" could not be partly forced out of the market by independent producers capable of increasing their production following price increases
(2) Even if current demand is inelastic, the exigencies of the cartel are limited by the concern not to restrict in the long term the development of substitutes, the re-cycling and rationalizing of consumption in the consumer countries

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producer country or countries taking such action. It would be important, however, to determine the economic capability of those countries to suspend their exports in the short or long term, given their dependence in regard to sales of the materials concerned in order to establish total export earnings as well as possibilities, for eventually developing substitute markets(1).

(iii) Suspension of deliveries by reason of increases in the domestic needs of the consumer countries. In such a case, the reduction in supplies would be more gradual, thus permitting the NATO countries to better adjust their economies and the geographical pattern of their imports to the new situation. This hypothesis concerns mainly the Soviet Union, which is the only producer country to be so heavily populated and industrialized.

(iv) Total or partial interruption of supplies as a result of internal political, economic or social upheavals in the producer countries (or in the countries through which the materials are transported).

In this case, supply difficulties would occur mainly from the reduction or stoppage of output in the mining centres. It should be clarified, however, that under normal operating conditions, mining production in the short term is generally rigid and very inelastic: fluctuations in demand result largely from accumulation and release of stocks. The extent of stocks held by producers when demand is slack is one element which could be taken into account in an assessment of the risks facing NATO countries over a short period.

9. The stockpiling of raw materials by consumer countries is one of the most effective ways of coping with breakdowns in supply. In this connection, several NATO countries have adopted policies - actual or potential - varying in scale or in methods of application - but in each case designed primarily to alleviate physical shortages - not to operate on world markets with a view to influencing prices. The United States holds stocks of 93 different products. The current inventory of the stockpile is approximately $16 billion, with an estimated value if all goals were filled of about $21 billion.

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(1) In particular, should the embargo be declared by a country in response to pressure from the Soviet Union, would the latter be capable of absorbing that country's output?

These stocks are sufficient to cover essential military, industrial and civilian needs in wartime on the assumption that the conflict in question would be a conventional war on two fronts over a period of three years (plus one year's mobilization). A "Goal Review Committee" is responsible for reviewing the targets annually, which are altered in the light of changing needs and technology, a process which leads (after Congressional approval) to the updating of stocks through purchases or the sale of surpluses. Criteria have been established to ensure that these operations do not disrupt world markets. Stockpiling costs - which are extremely high - are financed from public funds.

10. France has decided to build up its stocks and is currently implementing a procurement programme covering raw materials essential to its defence and to certain of its vital economic needs. The commodities concerned, stock levels and the stocking period have not yet been fully defined. Be that as it may, the reserves should be sufficient to cover peacetime requirements over a period of months rather than years (for reasons of financial constraints). Stockpiling will also depend on the possibilities of purchase at reasonable rates on the world market.

11. The Federal Republic of Germany has drawn up a limited stockpiling programme which is designed to reduce the effects of a short-term breakdown in supplies. It is planned to increase the stock levels of 5 items to 12 months of average peacetime consumption: cobalt, chromium, manganese, vanadium and certain types of asbestos. These raw materials are particularly sensitive and important for the national economy. The programme does not provide for governmental stockpiling but rather for agreements with users and importers organizations under which they will build up the necessary reserves. A $350 million fund financed by the state has been set up to cover the procurement costs of these stocks. Storage costs are to be borne by the companies participating in the scheme while interest costs will be assumed by the government. Accordingly the government will have the right of access to a portion of the stocks in the event of an emergency. Other measures are planned to ensure that private commercial stocks, estimated at 4 months average consumption, will not be adversely affected. The additional stockpile is scheduled to be set up as from 1981 over a period of about four years so as not to affect world markets.

12. In Italy, a government-approved project has been established providing for stocks of 30 different commodities sufficient for three months' consumption at an estimated cost of It.l. 1,500 milliard (1974 prices). The stocks would be held both by the government and by private industry and would be used to meet industrial requirements in the event of a breakdown in maritime transport. The Italian Authorities intend to implement this project over the next few years. The United Kingdom is currently examining the desirability and practicability of stockpiling in consultation with industry, without commitment to public expenditure. At the level of the European Communities,

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there exists the study group "Nikolai", to which members of the Community belong and the purpose of which is to discuss each countries' policy of stockpiling as well as to try to establish a common European policy.

13. To sum up, discussion of commodity stockpiling for securit purposes brought to light two major difficulties: firstly, the extremely high cost of maintaining these stocks and, secondly, the inherent difficulties involved in building up and updating stocks on a regular basis, given fluctuations in prices and the need for stability on international markets. One must bear in mind, particularly that in the case of new stocks the building up must be done in stages if the cost of procurement is not to be too high.

II. SOVIET RELIANCE ON OUTSIDE SOURCES OF RAW MATERIALS AND SOVIET TRANSACTIONS ON THE COMMODITY MARKETS

14. The Soviet Union is one of the world's leading producers of metals and non-metallic minerals; in addition, it holds plentiful reserves of a large range of products. In recent years, however, the changing ratio between growing industrial requirements and the development of resources has led to a decline in the country's traditional policy of virtual self-sufficiency (notable exceptions being, however, aluminium, tin and fluorspar) in the field of raw materials essential to the operation of a developed economy. It would seem in particular, that the USSR has been affected in certain cases by the exhaustion of the reserves which are the most readily accessible, in current economic and technological terms, and by the shifting of supply sources to remote and inhospitable areas where extraction and transport costs are extremely high and require considerable investment.

15. In regard to non-energy raw materials for which the industrial and/or strategic application is important, the USSR appears to be heavily dependent on external sources (to the extent of about 25% or more of its consumption) for aluminum (bauxite-alumina), baryta, cobalt, tin, molybdenum, tungsten and fluorspar. In relation to the situation at the start of the last decade, Soviet dependence seems to have decreased slightly for tin, to have remained about the same for baryta, but to have risen significantly for the other above-mentioned materials. The Soviet Union is also a net importer of antimony and mica, (about 10%) but at a fraction less than its domestic needs. The country also appears to be slightly dependent (less than 10% of consumption), on outside supplies of lead, zinc, sulphur and phosphates(1).

(1) A breakdown by product of Soviet dependence on outside supplies is set out at Annex II

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16. The medium-term outlook (to 1985) for Soviet reliance is not uniform: the latter should increase or at least remain steady in the case of such raw materials as aluminium, lead, zinc, and certain non-metallic minerals (fluorspar, sulphur and phosphates); dependence will probably remain unchanged in the case of tin but diminish for cobalt, molybdenum and tungsten. The country could even possibly return to its position of self-sufficiency with respect to antimony.

17. The quantity of Soviet raw material stocks remains unknown. While such stocks do in fact exist, practically nothing is known about the actual size of these stocks or about Soviet policy in this area. One case worth mentioning is that of uranium, for which the Soviet Union is not dependent on outside supplies and for which it has received the bulk of East European production over the past number of years: Soviet stocks of this material are said to be huge, currently in the order of 170,000 tons(1). Stocks held by other Warsaw Pact States are probably much lower and less diversified, if only because of the financial cost of building up and managing large stocks.

18. In the case of certain products for which it is heavily dependent on outside supplies, the Soviet Union is able to obtain a substantial proportion of its imports from other Communist countries which, in principle, offer politically certain sources of supply. This is presently the case for cobalt (obtained in part from Cuban deliveries of nickel/cobalt oxide) and for baryta (provided largely by Bulgaria, North Korea and Romania) and fluorspar (from Mongolia). This will also hold true in the medium-term for molybdenum (supplied by Mongolia).

19. In other cases, the Soviets have endeavoured to obtain some of their requirements under long-term contracts with Third World countries. Depending on the commodity concerned, there may be one supplier involved (Bolivia in the case of tin, Morocco for phosphates) or, on the contrary, there may be fairly extensive diversification of sources (bauxite-alumina). Of all the major commodities for which the Soviet Union is heavily dependent on outside supplies, only tungsten so far seems not to have been the subject of a contract with a producer country for substantial deliveries to satisfy Soviet needs. In recent years, the Soviet Union has been buying primarily on the Western metal markets; however, direct deliveries from China were resumed in 1979.

(1) Figure given at the meeting of experts on 15th-16th November 1979; it should be compared with world production (excluding the USSR and China), which in 1975 totalled some 24,000 tons of U308 content (source: US Bureau of Mines, Minerals Yearbook).

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20. In this connection, there is a tendency towards more agreements between the USSR and the developing countries for deliveries of raw materials in exchange, more often than not, for economic aid necessary in the exploitation of these commodities. It may be that the Soviet Union has no option but to import certain of these materials because of a genuine lack of sufficient reserves; this seems to be true for aluminium in so far as the current state of technology greatly limits the further utilization of the country's non-bauxite ores. In most other cases, however, it seems likely that agreements concluded with the Third World are prompted mainly by the Soviets seeking to achieve a comparative advantage; recourse to imports makes it possible to defer the development of national reserves (the cost of which would be extremely high in present economic conditions).

21. Whatever the case may be, the bilateral agreements for raw material deliveries concluded so far between the Soviet Union and the Third World are not likely to conflict with the Allies' economic interest. In other words, as matters now stand, Soviet purchases have a marginal impact on the market and consequently do not significantly affect Western supplies.

22. Soviet policy with respect to multilateral commodity agreements seems somewhat ambiguous. The USSR co-operates to some extent, in that it is more or less represented in most international negotiations, while at the same time systematically developing its official position; namely, that its trading exchanges are not disruptive since they come within the framework of long-term agreements. In practice, however, the Soviet attitude is often a passive one.

23. For example, the Soviet Union is an official party to the agreement on tin but did not contribute to the buffer stock, which admittedly was not compulsory. The Soviets are also members of the International Lead/Zinc Study Group but do not provide statistical data; they take part as well in inter-governmental discussions on tungsten, which occur from time to time. In March 1979, however, the Eastern countries agreed to participate within the framework of the UNCTAD integrated commodity programme, in the creation and management of the Common Fund (to the extent of 8% of the votes)(1).

(1) It is planned that the Fund should have two "windows", the first ($400 million) to fund buffer stocks, and the second ($320 million) to fund other ways of stabilizing prices.

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It will be important, however, to examine developments in the Soviet position during the discussions relating to each of the commodities proposed in the programme,(1) such as for natural rubber for which successful negotiations have recently been concluded.

(1) The UNCTAD integrated programme is intended to cover a list of 18 commodities, 10 of which are regarded as "core commodities": these are coffee, tea, cocoa, sugar, cotton, jute, rubber, hard fibres, copper and tin. The other items are: bananas, meat, vegetable oils, tropical woods, bauxite, iron, manganese and phosphates

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NATO COUNTRY DEPENDENCE ON IMPORTED COMMODITIES: ITEM BY ITEM BREAKDOWN

(i) ASBESTOS

1. Asbestos is used primarily for filtering and insulating purposes. The dependence of the NATO countries on outside sources of supply varies geographically depending on the different types of asbestos(1), which fall into three main categories: amosite and crocidolite (blue asbestos), which are produced solely in South Africa, and chrysotile which is produced primarily in the Soviet Union (49%) and in Canada (30%)(2).

2. It is obvious, therefore, that NATO is totally dependent on South Africa for two types of asbestos. In the case of chrysolite, the United States relies almost exclusively on Canada, with the European countries buying in fairly substantial quantities from the USSR(3). The supply problem appears to be particularly critical in the case of blue asbestos (which is essential in the manufacture of certain weapons), but the importance of amosite calls for closer examination.

(ii) COBALT

3. Nearly all cobalt is a by-product of other ores (mainly nickel and copper) and there is generally no substitute in its critical end-uses. It is used primarily in a large number of sophisticated alloys (particularly, highly resistant steel subjected to high temperatures) or in complex chemical compounds. Cobalt is used extensively in the electrical sector (magnets) and in aeronautics, mechanical engineering and chemistry. As base materials containing cobalt are most often processed in high technology industries, the main consumers are to be found in North America, Europe, Japan and the USSR.

4. In terms of refined metal, Zaire (56%) is, by far, the world's leading producer(4) followed by Zambia (13%), Japan (10%)(5), Finland (5%) and others (16%).

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(1) About 200.
(2) The main secondary producers are Rhodesia (4%), South Africa and the United States (2%).
(3) This is apparently the case for France, the Federal Republic, Belgium and, to a lesser extent, the Netherlands and Norway.
(4) Excluding Cuba and the USSR. The latter is the world's second largest producer, but nevertheless imported in 1978 about 1,000 tons of cobalt from the West (excluding Cuba). By 1985, its imports from the West could cease entirely.
(5) Japan obtains its concentrate from Australia and the Philippines.

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Even if NATO countries make an effort to diversify geographically their sources of supply, most of them depend very heavily on Zaire and/or Zambia(1). In addition, the supply (including stocks) and overall demand are such that cobalt is one of the raw materials which might pose one of the most serious problems for the Alliance in the short-term. Nevertheless, the upward trend of production in non-Zairian sources is encouraging(2)(3).

5. In the longer term, the prospect of increased cobalt production - from ore and particularly from polymetallic marine modules - indicates that the rising demand for this product will probably be satisfied. Since, however, cobalt is a by-product that appears only in small quantities in ores and nodules(4), the profitability of its exploitation is closely linked to the development in prices for copper and nickel which, at present, are not very favourable(5). Taking account of this restriction, the medium-term possibilities for new production in Zaire, Zambia, New Caledonia and South Africa are substantial. Concerning marine nodules - which will provide substantial reserves of cobalt - the beginning of their exploitation could be technologically feasible by 1985, but may be postponed until 1990 and even beyond depending on the profitability of production.

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(1) France imports a substantial proportion of its requirements from Morocco, which means that its supplies are less uncertain for the present. The Moroccan deposits, however, are rapidly being exhausted.

(2) Annual production in Zaire dropped from a peak of 17,000 tons in 1974 to 10,000 tons in 1976-1977. It then recovered to about 13,000 tons in 1978 and 14,000 tons in 1979.

(3) Canadian production of cobalt, after having dropped from 1,500 tons in 1977 to 1,240 tons in 1978, rose again to about 1,400 tons in 1979 and according to current prospects should increase still further over the next few years.

(4) About 0.2% in nodules.

(5) On the other hand, once cobalt has reached a certain price, producers might find it worthwhile implementing a number of projects which have already been worked out for recovering the large amounts of cobalt lost in the processes of concentration from the principal ore. Stocks of residue from concentrates might also provide a valuable source of cobalt in the future.

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(iii)CHROMIUM

6. Because of its very great resistance to corrosion and its mechanical qualities at high temperatures in different alloys (particularly stainless steels), chromium has become an essential element in modern metallurgy. The ore, for the most part is transformed into ferro-chromium(1) which is used increasingly in the production of a wide range of strategically important products with a high added value and of special interest to countries with advanced industrial technology(2). The two main world producers of chromium ore are: South Africa (33%) and the USSR (24%), and a few secondary producers such as Albania (10%), Turkey (7%), Rhodesia (6%), Finland, the Philippines, Madagascar and India. By the end of the century, given the rapid rate at which reserves are being exhausted among most of the small producers(3), the West could depend almost entirely on Rhodesia and South Africa whose reserves - which are plentiful - account respectively for almost one-third and two-thirds of world reserves(4).

7. For the present, there is no real substitute for chromium in making stainless steel and the recycled quantities are small(5)(6). The possibilities of cutting back on consumption by substitution, recycling or other economic measures were recently reviewed by the United States "National Materials Advisory Board". According to the latter, United States consumption of chromium could, in theory, be reduced by a third through application of existing technologies(7) and by another third (over the next decade) by a major effort in research and development. No precise indication was provided, however, as to the consequences which could result in terms of costs and/or lower quality performance for finished goods.

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(1) Almost 20% of chronium is used in the form of chromite in the chemical industry. It is to be noted that the ferro-chromium for metallurgical industry and chromite for the chemical industry can almost be regarded as separate commodities as far as their trade and patterns of use are concerned.
(2) Particularly aircraft engines and equipment used in the petrochemical industry and in power plants.
(3) Apparently including the USSR.
(4) There is always the possibility, however, of finding new deposits. Another possibility would be to work the "Beach Sands" located in Australia, Indonesia, New Guinea, and the Philippines, but this development would only be worthwhile under significant price increases and might be hampered in some cases by considerations of environmental protection.
(5) In the United States it accounts for about 8% of consumption and is derived from scrap stainless steel.
(6) The United States has currently two concrete projects for substitution and secondary recovery.
(7) Primarily through recovery from scrap and use of other materials.

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8. While the Western countries can admittedly diversify their imports to some extent, given the existence of a few second-line producers, they are none the less heavily dependent on South Africa. This dependence is tending to become even more accentuated due particularly to the fall in Soviet exports of chromite and recent technological discoveries(1) which allow a greater - and therefore cheaper - use of low-grade ore which is plentiful only in South Africa. The use of poorer ore makes it's transformation into ferro-chromium less feasible in areas remote from mines, with the result that the processing industry in the industrialized countries is bound to decline in the longer term. There are two other contributory factors, namely environmental constraints in the consumer countries and the desire of producer countries to increase the export value of their mining resources. Whatever the case may be, the United States imported 54% of its chromite and 85% of its ferro-chromium from South Africa in 1978(2)(3). Direct Canadian imports of the latter total 9% and 37% respectively(4). In regard to the EEC countries, they obtained close to 50% of their ferro-chromium and 25% of their chromite from South Africa in 1975 but more recent data would seem to indicate that the latter percentage could approach 50%(5).

9. For many years, the Soviet Union was by far the second supplier of chromium, to the West. However, its total sales of chromite dropped by about 50% between 1975 and 1978 and may have fallen even further in 1979; in addition, the proportion of its output earmarked for its satellites rose from 25% in 1975 to nearly 40% in 1978. According to the latest available estimates, the United States depended on the Soviet Union for about 18% of its needs(6) and the EEC as a whole for 23%(7)(8). The general outlook for Soviet chromium

(1) New processes used in the manufacture of stainless steel.
(2) As compared with 33% and 38% respectively during the period 1974-1977.
(3) Making a total of 66% of its requirements expressed in metal content.
(4) Making a total of 24% of Canada's total imports expressed in terms of metal content (excluding Soviet deliveries). This figure must, however, be adjusted to take account of the fact that Canada also buys 46% of its total imports from the United States.
(5) 1977: Germany 60%, United Kingdom 63%, Italy and France about 30%. Total for these four countries: about 50%.
(6) 1974-1977.
(7) 1975: The degree of dependence varies from one country to another: it is apparently lower for France and the United Kingdom than for Italy and Germany.
(8) The EEC also imported some 9% of its ferro-chromium requirements from the Soviet Union in 1975.

sales is uncertain and depends, inter alia, on the opening-up of new mines, the developments of domestic consumption(1) and the level of supplies to the satellite countries. In regard to chromite in particular, although the Soviet favour exporting chromium in the processed form of ferro-chromium, rather than ore(2) the necessary investment in ferro-chromium facilities appears not to have occurred to transform all the Soviet chromite available for export. Therefore, there is still the possibility that the USSR may be willing to continue its exports of chromite at the reduced levels of recent years and possibily at somewhat higher levels as new mines are developed.

(iv) MANGANESE

10. Manganese is an essential element in the iron and steel industry. The latter consumes over 90% of manganese output, the remainder being used in the manufacture of batteries and certain chemical products. No satisfactory substitute for manganese has been found and its retrieval from blast furnace slags is largely uneconomical. The two leading world producers(3) are the USSR (36%) and South Africa (22%), where production is sharply increasing. Seven other countries: Gabon (10%), Brazil (7.5%), India (6.5%), Australia (6%), Chine (4%), Zaire and Ghana together account for the balance(4).

11. In theory, the exporting countries(5) could rapidly increase their mining capacity. Brazil and India, however, are voluntarily limiting their production, Gabon is still heavily dependent on facilities for shipping its ore, while India and Australia (which could double its output in four years) are more oriented toward Japan(6). This being the case and despite the possibilities for diversifying their ore supplies(7), most major European countries, for these reasons, depend on South Africa for over 40% of their manganese requirements(8). This dependence is lower in the case of Canada (about 20%) and slight in the case of the United States (9%).

(1) Chromium is still used as a refractory material in the production of about 60% Soviet steel. Consumption may fall gradually if the Soviet Union brings in large oxygen converters.
(2) It will be noted in this connection that the Soviet Union has negotiated with Western firms for the purchase of ferro-chromium plants within the framework of compensation agreements.
(3) French Note circulated at the Experts' Meeting on 15th-16th November 1979 (Document No. 1 SGDN/AST).
(4) Reserves are centred mainly in South Africa (47%) and the USSR (27%), the remainder being found primarily in Gabon (10%), Australia and Brazil (5%).
(5) The Soviet Union is exporting almost nothing more to Western markets.
(6) A project for opening up a new deposit in Tambao, Haute-Volta, could enable France to diversify its sources of supply more extensively in the longer term.
(7) Mainly between Brazil, Gabon and South Africa.
(8) Italy: 23%.

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12. These figures admittedly need to be adjusted to take account of world trade in ferro-manganese, which is growing more rapidly and in terms of greater value than that of the ore. In 1975, this trade was dominated mainly by France, Norway and South Africa, which together represented over 75% of world exports(1). Of this total, 60% went to Italy, Germany, the United Kingdom and the United States(2). Direct deliveries of ferro-manganese from South Africa went to the United States and Canada in the proportions of 30% and 39% respectively(3) and seemingly large quantities also to Germany and the United Kingdom.

13. Manganese reserves being what they are, there seems little likelihood that the NATO countries as a whole could further diversify their sources of supply. Even the exploitation in the long-term of marine nodules would only top up mining output but not replace it. According to certain cautious projections(4), the working of these nodules would meet less than 3% of world demand(5) in the year 2000, on the basis of current criteria. However, others envisage a significantly greater percentage.

14. The Soviet Union is the world's largest producer of manganese; because of its domestic needs, however, its ore exports have dropped by 15% since 1975 and 90% of these now go to the Eastern countries. NATO country imports from the Soviet Union are therefore nil or very low(6). Several factors lead one to believe that the Soviet Union will probably not resume its rôle as a supplier of ore to the West on any great scale. Firstly, the abundance of Western resources, secondly, the low content and poor quality of Soviet ore and, lastly, the Soviet tendency to increase its export earnings by exporting only ferro-manganese. About 9% of the total Soviet sales of ferro-manganese(7) went to the West in 1978, a figure which does not seem to represent a large proportion of total Western consumption.

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(1) India, Brazil and Japan are also exporters.
(2) See "The World Manganese Market: Status Report", February 1978, United States Department of State.
(3) Canadian imports of manganese (including metal) direct from South Africa accounted for 42% of the country's requirements.
(4) See "The World Manganese Market".
(5) Or about one quarter of United States demand.
(6) Less than 10% of national consumption.
(7) Assessment based on value of export earnings as provided by the Soviet Union (see French Delegation Document No. 2 SGDN/DREG).

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(v) METALS IN THE PLATINUM GROUP

15. The metals in the platinum group(1) are used for their refractory properties, their chemical inertness, even at high temperatures, as compared to a large variety of other metals and their excellent catalytic qualities(2). These metals are among the rarest, hence their high cost and their tendency to be affected by the fluctuations of a highly speculative market. South Africa and the USSR account in approximately equal proportions for the bulk of world production, with Canada producing most of the balance (about 6%). Distinguishing the metals by category(3), South Africa's production consists of approximately 60% platinum, 25% of palladium and 15% of other platinoids. The figures for the USSR are 60%, 30% and 10% respectively(4). Canada's output is primarily made up of platinum and palladium. Total reserves of platinum and related metals are centred in South Africa (72%), in the Soviet Union (25%) and in Canada (2%)(5). Reserves of platinum are concentrated mainly in South Africa (83%), while palladium is divided more evenly between the latter (54%) and the USSR (43%)(6).

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(1) The metals in the platinum group consist essentially of platinum and palladium. The other platinoids (rhodium, irridium, ruthenium and osmium) are relatively rare. These metals are generally co-products of nickel (particularly in Canada) or copper. They are also extracted, though to a lesser extent, from platinum deposits.
(2) About 60% of platinum is used for catalysis.
(3) Platinum can replace other metals in the group for most purposes with little or no loss of performance. On the other hand, only some of these metals can be used instead of platinum in certain specific cases and there is generally some loss of efficiency.
(4) About 75% of Soviet production is obtained as a by-product of copper and nickel from the Norilsk polymetallic combine, which is the main processing centre.
(5) Reserves are thought to exist in certain other countries but these have not been estimated. There are a few deposits in the United States which are insufficient, however, to reduce its dependence on South Africa.
(6) According to other sources of information, the USSR has two-thirds of palladium reserves. Canadian reserves represent 2% of each metal.

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16. There exist practically no adequate substitutes for platinum. Its replacement by tungsten as a catalyst, which is theoretically possible in 50%-60% of cases, would sharply reduce efficiency and longevity of the products involved(1). Furthermore, the recovery of platinum seems to have reached its maximum possible level with 60% of consumption through the regeneration of catalysers used in chemical and petrochemical processes(2).

17. South Africa is the principal supplier of platinum and associated metals to the Western market. The Soviet Union being a large consumer of these materials, only supplies the market in the order of 20%-25%(3); its main customers are the United States (20% of their consumption), France (33%), Germany and Japan. Soviet exports of platinum-group metals held steady at 1.9-2.0 million troy ounces during the years 1976-1978 and even increased to about 2.1 million in 1979(4). It is true that since August 1977, the Soviet Union reduced significantly its spot sales, but this fact(5) is due to a change in Soviet marketing policy designed to increase its deliveries on a contractual basis. In the early 1980s, the USSR will likely have overcome the difficulties encountered with the present extension of capacit at its main processing centre at Norilsk and since then its industrial potential should enable it to increase production steadily and probably also to boost sales to the West.

(vi) VANADIUM

18. Vanadium is used primarily in the manufacture of different alloys, particularly steel alloys, to which it gives added strength and elasticity (pipelines, automobile industry). It is also used as a casing material for nuclear fuel. Although of widespread occurence in the earth's crust, vanadium rarely occurs as workable deposits except in a few countries. Thus, in 1978, virtually all vanadium was

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(1) Research is currently being conducted into rare earths as possible substitutes.
(2) There appear to be two methods of platinum recovery. The first is from old scrap bought on the market by the producers which, in the United States, represents between 17% and 20% of consumption. The second occurs when the user returns the used product, (at a fairly primary stage) to his usual supplier for reprocessing against payment (recycling of platinum used for catalysis).
(3) About two-thirds of these are palladium.
(4) As a result of rising international prices for platinum Soviet exports earnings increased considerably, exceeding $ 400 million in 1979 of more than twice the earnings of 1976.
(5) This fact probably accounts for continuing erroneous information concerning a reduction in Soviet platinum deliveries to the West in recent years.

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supplied by South Africa (39%)(1), the USSR (31%), the United States (16%), Finland (5%) and Chile. Reserves which can profitably be exploited are even more concentrated: USSR (46%) and South Africa (49%), the balance being spread between a few other countries(2)(3). The recovery of vanadium from heavy oil (Venezuela) and from oil shale could change fundamentally the world markets if intensified(4).

19. Vanadium - as an alloy component - can technically be replaced by niobium and molybdenum, but the very high prices of these substances would lead to substantial increases in costs(5). Furthermore, the recovery of vanadium (which according to some estimates could equal 15% of total consumption) from spent catalysers and the residue from fuel burnt in power stations is a distinct possibility.

20. With the exception of the United States where production covers 60% of consumption, all the NATO countries are entirely dependent for their vanadium requirements on imports. In volume terms, South Africa is the Alliance's main supplier and its dominant position has become even greater in recent years(6). This is because total Soviet sales of vanadium slag dropped by over 50% between 1974 and 1978, while Soviet exports of ferro-vanadium hardly rose during that period(7). Given Soviet domestic requirements, it is unlikely

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(1) The steady increase in consumption has prompted South Africa to expand sharply its extraction capacity.
(2) Chile, Australia, United States, Venezuela and India.
(3) The figures for total resources are very different: South Africa (32%), USSR (19%), Canada (18%), United States (16%), Venezuela and Australia (2.5%). Exploitation of these resources in the United States and Canada is currently hampered by insufficient technology and excessive extraction costs. The creation, or revival, of a French extraction industry (using bauxite, minette from Lorraine or uranium ore) would be technically possible in the event of shortage but would involve delays of indefinite duration.
(4) Oil shale deposits are also to be found in Canada, but priority is being given to oil rather than to vanadium recovery.
(5) Nevertheless, both these substances are employed for certain special uses. Niobium production is centred in Brazil (74%), Canada (20%), and Nigeria (4%) as well as in the USSR; molybdenum is produced mainly in the United States (64%), Canada (15%), the USSR (10%) and Chile (7%).
(6) Canada imported 71% of its ferro-vanadium requirements from the United States and the balance from South Africa.
(7) In 1978 these were not high, i.e. 1,600 tons.

that the USSR will become a large exporter to the West within the next few years(1). The percentage of Soviet vanadium used in domestic consumption is only known for a few countries: it is a small figure (less than 10%) for France, the United States and the United Kingdom, but could reach 35% in the case of Germany.

(vii) TITANIUM

21. The main titanium ores are rutile and ilmenite. The rutile deposits are located in Australia (34%), India (25%), Sierra Leone (13%), USSR (8%) and USA (7%). Ilmenite deposits - which are plentiful are to be found mainly in Australia, Norway, Canada, the United States, the Soviet Union (16%) and, in addition, India and Sri Lanka. About 90%-95% of these ores are used in the form of titanium oxide(2) and 5% for metal production. Because of its strength, lightness and exceptional resistance to corrosion and heat, titanium metal and its different alloys have become indispensable for advanced metallurgy. It has many applications in the aeronautical, aerospace and nuclear industries, particularly for the manufactore of sophisticated weapons (aircraft, ships, missiles, etc). There is no satisfactory substitute for titanium when used for its strength and heat-resistant qualities.

22. In contrast with the USSR (which uses only ilmenite)(3) the Western countries use rutile for the production of titanium sponge(4) which, after smelting, is turned into ingots (pure metal). The Western supplies of titanium are mainly in the form of titanium sponge, the production of which calls for highly sophisticated and extremely costly processes which produce only small amounts. At world level, production of titanium sponge is shared among four countries(5). Production capacity in the United

(1) Whatever the case may be technological progress made by the Soviet Union in the processing of ferro-vanadium slag leads one to believe that the Soviets will try to further refine their product and limit their exports to the West to ferro-vanadium.
(2) Titanium oxide is used mainly as a pigment in different industries (paint, plastics, paper and so on).
(3) the USSR also uses titanium magnetite.
(4) In the metallurgy of titanium extraction, rutile can be used as it is after enrichment, whereas ilmenite must first be processed to produce titanium-rich slag and to eliminate the iron in the form of cast iron. The Soviet Union's preference for ilmenite is dictated by its reserves which are located primarily in the Ukraine.
(5) See doc ent AC/127-D/628, dated 29th January 1980.

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States, Japan and the United Kingdom totals 22,000, 11,000 and 4,000 tons respectively(1) but is not being used to the full(2). Soviet production - which is constantly increasing - totalled 41,000 tons in 1978 and could rise still further in 1980 without, however, reaching the 1980 target of 50,000 tons laid down in the most recent five year plan.

23. In the past, the Soviet Union has been the West's largest supplier. Its deliveries of titanium sponge totalled about 8,000 tons in 1974 and averaged 5,000 tons between 1975 and 1977(3). However, since mid-1978, deliveries have been reduced; in 1979, small quantities were available only on the spot market. However, for a closer examination of Soviet supplies of titanium, it would be necessary to break down in 3 categories according to country: sponge, metal and scrap. In regard to the United States, the Americans purchase no metal from the USSR, and their recent importations of sponge and scrap have developed as follows:

	Sponge	Scrap
1974	3,212 (tons)	1,675
1975	1,191	622
1976	232	407
1977	425	1,860
1978	548	1,853
1979	299	3,300

Only figures for imports of titanium sponge are available for France and the Federal Republic of Germany:

- France: 1974: 750 tons; 1975: 200 tons; 1976-78: 500/700 tons per annum; 1979: 50 tons
- Federal Republic of Germany: 1974-1976: about 1,800 tons per annum (about 80% of consumption); 1978: 617 tons (21% of consumption)

(1) United States production capacity will rise by 1,500 tons in 1980 and could increase by a further 2,000 tons in 1981 and by 2,000 tons again in 1982-1984 depending on certain economic and commercial developments. Japanese production capability will probably total 15,000 tons by the end of 1980.
(2) Production in these countries in 1978 totalled 15,500 tons, 9,200 tons and 2,200 tons respectively.
(3) Generally on the basis of annual contracts.

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24. Among the reasons advanced explaining the Soviet suspension of titanium exports is the fact that a shortage of equipment has retarded the implementation of various projects to increase ore extraction as well as augment and modernize titanium sponge production. It was noted in this respect that in 1978 and 1979 the Soviet Union had entered into a number of contracts with Australian firms(1) for the purchase of ilmenite and had imported small quantities of ore from Sri Lanka. In regard to projects for the extension and modernization of titanium sponge production, it has been noted that progress is at a standstill at the Zaporuh'je works and that projects are being constantly postponed at the Ust'Kamenogorsk works for lack of proper equipment. This being the case and given the fact that the Soviet Union will give priority to its own needs, it seems unlikely that it will resume exports until 1985 at the earliest.

(1) One of these contracts - signed in June 1979 - provided for the delivery of 44,000 tons of ilmenite.

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ANNEX II to
C-M(80)35

ESTIMATED SOVIET DEPENDENCE ON OUTSIDE SOURCES OF IMPORTANT INDUSTRIAL RAW MATERIALS - BREAKDOWN BY COMMODITY

1. An analysis of about 30 industrial commodities which are of particular importance in metallurgy, the chemical industry, electronics and the nuclear industry(1) shows that the USSR is currently a net importer (the percentage of apparent consumption varying very considerably from one commodity to the other) of the following: aluminium (bauxite-alumina), cobalt, tin, tungsten, molybdenum, antimony, fluorspar, phosphates and sulphur. A tight situation could also develop with respect to lead and zinc. It has been found that the Soviet Union is dependent as well on outside supplies of barite, talcum and mica.

A. METALS

(i) Aluminium - Bauxite - Alumina

2. The USSR's raw material resources are insufficient to meet the needs of its aluminium industry. In 1977, almost half the metal obtained from primary smelting (about 2.5 million tons) was derived from imported bauxite or alumina. It must nevertheless be remembered that the Soviet Union exports a substantial proportion (20%-25%) of its production(2). This being so, the country's real dependence, assessed in terms of the ratio between imports net of exports and apparent consumption(3) is, in fact, considerably less, i.e. about 32% in 1977(4). During the past decade, the degree of dependence has tended to rise quite markedly (in 1977 it was 19%).

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(1) These are: aluminium, copper, iron, lead, zinc, beryllium, chromium, cobalt, magnesium, mangangese, molybdenum, nickel, niobium, tantalum, tin, titanium, tungsten, vanadium, gold, silver, metals in the platinum group, antimony, boron, fluorspar, lithium, phosphates, sulphur, uranium, zirconium silicium (see AC/127-D/614(Revised), dated 22nd October 1979)

(2) It will be noted that a large part of Soviet aluminium exports (68% in 1977) goes to European COMECON countries which, for the most part, are dependent on the USSR for a great proportion of their requirements in this product. An interruption in Soviet deliveries to its Warsaw Pact partners would thus lead in the short term to a weakening of the bloc's industrial potential.

(3) In the absence of information on stock movements, "apparent consumption" denotes internal production plus imports and less exports.

(4) See AC/127-D/607, dated 6th July 1979

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3. To alleviate the inadequacy of its bauxite resources, the USSR has for many years been turning to substitute raw materials, such as nepheline-syenite or alunites, for the production of aluminium. The outlook for more extensive use(1) of such substitutes seems limited, however; the Russians seem, in particular, to have run into difficulties over the use of nepheline, which has led to the closure of certain plants; kaolin has apparently been replaced by imported alumina. In the 1985 timeframe, Soviet dependence on external sources for the raw materials of aluminium will remain high and may even increase.

4. Soviet imports of bauxite are obtained in the first instance from Guinea which, in 1977, accounted for about two-thirds of deliveries. Greece and Turkey provide essentially the rest. The geographical breakdown of alumina purchases is wider, there being about ten supplier countries of which Hungary is the most important. Over the next few years, Guinea will probably remain the main source of bauxite supplies and Hungary of alumina supplies (although its relative importance will fall as procurements from other countries increase. In particular, Yugoslavia is a growing source of bauxite for the Soviet Union and is expected to become a large exporter to the USSR of alumina as well, perhaps, eventually surpassing Hungary as a supplier of alumina. The Soviet Union has concluded a series of long-term agreements, involving credits repayable in the form of alumina, with a number of Western (Greece, Turkey) or Third World countries (India, Indonesia, Jamaica) which will enable it to diversify its supplies fairly substantially(2).

(ii) Antimony

5. Soviet dependence on outside supplies of antimony is gradually falling: imports as a percentage of apparent consumption should drop from 20% in 1975 to about 10% in 1980. The continuing increase of Soviet production will probably be prolonged over the next few years and it is even possible that the country will attain

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(1) Alunites and nepheline are belived to have accounted for one-third of Soviet aluminium production in 1978

(2) In particular, the Soviet Union is to build an alumina plant in India in exchange for 300,000 tons of alumina per annum. Under an agreement reached with Jamaica in April 1979, the Russians, as of 1980, will be importing a minimum of 50,000 tons of alumina per annum. Provisions under a long-term agreement envisage that Jamaica, beginning in 1984, will deliver 250,000 tons annually.

self-sufficiency by 1985. It should be added to this relatively favourable outlook that substitutes already exist for most uses of the metal (although often at higher cost(1)).

(iii) Cobalt

6. With an estimated annual extraction of slightly over 5,000 tons of metal content (1977 figure), the USSR is the world's second leading producer after Zaire. The rate of growth of output has, however, slackened notably during the last few years because of the exhaustion of deposits in the Kola Peninsula and the delays in development of the Norilsk complex. The Soviet Union has become, to an increasing extent, a net importer of this metal and in 1980 its import requirements could reach 30% of apparent consumption. This is likely to go on for some years, but in the longer term (1985 and beyond) Soviet dependence should be substantially reduced with the expansion of Siberian nickel production at Norilsk(2).

7. A large proportion (some 40% in 1978) of Soviet supplies are covered by the processing of Cuban nickel oxide/cobalt(3). Supplies are also obtained from Western Europe and directly from certain African producers such as Zaire and Zambia. It is difficult to determine exactly what quantities the Soviet Union was buying on Western markets at the time of the Shaba crisis in the Spring of 1978, but it seems that their scale has been exaggerated. In the mid-eighties, with increased domestic production, Soviet cobalt imports, except those from Cuba, should cease.

(iv) Tin

8. Soviet tin import requirements are high as domestic production(4) accounts for only some three-quarters of apparent consumption. During the last few years, there seems to have been little variation in the degree of dependence, although it has declined slightly in comparison with the situation at the beginning of the

(1) Soviet output of antimony in 1978 was estimated at 8,000 tons of metal content and imports may have been in the order of 1,000 tons. Proven and probable Soviet reserves were estimated at 272,000 tons of metal in 1975, or 6.6% of the world total
(2) Soviet cobalt is obtained mainly as a by-product of nickel
(3) Total Soviet imports for 1978 have been estimated at between 2,000 and 2,200 tons
(4) Soviet production of tin (some 29,000 tons in 1978) is the third highest in the world, only Malaysia and Bolivia producing more

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decade (supplies from abroad in 1970 accounted for about 30% of consumption). In contrast to Western industralized economies, where over 40% of tin consumption is used for the production of tin plate, only 20% of Soviet consumption is employed for this purpose, with 60% going into the production of brass, bronze and anti-friction metal, and 20% for solders(1).

9. By 1985, the degree of Soviet dependence on foreign sources should be more or less unchanged at around 25% to 30% of consumption. While the Soviet Union has large reserves (estimated at 620,000 tons, or about 6.5% of the world total), extraction is difficult and costly because of the depth of the deposits and their location mainly in the Far East of the country in the mountainous areas (in the South) and in very rigorous climatic conditions (in the North); also, the opening-up of new deposits in these areas is very time-consuming.

10. The recent trend in the geographical pattern of Soviet tin imports highlights the increasing importance of Bolivia and the United Kingdom as suppliers. Soviet purchases on the London market were particularly high in 1978 (more than 4,000 tons for total imports of around 10,000 tons). Supplies from Bolivia(2) are covered by a long-term agreement and in all likelihood are provided in exchange for Soviet technical and financial assistance in the building of volatilization plants. Bolivia could probably become the USSR's main supplier over the next few years.

(v) Molybdenum

11. Having been self-sufficient for this raw material up until the early seventies, the Soviet Union has since then been faced with growing import requirements of molybdenum, with the result that, in 1978, the degree of dependence on foreign sources represented about 25% of apparent consumption. Molybdenum is

(1) Source: AC/127-D/574, dated 13th November 1978
(2) Estimated for 1978 at less than 3,000 metallic tons (see AC/127-D/607). Press sources (Reuter East-West Trade News of 4th January 1978) mentioned the conclusion of an agreement for the supply by Bolivia of 4,500 tons of metal in eight consignments, the first falling due in February 1978.

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becoming increasingly important to Soviet industry because of its use in the manufacture of oil and gas pipelines for the Northern regions; in all likelihood, therefore, the demand will continue to grow significantly. In view of its extensive reserves(1), the Soviet Union may step up efforts to expand production in the coming years, mainly from the Siberian deposits; it is also trying to boost the recovery of molybdenum as a by-product of the copper industry. By 1985, however, the country will in all probability remain dependent on imports to cover part of its consumption but the degree of dependence is likely to decline slightly in relation to its current level.

12. Most of the Soviet Union's purchases of molybdenum are made in the industrialized West; in 1978, out of a total of imports estimated at 3.5 thousand tons, nearly 2.2 thousand tons came from the United States and 1.1 thousand were acquired on the London market. Since 1977, some (probably small) amounts have also been obtained direct from Peru, while in 1978 Chile resumed exports to the USSR after a 5-year interruption. Between now and 1985, Soviet dependence on Western sources will probably decline sharply due to supplies from Mongolia in exchange for Soviet participation in the working of the vast copper and molybdenum deposits at Erdenet in Mongolia.

(iv) Tungsten

13. The Soviet Union comes second after China among the leading tungsten producers(2), although output by no means meets Soviet industrial demand. As a result, import requirements are high (in 1978 some 46% of apparent consumption) and have increased rapidly over the last few years (in 1970, purchases from abroad accounted for only 8% of consumption)(3). In theory, the Soviet Union

(1) Proven and probable Soviet reserves of molybdenum lie between 0.5 and 1.0 million tons, against an estimated world total of 8.7 million tons in 1975

(2) In 1978, Soviet tungsten output was estimated at 8,500 tons of metal content, or around 19% of world production. Chinese production was estimated at 9,000 tons

(3) It should also be pointed out that because it is very difficult to work, the recycling of tungsten poses major problems; moreover, for most of its uses, possible substitutes are limited and expensive, requiring rare materials (titanium, tantalum, columbium) or for which the Soviet Union already relies on outside sources (molybdenum)

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possesses reserves, which could lead to its self-sufficiency, but this is not a medium-term possibility due to the difficulties and the high cost of working the deposits. Nevertheless, it is probable that domestic production during the 1980s will increase and dependence on outside supply sources consequently reduced to a certain extent.

14. In recent years, most Soviet purchases of tungsten have been made through the Western metal markets(1). Direct imports from China, which apparently stopped in 1976 and 1977, may have been resumed in 1978. It seems that Moscow has not so far concluded a long-term agreement with one or more producing countries which would cover a sizeable proportion of its import needs, but in all likelihood, and to the extent possible, it will try to sign such agreements.

(vii) Zinc and lead

15. The USSR is in transition from net exporter to net importer for both lead and zinc. The Soviets appear not to be giving sufficient priority to development of Siberian deposits to reverse this trend, indicating that they may be dependent on imports of lead and zinc for part of their needs during most of the 1980s. The import dependence for lead, the more troublesome of the two for the USSR, is not likely to exceed 25%.

B. NON-METALLIC MINERALS

(i) Phosphates

16. The Soviet Union is the world's second largest source of natural phosphates, the first being the United States and the third Morocco. However, expansion of production is tending to slacken and exports have slumped(2). Although extensive recently discovered deposits of phosphate and apatite in Estonia and South Yakutia could lead to a rise in ore extraction in the 1980s, it seems probable that demand will cutstrip supply and that after 1980, the USSR will find itself slightly dependent on outside supplies; by 1985, it may rise slightly, while still remaining small.

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(1) In 1978, out of estimated Soviet imports of 7.7 thousand tons of metal contents, four-fifths came from Western metal dealers and the rest directly from China (see AC/127-D/607)

(2) In terms of phosphoric acid (P_2O_5), Soviet output of phosphates rose from 7.8 million tons in 1975 to around 8 million tons in 1978. Exports dropped from 2.3 million tons to approximately 1.6 million tons in 1978 (see AC/127-D/614(Revised)

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17. With a view to securing future supplies, the USSR in March 1978 signed long-term agreements with Morocco after many years of negotiations. According to available information(1), there is a commercial barter agreement for 25/30 years providing for Soviet exports of various commodities (oil, raw materials, chemicals) in exchange for Moroccan phosphates together with a financial and technical co-operative agreement whereby the Soviet Union will help to develop the working of the Moroccan Meskala deposits, the $2 billion credit extended for this purpose being repaid by Morocco in the form of phosphate deliveries. Altogether, Morocco will reportedly supply 5 million tons of phosphate rock a year, beginning in 1980, and the figure could rise to 10 million tons annually in 1990(2). The USSR has also made efforts to import intermediate materials, in particular a deal with Occidental Petroleum of the US concerns deliveries of superphosphoric acid.

(ii) Sulphur

18. The Soviet Union is very slightly dependent on outside sources for its sulphur supplies. In 1980 net imports will account for about 4% of apparent consumption, but this proportion could rise somewhat, although remaining slight. Whatever the case may be, the USSR's vulnerability must be viewed in the light that its sulphur imports come from Poland which represents a reliable source of supply.

(iii) Fluorspar

19. Fluorspar a raw material for which the Soviet Union is dependent to a great and increasing degree on outside sources. In 1975, 49% of apparent consumption was accounted for by imports, the figure is likely to rise to about 54% in 1980(3). By 1985, it seems unlikely that the USSR will be able to tap sufficiently new

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(1) Refer to ED/EC/78/31
(2) However, the exploitation of the Meskala deposits has reached the stage of survey work only. The project is running so far behind schedule that the projected figure of 5 million tons seems a little high
(3) In 1978, Soviet output and imports of fluorspar were estimated respectively at 500,000 and 550,000 tons (see AC/127-D/614(Revised)). Soviet proven and probable reserves in 1975 were estimated at 7.5 million tons, or 5.5% of the world total

important deposits to have a significant impact on output and it is probable that the country will have to resort to outside supplies to meet its rising industrial needs(1).

20. Mongolia is by far the Soviet Union's biggest supplier of fluorspar (in 1975, the last year for which sufficiently detailed Soviet trade statistics are available, Mongolia supplied three-fifths of the total). Mongolia's dominant rôle can be expected to continue over the next few years. Moreover, the USSR has recently concluded an agreement with Kenya for the supply of fluorspar.

(iv) Other non-metallic minerals

21. Although it appears to have extensive reserves(2), the Soviet Union by no means meets its baryta requirements from domestic production; in 1975, its net imports amounted to almost half (48%) of apparent consumption(3). Since then, the degree of Soviet dependence would hardly seem to have changed(4). One of the main current uses of baryta is as drilling mud for the oil industry. Up to 1975 at least, most of the Soviet Union's imports of baryta came from other Communist countries (Bulgaria, North Korea, Romania) and Yugoslavia.

22. Soviet dependence on outside sources for talc(5) seems to have risen slightly over the last few years and now represents about a quarter of apparent consumption(6). It can be assumed that, as in the early 1970s, Moscow continues to obtain most of its talc from Bulgaria and North Korea. In the case of mica, approximately 10% of the apparent consumption(6) of high-quality crystal would seem to be covered by imports.

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(1) In the present state of technology, there are apparently no economically acceptable substitutes for fluorspar. But in aluminium production (which, together with the iron and steel industry, is one of the main consumers of this product) increasing quantities of fluorspar can be recycled

(2) In 1975, Soviet proven and probable reserves of barium sulphate (barytine) were estimated at 11 million tons or 5.4% of the world total. Potential reserves are estimated at 70 million tons or 17% of the world total (source: DIW. Berlin)

(3) In 1975, Soviet output of baryta was estimated at 350,000 tons (source: Minerals Year Book, US Bureau of Mines) and imports totalled 330,000 tons

(4) The figure of 50% was referred to at the Economic Committee's meeting with Experts on 15th and 16th November 1979

(5) One of the main uses of talc is for the manufacture of pulp

(6) Figure given at the Economic Committee's meeting with Experts on 15th and 16th November 1979

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STATISTICS OF THE INDUSTRIAL PLANNING COMMITTEE ON THE DEPENDENCE OF NATO COUNTRIES FOR ASBESTOS, CHROMIUM, COBALT, MANGANESE AND TITANIUM

This Annex contains figures on the import requirements of NATO countries and the geographical pattern of sources by main supplier for the commodities referred to above. These statistics have been taken from the replies of member countries to the Industrial Planning Committee's questionnaire(1) on industrial commodities likely to become critical(2) in times of crisis or war(3).

(1) Industrial Planning Committee - work item No. 1(b)
(2) Because of the reliance of NATO countries on imports
(3) The Industrial Planning Committee prepares for each member country and for a provisional list of 21 items (see AC/143-D/450 dated 12th May 1978) a questionnaire on the volume of domestic production, consumption, exports, imports - as well as their geographical pattern by main supplier - and stocks.

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ANNEX III to

STATISTIQUES DU COMITE DE PLANIFICATION INDUSTRIELLE
STATISTICS OF INDUSTRIAL PLANNING COMMITTEE

TABLEAU I

Importations, consommation, production intérieure, exportations et stocks en fin de période des pays OTAN pour les produits sélectionnés (Année 1977) (1)

TABLE I

Imports, consumption, own production, exports, stocks and/period of NATO countries for selected products (for Year 1977) (1)

	Cobalt(CTCI 689.99 (1) (tonnes métriques) (metric tonnes)					Concentrés de chrome(CTCI 287.91) (1.000 tonnes métriques) Chrome concentrates (1 000 metric tonnes)					Concentrés de manganèse(CTCI 287.7) (1.000 tonnes métriques) Manganèse concentrates (1 000 metric tonnes)				
	Import.	Cons.	Product.	Export.	Stocks	Import.	Cons.	Product.	Export.	Stocks	Import.	Cons.	Product.	Export.	Stocks
Belgique/Belgium	..(2)	..(2)	..(2)	..(2)	..(2)	3,9	2,8	N	1,1	0,7	206,7	196,8	N	9,9	108,0
Canada	8000	..	..	2000	..	40,0	..	N	N	..	56,0	..	N	N	..
Danemark/Denmark	N	N	N	N	N	N	..	N	N	..	2,0	..	N	N	..
France	600	500	900	N	N	281,0	281,0	..	..	..	922,0	914,0	..	..	..
Rep.Féd.d'Allemagne/Germany	2036	..	..	276	..	374,0	..	..	4,0	..	528,0	522,0	..	..	407,0
Grèce/Greece	200	200	N	N	..	1,0	..	33,4	15,6	..	1,0	..	7,8	5,0	..
Italie/Italy	226	226	N	..	..	178,1	176,1	..	..	..	268,5	277,8	9,3	..	..
Pays-Bas/Netherlands	10	N	84	94	..	26,4	2,2	N	19,5	..	81,2	49,7	N	31,6	..
Norvège/Norway	5	..	700	700	..	28,2	48,7	N	N	4,5	591,4	708,7	N	N	80,0
Turquie/Turkey															
Royaume-Uni/United Kingdom	2100	..	N	600	..	197,6	197,6	N	0,02	..	327,8	321,0	N	6,8	..
Etats-Unis/United States	7900	7500	200 (3)	400	3600	1418,4 (4)	1317,8	N	245,8	1213,6	2328,8 (5)	2036,2	N	130,6	1743,3
TOTAL	21077	8426	1884	4070	3600	2548,6	2026,2	33,4	286,0	1218,8	5313,4	5026,2	17,1	183,9	2338,3

Note : Le symbole .. indique qu'aucune donnée n'a été fournie par les Pays.
Le symbole "N" indique que les chiffres sont nuls.

Note : The symbol .. indicates that no figures were provided by capitals.
The symbol "N" represents "nil".

(1) - Les statistiques pour 1978 sont en cours de préparation.
. - The statistics for 1978 are in the process of preparation.

(2) - Toutes les informations sont classifiées "Confidentielles" et ne sont pas communiquées.
- All informations classified "Confidential" and not provided.

(3) - Production à partir de déchets.
- Production from scraps

(4) - Y compris les ferro-alliages et la chromite.
- ferro-alloy and chromite included.

(5)-Y compris le ferro-manganèse
- Ferro-manganese included.

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STATISTIQUES DU COMITE DE PLANIFICATION INDUSTRIELLE (année 1977)
STATISTICS OF INDUSTRIAL PLANNING COMMITTEE (for year 1977)

TABLEAU I (suite)
TABLE I (continued)

Pays Country	AMIANTE(CTCI 278.4) (1.000 tonnes métriques) ASBESTOS (1,000 metric tonnes)					CHROME(CTCI 689.99) (v) (tonnes métriques) CHROMIUM (metric tonnes)					TITANE(CTCI 689.99) (ii) (tonnes métriques) TITANIUM (metric tonnes)				
	Import.	Cons.	Prod.	Export.	Stocks	Import.	Cons.	Prod.	Export.	Stocks	Import.	Cons.	Prod.	Export.	Stocks
Belgique/Belgium	54,2	55,0	N	0,2	..	200	200	N	N	..	400	400	N	N	..
Canada	4,0	..	1588,0	1414,0	..	N	N	N	N	N	N	N	N	N	N
Danemark/Denmark	32,8	..	N	N	..	N	N	N	N	N	N	N	N	N	N
France	115,0	115,0	N	..	..	N	N	N	N	N	N	N	N	N	N
Rép.Féd.d'Allem./Germany	617,2	..	N	38,6	9,6	334	..	..	66	..	1652	..	..	1380	..
Grèce/Greece	19,2	..	N	N	..	..	..	..	..	..	..	..	..	..	..
Italie/Italy	65,0	147,9	149,3	..	..	100	100	N	..	..	1500	1500	N	..	..
Pays-Bas/Netherlands	39,9	..	N	0,3	..	63	50	N	21	..	166	69	N	97	..
Norvège/Norway	2,3	2,1	N	N	0,1	N	N	N	N	N	N	N	N	N	N
Turquie/Turkey															
Royaume-Uni/United Kingdom	127,2	126,5	N	0,7	..	100	1200	..	2100	..	400	..	..	..	..
Etats-Unis/United States	551,0	610,0	93,0	34,0	83,2	..	..	..	..	..	2200	14700	..	400 (1)	3200 (2)
TOTAL	1627,8	1055,5	1830,3	1487,8	83,3	797	1550	-	2187	-	6318	16669	-	1877	3200

(1) - essentiellement des déchets.
- mainly scraps.

(2) - Eponge de titane
- Sponge of titanium

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STATISTICS OF INDUSTRIAL PLANNING COMMITTEE

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Table II

COUNTRIES	MAIN SUPPLIER COUNTRIES OF RAW MATERIALS TO NATO COUNTRIES AND SHARE OF THEIR TOTAL IMPORTS (in percentage) (for year 1977)					
	COBALT	CHROME CONCENTRATES	MANGANESE CONCENTRATES	ASBESTOS	CHROMIUM	TITANIUM
Belgium	...	South Africa 41 Nigeria 31	Ghana 27 South Africa 24 Nigeria 12 Brazil 11	Canada 39 USSR 28 South Africa 19 Hungary 5 EEC 5 Cyprus 3	USSR 56	US 84
Canada	South Africa 69 US 20 Finland 4	Finland 39 US 30 Philippines 20	Gabon 31 France 17 South Africa 15 US 10 Brazil 2	South Africa 66	nil	nil
Denmark	nil	nil	Gabon 30	Canada 62	nil	nil
France	...	South Africa 32 Turkey 21 USSR 19	Gabon 40 South Africa 25 Brazil 18	Canada 34 USSR 31	nil	nil
Federal Republic of Germany	Zaire 42 Belgium 19 France 14 US 12	South Africa 68 US 12 USSR 11 Turkey 1	South Africa 64 Australia 16 Brazil 11	Canada 86 USSR 6 South Africa 4	Japan 44 Belgium 23 UK 8	Japan 48 UK 18 US 15 USSR 12
Greece	...	France 100	Belgium 97 Fed.Rep. of Germany 3	Canada 37 South Africa 35 USSR 9	...	...
Italy	Belgium 50	South Africa 30	South Africa 60	South Africa 40	France 30	US 58
Netherlands	EEC 98	South Africa 99	...	Canada 79 Italy 7 USSR 6	EEC 54 Japan 46	US 49 EEC 38 Japan 12
Norway	Belgium 40 Zaire 40 Fed. Rep. of Germany 20	Turkey 68 USSR 18 Greece 12	South Africa 35 Gabon 30 Brazil 12 Ghana 10 US 8 Australia 3	Canada 41 Fed. Rep. of Germany 27 USSR 26 US 5	nil	nil
Turkey						
United Kingdom	...	South Africa 63 Philippines 26	South Africa 59 Ghana 14	Canada 69	...	...
United States	Zaire 42 Belgium 23 Zambia 7 Finland 6	Chromite: South Africa 35 USSR 18 Philippines 16 Turkey 13 Ferrochrome: South Africa 38 Rhodesia 23	Norway 35 Canada 25 Italy 12 Netherlands 12	Canada 96 South Africa 3	...	Japan 53 USSR 37 UK 10

The symbol ... indicates that no figures were provided by capitals

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