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4. Minerals as a factor in strategic policy and action

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1. Introduction

International conflict over natural resources is basically caused by the concern of governments and private firms over long-term predictability and reliability of resource supplies. Such concern is particularly strongly felt with respect to those natural resources which are perceived as vitally needed for military-political or economic reasons, or both. The present study has selected some such resources for special scrutiny: chromium, cobalt, and uranium. These are among the so-called strategic minerals.

Strategic minerals are not considered strategic solely for military reasons. The overall economic position and the industrial strength of nations are intimately linked to military planning and to programmes for national defence. Many in fact would conceive of the former as pre-conditions for the latter.

The supply of strategic minerals is influenced by several factors: (a) political bargaining or intervention; (b) the structure of world industry; and (c) physical, ecological, economic, and technological constraints. Conversely, demand for such minerals is influenced by such factors as: (a) the degree of national self-sufficiency of the main users; (b) global availability; (c) technological change; (d) changes in social structure; (e) changes in consumption patterns; and (f) the ability to adjust to perceived shortages of or barriers to supply by domestic re-adjustment policies. Several of the enumerated factors are among the chief determinants of conflict among nations and thus represent a considerable potential for such conflict.

The present chapter builds upon previous work by the author (Hveem, 1978; Hveem & Malnes, 1980). It does not cover oil or natural gas (for which see chapters 2 and 3).
II. Conflict over natural resources

For analytical purposes, the potential for conflict can be distinguished from the cause of conflict. Strategic minerals represent more of a potential for conflict than minerals in general. Six aspects appear to be important clues in determining whether or not a potential for conflict over natural resources exists:

1. The extent to which the military sector and industrial system in the short to medium term are dependent on the natural resource, that is, cannot do without it under prevailing technology and applications;
2. The extent to which the industry concerned with the natural resource is subject to monopoly, oligopoly, or other form of dominance or selective control;
3. The extent to which imbalance in the supply position of countries and firms prevails regarding the natural resource, such imbalance being greater the more one country or firm is self-sufficient in supply relative to a competitor;
4. The extent to which there are natural limits to the supply of the natural resource, for example, imminent depiction or lengthy transportation routes;
5. The extent to which locations and routes of supply of the natural resource cross the political-ideological divisions of the international system; and
6. The extent to which a struggle for independence or a struggle over disputed territory involves the natural resource.

Economic factors, such as pricing behaviour on the side of suppliers, may also represent a potential for conflict. Reactions of some major Western powers to the oil-price shock in 1973 indicate this. None of the other minerals which would fall under the term strategic comes close to oil in terms of its importance in the import budgets and the strategic planning of most developed nations (see chapters 2 and 3). It can therefore be assumed that the price of strategic minerals other than oil is a less important factor to consider than those mentioned above. Within wide margins, the demand for the strategic minerals is, in economic terminology, price-inelastic. If supply could be assured, the buyer might be willing to pay a high price in those cases where a total dependence exists on the mineral concerned for some vital application. The threat of an embargo is far more important than that of a price increase.

Policy planners in government and industry turn to the above aspects of the supply situation when they consider their own position. If they are not in a position in which the threat of supply distortion appears to be imminent, their planning strategy would nevertheless probably be attentive to the possibility. As shown below, such a position is normally that of a country or firm not particularly dependent on foreign supplies. Interest in this case lies in the possibility that dependence might come in the future, or in that the country or firm concerned is interested in influencing the supply position of competitors.

If dependence on foreign supplies exists, then the country or firm will be either 'sensitive' or 'vulnerable' to interference with the dependency relationship (Keohane & Nye, 1977). It will be sensitive to the extent that it is liable to suffer costly effects from such interference before policies can be introduced that would change the situation. It will be vulnerable to the extent that it is liable to suffer costs from outside interference even after policies to change the situation have been introduced.

The vulnerability of a nation is a major cause of conflict over natural resources, one of three to be stressed here. The threat or actual imposition of an embargo on supplies of some strategic mineral is normally seen as an act of unfriendly behaviour or aggression by those who are the object of the embargo. But even the fear, realistic or not, of being subjected to such act may cause the affected party to take measures in order to pre-empt interference.

A second major resource-related cause of conflict is linked to the issue of global distribution. If industrialized and non-industrialized countries are compared, the consumption of natural resources is seen to be highly uneven. Moreover, the consumption gap has tended to widen in recent years. The explanation for this, especially in most of the more industrially advanced countries, is that the demand for new products increases faster than their natural resource base can provide the necessary inputs. If depiction of natural resources is anticipated, extra weight is added to the domestic pressure. The outlet for such pressure is to seek increased supplies from abroad (Choucri & North, 1975), thus colliding with the aspirations of other countries to increase their consumption. As may happen in the case of vulnerability, distributive conflict may lead the country to intervene politically or militarily in the supply area.
A third major resource-related cause of conflict is the play of politics or the process of tough bargaining, the latter including threats and counter-threats. These threats may be made in order to interfere in the internal affairs of other nations or firms or otherwise to change the rules of international relations. The demands of developing countries for a so-called new international economic order have meant that prices on primary commodities should be regulated by global multilateral bodies, subject to increased national control by the developing countries themselves; they have further meant that primary commodities be increasingly processed in the producing countries before export takes place. These demands, among others, have led to open conflict with many developed countries and with transnational corporations. If the demands were implemented, the transnational corporations would lose much of their control over the flow of global resources.

When a relatively self-sufficient country seeks to control the sources of supply in another country, the motive may be to hurt some third country which is supplied from these sources. More precisely, the motive here would be to take advantage of the vulnerability of the more dependent country. Such a motive could explain past and present actions of the major powers in the Persian Gulf and it may offer clues to their thinking about change in southern Africa. The dependence of the Western great powers on supplies from southern Africa is a source of considerable concern to those and other countries. This dependence is also a possible source of temptation for the USSR to intervene there, at least in the perception of Western military planners and analysts (Hacked, 1981).

III. Historical experience

Throughout history, conflicts over natural resources have often been associated with competition over concessions or colonies. In many cases, the interests of private firms have been the source of expansionist policies. In many others, national interests have prevailed over private ones. Whereas national and private interests have often coincided, they have in a number of cases clashed.

Publications of scholarly research into past cases of resource conflict are rather scattered and of highly uneven quality. Only very circumscribed conclusions can therefore be drawn from such research. One safe observation would be that conflicts have been located mostly in what is now commonly referred to as the Third World. Disregarding the rather obvious cases of imperialist expansion and the 'colonial scramble' in the past century, past cases of resource conflict appear to have fallen into one or another of three distinct categories:

1. Competition among major powers which led them to intrude upon each others' 'spheres of influence' for some of the reasons already suggested;
2. Conflict between investing or ownership interests (notably in Western capitalist countries) and national or local interests in countries where the resources were located (notably in the Third World); and
3. Conflict owing to strong ideological-political differences, in particular as these resulted from a sudden change in government in one of the countries concerned.

Most observers would agree that conflicts of the first type enumerated above are no longer common occurrences, whereas those of the second two types are. An example of violent conflict that involves a commodity of strategic importance—phosphates—and that was caused by a mixture of ideological dispute, territorial dispute, and external involvement, is the Western Sahara Revolt of 1976—(Kilgore, 1981; see also appendix 2, war 11). In fact, if the above analysis is not restricted to war, then all three types remain common occurrences. Such an extended interpretation of conflict is necessary in order to include, on the one hand, post-war tensions among the major powers and, on the other, so-called trade wars among major capitalist countries. Examples of the latter have become quite common during the 1970s and early 1980s.

Non-violent conflicts in the past which were caused by attempts to control natural resources, or which in some other way involved natural resources, dealt with control over: (a) production sites; (b) transportation routes; or (c) some other key element of control, for example, the local government concerned or the marketing and distribution system.

IV. National vulnerability and international market structures

During periods of crisis and war, governmental control in capitalist countries has assumed a particularly important role in controlling
access to natural resources. The declared policy of Germany during World War II was to take control of or else interdict the supply routes of the Allied powers. This strategy led the Allies to organize their supplies from both national and foreign sources into a joint allocation scheme (Leith et al., 1943).

The emergency measures of World War II dealing with natural resources were dissolved after the war as part of the general liberalization of trade that took place in the late 1940s. However, even though governmental control over the supply of raw materials ended in the USA and United Kingdom, this did not re-introduce a fully competitive market. In a great number of primary commodity industries, the degree of concentration of production and exports has remained high. National vulnerabilities therefore not only affect the international industrial structure; they are also influenced by it.

Looking at the problem from the national point of view, high import dependence is a condition of sensitivity only if measures can be taken with great speed and at minimum cost for the purpose of adapting to changes in supply. If measures can be taken only in the long term or at great cost, then the country concerned is in a situation of vulnerability. There is a considerable imbalance in the apparent import dependence position of the major powers regarding minerals of particular importance in military and civilian industrial applications (Hvecm & Malnes, 1980, pages 67-75). Whereas Japan is close to completely dependent on imports for these minerals, Western European powers are somewhat less so and the USA is again a little less so. The USSR is substantially less dependent upon mineral imports than the USA; and the USA, in turn, less so than the United Kingdom (table 4.1).

Although data on trends in import dependence are incomplete, the general tendency appears to be in the direction of greater rather than lesser import dependence for the USSR and China. The imbalance in the supply situation of the major powers is, however, still quite considerable and will most probably remain so for the next two decades or so. This imbalance represents an important part of the potential for international conflict.

The high degree of concentration in the global supply of minerals is evident at the level of reserves, at that of production, and at that of exports (Hvecm & Malnes, 1980, pages 59-64). As to reserves, only three countries account for HK) per cent of known global platinum reserves, three countries for almost 100 per cent of known chromium reserves (table 4.2), and three countries for about 90 per cent of known manganese reserves. As to production, only three countries account for close to HK) per cent of current platinum
Table 4.2. Concentration in the global chromium, cobalt, and uranium regimes

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Known reserves</th>
<th>Production</th>
<th>Exports</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium</td>
<td>South Africa (68)</td>
<td>USSR (30)</td>
<td>South Africa (28)</td>
<td>Japan (22)</td>
</tr>
<tr>
<td></td>
<td>Zimbabwe (30)</td>
<td>South Africa (28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Finland (1)</td>
<td>Albania (11)</td>
<td>USSR (18)</td>
<td>Sweden (12)</td>
</tr>
<tr>
<td></td>
<td>Top three (99)</td>
<td>Top three (69)</td>
<td>Albania (26)</td>
<td>China (10)</td>
</tr>
<tr>
<td></td>
<td>Cobalt</td>
<td>Zaire (49)</td>
<td>Zaire (55)</td>
<td>USA (44)</td>
</tr>
<tr>
<td></td>
<td>Zambia (15)</td>
<td>Zambia (13)</td>
<td>Zambia (18)</td>
<td>Japan (13)</td>
</tr>
<tr>
<td></td>
<td>USSR (9)</td>
<td>USSR (10)</td>
<td>Finland (6)</td>
<td>FR Germany (12)</td>
</tr>
<tr>
<td></td>
<td>Top three (73)</td>
<td>Top three (70)</td>
<td>Top three (79)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uranium</td>
<td>Australia (227)</td>
<td>USA (21)</td>
<td>South Africa (34)</td>
</tr>
<tr>
<td></td>
<td>South Africa (217)</td>
<td>South Africa (20)</td>
<td>Canada (29)</td>
<td>France (19)</td>
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<tr>
<td></td>
<td>Canada (127)</td>
<td>Canada (17)</td>
<td>Australia (14)</td>
<td>FR Germany (14)</td>
</tr>
<tr>
<td></td>
<td>Top three (55?)</td>
<td>Top three (58)</td>
<td>Top three (77)</td>
<td>Top three (63)</td>
</tr>
</tbody>
</table>

Sources and notes:

Table prepared by A. H. Westing.

* Known-reserve values: (i) chromium for ca 1979 from Morning et al. (1980. page 171); (ii) cobalt for ca 1979 from Sibley (1980. page 204); and (iii) uranium for 1982 from US Statistical Yearbook. New York. 33. table 104 (1982); the compilation for uranium, however, does not take account of reserves in China, Czechoslovakia, Israel, the USSR, and perhaps elsewhere, for which the data are not made public.

Production values: (i) chromium for 1983 from Papp (1983, page 217); (ii) cobalt for 1983 from Kirk (1983, page 261); and (iii) uranium for 1982 from UN Statistical Yearbook. New York. 33. table 104 (1982), adjusted for the missing value for the USSR. assumed here to be two-thirds that of the USA; however, the missing uranium values for China. Czechoslovakia and Israel, assumed to be substantially smaller, are not taken into account.


The values for South Africa include those for Namibia, a de facto possession of South Africa.
production and three countries account for about 90 per cent of current molybdenum production. As to exports, only three countries account for some 85 per cent of current molybdenum exports; and three countries account for about 80 per cent of current cobalt exports (table 4.2).

These high concentrations of mineral supply indicate a potential for monopolistic behaviour and producer or exporter co-ordination in the form of cartels, market sharing deals, and the like. The probability that such co-ordination in fact occurs is a function of several factors, among them political-ideological, economic, cultural, and geographical ones (Hveem, 1978).

A distinction should be made between critical and non-critical supplies. Potentially critical import dependence occurs when supplies come from one or a few suppliers, over long distances, or from a country of different ideology. If all of these factors are present, the situation must be characterized as a highly vulnerable one, indeed.

Diversification of mineral supply has been an important goal for several great powers over the past decade. It is less of a possibility if concentration is high. The significance of high geographical or structural concentration on the supply side is reinforced when it is coupled with a pattern of consumption that is highly concentrated as well. The industrialized capitalist countries consume a very high proportion (more than two-thirds) of the global production of the most important minerals; by contrast, the industrialized socialist countries consume a low proportion (less than one-third); and the developing countries, including China, consume the very small remaining proportion (perhaps one-tenth).

Until the present recession started in the mid-1970s industrialization meant a steady decrease in the self-sufficiency of the industrialized and the newly industrializing countries. For example, whereas the USA in 1950 relied on imports for more than 50 per cent of its requirements for only four important minerals, by 1976 this list had grown to 23 minerals (Hankce & King, 1978). For at least 12 of these minerals, import dependence was more than 80 per cent. A considerable part of this growth has resulted from changes in both intermediate (industrial) and final (consumer) demands. Even though the overall demand for minerals grew over the period, within that aggregation are hidden some important declines as well as some phenomenal increases. Iron consumption, still of huge proportions, declined in relative terms; on the other hand, the demand for certain so-called minor minerals grew rapidly until the beginning of the 1980s. This latter growth was the result of qualitative improvements in products, both in the civilian and military sectors.

All of the five major capitalist countries—France, FR Germany, Japan, the United Kingdom, and the USA—appear to be critically dependent upon foreign supplies for a number of strategic minerals, especially chromium and cobalt (table 4.1; Hveem & Malnes, 1980, pages 67-75). Chromium, the most highly critical mineral from the point of view of these five countries, is supplied largely by South Africa, Albania, and the USSR (table 4.2). The United Kingdom is in a relatively favourable import-dependence position regarding molybdenum, cobalt, and some other minerals because it receives these mainly from Canada, with which it has a close relationship. Here vulnerable transportation routes appear to be the major potential problem. Imports by the USA from Canada and Mexico are even more secure when judged by political, economic, and transportation factors.

For the USSR and China, the two major socialist countries, the picture is quite different. The USSR appears to be dependent—but apparently not critically so—on supplies of aluminium, barium, cobalt, tungsten, and perhaps a few additional minerals (table 4.1). The Soviet imports of cobalt from Cuba could also be vulnerable in the case of major crisis. China appears to be dependent on foreign supplies for at least some of its aluminium, copper, and iron (Chin, 1983, page 184). The current large Chinese industrial expansion programmes could reduce import dependence for some minerals, but possibly increase it for others.

The second main class of concentration factors lies partly in the domain of national politics and partly in that of the transnational corporate dominance of world industries. Governments have made long-term bilateral agreements for a large number of supply lines and for a number of minerals. Of the order of one-third of world trade in minerals takes place under some sort of countertrade agreement, such as barter, counter-purchase (‘offset’), or a compensation (‘buyback’) arrangement (BusinessWeek, 1982; Mahcr, 1984). Military items are often tied to such deals (Neuman, 1985).

In addition, transnational corporations conduct intra-firm trade. Perhaps one-third of world trade in minerals might be covered by such organized exchange. Historically, transnational corporations...
have been dominant in many if not most of the mineral industries in the world. They have integrated the product line vertically. Nationalizations have changed the bargaining situation in many instances, but in far from the majority of cases. If in addition practices of oligopolistic rule continue, with corporations operating cartels or something similar, the corporations could potentially control access to vital supplies. Even if the considerable overlap between negotiated bilateral trade and intra-firm trade is accounted for, the conclusion must still be that world industries are highly organized and highly politicized.

Although there are several possible motives behind the trends that are suggested above, two implications become quite clear: (a) access to supplies can be secured only following the completion of bargaining over non-economic factors; and (b) corporate dominance constitutes a gateway to supplies that has to be negotiated as well. To the extent that such factors operate, countries with greater bargaining power and transnational corporations having a special relationship with their home governments will enjoy privileged positions.

Demands by developing countries for a new international economic order have led to negotiations at the United Nations Conference on Trade and Development (first held at Geneva in 1964 and subsequently in various cities at three- or four-year intervals) over proposals to regulate trade in a number of minerals and other primary commodities. Various industrialized nations have opposed the idea of regulating raw-material industries in an efficient manner and this has led to considerable North-South conflict. Attempts to put the developing countries into a stronger bargaining position have foundered for several reasons, among them the high indebtedness of the developing countries and resulting lack of economic resilience, and their political disunity. This failure has been a major cause of the worsening economic and social problems being experienced today by many of the developing countries.

Raw-material prices went up in 1974-75 owing to a number of factors, among them (Hveem, 1978): (a) inflationary pressures which began in 1971; (b) a spurt of industrial growth that led to an increased demand for raw materials; and (c) anxiety over access to minerals triggered by the OPEC actions in 1973 (see chapters 2 and 3). Producer-country collaboration was the result rather than the cause of these price increases for a number of raw materials (aluminium, phosphates, and sisal having been notable exceptions). However, the perception of a substantial threat of cartel dominance in the mineral industries (see, e.g., Bergsten, 1973) proved to be largely ill-founded long before the recession in the main industrial countries started (Hveem, 1978; Maull, 1984). Since the late 1970s, raw-material prices have stagnated or declined, causing the terms of trade of most developing countries to deteriorate seriously (World Bank, 1985, pages 59, 153).

V. The strategic imperative and the potential for adaptation

In trying to cope with a situation of potential or actual vulnerability, several possible options could be considered by a country which is powerful enough to influence its environment. Short of war or threat of other violent form of action aimed at influencing the source of trade disruption, the burden of adjustment may be passed on to others, whether the disruption had been intended or not. During the Second Indochina War, the USA successfully pressured its suppliers of nickel into allocating a larger share of available supplies to US defence industries, forcing European and Japanese purchasers to turn to the USSR and suffer a fivefold price increase (Interfutures, 1979, page 53).

A country that produces and exports minerals can be considered vulnerable when it cannot cope with a loss of income from exports without having to undergo major economic and social adaptations. This is the situation which characterizes a great number of Third-World countries. The economic resilience of these countries to falling demand or to political pressures from importing countries is very modest, a condition that was reinforced by the stagnant world economy at the end of the 1970s which had led to high interest rates, balance-of-payment problems, huge foreign debts, and so forth.

Most importing countries have been able to continue to maintain secure sources for their desired raw-material imports. They have accomplished this through their foreign policies or by means of their transnational corporations. If options of this sort are either barred to a country or insufficient for the purpose, then domestic readjustment becomes necessary. Such adjustment involves a consideration of economic, social, and political costs. It is possible to assess where
a country is positioned on the sensitivity-vulnerability continuum with respect to minerals. For example, it has been shown that a modest (5-10 per cent) disruption of energy supply would have substantial effects on the US economy, as reflected in a 3-5 per cent drop in gross national product (Levine & Yabroff, 1975). Energy is the most critical resource category in this respect, oil and coal more so than uranium. The impact in terms of gross national product of material shortages in the non-energy categories appears in general to be less dramatic than for the energy raw materials. A 15-30 per cent shortage of supply for only about a dozen minerals could have serious effects on the economy. Some of these are, in decreasing order of impact: titanium, platinum, cobalt, tin, chromium, aluminium, copper, silver, nickel, and tungsten (Levine & Yabroff, 1975). By way of example, for the USA a 20 per cent cut in aluminium supply would mean about a 3 per cent reduction in its gross national product. For FR Germany, a 30 per cent cut in the supply of several minerals could have a profound effect on the economy even though they account for only a small proportion of the monetary value of the nation's total trade (Economist, 1979). Manganese is estimated to be of equal importance to the economy of FR Germany as copper even though the monetary import value of the latter is perhaps 30 times that of the former.

The scope for adjustments to overcome supply disruptions is large. Even if military requirements for a number of strategic minerals are estimated to treble in the case of war or other major crisis, policies of diverting consumption from civilian to military use are believed to be able to keep the economy as a whole of a developed nation running for at least a year (Little, 1974, page 60). Lateral pressure for civilian consumption would ease under such circumstances. If such circumstances did not apply, then the social costs could be considerable in terms of an increased burden on consumers or in employed people being laid off.

In order to protect themselves against having to face the option of costly adjustment, governments (as well as firms) have adopted a series of measures of national preparedness against supply disruptions. The best known is stockpiling. Stockpiling used to be practised chiefly by the USA. But during the late 1970s and early 1980s several other countries also initiated such programmes (Hargreaves & Fromson. 1983; Warncke. 1980). These programmes have made countries practically invulnerable in some of the most critical minerals, especially in the short term. Governments and firms are able to defuse a threat of price increase or embargo by resorting to their stockpiles.

Conservation is another measure which can strengthen the position of heavily import-dependent consumers. If the efficiency of recovering used material (scrap) is increased and the level of consumption reduced, the life of the resource base (the reserve and the stockpile) could be radically extended. More efficient processing techniques or material-saving designs are among the options. Up to one-third or so of total domestic consumption of some important industrial minerals was derived from recycling in the major industrialized countries in the early 1970s. However, an expansion of recycling is limited by technical and economic factors. The degree of governmental intervention may be a decisive factor in this respect. Thus recycling is more effective in FR Germany and Japan than in the USA, the main reason for the difference appearing to be that the former have instituted tax incentives and other regulatory measures.

A third option is substitution. The range of possibilities for substitution is very great for non-fuel minerals. However, substitution is not easily attained for political, economic, and technical reasons. Long lead times or high investment requirements may reduce the feasibility of substitution. The use of composite materials (i.e., synthetic materials reinforced with embedded fibres or particles) and plastics as substitutes for metals is on the increase. In the long run, these materials could reduce a nation's dependence on mineral imports for a wide range of civilian and military products.

Increased production from domestic deposits and exploitation of the extra-territorial ocean floor and Antarctica are possibilities for developed countries in the medium- to long-term perspective, although increased domestic extraction is not so much of an option for Western Europe or Japan as it is for the USA or Canada. Most major powers did stress this latter option during the raw-material crisis of the 1970s, but reductions in demand, increasing costs, and environmental considerations have thus far precluded such action to a great extent.

The technical feasibility of extracting minerals from the sea-bed has been essentially proved, but when large-scale exploitation will begin is largely an economic question. The nebulous future for the
1982 Law of the Sea Convention (see appendix 6)—not yet in force primarily because of the unresolved issue of control over high-seas mining—leaves a potential for future conflict. Third-World countries have expressed great concern that such mining could weaken their position as mineral producers and suppliers. They have striven for international control of sea-bed mining under the auspices of the United Nations that would serve the interests of all countries. To this must be added the potential for international conflict that arises from the growing interest in mineral exploitation in the two polar regions. The Falkland/Malvinas Conflict of 1982 can be attributed in part to an interest in the natural resources of Antarctica (see appendix 2, war 12).

VI. Southern Africa

The southern African region—primarily the area south of the Equator—occupies a prominent position in the strategic thinking of several, if not all, of the major powers. One reason is the importance of the region for sea transportation routes vital to international trade. Another is the role of the region as a supplier of several strategic minerals. The increased political tension and the possibility of large-scale violent interracial conflict within South Africa have made the region the potentially most volatile one in the coming years.

Various parts of the region were the scene of violent conflict during the 1960s and 1970s, and the cause is believed to have been in part the interaction between political and racial tensions on the one hand and natural resources on the other. For example, the present Zaire was dragged into a resource-related conflict on a number of notable occasions: the abortive Congo Civil War of 1960-64 and its two follow-up actions, in 1977 and 1978 (see appendix 2, war 5).

Apart from the political, economic, and logistical importance of southern Africa in global strategic thinking, there are three aspects of the regional situation that must be pointed out: (a) that a major political and racial conflict in South Africa could poison North-South relations and influence the relative positions of the major powers in Africa and elsewhere in the Third World; (b) that the region supplies Western powers and Japan with several of the most critical minerals; (c) that the largest alternative present and future supplier of some of these minerals is the USSR.

Above it is pointed out that chromium and cobalt are at the top of the list of strategic minerals which are particularly critical to the vulnerability of the USA, Japan, and Western Europe. Manganese should be classed with these also, because of its importance in the ferro-alloy industry, as should platinum and vanadium. Southern Africa is the largest source of supply for these minerals. If to this brief list are added gold (for its special role in financial reserve systems) and uranium (for its role in nuclear energy and in the manufacture of nuclear weapons) then the strategic importance of southern Africa becomes even more evident.

It has been suggested that the worst-case scenario from the point of view of strategic planners in the Western military alliance would have been one in which South Africa changed to black rule with a Marxist philosophy that would make it a logical ally for the USSR (Duchene, 1979). In that scenario, an embargo on supplies of minerals to the Western countries has been suggested to be a possible event. In a variant of this scenario, some kind of cartel behaviour would occur whereby the governments of southern Africa colluded with Moscow in order to dictate the conditions for supplying Western countries.

Less dramatic scenarios would probably be more realistic. Reports of Soviet involvement in the 1978 Shaba revolt (see appendix 2, war 5) have not been substantiated, neither have prophecies that Angola or Zimbabwe would turn against Western interests after decolonization or after changing to leftist governments. Indeed, employment and national economic reasons as well as normal political and diplomatic considerations seem to favour a continuation of existing supply arrangements even if domestic political systems change fundamentally. Moreover, there appear already to exist secret collaborations between the USSR and South Africa on the marketing of gold and of platinum that came to pass irrespective of differences in political philosophy (Hargreaves & Fromson, 1983, pages 12-13). Lastly, if an embargo is to be considered as a serious possibility, then it could be put into effect by the present Government of South Africa as well as by a new government. Indeed, South Africa recently announced the possibility of a cut-off of chromium to the USA and Western Europe (AP, 1985).

Continued violent conflict within South Africa and between it and some of its neighbouring countries, mounting pressure from Western powers, and a growing socio-economic crisis in large parts
Global resources and international conflict

of southern Africa all emphasize the volatile character of the regional situation. This, coupled with the fact that most of the major powers are particularly vulnerable with regard to some of the minerals for which the region is a prime supplier, warrants special attention to these minerals. An additional reason is what appears to be a growing need by the USSR to import some of these minerals, notably chromium and cobalt (Little, 1977). Such need could lead even the USSR to turn to southern Africa for imports. If this is indeed the case, a potential for East-West conflict over natural resources in the region could, of course, develop.

Uranium is extracted domestically by several of the nuclear powers, but is still the object of considerable international trade. The very special role of uranium as both a source of energy and a base for nuclear weapons also makes it a potential source of international conflict. This further enhances the importance of southern Africa, for the region is also a substantial source of that mineral.

Three of the strategically most crucial minerals associated with southern Africa—chromium, cobalt, and uranium—are singled out below for more detailed examination.

Chromium

By far the largest use of chromium—perhaps three-quarters of it—is for metallurgical purposes. The bulk of the metallurgical applications is in the steel industry, where chromium is added to steel in order to make it harder, less subject to corrosion, and more heat-resistant. It appears to be an indispensable additive, at least in the medium-term perspective.

Reserves, production, and exports are all highly concentrated at the country level (table 4.2). South Africa and, to a lesser extent, Zimbabwe together account for most known global reserves. The USSR and South Africa are the current main producers, whereas South Africa, Albania, and the USSR are the current main exporters. Japan has been the main importer for a number of years.

Countries currently producing moderate amounts of chromium are: Turkey and the Philippines, both allied to the West and both experiencing declining shares of world production; Finland and Zimbabwe, both non-aligned and both with stable shares of world production; and Albania, non-aligned and experiencing a rapidly increasing share of world production. The rapid expansion of production in Albania during the past decade has made it one of the largest exporters. A decrease in Soviet exports of chromium appears to reflect both a real decline in self-sufficiency and a policy of protecting its own reserves from being depleted too rapidly. It is even possible that the USSR will become an important importer before the end of the decade. A similar, if not quite as explicit, tendency to reduce exports can also be discerned in several other producing countries. Such a trend can only lead to an even more concentrated international supply situation.

Another general tendency is for producing and exporting countries to turn into processors (mainly of ferro-chromium) in order to reap a higher share of value-added profit, or for reasons of economic nationalism. This logically challenges the market shares of established metallurgical, refractory, or chemical producers and the mineral policies of major powers that wish to preserve a strategically important processing industry. This represents yet another potential source of conflict.

If the chromium industry is highly concentrated at the country level, then the degree of concentration at the corporate level is even more pronounced. Chromium in the capitalist world is involved in a complex and apparently stable cobweb of conglomerate corporations with ownership, partnership, or other linkages among themselves. The Anglo American Corporation of South Africa is apparently the centrepiece of this oligopolistic system through its dominant position as a controlling agent in GENCOR and some of the other principal South African and Zimbabwean producing companies. Through joint ventures with other corporations such as the Rio Tinto Zinc Corporation in the United Kingdom, and by integrating 'downstream' into the processing and refining of chromium and steel, the Anglo American Corporation of South Africa appears to have secured for itself a key decision-making position in the global chromium industry.

There is relatively little apparent 'upstream' integration by the big steel and ferro-alloy producers in the USA, Canada, or Western Europe. There may, however, be an element of control by such agents in the form of long-term contracts and special relations of a more informal character. Prices are not determined in a free market, but in negotiations by the corporations. There is also an important element of price differentiation in specific market seg-
menials, assisted also by tariff and other barriers. Such features could, in a light supply situation, lead to the less privileged buyers being left out of normal supply.

These structural and political factors create a level of uncertainty that has led to considerable efforts to diversify supplies and to intensify measures of domestic adjustment. Diversification into new territories or old mining sites with lower grade ores is, however, always under the threat of South African producers who are in a position to cut prices and flood the market with cheap chromium, ferro-chromium, and even stainless steel. Domestic adjustment therefore appears to be a more feasible choice. There are stockpiling programmes in all of the major industrialized countries, both in the governmental and private sectors. Recycling is now providing of the order of one-quarter of all chromium needs. Perhaps one-third of the chromium used today could theoretically be substituted for; but for a range of important applications, as in stainless steel, there is simply no substitute. Chromium could be replaced for some purposes by materials such as titanium, nickel, or composite materials based on boron or silicon. However, these substitute materials suffer from either deficient performance or higher cost, or both. Technical innovations have so far not come far in overcoming these problems. Therefore, it appears as if chromium is one mineral that will continue to occupy a highly strategic position in the world arena. The limits of domestic adjustment measures and the uncertainty facing diversification strategies add to the extreme concentration of control over the first links in the production chain, to the unbalanced vulnerability of the major powers, and to the location of reserves, production, and corporate decision-making in an increasingly unstable area. These factors clearly combine to make control over chromium a potential for international conflict.

Cobalt

Cobalt, like chromium, is a strategic mineral that is likely to become involved in conflict. In 1976, transportation of cobalt from two of the three main exporting countries—Zaire and Zambia (table 4.2)—was interrupted for some time by the civil war that had just then started in Angola. In 1976, military forces opposed to the Government of Zaire attacked mining installations in Shaba Province (see appendix 2, war 5), leading to an interruption of production (Commerce, 1981). Belgium responded, backed by some other NATO governments, by deploying a military force in Shaba. The resulting supply disruptions caused the USA to declare cobalt a so-called priority metal in its national stockpile (bringing the list of those to 11) (Guttman et al., 1983).

Cobalt is a vital alloying element in metals for the aerospace industry. In fact, an estimated 17 per cent of US consumption goes into the manufacture of jet aircraft (Maul, 1984, page 215). The crucial property of cobalt alloys is their resistance to high temperatures. The second main application for cobalt is in permanent magnets and thus in electric motors; and the third is for a variety of uses in the chemical industry.

The availability of cobalt is highly dependent on the production of copper and nickel as some 95 per cent of all cobalt is mined in association with these two metals. As cobalt is also usually less than 3 per cent of the metal content of the ores mined, the linkage of cobalt to copper and nickel is an important structural determinant for the world cobalt regime. Only exceptional circumstances could lead to a decision to mine cobalt without first considering the copper or nickel situation. Since the mid-1970s, cobalt production has stagnated owing to reduced demands for copper and, to a lesser extent, nickel.

World resources of cobalt are abundant, especially so if the cobalt content of sea-bed nodules is considered; the quantity of these sea-bed deposits is estimated to be huge (Guttman et al., 1983; Waldheim, 1975). However, in the short- to medium-term perspective the reserve situation is centered around access to deposits in Zaire, in Zambia, and in the USSR (table 4.2). If low-grade currently non-commercial deposits of cobalt are considered, then Cuba, New Caledonia (an overseas territory of France), the Philippines, and the USA become potentially important producers and, to a lesser extent, also Finland and Morocco. However, the USA at present remains the major importer (table 4.2).

In the short- to medium-term perspective, the two main African producers—Zaire and Zambia (table 4.2)—occupy a strategic position, whereas in the longer term, the Pacific producers may become more important. Reactions to the 1976 and 1978 Shaba events (see appendix 2, war 5) suggest that the short-term perspective cannot be overlooked. For example, the USA started buying cobalt in 1976 in order to double the size of its strategic stockpile (Guttman et al.)
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This action and subsequent destruction of production facilities in Shaba led to soaring prices. The effect was all the more dramatic as the Shaba incidents coincided with an increasing demand for cobalt during a period of depressed demand for copper and nickel. The price increases led to a sudden increase in purchases from Zambia and a renewed interest in producing cobalt domestically in the USA, where production had ceased in 1971. The response of Zaire was to reduce its selling price to well below the cost of production and to far below what was considered a break-even price for resumed production in the USA or elsewhere. Thus, instead of some form of collusion between Zaire and Zambia, there developed intense competition.

A knowledge of the corporate structure in cobalt is—as is also the case with chromium—crucial to an understanding of the world cobalt regime. The market is highly organized. The Belgian financial-industrial conglomerate, Société Générale, has a part in the management of GECAMINES in Zaire and its trading arm SOZACOM and, through its processing arm in Belgium, is one of the main buyers of cobalt from Zaire, in association with copper. INCO of Canada and Falconbridge Nickel Mines of Canada are important producers of cobalt. Another is the Anglo American Corporation of South Africa, which holds an important share in the Zambian producer, Zambia Consolidated Copper Mines. As dominant producers and as vertically integrated entities, these corporations logically have a common interest in preventing diversification away from areas which they control and in keeping prices low on the raw materials which they process. At the same time, they may feel inclined to compete for market shares when the market is unstable and when demand is down.

As with chromium, there is no world price for cobalt. Prices are set by producers or negotiated in contractual arrangements, or are simply a matter of intra-firm trading and hence a corporate decision. If the Belgian-Zairian sub-system may be considered a price leader in the capitalist world, there are several 'special relationships' where factors other than price count. Additionally, there exist Cuban-Soviet and Japanese-Australian sub-systems. Imports to the USA are also highly concentrated (Kirk, 1983).

If diversification has been inhibited so far by volatile prices, adjustment measures seem to have had some success. Total consumption is being reduced by cutting down on the amount of cobalt being used in specific applications. Cobalt can be applied in smaller quantities and still offer its unique heat resistance, but it cannot be completely substituted for. Besides, some of the substitutes, such as molybdenum, are also critical materials. New techniques to apply a changed material composition already exist; the lead time is therefore not as long as is usually the case when substitution is considered. Recycling, on the other hand, seems to offer few adjustment opportunities because scrap is mostly spread in a large variety and number of products, often in very small quantities.

The medium-term availability of cobalt will be influenced largely by developments in southern Africa. Political instability and fragility of transportation networks are factors that must be taken into account. Again, the highly unbalanced supply situation between the major powers of East and West could provide a potential for conflict. This is partly why the major Western powers, probably even Japan, maintain stockpiles of cobalt. US stockpiles appear to be sufficient for about six years of domestic consumption (Sibley, 1980, pages 206, 209-10).

Uranium

Uranium is used in the manufacture of nuclear weapons and this aspect alone makes it a strategic mineral. Practically all non-military uses are for the production of energy. In the immediate aftermath of the 1973 oil crisis, access to uranium was considered by many countries to be important because of its use in producing energy. For countries with nuclear-energy programmes, it became a special matter of national security in the 1970s to obtain satisfactory control over all relevant links in the extraction and manufacture of uranium.

Although the perceived urgency of ensuring access to uranium has eased somewhat owing to a radical downward revision of many nuclear-energy programmes, this is still considered highly important. The military aspect of access to uranium has become ever more important owing to continued proliferation of the capacity to produce nuclear weapons. In addition, environmental concerns have become far more important to populations all over the world.

The expanded programmes of uranium production in the 1970s led to a perception of impending depletion. A rush developed on those uranium deposits that could still be considered not closely
controlled by the nuclear powers, such as those in Australia. Although this rush has now slackened, there remains considerable uncertainty as to the future development of the uranium industry. Inasmuch as fuel being used to make nuclear explosives accounts for only a marginal share of total uranium demand, neither escalation of the nuclear arms race nor nuclear disarmament would exert a big effect on total demand.

A very considerable level of secrecy pervades the uranium industry. The only national system which is relatively transparent is the US one; the Soviet system is especially opaque, as is also that of China. Major reserves are known to exist in Australia, South Africa, and Canada (table 4.2), although the USSR and China are also thought to have large reserves. As regards current production, the USA heads the list, with South Africa and Canada not far behind (table 4.2). However, US production is at present declining owing to a combination of reduced demand and environmental concerns, so that Canada will probably soon become the largest producing country in the capitalist world. As there is a long lead time from initiating uranium production to achieving an output in the form of fuel, changes do not take place rapidly. It is expected that in the 1990s and 2000s the US nuclear industry will be importing up to 35 per cent of its total uranium consumption, largely from Canada, as compared with an import level of less than 10 per cent in the 1970s and early 1980s (Reagan, 1984). Japan, France, and FR Germany are the current major importers (table 4.2).

Uranium extraction and manufacture are tightly regulated. Some 90 per cent of all sales are covered by long-term (at least 10-year) contracts, often containing restrictive clauses. Only a small proportion of these contracts are made without governmental participation. The structure of the market and the high strategic importance of the products imply that there is no world price. This only goes to emphasize that availability and security of supply are considered by most users as being much more important than price. Price competitiveness may, however, be important for small utilities and for those who compete directly with other energy producers.

A considerable part of uranium production is controlled through vertical integration and by conglomerates. Nuclear energy producers (e.g., the Westinghouse Corporation in the USA and Compagnie Générale d'Electricité in France) and energy diversifies or conglomerates (e.g., Exxon in the USA) are therefore to some extent involved in uranium production. There are also some so-called uranium independents (e.g., American Nuclear). Finally there are the conglomerate mineral producers, some of which are also vertically integrated. The most important ones are the Anglo American Corporation of South Africa, the Rio Tinto Zinc Corporation in the United Kingdom, and the Newmont Mining Corporation in the USA. The two former control practically all of the combined production in South Africa (including Namibia). Anglo American being the leading partner in NUFCOR, the South African marketing cartel. Cross-ownership or minority ownership link several of the large corporations, facilitating co-ordination and cooperation. An international cartel was organized in 1972 (with headquarters in Paris) among uranium producers in Australia, Canada, France, FR Germany, and the USA which is said to have organized a market-sharing agreement that for several years led to major price increases (Bethel, 1977). Since Rio Tinto Zinc is also strong in Australia (the country which has expanded production the most since the 1970s), the Anglo American-Rio Tinto Zinc link must be considered a vital one in future world trade in uranium.

US uranium producers have formed NUEXCO, whereas most of the other corporate producers are members of the Uranium Institute in London. The role of the Uranium Institute is not well known, but it probably serves as a co-ordinating unit and information pool, perhaps even as a quasi-cartel. It can be assumed to have some influence over three of the main uranium trade routes: from southern Africa to Western Europe and Japan; from Australia to Japan and the United Kingdom; and from Canada to Western Europe. However, some of the producing countries are not regulated by the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (for which see Goldblat, 1982, pages 172-74) and this may have an important effect on the international movement of uranium. Thus the uranium regime appears able to secure long-term supplies of uranium for enrichment facilities throughout the capitalist world. However, it must be considered weak when it comes to providing security against military applications or against leakages that threaten the environment during extraction and manufacture.

The French sub-system could become another dynamic factor in the uranium industry (Rydell & Mullins, 1981). France itself has expanded production. More importantly, French interests are
dominant in what is a rapidly growing level of production in three African countries with no domestic demand, but apparently with considerable reserves: Niger, the Central African Republic, and Gabon. Indeed, more than one-third of the national budget of Niger now rests on its income from uranium (Rydell & Mullins, 1981, page 34). Supplies to FR Germany are provided through joint ventures within the French subsystem together with producers in southern Africa and Canada. Japan has organized its imports in closely woven relations with producers in Australia and South Africa.

A fear in the mid-1970s over supply shortages in the capitalist world has led to a situation of world-wide over-supply. In 1983, known stocks represented more than three years of consumption. The great gap between forecasted and actual requirements in the recent past is a warning that future developments, even when restricted to the capitalist world, can only be guessed very roughly.

From a strategic point of view, the dynamic factors of importance in relation to uranium are: (a) the evolution of the East-West political climate and the arms race; (b) the extent to which the policies of countries with a potential to develop nuclear explosives can be controlled or at least foreseen; and (c) the developments in southern Africa. All of these factors can exert pressures on the uranium industry and lead to conflicts over access to supplies or over attempts to deny such access.

VII. Conclusion

This chapter shows the extent and importance of strategic considerations vis-à-vis those minerals which are seen as critical to military as well as national economic interests. Although there are few examples of direct violent intervention to control sources of mineral supply, there is a clear potential for such conflict. The volatile situation in southern Africa is pointed to as being especially important in this regard. The military and political-ideological competition between the USA and USSR and the economic competition among the major powers are both additional factors of great importance.

Changes in demand and the potential for adjustment domestically are among those factors which influence the strategic mineral industries. However, all of the three minerals which are given special attention here remain indispensable for military and civilian purposes, at least for the next 10 to 15 years. Technological developments and measures of stockpiling can alleviate, but not entirely eliminate, this dependence. And, as most major powers are dependent upon mineral imports, the crucial dimension in policymaking is, and will continue to be, foreign policy.

For mineral-producing countries in the Third World, it is of particular importance that their exports continue in order to provide them with highly necessary income. For mineral-poor countries, it is of particular importance that their imports continue in order to maintain their industries. Multilateral agreements to meet both of these needs would reduce international tensions and are thus a prerequisite for ultimate world disarmament (Hveem & Malnes, 1980).

If attempts are made to make access to foreign sources of supply more difficult, countermeasures can be expected that could in time lead to open conflict. The possibility that this will happen is a function of: (a) the East-West relationship; (b) policies of control over natural resources in producing countries, (c) the extent and form of corporate control overproduction, marketing, and distribution; and (d) the development of new sources of supply. In the short- to medium-term perspective, even the import-dependent countries appear to be in a good position to secure suppliers because: (a) they maintain close diplomatic and economic relations with many of the resource-surplus countries; (b) many of the corporations running the mineral industry are home-based in—and to a considerable extent dependent upon the assistance of—the countries which they mainly supply; (r) much of the international trade is tightly controlled in the form of long-term contracts or intra-firm trade; and (d) the probability is not great that an opponent will intervene in their transportation routes.

In closing, two points stand out: (a) that the weak link in the mineral supply chains is southern Africa; and (b) that the volatility of mineral supply and demand could add to the competition among the major powers and thus to the potential for international conflict.
References


