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**STRATEGIC MINERALS
IN THE NEW WORLD ORDER**

Kent Hughes Butts

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STRATEGIC MINERALS IN THE NEW WORLD ORDER

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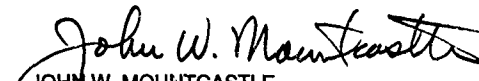
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FOREWORD

The U.S. dependence on overseas sources of strategic minerals essential to sustain its economy and defense sector is much more pronounced than its dependence upon foreign oil. Approximately 50 percent of the oil consumed in the United States is imported. By comparison, the United States almost totally depends upon overseas suppliers for its most important strategic minerals. There are substitutes for petroleum as a source of energy, but this is not true of critical minerals. There is not, for example, a substitute for manganese in the production of steel. During the cold war, U.S. vulnerability to supply cutoff became an active part of Soviet geopolitical strategy and much literature reflected upon the "resource war" between the United States and the mineral rich Soviet Union. Although the cold war has ended, U.S. vulnerability to a loss of access to these important mineral supplies is more pronounced than at any time since World War II. The uneven distribution of strategic mineral reserves and their concentration in a handful of politically unstable countries make it essential that U.S. policymakers ensure mineral availability in the new world order.

The author of this report examines the geographical imbalance of mineral trade patterns, evaluates the stability of the major strategic mineral producing countries, and assesses the potential for mineral supply disruption. He also examines the major policy options for reducing U.S. vulnerability to a loss of strategic mineral supplies and demonstrates that the National Defense Stockpile, the nation's primary bulwark against a loss of mineral imports, is being disposed of.

By calling attention to the chronic political instability in the most critical mineral producing countries and the vulnerability of the National Defense Stockpile, this report represents an important contribution to the debate concerning how best to protect the United States from a loss of these vital materials.


JOHN W. MOUNTCASTLE
Colonel, U.S. Army
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BIOGRAPHICAL SKETCH OF THE AUTHOR

KENT HUGHES BUTTS is a Strategic Research Analyst with the Strategic Studies Institute (SSI), U.S. Army War College. A 1973 graduate of the U.S. Military Academy at West Point, Lieutenant Colonel Butts holds a Master's degree in Business Administration from Boston University, an M.A. and Ph.D. in Geography from the University of Washington, and was a John M. Olin Post-Doctoral Fellow in National Security at the Center for International Affairs, Harvard University. He is a graduate of the Army Command and General Staff College and the Army War College. A former Associate Professor at the U.S. Military Academy where he was the course director for the Conservation of Natural Resource Course and Strategic Minerals Seminar, Lieutenant Colonel Butts has served in Southern Africa as a U.S. Defense Attache. On a separate assignment he traveled widely in Southern Africa for the Department of Defense conducting a study of strategic minerals in which he visited the major strategic mineral producing mines, smelters and export terminals. His doctoral dissertation was entitled "Resource Geopolitics: U.S. Dependence on South African Chromium" and he is co-author of the book, *Geopolitics of Southern Africa: South Africa as Regional Superpower*, published by Westview Press.

SUMMARY

Strategic minerals are those metallic minerals that are critical to the economies and defense sectors of the industrialized countries. Chief among them are chromium, cobalt, manganese, and the platinum group metals. The United States annually consumes over one million tons of these four minerals alone. They have no substitutes in their most critical uses, such as superalloys for the high-tech weapons systems and the production of steel. Although relatively abundant and low cost, reserves of these minerals are geographically concentrated in southern Africa and the former Soviet Union. The United States and the other industrialized countries have no significant domestic reserves of these minerals. The resulting vulnerability to import supply disruption and their criticality to the economy and weapons production make these minerals strategically important to national security.

At the end of World War II, security analysts wrongfully assumed that new high-tech nuclear weapons would obviate the need for conventional warfare and drew down force structures and conventional logistical support systems to low levels. Within 5 years the Korean War had broken out and the United States was forced to spend \$7 billion under Title III of the Defense Production Act to expand supplies of the strategic minerals essential to the defense and economy of the United States. Today, mineral security planners at the Department of Defense are making a similar assumption: that in the wake of the cold war's end, the United States will have free and open access to the mineral supplies of foreign producers and a single future conflict involving U.S. forces will be of short duration and easily terminated using new, sophisticated high-tech weapons systems.

Significantly, these assumptions are the justification for the Department of Defense (DOD) selling off the \$6 billion National Defense Stockpile and reducing the supplies of its strategically important minerals to approximately \$440 million. This policy decision, which has now received congressional authorization,

is not consistent with DOD's own Bottom Up Review scenario, which suggests that the United States may be required to fight two regional wars at the same time in the 1990s, and the reality that because of economic and political instability in the producing countries, strategic mineral supplies to the United States are less secure today than at any time during the cold war. This study examines the political and economic variables affecting stability and the security of supplies in the important mineral producing countries and determines that the political instability and economic difficulties affecting most mineral producers reduce their reliability as suppliers of U.S. strategic mineral imports. The study also examines the policy options available for minimizing U.S. vulnerability to mineral supply disruption.

Minerals Vulnerability.

Resource dependencies create vulnerabilities and the potential for political instability whenever a country is not autarkic. If the United States, for example, produced sufficient quantities of industrial minerals and petroleum to meet its own economic needs, then it would be economically self-sufficient and able to govern its own destiny. However, the United States is not self-sufficient in mineral production; its powerful economy depends for the factor inputs of its production upon supplies produced in other countries and, therefore, upon political decisions made in the international arena. Thus, the U.S. economy and its national security are vulnerable to the cutoff of supplies of these resource imports. The degree of vulnerability is governed by such factors as the geographic location of mineral deposits, the availability of substitutes for those resources in critical industrial processes, the availability of technology to recover and process the minerals, the economic price of the resources themselves, and political and economic threats to the producing countries.

The geographic imbalance of supply and demand creates problems for the United States. When the supply of a given resource is concentrated in one or a few developing countries, and the demand for the resource is concentrated in the industrialized countries, a precarious balance exists that may

threaten political stability. The politicization of the developing world and the enmities of the North-South debate in the 1970s led to the nationalization of mines and caused political and economic leverage and power to shift to the producing countries. At the same time, the Western industrialized countries had to concern themselves with the potential for the Soviet Union to cut off supplies of its strategic mineral exports, as it did during the Korean War and the Berlin Blockade, or to encourage surrogates to threaten mineral supplies from other countries, such as the Shaba II invasion of Zaire in 1978. Today, regional conflict and internal collapse in producing countries pose a new threat to the scarce supply of strategic mineral resources that exceeds the threat of Soviet cutoff during the cold war.

The strategic mineral reserves and production capabilities of the world are concentrated in the former Soviet Union and southern Africa. Of the foremost important strategic minerals, chromium, cobalt, manganese and platinum, these two regions account for 88 percent, 63 percent, 91 percent, and 99 percent of the known world reserves, respectively. (See Figure 1.) With the exception of small quantities of platinum produced domestically and scrap, the United States is 100 percent dependent upon foreign imports for its supplies of these four strategic minerals. In addition, the chief competitors of the United States for world market share, the European community and the Pacific Rim nations, also depend upon mineral imports from these regions for most of their strategic mineral requirements. Thus, the political and economic stability of the producing countries is critical to U.S. national security needs.

The New Threat.

Strategic mineral producing regions face greater political turmoil and economic challenges today than at anytime since World War II. In Africa, the mineral producing countries of Zaire, Zambia, and South Africa are struggling to make the transition to multi-ethnic democratic rule. In Zaire, President Mobutu has been reluctant to give up power and has created a situation of political and economic chaos that has caused the expatriate foreign workers essential for the production of

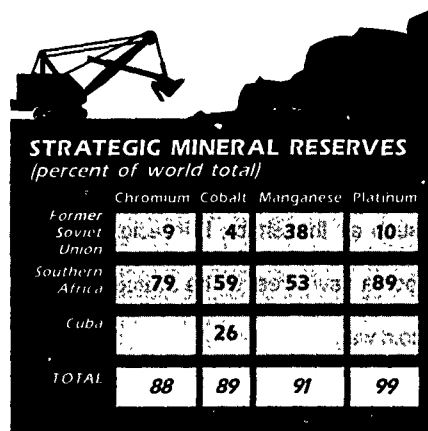


Figure 1.

minerals to flee the country, ethnic violence and the breakdown of law and order. The economy and production from strategically important copper-cobalt mines have ground to a halt. In Zambia the mine production has dropped 40 percent since 1978 and the new Chiluba government is struggling unsuccessfully to manage a weak and faltering economy inherited from long-term President Kaunda. In South Africa, where the world's greatest concentration of platinum, manganese and chromium occur, the transition from white rule to multi-ethnic government has been complicated by increasing black-on-black violence, a loss of control of the social infrastructure by the police and the defense force, and the recent assassination of A.N.C. military leader and its chief representative to the country's angry youth, Chris Hanni. Once optimistic predictions of a smooth transition have given way to forecasts of exacerbated ethnic violence and radical drop in the efficiency of and wealth returned to the important mining sector.

The former Soviet Union is struggling with a transition to democratic forms of government that includes the recent coup attempts and a problematic conversion to a market economy. These struggles have generated enormous inefficiencies, and a breakdown in central control and the traditional methods of marketing its minerals that provided mineral industry access to exploration, production and smelting technology. Because of the distances involved, transport costs for moving minerals between mine site, smelting and refining locations in the former Soviet Union may prevent the profitable recovery of strategic minerals. In addition, the production and export of these minerals are threatened by the ongoing ethnic and nationality based violence and regional efforts to gain political and economic power.

What these events make clear is that neither the former Soviet Union nor the region of Southern Africa can be depended upon to sustain the levels of mineral production upon which the Western industrialized powers have come to depend. Because of the physical concentration of strategic mineral reserves, the collapse of one of the major mineral producing states could result in significant shortfalls that would have a devastating impact on the U.S. economy and the ability of the United States to reach its objectives in a surge capacity. For this reason it is important to focus on options for reducing supply vulnerability.

Policy Options.

Several options exist to reduce this vulnerability to the disruption of imports from the producing countries. The consuming countries can promote conservation in the use of the resource. Substitution and domestic mining can be encouraged by tax policies that increase the price of mineral imports, and by added funding for R&D efforts that develop technologies requiring alternative resources. Tax incentives and development aid can promote exploration in other countries so that the sources of supply will be broadened. However, most of these solutions are price dependent and are affected by domestic economics.

Implementation decisions will not be supported unless there is an economic incentive. While the price of the mineral remains relatively low, manufacturers will be encouraged to use it more widely in the production of the manufactured goods. Similarly, research and development will only be funded if the new product promises to be economically viable, not because of the possibility that supply access could possibly be lost. Business decision making in America is based on short-term profit motives and this drives most private R&D funding.

Even more difficult is the problem of exploring for new reserves. Such exploration is costly, time consuming, and is undertaken only if there is the possibility of attaining a return on the exploration investment. Although highly concentrated in a handful of countries, the known reserves of easily mined chromium, cobalt, platinum and manganese found in southern Africa are sufficient to sustain current or projected industrial world consumption for at least a generation. The abundant and easily recoverable supplies of these minerals outstrip demand and the resulting low prices do not encourage active exploration strategies on the part of mineral producers or consumers. They are unlikely to be undertaken without government incentives.

Governmental incentives for the vulnerability reducing options of exploration, conservation, alternative R&D technology and substitution are politically difficult to achieve. In times of constrained domestic budgets there is rarely support for such non-market "insurance" measures. Even with the current political uncertainties in producing countries, few policymakers in Washington are preparing initiatives to reduce supply concentration vulnerabilities.

Domestic mining is limited primarily because of the strength of the environmental pressure in the United States which decreases the innate profitability of any mining venture; the low cost of foreign supplies; and the inadequate domestic reserves of the most important strategic minerals. However, domestic mining can contribute to U.S. minerals security at the margin if the revisions to the Mining Law of 1872 recognize domestic mining's right to exist and include reasonable royalties.

Critical Importance of the Stockpile.

The single best option for mitigating the threat of mineral import cutoff is the National Defense Stockpile. Born from U.S. experience in the two World Wars and Korea, the stockpile contains over \$6 billion in the strategic and critical materials necessary to meet U.S. requirements during wartime or surge conditions. The quantity of minerals contained in the stockpile has been based upon goals associated with a 3-year war scenario, and reflect the importance to national security of the four minerals discussed above. Although requiring regular specification updating to reflect changes in technology, and requests of Congress for the funding necessary to achieve its goals, the stockpile has provided a bulwark of minerals security that complements the more recently created Strategic Petroleum Reserve and allows the U.S. Government to respond to events in mineral producing countries in a non-crisis atmosphere.

Key Judgments.

The National Defense Stockpile already exists. To realize the security advantages of this option, great sums of money need not be appropriated; it simply needs to continue as it is, with minor annual adjustments. Selling off the stockpile when the threat to the mineral producing countries is at unprecedented levels makes no more sense than selling off the Strategic Petroleum Reserve to help balance the budget when Middle East security is in doubt. While there is legitimate concern that a 3-year war scenario may not be justified as the basis for maintaining the national stockpile, it is too early to determine what the future threat environment will be. Few people anticipated the Gulf War, U.S. involvement in Somalia, possible involvement in Bosnia, and other potential peacekeeping and peacemaking activities for U.S. forces, or the dangerous intransigence of North Korea. Moreover, the proliferation of weapons of mass destruction, political Islam and a plethora of nationalistic conflicts from the Balkans through the Caucasus to the Cape of Good Hope, reflect a dynamic and unpredictable geopolitical environment that could involve the United States in conventional war at anytime. The

DOD effort to virtually eliminate the stockpile based upon the unrealistic assumption of a single 3-month war is dangerously optimistic and fails to consider the threat to mineral producing countries. The assumptions on which this new scenario is based and DOD's request to sell nearly \$5 billion of stockpile materials have been challenged by many experts in industry and government, and several foreign producing nations.

Given the unsettled international situation and the threat to stability in the mineral producing countries, it would be far wiser to retain the National Defense Stockpile and examine the stockpile goals with meaningful input from the congressionally mandated DOD Government-Industry Advisory Committee on the Operation and Modernization of the National Defense Stockpile to ensure multi-agency advice on this critical issue. The stockpile has many critical ferroalloys such as ferrochromium and ferromanganese that have been built up over the last decade through specific contracts directed toward the few remaining U.S. ferroalloy producers. These minerals are required in surge capacity in large quantities. The United States consumes over a million tons of chromium and manganese every year primarily in their ferroalloy form. Other critical elements required in large quantities are copper, lead, and zinc. The DOD plan would retain none of these materials in the stockpile requirements. Without sufficient stockpiles of these materials, the United States is vulnerable to a shortfall in munitions and armaments in time of surge capacity, and, as events of the last 2 years indicate, the United States has little warning when it will become involved in regional wars.

The proliferation of nuclear weapons technology, the breakdown in control within the former Soviet Union, and the rise of radical religious fundamentalism could, at any time, generate armed conflict in distant areas of the globe in which the United States, for its own national security interests, would be compelled to participate. Thus, Congress should elevate the importance of minerals security in its domestic and international policy recommendation to the administration and reconsider authorizing the Department of Defense to sell nearly \$5 billion in stockpile materials. Congress also should direct DOD to request meaningful input from other relevant

agencies such as State, Commerce, Department of the Interior (Bureau of Mines), and the Federal Emergency Management Agency, and require a vetting of new stockpile goal proposals by the DOD Government-Industry Advisory Committee on the Operation and Modernization of the National Defense Stockpile. By following this cautious approach, the best minds associated with U.S. readiness will be contributing to DOD's efforts to maintain this important area of national security.

STRATEGIC MINERALS IN THE NEW WORLD ORDER

INTRODUCTION

While the cold war has ended, U.S. requirements for Africa's industrial materials have not. Southern Africa is the Persian Gulf of minerals. The only significant alternative source of supply is the politically unstable former Soviet Union. Both the United States and its major economic competitors in the new world order (Japan, the Pacific Rim, and the European community), depend upon imports for the most salient of their critical industrial materials. Recalling that Japan went to war partly to maintain access to petroleum and scrap metal, and that the Third Reich was at least partially motivated by its denial of access to colonies and their mineral wealth, it is reasonable to assume that access to mineral resources could become a divisive issue that would lead to conflict between the industrial nations. This study examines the current global pattern of supply and demand for the minerals essential to the U.S. economic and defense sectors to determine the stability of the mineral producing countries and the security of their supplies. It then evaluates policy options for reducing U.S. vulnerability to mineral supply cutoff, and preventing mineral-related conflict.

Strategic minerals policy has traditionally been cloaked in controversy. In part, this is because it involves competing ideas in America's political and economic culture. Those espousing free trade maintain that mineral scarcity does not exist; for an "economic" price any product will be available in the world market. The domestic mining industry and those responsible for ensuring economic and domestic productivity and maintaining America's capacity to meet surge capacities in time of national emergency, however, point out the long lead times for new mining development and other vulnerabilities in the free market system. They lobby for some form of security insurance. Because any form of insurance requires costs, free

traders have always found a sympathetic ear in budgeteers and mineral consuming industries. In the First World War, for example, industrial interests, well represented by the War Industries Board, overcame the argument of risks to U.S. shipping, and domestic mining industry efforts to establish subsidies for U.S. mineral production, using foreign flag hulls to import the minerals and the United States continued low cost mineral imports. However, the greater role of the United States in World War II and in Korea led the government to encourage domestic mineral production.

Other controversy concerned the Soviet threat. Because the largely autarkic Soviet Union was aware of the importance of strategic minerals and had cut off U.S. supplies of these minerals during the Berlin Blockade and the Korean War, there was much written about the need to protect the United States from a loss of access to strategic mineral imports during the cold war. Debate surrounding protection policies again involved the domestic mining lobby, which sought protection for U.S. mining and subsidies to encourage domestic alternatives; environmentalists seeking to prevent further mining industry damage; and those who saw the strategic minerals debate as but another politically incorrect effort to portray the Soviet Union as an evil empire. In advocating their position in the debate, these interests typically over- or understated the importance of minerals and made assumptions that attempted to undermine opposition credibility. Therefore much of the literature concerning the U.S. strategic minerals position reflected the particular organization's political agenda. The fact remains, however, that the U.S. supply of strategic minerals is a critical and essential part of the economy, the defense industrial complex, and of any plan to reach surge capacities in time of national emergency. The United States does not produce its most important strategic minerals domestically and consumes over 1 million tons of the four most critical minerals in a *peacetime* environment. The need to ensure supply security for these minerals will remain an important aspect of U.S. national security strategy for the foreseeable future.

Much of the literature associated with the strategic minerals debate assumed a loss of access resulting from geopolitical decisions made by the Soviet Union. Access to strategic minerals was examined from the perspective of political denial, not production capacity collapse. Thus, the thinking went, in the absence of a Soviet threat, secure supplies of strategic minerals may be assumed. Unfortunately, the demise of the Soviet Union has unleashed interstate and intrastate nationalistic fervors and a widespread experimentation with democracy and multi-party states. Those conditions threaten to bring, at least in the short term, civil disorder, regional conflict, and economic and political instability in the mineral producing countries. Analysis of access to strategic mineral imports should now focus less on the "potential actions of adversaries to change the status quo" in mineral trade relationships, and more on the political and economic variables that govern the longevity of governments and on the mineral industries in those countries producing the greatest quantities of the strategic minerals.¹

In his 1980 State of the Union Address, President Jimmy Carter drew a line in the sand and declared the security of the Persian Gulf to be a *vital* U.S. interest, one for which men, if necessary, would fight and die. The Carter Doctrine underscored the vulnerability of U.S. economic vitality to a cutoff of mineral imports, which is greater now than in 1980. To meet their energy needs, the United States and the other OECD countries must depend upon petroleum imports, and most of the known reserves of petroleum occur in the Persian Gulf. Should access to this resource be lost, alternative sources of supply would be insufficient to support the world economies. In recognition of this vulnerability, the United States created a petroleum stockpile, the Strategic Petroleum Reserve, to provide a domestic reserve should access to foreign supplies be lost. This classic geographical conundrum, the spatial imbalance of natural resource supply and demand, poses a significant problem for U.S. national security, and not only with petroleum.

With the exception of Middle Eastern oil, the fact that the economic strength and power of the United States depends

upon the import of natural resources is not widely appreciated. Images of Texas oilfields and Western mines are standard icons of the silver screen and leave many with the outdated belief that America's economic might is supported primarily by domestic mineral production. This is not so, and has not been since World War II. Unfortunately, the correlation between the geography of resources and national power attains popular appreciation only in times of crises, and then primarily when the unusually low price paid by Americans for gasoline rises. In reality, the national security of the United States is inextricably linked to the production and transport of industrial resources found in foreign countries. International events that affect this relationship affect U.S. national security.

IMPORTANCE TO NATIONAL SECURITY STRATEGY

Minerals have always been strategically important to the economic and military power of states. The U.S. economy grew to world preeminence upon its cornucopia of high quality ores and petroleum. All too often, however, minerals have been the motivation for the covetous glances of one country upon the territory of another, and for conflict. The Romans found great military value in the tin mines of Cornwall. World War I reflected the competition of Germany and France for the world's second largest iron deposits in the Alsace-Lorraine Spurr.² The Japanese invaded Manchuria for its resource wealth. Germany understood fully that its military potential was limited by a lack of strategic minerals, and its grand strategy reflected this understanding. When Von Rundstedt's Panzer Group South reached the Sea of Azov, it secured the mineral rich Donets Basin and provided the German war industry with essential materials.³ "Since the bulk of Europe's chrome ore is in the USSR, and since chromite is an invaluable alloy in the manufacture of armor plate, Krupp could replace and reinforce the bruised Panzergruppen."⁴ Today the United States can no longer provide the strategic minerals necessary to sustain its high technology weapons system or economy. The bulk of the most critical minerals in sophisticated super alloy weapons components such as the engines powering the F-15 and F-16 Fighters are imported. (See Figure 2.)

MINERALS IN PRATT & WHITNEY F100 TURBO FAN ENGINE (Two on F-15, one on F-16)

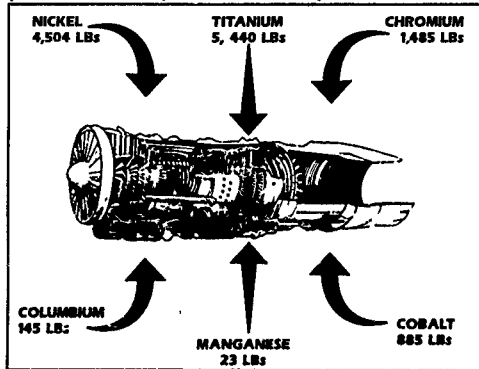


Figure 2.

The U.S strategy document that guides policy making in the area of national security is *The National Security Strategy of the United States* (NSS). The NSS defines the interests and objectives that the United States must pursue in order to maintain its position of world leadership in a dynamic international milieu. NSS documents capture those U.S. interests that are enduring and essential for preserving the sources of national strength, now and in the future. These include:

- The survival of the United States as a free and independent nation.
- A healthy and growing U.S. economy to ensure opportunity for individual prosperity and resources for national endeavors at home and abroad.
- Healthy relations with allies.
- A stable and secure world.⁵

The NSS is based upon the tenet that "National security and economic strength are indivisible."⁶ A strong national economy is necessary to manufacture products traded to other countries to increase national wealth and maintain a favorable balance of trade. A vital economy will strengthen a country's defense by providing an industrial complex with the domestic research and development and manufacturing capabilities necessary to produce the state-of-the-art weaponry required to deter aggression, defeat military attack or end conflict on favorable terms. However, for any economy to remain vital and expanding it must have raw materials, *resources*. Recognizing this, the NSS sets forth two critical objectives calculated to ensure the interests of the United States are achieved:

- Promote a strong, prosperous and competitive U.S. economy;
- Ensure access to foreign markets, energy, mineral resources, the oceans and space.⁷

Much of the literature of the last decade that concerned access to resources was set in a bipolar milieu and couched in terms of a "resource war" in which the Soviet Union sought to threaten the economic strength of the United States through geopolitical maneuvering that would cut off U.S. access to Middle Eastern oil and African minerals. With the demise of the Soviet threat, why does access to these resources remain a national security concern? Because the United States is entering a period of history wherein the securing of market share in the global economy will be the major determinant of national vitality and power; and the competition for market share will be just as important and intense as the quest for colonial empires in previous times. The NSS made this point clear in discussing the political and economic emergence of Japan and Germany:

We frequently find ourselves competitors—sometimes even bitter competitors—in the economic arena. . . . Ongoing trade negotiations now share some of the strategic importance we have traditionally attached to arms talks with the Soviet Union.⁸

In a multipolar world, such competition can lead to conflict.

If one reflects upon the most recent era of multipolar configuration, the interwar years, one will find a period of intense economic competition, with Great Britain struggling to maintain influence over its resource rich empire, Japan systematically establishing hegemony over Asian states of resource wealth, and Germany using its lack of resources as a rationale for territorial expansion. During this period the United States considered itself resource rich and was generally not in competition with other world powers for resource access. However, the depletion of domestic mineral reserves, the technology-driven exacerbated demand for more and new resources, and the exponential expansion of the post-war economy outstripped domestic minerals supply and forced the United States to increasingly turn to foreign sources for its resource needs. Thus, the United States faces the new multipolar world with a hunger for natural resource imports similar to that of its competitors for shares of the world market. If one recalls that the multipolar interwar era ended with the United States confronting resource-poor Japan over its quest for a resource empire in Asia and cutting off Japan's access to U.S. petroleum and scrap metal, the link between competition for natural resources and war becomes clear, as does the legitimacy of mineral resource access as a national security issue.

To a large degree, the 40-year cold war with its bipolar world fostered an artificial pattern of state alignment, and a nuclear milieu that greatly constrained the employment of military forces. In international affairs, other states often assumed a client status, aligning themselves with one superpower or the other in an East-West framework. Policymaking by these states, therefore, reflected consideration of their status within this framework. The breakup of the Soviet Union now allows these states to pursue their interests unfettered, in what is becoming a multipolar global arrangement.

While the economic reemergence of Japan and Europe is signalling an era of intense economic competition with a commensurate need for industrial resources, the freedom from concern for nuclear war itself is already loosening the restraints against conventional military conflict. Long-simmering regional

and ethnic enmities, once held in check by superpower influence, have already brought war to the Middle East, Caucasus and the Balkans. Without the fear that conventional wars could escalate into nuclear conflict, conventional war is increasingly seen as a legitimate option of foreign policy. If this trend continues, it could broaden the concern for resources from economic competition to the industrial capability to sustain military forces.

ECONOMIC INTERDEPENDENCE

The countries of the world are today more interdependent than ever before. During the four decades following the Second World War, the spatial dimensions of the world were significantly reduced in all but the literal sense. There was—and continues to be—an exponential growth in technology, transportation and communication. Advances in these fields have increased the efficiency with which flows of information, capital goods and people cross international boundaries, thereby reducing the friction of distance and effectively shrinking the world. The result has been a trend away from national autarky toward greater global interdependence and increased domestic vulnerability to external events.

Interdependence has greatly complicated the role of national leadership by making domestic success dependent upon global events. Institutions such as the United Nations, NATO, the Group of Seven, OPEC, and the INF Treaty, and events, such as Chernobyl, the 1974 oil embargo, the Montreal Protocol, and the emergence of multinational corporations, reflect the rise in importance of international events and bind states inextricably to a web of global interdependence. (See Figure 3.) Particularly salient is economic interdependence where the potential for geopolitical conflict over strategic resources remains pronounced.

The post-war growth of the industrialized countries' economies soon expanded beyond the means of domestic resources to supply the wherewithal for industrial production. The United States, for example, produced 90 percent of the oil that it consumed as recently as the early 1960s. Today,

INTERDEPENDENT WORLD

Communications • GATT • Minerals • Currency

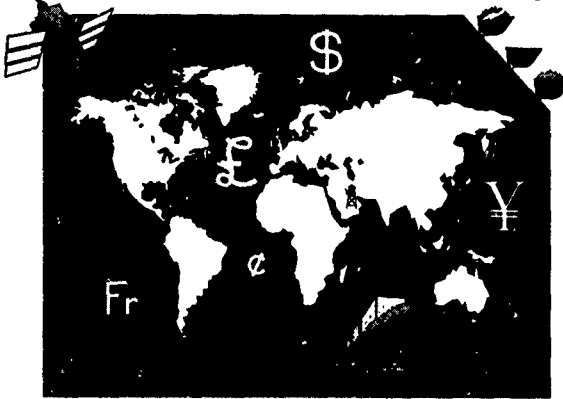


Figure 3.

approximately 50 percent of U.S. domestic consumption of petroleum comes from foreign sources.⁹ The increased interaction between countries in terms of trade has been affected not just by the growth of economies but by catalytic institutional entities such as the Bretton Woods Agreement and the General Agreement on Tariff and Trade (GATT), which have sought to expand foreign trade for the purpose of reducing the likelihood of a worldwide recession or the great depression of the interwar years. Technological progress and logical institutional developments have made the world increasingly interdependent for industrial raw materials. Interdependence has created vulnerabilities.

This vulnerability is partially explained by several social science theories. Geographers developed the concept of the functional region, wherein a region of the world is bound together not by shared cultural phenomena or national identity but by its transport infrastructure, or patterns of communication such as banking networks, or computerized telecommunication systems.¹⁰ When these networks transcend national borders,

the control of the state is weakened and it becomes dependent upon the successful outcome of events in other countries. Political scientists went on to develop a body of literature referred to as interdependence theory. This literature sought to demonstrate that when two countries are mutually dependent or interdependent, and the dependencies are not balanced, then one country may be harmed by the policy decisions of the other, such as the denial of access to its resources, or changing the terms or quantities of interaction between the two countries. Most interdependent relationships are asymmetrical, leaving one country vulnerable to decisions made by the other country and giving that second country power or leverage over the first country.¹¹

When applied to the trade of mineral resources the understanding of interdependence theory has a large explanatory value. In the early 1970s, the Organization of Petroleum Exporting Countries (OPEC) banded together in a loose cartel arrangement and decided to use the dependence of the industrialized countries upon their petroleum production to elicit greater revenues from the Organization for Economic Cooperation and Development (OECD) countries. The oil embargo caused the price of oil to rise from \$3.00 a barrel to \$12.00 a barrel. Subsequently, economic objectives were joined by political demands as the OPEC countries sought to pressure the United States and other countries to reduce their support of Israel. This was a clear example of the vulnerabilities of interdependence and the shift in political and economic power to suppliers when the industrialized countries are no longer able to satisfy their resource needs from domestic resources.

In previous days, U.S. foreign policy and its grand strategy reflected the bipolar, nuclear-dominated international arena in which the Soviet Union was the chief rival to the United States. Because the Soviet Union was largely self-sufficient in strategic resources, the United States had to concern itself with the efforts of the Soviet Union to deny the United States access to these important mineral resources. While the Soviet threat has waned, the U.S. economy remains dependent upon foreign sources for its most important industrial minerals; this

interdependence makes the United States vulnerable. Today the United States must concern itself with the growing political and economic threat from mineral producing countries and economic competition from Europe and Japan, neither of which have the resource base of the United States and, thus, are both potential competitors for resources on the world market. Those who would dismiss the concern for access to strategic and critical resources simply because the United States is no longer threatened by the Soviet Union misunderstand the importance of these resources to the economic element of national power. For many of these minerals there is no substitute.

The decision to seek economic gain through a combination of comparative advantage and international trade realized unheard of economic success, but resulted in a fragmentation of decision making and increased vulnerability to trade disruption. In a world with an imbalance of resource supply and demand, control of resources, especially strategic resources for which limited substitution is possible translates directly into potential power; power to influence the behavior of other states without the need for economically draining and politically unacceptable military intervention. It is now possible to speak softly and wield a big resource.

STRATEGIC MINERALS

The United States imports minerals to satisfy the demands of its economy when economic deposits are not known to occur domestically, or when other countries enjoy a comparative advantage in minerals production and may therefore sell them to the United States at less cost. Minerals that are required to satisfy the needs of essential sectors of the economy may be referred to as critical. When such minerals are "wholly or in large measure imported," often through trade from nonsecure overseas sources, and where the denial of access to these resources is possible to the benefit of an adversary, they may be referred to as strategic.¹²

The degree of concern expressed for a given strategic mineral is governed by the number of alternative sources from which the resource may be obtained; the political and

economic stability of producing countries; and the relative self-sufficiency of adversarial nations in the given resource. If a given resource, not occurring domestically, is available from 20 separate countries, the likelihood of a complete denial of resource access is remote; if the number is reduced to four, denial becomes a concern. When the political or economic stability of these countries is threatened, vulnerability increases. Thus, the ongoing economic problems in Zambia call into question the continued supply of 23 percent of U.S. cobalt requirements.¹³ One must constantly ask whether a succeeding regime would or could continue this trade.

The production and export of minerals is a complex and difficult process, particularly in the developing world, where the foreign exchange necessary for mine expansion, technologically sophisticated exploration, offshore equipment purchases, safety improvements, and maintenance is scarce. The factor inputs of mineral production: labor, electrical power, fuel, refining chemicals, equipment and transportation, are often at the mercy of the all too prevalent life-president; local (often corrupt) governor; ethnic rivalries; management of rail lines (and tariffs) by neighboring, and sometimes unfriendly countries; labor unions; rainy seasons; and, the relative efficiencies foreign ports. Minerals production, in the best of times, is tenuous.

Zaire, which as recently as 1990 produced 58 percent of the world's cobalt, is a case in point. The land-locked copper/cobalt mines of Zaire are located 1,600 kilometers (km) from the capital of Kinshasa in culturally distinct Shaba (formerly Katanga) province, where secessionist sentiment has simmered since independence from Belgium. Mine electrical power is provided via an often interrupted high tension power line from the Inga Dam complex 2,000 km away, or local diesel generators burning imported fuel. Zaire's minerals are transported 4,000 km across three countries and exported from South Africa. Mining operations have been interrupted twice by rebel invasions from politically unstable Angola, where the civil war continues. And, institutionalized government skimming of mine profits has frustrated mine managers and led to the early closure of viable mines, mine

collapse, and a constant decline in mineral production.¹⁴ Zaire is not unique; the production of chromium in Kazakhstan is similarly complex and fragile. Add to these normal difficulties, the twin, 1990s horsemen of political and economic instability and concern for continued minerals supply becomes all too real.

The U.S. rival in the bipolar world of the cold war was the Soviet Union, which was largely self-sufficient in mineral resources. Concern over the availability of the strategic minerals of chromium, cobalt, manganese and platinum was increased by the realization that the Soviet Union was a major foreign source for U.S. supplies of chromium and manganese and had halted exports of both minerals during the Berlin blockade and the Korean War. While the Soviet threat no longer lends its status to the minerals security equation, the need for security of supply of strategic minerals is as important as ever.

At least 50 percent of 17 strategic and critical minerals, essential to either the U.S. defense sector or the economy, must be imported.¹⁵ Because of their important role in critical defense and economic sectors, and lack of substitutes and domestic production, cobalt, chromium, manganese and platinum are considered to be the most important of the strategic minerals. The major deposits of these minerals are located in the politically unstable regions of southern Africa or the former Soviet Union.¹⁶ With the exception of small quantities of platinum produced domestically and scrap, the United States is virtually 100 percent dependent upon foreign suppliers for the four most important non-fuel mineral resources: cobalt, chromium, platinum, and manganese.¹⁷ (See Table 1.) Import dependence, however, is, in and of itself, not a cause for concern. If a given resource is produced by a friendly neighboring state (nickel produced in Canada, for example) or it occurs ubiquitously, its supply dependability may be considered relatively secure. As regards these four minerals, such is not the case. Not only must the United States rely upon foreign producers, but its economic competitors, Japan and the European Community, must also depend upon overseas supplies. Thus, the world's major industrial powers

	<u>U.S.</u>	<u>EEC</u>	<u>Japan</u>
Manganese	100	99	100
Chromium	74	100	99
Cobalt	76	100	100
Platinum	94	100	99

Source: U S. Bureau of Mines, 1993.

Table 1. Mineral Import Dependence in Percent.

rely upon a handful of increasingly unstable countries for minerals, without which their economies would collapse.¹⁸

POLITICAL INSTABILITY: THE NEW THREAT

While many believe that the demise of the Soviet Union eliminates the only credible military threat to the United States and brings the world closer to a more secure environment, it may be that just the opposite is the case. At the strategic level, no doubt the events in the former Soviet Union have greatly reduced the likelihood of global nuclear war. However, long-held cultural enmities, religious fundamentalist movements and, in particular, nationalism, increasingly determine today's international security relationships, and are a potentially greater threat to global political stability than was the relatively stable, bipolar environment of the cold war. Nationalism is already a major concern in promoting conflict and violence in the former Soviet Union, Eastern Europe and Africa. Freed of Soviet and American client status, and with the growing pressure to establish democratic governments, many countries with multiple nationalities inside their borders will struggle to maintain territorial integrity. Moreover, countries such as China, Japan and Germany, long known for dynamic cultures and a willingness to pursue foreign policies contrary to world peace, may well become a new threat, economically, if not militarily. The increased specter of political instability and conventional conflict argues for a national security policy of secure access to mineral resources. There is already

instability and a threat to continued mineral production in many of the regions of the world upon which the United States depends for its natural resource imports.

Southern Africa.

In terms of strategic minerals, the most important countries in Africa and major sources of U.S. supply are Zaire, Zambia, Zimbabwe and the Republic of South Africa. In all of these countries there are either economic problems, political instability, or an ongoing process of political transition from one form of government to another.

Zaire has long been important to the United States as a source of minerals. The uranium used in the original atomic weapons was obtained from Zaire. In the last decade Zaire has maintained a position of leadership in the production of cobalt, strategically important for use in the turbine fan blades of jet engines and in other high-pressure, heat-resistant components. Zaire regularly provided more than half of total world cobalt production.¹⁹ Its reserves of cobalt are the largest in the world. Unfortunately, Zaire does not produce cobalt directly. It is recovered as a by-product of Zaire's copper production which formerly ran at approximately 500,000 tons per year. Over the last 25 years President Mobutu systematically diverted profits in foreign exchange earned by the copper-producing mines for his own use and political career maintenance. Therefore, the mines failed to receive the foreign exchange necessary to expand production and maintain their facilities. As a result, mine production began to drop, and, by 1992, production was less than 100,000 tons per year. Cobalt production has also plummeted. Further reductions in production of both minerals are to be expected.

President Mobutu is on his way out. Responding to the democratization of Eastern Europe and pressures from Western governments, to include its former benefactor, the United States, Mr. Mobutu halfheartedly attempted to allow multiparty democracy in what was formerly a one-party, life president state. Predictably, there has been growing anarchy in the country: instances of military forces revolting against

their leadership and going on violent sprees of theft and disorder abound. Railway strikes and other transportation interruptions, which interrupt exports and create supply gaps, are ongoing. The likelihood of Zaire making a nonviolent transition to multiparty democratic rule is unlikely. The civil war that occurred upon independence, when multiparty democracy was initially attempted, was one of the worst experienced since the Second World War. Simply from corruption and maintenance neglect, production of cobalt ore in Zaire had dropped from approximately 18,000 metric tons in 1986 to approximately 6,000 metric tons in 1992.²⁰ (See Figure 4). The political chaos that is increasing in Zaire and has already spread to the mineral-rich Shaba Province is causing most expatriots, essential for the continuation of the mining industry, to flee the country.²¹ Mining production continues to decrease precipitously and is now at or near complete collapse. A meaningful recovery of Zaire's cobalt production cannot be expected if the likelihood of a nonviolent transition to multiparty democracy continues to fade.

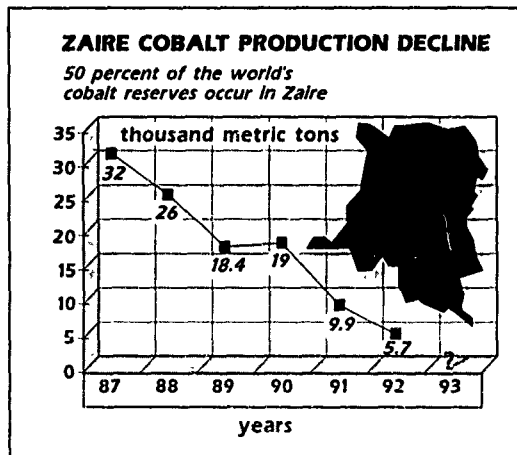


Figure 4.

Zaire's neighbor and the world's second largest producer of cobalt is the country of Zambia, itself experiencing a difficult political transition. Having followed industrial and economic policies more appropriate for the industrialized north than a developing country, Zambia has essentially destroyed its agrarian economy and drawn millions of unemployed people to its primate city, Kinshasa. Over the past two decades this imbalance of labor, mismanagement and corruption on the part of the Kaunda government have resulted in riots, strikes, and a failed economy. The country has been sustained almost exclusively by the export of copper and its by-product, cobalt. However, annual copper/cobalt production has fallen 40 percent since 1978.²² Like Zaire, the bulk of Zambia's mineral products are exported through distant South African ports.

The recent resignation of President Kaunda and the assumption of power by a more democratic regime has done little to improve the economy of the country or the likelihood that the government would be able to satisfy the increasing demands of its growing population. Newly-elected President Chiluba is struggling to maintain stability by assuring the population that the daily increases in commodity prices will somehow be arrested.²³ At the same time Zambia has been forced to order 300,000 tons of grain to meet ongoing drought related shortfalls, further aggravating its international debt position, and the program to promote privatization of the agriculture sector has thus far failed to increase agricultural production or result in economic improvement.²⁴ Thus Zambia, in the process of political transformation, is struggling to establish political stability and continues to divert scarce foreign exchange resources from the mineral industry upon which the United States must increasingly depend as Zaire's production of cobalt falters.

The Republic of South Africa has the greatest concentration of strategic industrial minerals on earth. This country alone has the world's largest reserves of three of the four most important strategic minerals: chromium, manganese, and platinum. South Africa has a highly industrialized "northern" European economy that has maintained sophisticated minerals production and downstream processing for the better part of

the last 30 years. So sophisticated is its economic and industrial development that it is the only country in the world that claims to produce synthetic petroleum at a profit. The mining industry in South Africa has been sustained by European (white) capital, management and technology, low-cost African labor and the abundance of low-cost energy. Further, the South African rail import infrastructure handles the export of much of strategic minerals production of its northern neighbors: Zimbabwe, Zambia and Zaire. A secure source of these strategic minerals even during times of international sanctions and the cold war, South Africa's mineral production may soon be threatened by the political transition to multi-ethnic democratic (black) rule.

South Africa's white community is looking for signals from the leadership of the black community that it will guarantee sufficient rights and privileges to encourage them to stay in South Africa. The financial and mining industries are looking for signals from the black leadership that it understands capitalist philosophy and Western financial institutions and the necessity of private ownership. On both scores, mixed signals have been sent and there is very little certainty that the post-white government of South Africa will not go the way of Zimbabwe to the north, which has, under the black government in power since 1980, maintained Marxist rhetoric and poor economic policies and allowed graft and corruption to such a degree that virtually neither foreign investment nor industrial growth has occurred in the country since independence. There is great concern that South Africa's minerals productivity and economic growth will be destroyed by the application of socialist ideology still present among such middle-of-the-road black leadership groups as the African National Congress (ANC). For example, ANC President Nelson Mandela, the beneficiary of countless economic briefings and lectures on the importance of private investment, banking and mining in South Africa since his release from prison, stated in a controversial address to business leaders, "Mines and Banks will be nationalized, and massive state intervention is likely, to correct the social and economic traumas of apartheid."²⁵ While such statements may be made to appease pressure from radical

black elements, such pressures will remain after the election of a black government.

It is far too early to tell which policies will be followed by the future black governments of South Africa. Nevertheless, such statements taken in the context of the performance of new black governments in other parts of southern Africa, such as Zambia and Zimbabwe, portend, at best, a period of economic decline and uncertainty concerning continued mineral production in this strategically important country. Even with the governance of the white minority, the economic situation in South Africa is already extremely problematic. Its international debt is over \$20 billion, and unemployment has reached a new high of some 43 percent of the economically active population.²⁶ The recent drought has been particularly virulent in southern Africa and has taken a major toll on South African crops. The economic system of the major cities is struggling with the large influx of unemployed blacks from the countryside who are establishing squatter camps and overburdening the social infrastructure. The current, relatively efficient government would be hard-pressed to deal with these problems and the continued economic decline resulting from economic sanctions, much less any new, less experienced government that is ideologically bound to replace the more knowledgeable and experienced government bureaucrats with less experienced workers because of their affiliation with new political parties. For this reason alone, concern for the availability of minerals in South Africa is justified.

More disturbing is the ongoing ethnic and politically based violence, work stoppages and strikes at the major mines. The recent Impala platinum mine labor strike, for example, kept 10,000 workers out of the mines and resulted in the dismissal of 2,000 miners.²⁷ The government's ability to control violence has eroded greatly. Once rare, AK47 assault rifles are now everywhere abundant; armed robberies, drive-by shootings and ethnic massacres are commonplace and growing in frequency. The assassination of the ANC's Chris Hani appears to have robbed the ANC of the one man capable of maintaining the organization's allegiance from the radical black youth.

The Former Soviet Union.

Even more troubling than the situation in southern Africa is the ongoing political instability resulting from the breakup of the Soviet Union. In the strategic and critical materials and fuels area, the Soviet Union had no peers. It was the world's largest producer of crude oil, the second largest producer of chromium, third largest producer of cobalt, the number one producer of manganese and the second largest producer of platinum. It also has substantial gold reserves, being the second largest producer after South Africa. However, the availability of these mineral products on the world market can no longer be assured. Part of the problem is political, but economic malaise and environmental health threats also play a major role in undermining continued mineral production. Russia, alone, is some 79 percent larger than the United States, has twice the proven crude oil reserves and over six times the reserves of natural gas.²⁸ While the resource cornucopia of the former Soviet Union may be enticing to potential investors, their willingness to invest and their ability to effect improvements in the already weakening former Soviet mineral production depend in large degree upon how well the new governments manage this vast territory and turn around their Soviet economies.

The international debt of the former Soviet Union is some \$68 billion. At the time of its breakup at the end of 1991, the Soviet Union needed further loans of between \$5 and \$10 billion to meet balance of payments obligations for just 1 year. Recent revelations make it clear that the ability to repay this debt has been reduced substantially by the depletion of gold reserves, an unusually large drop in petroleum production, and a 50 percent fall in exports of petroleum.²⁹ The measure of the economic potential of the individual republics is reflected in the final statistics of the Soviet Union. Imports fell by 45 percent in the first quarter of 1991; economic production had dropped 8 percent in the first quarter and 6 percent in the second quarter of 1991, and the federal budget deficit was forecast to be some 30 percent of the GNP.³⁰ During 1992, the real GDP of the former Soviet Union fell 18.5 percent.³¹

A good example of the problems that this economic morass brings is evident in the gold mining industry. According to *Gold 1991*, the annual survey, the 1991 production of the Soviet Union for gold was only 260 tons, estimated to be the lowest in a decade. The reasons for this fall in production in the Soviet Union's most important mineral industry were shortages of machinery, qualified workers and energy; and local concerns about environmental safety. The once abundant alluvial deposits of Siberia are largely depleted, which forced the Soviet Union to turn to Armenia and Uzbekistan where conventional mining techniques are employed at greater cost. Recently, the technology to mine these new deposits was sought from South Africa's Chamber of Mines.³²

Production has also fallen in manganese and platinum group metals. Because the production of export earning minerals such as crude oil is of unusual importance, it is noteworthy that the 1988 production of 11.8 million barrels per day dropped drastically to 10.7 million barrels per day in 1990 and in the first 11 months of 1991 averaged only 9.6 million barrels of oil per day.³³

The only thing that could reverse the decline in mineral production in the former Soviet Union would be meaningful foreign management participation and private foreign investment. However, several issues complicate such foreign involvement. First, there is no legal framework in any of the Republics of the former Soviet Union that is acceptable to foreign firms. Although the Russian republic is attempting to develop such a legal framework, it is not currently in effect. Moreover, in the oil industry the Russian republic has implemented some ill-advised tax laws that add approximately \$5 per barrel to oil exports, and a value added tax of some 28 percent on in-country goods and services purchases. Thus, Western oil companies that wished to develop oil deposits inside Russia have been faced with tax burdens heavier than anywhere else in the world.³⁴

Complicating the participation of foreign firms and development of former Soviet Union resources is the fact that they now must negotiate with the independent republics. (See Figure 5.) Chevron, for example, had negotiated an agreement

FORMER SOVIET STRATEGIC MINERAL PRODUCTION

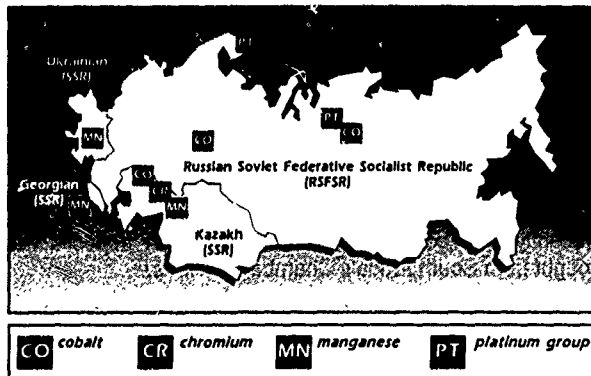


Figure 5.

with the Soviet Union to develop the Tengiz oilfields in Kazakhstan. At the time of the breakup, the negotiations had been concluded and Kazakhstan was presented with a finalized agreement. The new Kazakhstan government rejected the agreement forcing Chevron to renegotiate. In fact, foreign investors must now identify mineral resources, go to the individual republic's fledgling government and attempt to discern what, if any, legal framework, financial system and body of mining laws exist so that they may formulate an individual mineral exploitation plan and negotiate this with the government.³⁵

Politically, the situation is equally disturbing. Russian President Yeltsin is struggling to maintain his power and has yet to demonstrate the ability to manage his country. The Caucasus are a boiling pot of dysfunctional political borders and nationalistic fervor that makes the Balkans look calm in comparison.³⁶ The Ukraine and Russia continue negotiating publicly over what portion of Soviet military resources will be allowed to remain with the Ukraine and the disposition of

nuclear weapons. In the Asian republics, fundamentalist Muslim groups are struggling against moderates and the old Communist leadership for power. This is complicated by outside country interference. Such countries as Iran and Turkey are competing to establish economic ties as well as philosophical influence over the political direction of the new republics. Thus, there is great doubt as to which financial and economic systems will be adopted by the various republics and how the revenues from resource exploitation will be utilized.³⁷ This bodes ill for mineral markets.

Beyond the major mineral producers, marginal or secondary producers of minerals are also experiencing political difficulties that threaten production. The strategic mineral-producing and processing countries of New Caledonia, Madagascar, Albania and Yugoslavia are also struggling to maintain political stability and may develop new governments over the next few years. Thus, alternative sources of minerals supply to which the industrialized countries could turn if mineral supplies from the major producing countries falter are also suspect.

MAINTAINING MINERAL SUFFICIENCY: POLICY OPTIONS

The most pressing question is how the United States deals with the geographic imbalance of supply and demand. Given the growing regional conflict and political instability that threaten the continued production of strategic minerals and secure sources of supply for the United States, what policies must the United States pursue to maintain the security?

The National Defense Stockpile.

The thing is the security. If you go back even before the Congress of 1939, if you get out the 41st chapter of Genesis, and go back 3,800 years and look up the story of Joseph in Egypt and the stockpile—the 2-year stockpile—that the dear Lord told them to have, it had an advantage. I think we've had a security advantage and an

economic advantage and a political advantage that outweigh any dollar and cents calculation by having this stockpile.³⁸

Dr. John D. Morgan
Chief Staff Officer
U.S. Bureau of Mines

A great number of events have occurred in the last decade that have a direct impact on our national minerals policy. As previously mentioned, the breakup of the Soviet Union and the significant reduction in the strategic military threat have enabled U.S. planners to reduce the size of the U.S. military and dedicate these resources to other purposes. While some national security experts advise caution, pointing to growing regional conflicts and the conventional threat that is increasingly prevalent in the developing world, Congress and the administration have acted with alacrity to reduce the size of the military budget. Commensurate with the drawdown in military forces has been a move to reduce expenditures for supporting strategic security ventures, mainly the effort by Department of Defense (DOD) to reduce the size of the National Defense Stockpile.

The National Defense Stockpile is governed by the Strategic and Critical Materials Stockpiling Act and has been managed by DOD since 1988. Its purpose is to reduce the dependence on foreign suppliers for strategic and critical materials during time of national emergency.³⁹ The stockpile was established by Congress in 1939 in response to Japan's drive for resources in Manchuria and Southeast Asia.⁴⁰ The stockpile is an excellent method for ensuring the availability of the basic materials necessary to support surge capacities during times of national emergency. It is particularly valuable for maintaining minerals required in large quantities, such as chromium and manganese, the annual U.S. *peacetime* consumption of which is 435,000 metric tons (MT) and 610,000 MT respectively, which must be imported on foreign flag ships.⁴¹ The stockpile is not suited for high-tech materials whose specifications often change significantly in the course of a year.⁴²

A policy of stockpiling enhances a nation's strategic flexibility and historically has provided alternatives in times of crisis management. In November of 1943, for example, Soviet forces were advancing on the German occupied Ukrainian manganese mining center of Nikopol. Because of this mineral's strategic importance, Hitler planned to organize an entire army group in the tenacious defense of the center. When it was realized, however, that German stockpiles of manganese were equal to a year's supply of the metal, the justification for the costly defense of Nikopol was removed and military resources were diverted elsewhere.⁴³

In the United States, however, the importance of the stockpile is often obscured by domestic political imperatives. The National Defense Stockpile has a long history of controversy involving various factions of the domestic policy community. Decisions concerning stockpile management are often controversial and beset by political maneuvering. For example, the U.S. defense industrial base is in deep trouble, and very few of the critical ferroalloy smelters remain. The surviving smelters would benefit greatly, and possibly be able to maintain their solvency, should they continue to receive mineral ore from the stockpile to upgrade into required ferroalloys, such as ferrochromium and ferromanganese. This makes good sense from a national security perspective because during a surge capacity the United States would need this ferroalloy production capacity as well as the upgraded minerals themselves. However, some critics suggest that stockpile agreements aimed at the maintenance of these ferroalloy producers is something of a pork barrel for Congressmen in whose states the smelters are located and characterize the upgrades as unnecessary.

More problematic is that all too frequently the stockpile is thought of as a source of income. One could sell off portions of the stockpile to bring in revenue in a difficult economic (or election) year. This may be accomplished by simply changing the assumptions on which the stockpile is based. For instance, if one assumed a 5-year national emergency, then required stockpile quantities would be forty percent larger than under a 3-year national emergency scenario. This type of maneuvering

was practiced by the Nixon administration, which, in spite of the Soviet threat, actually reduced the national emergency scenario to one year for political reasons. However, under the subsequent administrations the 3-year national emergency scenario was restored.

Under the Bush administration, however, the Pentagon proposed reducing the scenario to a one-year national emergency and a single 3-month war reducing the stockpile by \$5 billion, and Congress went along. Important commodities such as nickel, palladium, ferrochromium, and refractory bauxite have been identified for sale.⁴⁴ Part of the rationale for selling off the stockpile is the assumption that certain areas formerly considered to be strategically vulnerable to Soviet influence are now secure, such as the Caribbean, which the United States believes it can protect in time of war, and Africa, no longer threatened by Soviet client states. Moreover, in the near term, security analysts are predicting regional, not global, wars, wherein it is hoped the United States would end the war quickly with high tech weapons and no major loss of weapons platforms. This is the type of rationale that pervaded U.S. security planner attitudes after World War II, where it was mistakenly believed that the new, high-tech nuclear weapons would make large scale conventional wars obsolete. In less than a decade, the Korean War forced the unprepared United States to spend \$7 billion under the Defense Production Act of 1950 to expand the supply of strategic minerals such as manganese and cobalt, the same materials designated for sale under the current DOD stockpile plan.⁴⁵ In addition, some correctly argue that the form of the stockpile needs to be changed to account for new technologies and new defense and economic requirements. In particular, items such as columbium, indium, rhodium, ruthenium and titanium sponge should be added to the stockpile. As U.S. Senator Bingaman suggested, "Our security would be better protected by a smaller stockpile coupled with a vigorous program to keep the U.S. at the forefront of advanced materials development."⁴⁶

However, others believe that the motivation to sell off the stockpile was underpinned by a desire to use the sales to avoid the difficult, congressionally-mandated requirement to cut the

budget deficit and question the likelihood of the Federal Government taking meaningful action to promote the advanced materials development required to find substitutes for the strategic minerals.⁴⁷ Regardless of the motivation, if the proposed stockpile sales are affected, the outcome would be to virtually eliminate the primary policy instrument for mitigating strategic and critical materials vulnerability.

Under the Bush administration, the Department of Defense depended upon a free market to provide minerals for future U.S. economic and military needs. The Department of Defense *had no minerals policy* other than the stockpile, which it believed should be reduced significantly. One supporting argument for DOD's plan to sell off the stockpile is that because the embargo against South Africa had been lifted, the free market should be even better able to provide for the mineral needs of the United States. In addition to the fact that strategic minerals have always been excluded from the embargo against South Africa (indeed chromium was specifically omitted from the world embargo against white-governed Rhodesia in the 1970s), the argument that a free market can provide essential mineral supplies is further challenged by the previously discussed political instability in the producing countries. In its critical 1993 report on DOD's efforts to maintain the Defense Industrial Base, of which mineral supplies and the stockpile are a part, the Government Accounting Office (GAO) said,

DOD has taken the position that free market forces will guide the restructuring of the defense industrial base. We believe this is not a realistic strategy. . . . to meet future national security requirements.⁴⁸

The cost of storing stockpiled materials is not a factor in determining its size. The stockpile has been caught in the effort to downsize the military and balance the budget. Annually, the Defense Guidance delineates a new threat picture; the recent lessening of the threat has justified cuts in DOD force structure and the reallocation of defense dollars to domestic issues. Some suggest that the stockpile should be reduced correspondingly, tying the goals to the current threat. This is shortsighted and simplistic. Cutting DOD's budget by 50

percent from cold war days would save \$150 billion per year; tanks, ships and aircraft are mothballed and a smaller force nucleus is maintained that could rapidly expand, albeit with great loss of quality, should the threat escalate.

This approach will not work for the stockpile, because its goals must reflect the *threat to import supply*, as well as the global military threat posited in the Defense Guidance. For example, if one wished to reduce the ferrochromium in the stockpile by 50 percent, one must examine the supply threat. South Africa is the world's largest ferrochromium producer with a production capacity of 1 million tons per year. It supplies Europe and Japan as well as providing 50 percent of total U.S. chromium imports. Meanwhile, domestic ferrochromium production has wasted away. Of the 11 U.S. ferroalloy smelters producing ferrochromium in 1970, only one remains, and it has been in receivership. Should the increasingly troubled transition to black rule in South Africa fail, and ferrochromium production lost for even one year, U.S. production and imports from lesser producers could not make up the shortfall, and the stockpiled ferrochromium would be required—in *peacetime*.

The stockpiling option represents a viable policy with which to mitigate import vulnerability. To be most effective, the form of the stockpile must be constantly reevaluated and updated. *Sales of stockpiled materials should only be made when a multi-agency review board determines there is no longer a genuine need for the material and approves the sale.* The proceeds from such sales should be firmly reserved exclusively for upgrading and maintaining the stockpile. Stockpiled materials should not be unilaterally reduced simply to help Congress or DOD avoid painful budget cuts. Assumptions that suggest security of foreign minerals supply when political uncertainty or economic chaos are everywhere apparent in the major strategic mineral producing countries should be seriously questioned. The Clinton administration needs to closely examine the Bush administration's stockpile management program and request to sell off all but \$440 million of the \$6 billion of stockpile materials, and ensure that such a plan does not undermine evolving administration

industrial policy and efforts to support the U.S. Defense Industrial Base.⁴⁹

Domestic Mining.

Another option for decreasing dependence on foreign suppliers for strategic minerals that should be appropriately encouraged is the development of domestic mineral deposits. The United States has long been known for its mining industry and important mining continues today. Molybdenum is mined in Colorado, titanium in Nevada, and copper in many locations, chief among them Arizona. With the exception of platinum, however, the most important of the strategic minerals have no meaningful *economic* reserves in the United States. The Stillwater Mining Company is operating a successful platinum mine in the Stillwater Complex of Montana, but its contribution to U.S. requirements is currently less than 10 percent of U.S. consumption, and its ore must be exported to Europe for further refining. Limited deposits of cobalt exist in Missouri and Idaho, but they are sub-economic, cannot be profitably produced without a major subsidy, and could not be counted upon to make up a noteworthy percentage of the shortfall should access to Zambian and Zaire cobalt be lost. For chromium, there are some minor podiform deposits on the West Coast and some stratigraphic deposits in the Stillwater complex of Montana. However, neither of these deposits are profitable and only the Stillwater complex has been mined during national emergency to any significant degree. The United States has no noteworthy deposits of manganese that could be mined. There is very little chance, in these dire economic times, that subsidies for the U.S. mining industry would be envisioned, much less adopted.

Increasing the output of domestic mines broadens the economy and the defense industrial base. Protectionist policies and mining subsidies have struggled for political support, however. Subsidizing the domestic mining of sub-economic resources runs counter to the preference of American manufacturers, who seek to acquire least cost supplies and maximize profits. During World War I, for example, Bernard Baruch, then chairman of the War Industries

Board, was able to successfully establish a policy of mineral imports to supply defense production in spite of the "the political muscle of a well-organized Western minerals block," on the basis of lowest cost source. By war's end, he overcame the argument of unnecessary war losses to American shipping by utilizing foreign flag ships to transport the ore. Although domestic minerals have been produced under subsidy in time of conflict, the guiding tenet of U.S. minerals policy was best delineated by the Paley Commission Report of 1952 which stated:

The overall objective of a national materials policy for the United States should be to insure an adequate and dependable flow of materials at the lowest cost consistent with the welfare of friendly nations.⁵⁰

As long as the cost of imported minerals is less than domestic production, the business sector will argue forcefully against subsidizing higher cost domestic production. In the early years of the Reagan administration, the ferrochromium industry sought protection under section 232 of the 1962 Trade Expansion Act. The U.S. steel industry was willing to support this effort only if it did not result in higher ferrochromium costs.⁵¹

The suggestion of domestic mining as a potential solution to foreign resource dependence usually pits mining state Congressmen and the Department of the Interior against the Department of State, the Environmental Protection Agency (EPA) or the Office of Management and Budget (OMB). The array of domestic variables that limit domestic minerals production is substantial and was well captured by the Comptroller General's report to Congress:

... long lead times and the high cost of investment capital may impede introduction of new domestic processing capacity in some industries, including manganese and chromium. Environmental regulations, energy requirements, and the shift of processing capacity overseas where the ores are mined may also deter expansion of processing capacity in the United States.⁵²

That said, domestic mining does make a significant contribution to national security as a base of industry and alternative to import dependence. Reducing imports of

strategic minerals reduces vulnerability. When mining projects in the United States are proved to be profitable and in consonance with environmental law, they contribute to national security and should be supported. The Stillwater Platinum Mine is a case in point.

The Stillwater Mining Company has been operating its platinum mine for 6 years. Although located in a national forest area, the mine has an impeccable environmental record and produces approximately 4 percent of U.S. platinum-group metal consumption.⁵³ With unstable South Africa and the former Soviet Union accounting for 92 percent of world platinum production, domestic production is important.

Stillwater Mining Company is attempting to double the size of the mine and has received the necessary permits from the state and national forest service. However, the mine's patents have been delayed by the Department of the Interior pending the outcome of efforts to amend the Mining Law of 1872 and congressional debate over the imposition of new royalties on domestic mineral production.⁵⁴ Such uncertainty creates an unappealing investment climate, and combines with competition from low-cost foreign producers, environmental opposition and limited domestic deposits to limit domestic mining's capacity to reduce U.S. vulnerability to the cutoff of mineral imports.

Substitution.

Another alternative to continued dependence on foreign supplies is the development of substitutes for critical products. This is of limited use in reducing the problem because the minerals in question either have no substitute or are the most economic alternatives. For example, there is no substitute for manganese in the production of steel nor for chromium in the production of stainless steel. Similarly, many of the uses of platinum are unique and the substitution of other minerals could only be achieved at reduced efficiency. This uniqueness accounts for its popularity in spite of the relatively high price. As regards other uses of chromium, it is inexpensive and efforts to find substitutes would only be promoted if the price of

chromium were to rise precipitously. Substitutes have been found for some uses of cobalt but these resulted primarily from efforts undertaken when the price of cobalt rose to some \$50 a pound, from a normal price of approximately \$10-\$20 a pound, after the Shaba II invasion of Zaire in 1978. Certain ceramics have been developed as substitutes for cobalt, but in the most important applications, such as turbine fan blades, acceptable substitutes have yet to be found.

Substitution is usually driven by price and availability. In a national emergency, or if there is a shortage of a particular product, or its price becomes uneconomic, then research and development efforts will be made to find a better product. Lead times probably will be long. Because the four minerals in question are generally available at low prices, the return on investment for such R & D work cannot be justified or obtained. This leaves only government subsidies to encourage research and development for the purpose of substitution and, in general, this runs contrary to American dependence upon the private sector and lowest cost sources of supply.

Conservation and Recycling.

Conservation and recycling are two options that do have promise for reducing vulnerabilities and are in keeping with the current trend towards environmental awareness in the United States. Platinum group metals, for example, can be recycled at certain cost savings, in particular catalytic converters in old automobiles. Approximately 6 percent of U.S. platinum consumption is provided by scrap. Because manganese is consumed in the production of steel, scrap recycling makes no significant difference in U.S. consumption of manganese. For cobalt and chromium, great strides have been made to improve recycling. Today, some 24 percent of U.S. consumption of cobalt and some 26 percent of chromium consumption are accounted for through the purchase of scrap materials, and these could be increased. However, the recycling of one quarter of cobalt and chromium consumption reflects, in part, the weak domestic economy. It is unlikely that recycling would offer such a significant contribution to the consumption

requirement in time of a strong economy, or to the surge capacities required during a national emergency.

To a large degree, recycling is driven by price, and it would be possible, although unlikely in peacetime, for the Federal Government to involve itself in providing incentives for recycling efforts. This would most likely occur as part of a comprehensive national energy strategy or national industrial strategy aimed at reducing the expenditures per unit on transportation or energy variables. In time of national emergency, it is possible to conserve on the consumption of some minerals simply by accepting a reduction in the quality of the nonstrategic products and replacing them with other materials. However, in a normal domestic economy such replacement would reduce the quality of the product and hurt sales, and is therefore an unacceptable alternative.

Global Strategy.

Perhaps the best proactive option for reducing U.S. minerals vulnerability is to make the security of minerals supply part of U.S. foreign policy objectives by following the Japanese strategy of *acting to diversify import sources of supply* and to establish secure working relationships with mineral producers. The Japanese approach reflects a sophisticated understanding of the role geography plays in international security strategy, its long history of domestic mineral resource deficiencies, and a concerted government effort. The United States prioritizes its allocation of political attention and foreign aid based on a number of factors. With the exception of petroleum, there has been little emphasis on promoting better relations with countries because they produce minerals upon which the United States depends. This could and should be undertaken by the U.S. Government as it is by the Japanese government, which recently announced that it was upgrading the South African Consulate General in Tokyo to embassy status.⁵⁵

Traditionally, U.S. interest in foreign areas has been led by status in trade quantity figures. Geographic vulnerabilities are real, however, and there is need to recognize isolated countries

whose location or mineral products are strategically important to the United States. Kazakhstan, for example, produces most of the former Soviet Union's chromium and has great reserves of the other critical minerals, including petroleum. U.S. resources directed at promoting political and economic stability in Kazakhstan would directly benefit U.S. minerals security. Japan facilitates joint ventures by encouraging its corporations to form partnerships with mineral processors and producers in such countries as Russia, South Africa, and even the United States. In Henderson, Nevada, for example, the Japanese are financing a new titanium sponge production facility and providing state-of-the-art vacuum distillation technology for the plant. As a quid-pro-quo, the Japanese have an option for 25 percent of the plant's production.⁵⁶

The United States has a wealth of powerful international mining and mineral processing companies capable of developing strategically important overseas mineral deposits. As part of a revitalized, desperately needed, industrial policy, the United States could offer incentives to companies seeking to develop strategic mineral deposits in other than the primary mineral producing areas, thus enabling them to establish equity ownership, long-term contracts and control of product. New mining opportunities within the Western hemisphere are especially promising and offer greater transport security. Mexico and Argentina, for example have completely rewritten their mining laws, providing incentives to foreign mineral investors, in an effort to strengthen the export contribution to their national economy.⁵⁷ Neither country has been fully or properly explored, although Mexico has known manganese deposits. Favorable loan status could also be granted to countries that produce critical and strategic minerals and used to promote communication and trade between these countries and the United States. The United States has many organizations capable of contributing to this process, such as the International Program of the U.S. Geological Survey, the Trade and Development Program of the International Development Cooperation Agency, and the Overseas Private Investment Corporation.⁵⁸ By *focusing* these efforts on strategic minerals, they would reduce the U.S. vulnerability, and avoid competition with the domestic mining industry.

Federal Government leadership is essential if the United States is to diversify its sources of supply.

CONCLUSIONS AND RECOMMENDATIONS

The economy of the United States could not be sustained without the manganese essential for steel production, or the cobalt so critical to turbine fan blades in our best commercial and military aircraft. Without these natural resources the U.S. economy cannot function. Jobs would be lost, the government would struggle for legitimacy, and economic power would be severely degraded. Moreover, the United States must compete for wealth in the world marketplace and, as evidenced by their joint ventures and lending policies, the governments of both Japan and Europe understand the role of minerals in maintaining national strength and have taken actions to ensure their continued availability. The United States must not let a temporary lull in the international threat restrict it from taking the actions necessary to maintain continued access to the minerals upon which its economic and industrial strength depend.

The United States can take several actions, and has or is taking some to reduce the vulnerability that results from its resource-related interdependence with other countries.

- *Foster substitution.* Research and development can be subsidized or encouraged by the government so that dependence on scarce or difficult to obtain resources can be reduced.
- *Retain and modernize the National Defense Stockpile of strategic and critical materials.* It has served the nation well since 1939 and provided critical materials during the Korean and Vietnam Wars. However, the DOD stockpile modernization program could scuttle the stockpile and leave the United States vulnerable. Begun under the Bush administration in the euphoria of the cold war's end, the DOD program is based on a philosophy of free trade and a backward looking model that has received criticism from many experts in industry and government, and several foreign, mineral

producing nations. This criticism reflects a general dissatisfaction on the part of most knowledgeable mineral security experts with the free market approach to maintaining the stockpile put forth by DOD under the previous Republican administrations, and a lack of frequent and substantial communication between DOD and these agencies. To correct this and assure a strong and effective National Defense Stockpile that provides security commensurate with the Strategic Petroleum Reserve, DOD should:

- Delay major sales from the stockpile until it can be integrated into the new administration's industrial policy for maintaining the defense industrial base.
- Regularly convene the Government-Industry Advisory Committee on the Operation and Modernization of the National Defense Stockpile, and invest it with the authority to determine stockpile goals. This will ensure the broadest contribution of minerals expertise to the modernization effort and preclude criticism that the stockpile is being used for political purposes.
- Use the Transaction Fund, a revolving fund for proceeds of stockpile sales, only to upgrade the stockpile or support research and development of substitutes for advanced uses of stockpile materials. Congress, DOD, or the administration should not be allowed to divert stockpile funds for other purposes.
- *Establish good economic, political and military relations with those countries that produce the minerals that the United States needs.* This task is often complicated because countries such as Zaire have one-party governments or are mired in corruption, and maintaining good relations may counter another U.S. interest, encouraging democracy. Creating such relationships will require creative diplomacy and priority. Nevertheless, the importance of establishing these relationships cannot be overemphasized. Mineral producing countries

should receive high priority when allocations of security assistance resources, foreign aid, and political largesse are determined.

- *Use tax incentives to encourage overseas U.S. mining corporation owner equity.* Diversification of mineral supply and reduced import vulnerability can be achieved when U.S. mining interests establish joint ventures and owner equity relationships in mining and mineral processing that guarantee them product control.
- *Promote overseas mineral exploration of high potential, geographically diverse areas.* As environmental regulations increasingly limit the mineral industries in the United States and Canada, other countries such as Mongolia, China, Argentina and Mexico are rewriting mining laws to encourage mineral exports. The United States should encourage U.S. mining companies to take the lead in exploration and development and broaden the global sources of strategic mineral supply.
- *Recognize the contribution of domestic mining to U.S. national security.* In revising the Mining Law of 1872, exorbitant royalties designed to discourage domestic mining should not be imposed. Where mineral deposits can be exploited economically and meet strict environmental standards, they should be encouraged, especially if strategic minerals are involved.

The geographic problem of imbalance of supply and demand will grow more acute in the future as technology creates demand for minerals found overseas and U.S. supplies of resources are further depleted. If the United States wishes to compete for wealth in the international marketplace and maintain its national security, it must adopt policy options designed to ensure the secure access to foreign natural resource supplies.

ENDNOTES

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- Where are the major resources of the mineral located?
- Where are the major production sources?
- How politically safe are these sources?
- How prone to labor disruption are they?
- Are they threatened externally?
- Are they economically sound?
- Are they vulnerable to energy supply disruptions?
- Are they vulnerable to the outside supply of other natural resources?
- Are the producer countries vulnerable within the currently volatile framework of international finance?

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