

Ore Wars: The Problem of U.S. Dependence on Foreign Materials

JOHN ORME

Attacks by Katangan rebels invading Zaire's Shaba province in 1978 interrupted copper and cobalt production in the mineral rich area around Kolwezi. Full production was not restored for two months, and the already high prices in the cobalt market sky rocketed. Prices of this heavy, silver-white metal, one ton of which goes into the temperature-resistant alloys in the jet engines of an F-16 fighter, jumped from \$6.75 to \$50 per pound in spot markets, eventually settling back to \$20 to \$25 per pound.¹

This incident brought to public attention the West's dependence on foreign sources for many of the non-fuel minerals necessary to an advanced industrial economy. The problem was already under study in the Carter administration, and minerals soon became the subject of numerous articles and Congressional investigations. Much of the commentary viewed the situation as disturbingly similar to that which the US faced during the oil embargo in the early 1970s. As Nevada Democrat Jim Santini, chairman of the House Subcommittee on Mining and Minerals, saw it, "We seem to be hell-bent on the same road of materials myopia . . . that we were in oil and gas."²

The United States imports upwards of 90 percent of its cobalt, manganese, chromium, and platinum, while our European allies have no domestic sources of these minerals, excluding secondary recovery. The Europeans, unlike the United States, are also heavily dependent on imports for copper, tin, tungsten, iron ore, and titanium.³ In many of these mineral's most important uses, it is difficult or impossible at present to substitute for them. Manganese, for example, is indispensable in its role as a deoxidizer, desulfurizer, and hardener of steel, and stainless steel cannot be made without chromium, which imparts its corrosion- and oxidation-resistant qualities.⁴

John Orme is a graduate student in the Department of Government at Harvard University.

1. US Congress, House Subcommittee on Mines and Minerals, *Subsaharan Africa: Its Role in Critical Mineral Needs of the Western World*, 96th Congress, 2nd session, p. 9; National Strategy Information Center, *The Resource War and the US Business Community*, a White Paper, p. 15.
2. *The Resource War*, p. 4.
3. Phillip Crowson, *Nonfuel Minerals Data Base* (London: Royal Institute for International Affairs, 1980), table 2.
4. US Department of the Interior, *Mineral Facts and Problems 1980*, "Manganese," pp. 1-4; US Department of the Interior, *Mineral Facts and Problems 1980*, "Chromium," pp. 8-9.

What makes the situation especially worrisome is the whimsy with which nature distributed these minerals. "High Africa," the plateau covering most of Africa south of the equator, has been called, with only a little exaggeration, "The Persian Gulf of minerals." GECAMINES, Zaire's state-owned mining company, dominates the cobalt market with over half of world exports.⁵ The Soviet Union and South Africa are the leading producers of palladium and platinum, respectively, and together produce over half the world's chromium and manganese. Over time, our reliance on southern Africa is, if anything, likely to increase, as South Africa and Zimbabwe hold over 97 percent of the world's chromium reserves and South Africa alone has about 87 percent of the reserves of platinum and 75 percent of the free world's manganese.⁶

Considering the situation in southern Africa, it is not difficult to imagine scenarios leading to supply interruptions. Underground mines are highly vulnerable to sabotage. Power outages at the Kamato mines in Zaire during the second invasion of Shaba province stopped nine pumps, halting production for 30 days. Terrorists might also try to intimidate foreign technicians into leaving or attack the railways critical for transporting minerals from the interior.⁷ While revolutionary violence would seem to be the greatest threat in South Africa, some writers have also speculated that the present government there might fight back against pressures for change from Western governments by embargoing mineral exports.⁸ Others believe that the Soviet Union aims to create a "supercartel" encompassing the fifteen strategic minerals found only in the Soviet Union and southern Africa. According to the *Economist Foreign Report*, Leonid Brezhnev boasted at a 1973 Warsaw Pact meeting that the Soviet Union would achieve world domination by 1985 by seizing control of Europe's sources of energy and raw materials.⁹ The Soviets have recently changed their traditional behavior in world mineral markets in what experts see as a fundamental, long-term shift in policy. Exports of minerals to the West have been cut back sharply and purchases have increased in a number of categories. At the same time, the Soviets have reached mineral agreements with thirty different developing countries (eleven of them African), offering Soviet technical help in return for a share of the output. Whether these moves were made in response to declining ore quality, technical problems, increased demand, a desire to defer development of Siberian

5. Crowson, *Nonfuel Minerals*, table B4.

6. *Ibid.*, tables D1, E1, B1; US Congress, Senate, Subcommittee on African Affairs, *Imports of Minerals from Southern Africa by the US and OECD Countries*, 96th Congress, 2nd session, p. 14.

7. *Subsaharan Africa*, p. 9.

8. *Imports of Minerals from Southern Africa*, pp. 19-22.

9. Bohdan Szuprowicz, *How to Avoid Strategic Materials Shortages* (New York: John Wiley and Sons, 1981), pp. 134-35.

resources, or a more sinister "resource war" strategy is difficult to say, but whatever the motivation, the effect is the same — increased competition for scarce world, and especially African, resources.¹⁰

How Significant a Problem is Western Mineral Dependence?

There is no doubt that the West's dependence on foreign sources of non-fuel minerals is a serious matter. The situation, though, is not as bleak as some alarmist reports have made it out to be. First of all, the doomsday prophecies of the early 1970s, projecting "limits of growth" either through a Malthusian exhaustion of resources or a proliferation of OPEC-type cartels, are far off the mark. Technological improvements have made it feasible to mine poorer and poorer ores, and present resources should be adequate to meet demand over the long run, provided access is not interfered with. Temporary imbalances in supply and demand, such as those contributing to the inflationary raw materials boom of the early 1970s, could recur, however, because of the less than friendly investment climate in many potential producer countries in the Third World and the long lead times involved in expanding capacity in the minerals' industry.¹¹ Lack of market concentration and availability of substitutes will probably render cartels in tin, tungsten, and iron ore as ineffective as CIPEC, the toothless copper cartel. The lone success among mineral cartels has been in bauxite, where Jamaica successfully raised prices seven times in the period since 1976. Even here the long-run power of the International Bauxite Association (IBA) is constrained by the presence of higher cost ores in the United States. Jamaica has paid dearly for her aggressive tax policy, losing a sizable chunk of the American market to Australia, which undersold Jamaica in the absence of a common IBA price.¹²

Cartels in manganese and chromium are improbable, because the two leading producers, South Africa and the Soviet Union, are at opposite ideological poles. Cartels in cobalt and the platinum group would be redundant because one country already dominates these markets.¹³

-
10. Daniel Fine, "Mineral Resource Dependence Crisis: Soviet Union and the United States," in James Miller and Daniel Fine, eds., *The Resource War in 3-D* (Pittsburgh: World Affairs Council, 1980), pp. 4, 39-42.
 11. Alfred Eckes, *The United States and the Global Struggle for Minerals* (Austin: University of Texas, 1979), pp. 238-39; US Congress, House, Committee on Science and Technology, *Material Policy, Research and Development Act of 1979*, October 1979, p. 47; J. A. Clay, "Considerations that Affect Stockpiling," in M. Jones, ed., *Availability of Strategic Minerals* (London: Institute of Mining and Metallurgy, 1980), p. 56.
 12. Michael Klass, James Burrows, and Steven Boggs, *International Mineral Cartels and Embargoes* (New York: Praeger 1980), p. 111; Fillmore Earney, "The Geopolitics of Minerals," *Focus* May-June, 1981, pp. 9-10.
 13. Klass *et al.*, *International Mineral Cartels*, pp. 135, 189.

Supply interruptions from southern, or "High," Africa, as the geologists call it, are clearly a much greater threat, but the probability of some of the scenarios put forth recently has been questioned, and rightly so. Minerals amount to 18 percent of South Africa's gross national product and are even more important as a source of foreign exchange. South Africa would be wounding herself more than the targets of an embargo in limiting mineral exports, as a recent study by the Foreign Affairs Association of South Africa recognized.¹⁴ Critics apply the same reasoning to the "supercartels" hypothesis. Zaire and Zambia earn over 80 percent of their foreign exchange from mineral exports. Even if Marxist governments hostile to the West came to power in those countries, it would be difficult for them to forego that revenue. The industrialized countries are their best customers as well as preferred suppliers of capital and technology. The regimes currently governing Angola, Mozambique, and Guinea all owe their existence to the USSR, but have been more liberal toward foreign investment than Nigeria. Gulf Oil continues to pump oil in Angola and sell it to the West.¹⁵

Those who are concerned about a "supercartel" respond that the Soviet Union could make membership in such an arrangement attractive to African countries by 1) military aid, 2) barter agreements allowing poor countries to expand their tropical products exports much more than saturated western markets would permit, and 3) a willingness to curtail her own minerals' production to drive up prices and expand or contract production to maintain prices.¹⁶

Whatever the plausibility of these scenarios (and one should not discount them completely), the more likely problem would seem to be short- or medium-term interruptions in supply because of sabotage, terrorism, or civil war. If these interruptions are similar to those caused by the second Shaba invasion, or even considerably more serious, there are good reasons for believing that the West will cope with them much more effectively than some expect. First, unlike petroleum, the cost of strategic minerals is only a small percentage of the price of end products. Chromium, for example, contributes only 5 percent of the cost of stainless steel. Hence, even large increases in mineral prices would not have much inflationary impact at the consumer level.¹⁷

Second, there is more elasticity in the demand for minerals than is popularly thought. Charles River Associates have estimated that much

14. *Imports of Minerals from Southern Africa*, p. 7.

15. US Congress, Senate, Subcommittee on Africa, *US Interests in Africa*, 96th Congress, p. 181.

16. Szuprowicz, *Strategic Materials Shortages*, p. 14102.

17. Klass *et al.*, *International Mineral Cartels*, "Chromium," p. 139, "Cobalt," p. 192, "Manganese," p. 165.

of the non-priority uses of cobalt could be replaced, given a little time. Different alloy mixes (usually employing nickel, of which Canada is the leading supplier) could save some cobalt even in priority uses, though at some loss of convenience, cutting total American consumption about 50 percent.¹⁸ There are no substitutes for manganese in steelmaking, but prospects for economizing on it are good: Charles River Associates calculate that 10 percent could be conserved in the short run and as much as 65 percent in the long run if new production processes were adopted.¹⁹ Chromium will remain the toughest nut to crack. Unlike cobalt, no substitutes are available for chromium's use in high performance jet engines.²⁰ Much stainless steel is put to use in relatively mild environments where its corrosion resistance is not strictly necessary, and a good deal of this could be substituted for. Nonetheless, even after ten years one-third of our demand for chromium could not be replaced.²¹

Finally, some combination of the United States' stockpiles and market forces should give the US enough breathing space to make the adjustments mentioned above and buy time if additional steps are necessary. The government has no available inventories of cobalt and chromium, but private stocks of the former are estimated to be large enough to last for several months.²² Available government and private manganese stocks are large enough for only fifteen months, but elimination of South Africa's 30 percent of world exports from the market would drive prices high enough to make it worthwhile for producers such as India, Gabon, and Brazil to increase their production. Under these circumstances the total shortfall would be only about 15 percent.²³

Market Forces and Domestic Production as Solutions to Mineral Dependence

Five broad policy approaches to the problem of mineral dependence have been suggested. The simplest, of course, would be simply to rely on market forces to improve the situation. The adjustments following cobalt's rise in price give some indication of how potent these incentives can be. Most manufacturers of magnets substituted other materials for cobalt within nine months.²⁴ Substitution in superalloys is not as easy, but Pratt and Whitney Aircraft, producers of the J-57 engine, planned

18. *Ibid.*, pp. 191-95.

19. *Ibid.*, pp. 175, 182.

20. *Materials Policy*, p. 221.

21. Sandy Feusel "African Minerals and American Foreign Policy," *Africa Report* (September-October, 1978), p. 14; *Imports of Minerals*, p. 13.

22. Klass *et al.*, *International Minerals Cartel*, pp. 196, 161-62.

23. Klass *et al.*, *International Minerals Cartel*, pp. 175-76.

24. Interview with Firoze Katrak of Charles River Associates, 26 March 1981.

to eliminate the need for approximately 65,000 pounds of cobalt in 1979 by switching to a new alloy.²⁵ Overall American consumption of cobalt dropped 180,000 pounds in the first half of 1977. On the supply side, one estimate is that world production will more than double by 1985. To take one example, Idaho's Blackbird Mine,²⁶ the ore of which is about one-sixth as rich as that in Zaire, closed in the 1950s when prices fell below \$2 a pound. Prices of over \$20 per pound interested Noranda Mines, Limited, in reopening the mine, which has the potential to meet 20 percent of America's demand for cobalt. According to one analyst, however, the recent softening of cobalt prices has made Noranda more hesitant about undertaking the \$220 million project.²⁷

Congressman Santini, an advocate of the mining industry's position, introduced legislation in April 1981 to remove disincentives to domestic mineral production. His program calls for the opening of more federal lands to exploration, large government purchases and sales of minerals, changes in tax laws, and cost benefit analyses of environmental restrictions. Secretary of the Interior James Watt is sympathetic to these proposals, but Congress may not be.²⁸

Experts such as John Morgan, the Bureau of Mines chief staff officer, would like to see Congress go farther and use its authority under the Defense Production Act of 1950 to stimulate increased mineral production. This legislation allows the government to set floor prices, grant low interest loans, or permit accelerated write-offs of investment. Its most spectacular success followed China's cut off of tungsten exports to the United States during the Korean War. China had supplied half of our demand at \$16 per pound, but the government guaranteed a price of \$63 per pound to domestic companies, and within three years they were producing three times what the government required.²⁹

The Reagan administration favors increasing domestic production of minerals as a solution to our dependence problems, and such an emphasis on expansion would have its advantages.³⁰ We already have a \$7 billion balance of payments deficit for all minerals, and this deficit could reach alarming proportions in another twenty years.³¹ Second, a long-term com-

25. *Materials Policy*, p. 221.

26. *Purchasing*, 5 December 1979, p. 20, A2.

27. US Congress, House Subcommittee on Mines and Minerals, *US Minerals Vulnerability: National Policy Implications*, 96th Congress, 2nd session, September 1980, pp. 87-89; *Engineering and Mining Journal*, 19 October 1981, p. 48.

28. *Engineering and Mining Journal*, May 1981, p. 15; *Engineering and Mining Journal*, June 1981, p. 13.

29. *Aviation Week*, 5 May 1980, pp. 44-45.

30. *Engineering and Mining Journal*, April 1981, p. 92.

31. *Materials Policy*, p. 217.

mitment, rather than a crash program in response to an emergency, may be necessary to increase domestic capacity in minerals such as manganese and chromium, where lead times are long and investment risks large.³²

The difficulty with a "project independence" in minerals is that the poor quality and limited extent of our domestic resources are what made importation attractive in the first place. It would take large subsidies to produce manganese in the United States, and the tailings of South African mines contain more chromium than the laterite deposits of Oregon and California.³³

Manganese and cobalt resources are relatively plentiful, but there is not enough chromium ore to meet our demands in the long run.³⁴ Cobalt mining is more feasible, and one official estimates that subsidies could encourage an expansion of production sufficient to meet one-third of our demand by 1985.³⁵ As mentioned above, though, market conditions alone have already created an interest in reopening the Blackbird mine. Recent technological advances in the processing of laterite ores belie earlier pessimistic reports to the effect that chromium prices would have to double or triple before American resources would be exploited. California Nickel Corporation plans to use a newly developed technology to extract nickel, cobalt, and chromium from Gasquet Mountain in northern California. This mine should meet a substantial percentage of our military requirements for these minerals over the next twenty years.³⁶ The wisest course regarding domestic resources of strategic minerals is the cautious one of continuing research into the exploitation of lower grade ores, reliance on the market, and conservation of our imperfect but still useful endowment.

Alternative Solutions: Source Diversification and Deep Seabed Mining

A cheaper alternative to reliance on expensive or scarce domestic resources would be diversifying our dependence by investment in new foreign supplies. One difficulty here is that the ores of southern African countries are so vast and rich that would-be competitors must face the danger that Africans might depress profit levels in order to squeeze higher cost entrants out of the market.³⁷ During the 1970s, the dangers of excessive taxation or expropriation in Third World countries frightened away investors, and 80 percent of the exploration between 1970 and 1977 was done in South

32. Klass et al., *International Minerals Cartels*, pp. 168-69, 142-43.

33. *Ibid.*, pp. 168-69; *Mining Journal*, 1 February 1980, pp. 73-74.

34. Klass et al., *International Minerals Cartel*, "Chromium."

35. *Aviation Week*, 5 May 1980, p. 55; Klass et al., *International Minerals Cartel*, p. 198.

36. *Engineering and Mining Journal*, June 1981, p. 35.

37. Szuprowicz, *Strategic Materials Shortages*, pp. 95-97; *Aviation Week*, 5 May 1980, p. 46.

Africa and developed countries.³⁸ This situation is improving now as companies are offering host countries part ownership or other concessions to make investment more politically acceptable, and Third World states are becoming more receptive to foreign investment as the availability of Western aid declines.³⁹

The US Overseas Private Investment Corporation guarantees loans up to \$50 million for investment in foreign mineral ventures, and was granted the authority by Congress in 1978 to loan \$4 million directly.⁴⁰ Other governments have gone much farther in promoting foreign minerals projects: both Japan and West Germany offer investment guarantees and various subsidies to firms investing in such projects, though these programs are still not as comprehensive as their firms would like.⁴¹ The Reagan administration is particularly interested in encouraging foreign investment, but has not yet made any specific proposals.⁴²

Deep-seabed mining has the potential eventually to eliminate many of our dependence problems. It is estimated that one mining site alone could meet 17 percent of our demand for manganese, 37 percent of our demand for cobalt, and 5 percent of our demand for nickel.⁴³ The obstacles here are political as well as economic. Last March, President Reagan announced that the United States will seek to defer final action by the UN Conference on the draft of a Law of the Seas treaty so painstakingly constructed over eight years and due for completion at the end of the summer. Critics found many clauses of the draft objectionable: the controls on production to protect the interests of land-based producers (Canada, ironically, being the most notable); the reserving of one site for the Third World "Enterprise" for every one granted to the consortia of the industrialized countries; the compulsory and gratuitous transfer of capital and technology to the "Enterprise"; the absence of assurance that companies which had already invested would receive licenses to mine; and the structuring of the seabed authority, which does not guarantee the United States a seat, but gives three to the Soviet bloc.⁴⁴

Most industry spokesmen applauded the President's action, saying that it was not likely that their boards of directors would permit further

38. *Business Week*, 18 July 1977, pp. 18-19.

39. Interview with official with the Overseas Private Investment Corporation, August 1981.

40. US Code.

41. Phillip Crowson, "Approaches Taken By Other Countries," in M. Jones, ed., *Availability of Strategic Minerals* (London: Institute of Mining, 1980), pp. 96-97.

42. Daniel Fine, "Reshaping the Strategy Behind US Mineral Policy," in James Miller and Daniel Fine, eds., *The Resource War in 3-D* (Pittsburgh: World Affairs Council, 1980), p. 93; *Engineering and Mining Journals*, April 1981.

43. *Mineral Facts and Problems*, "Cobalt," pp. 15-16.

44. *New York Times*, 4 March 1981, p. 1; *New York Times*, 5 March 1981, p. 4; *Engineering and Mining Journal*, April 1981, pp. 9-11.

expenditures on seabed mining unless the draft were altered. The companies hope that Reagan will succeed in changing the treaty. The passage of legislation by the United States and other industrial nations allowing the consortia to mine in the absence of a seabed treaty has increased American leverage, and at the time of this writing, the prospects for revision seem reasonably good.

Even if the political impediments are removed, economic ones will remain. The amount of capital needed to mine the seabeds is massive — a single project could cost as much as \$1 billion — and the companies say that they would like a rate of return of 30 percent before they risk this kind of money. Ocean mining is more expensive than the most energy intensive land-based production, and even if nickel and copper rise 70 percent from their current depressed levels, profits will still be no higher than 20 percent or so. In addition, the size of operations necessary to reach economies of scale in nickel and manganese might glut markets and depress prices.⁴⁵ Even if everything falls into place, no one expects production to begin before 1990.⁴⁶ Seabed mining cannot contribute to a solution to the short-run problems of dependence, but its long-term potential is so great, and the uncertainties so intimidating, that government encouragement of some kind should receive serious consideration.

The Reagan administration recently made the largest stockpile purchase in twenty years, spending over \$100 million, mostly to bring our cobalt stocks up to contemporary quality standards.⁴⁷ This was commendable, but a sweeping program to enlarge our inventories would be inadvisable at this time. It would cost \$6 billion just to fulfill American stockpile objectives, and government buying would provide a disincentive for private industry to serve its own interest by building up its own stocks.⁴⁸ Further, our allies have much smaller stockpiles. West Germany's is the largest at four months, while Japan and Britain have next to nothing. Earlier, several European countries were considering attempts to build up stockpiles. Late in 1980, West Germany canceled plans to accumulate a stockpile, opting instead to increase reliance on the Soviet Union. It is in the US interest to encourage our allies' efforts, for adequate stockpiles would make a future minerals crisis much less disruptive of allied harmony than the oil crisis of 1973. Large American purchases, we can be sure, would not make it any easier for European governments to do so.⁴⁹

45. *The Economist*, 31 May 1980, pp. 86-91.

46. *Engineering and Mining Journal*, March 1981, p. 119.

47. *Ibid.*, April 1981, p. 11.

48. *Aviation Week*, 5 May 1980, p. 44.

49. Crowson, "Approaches Taken By Other Countries," pp. 97-98; *The Economist*, 24 May 1980, p. 87; *Business Week*, 22 December 1980, p. 38; *Business Week*, 14 July 1980, p. 57.

A cheaper alternative for the US would be to change the laws governing the strategic stockpile. Under existing legislation, inventories up to the stockpile goal can be used only in the case of war or national emergency. Any surpluses held above the goals may be sold, subject to the approval of the Armed Services Committees of Congress.⁵⁰ Giving the executive branch more flexibility to sell off stocks to stabilize prices would cost nothing and would greatly improve our capacity to adjust to supply interruptions. The same effect could be achieved by lowering the stockpile objectives, which would free inventories for use without a change in existing legislation.

Finally, some observers have urged political accommodation or support of South Africa as the best means of keeping High Africa's immense mineral wealth out of the hands of pro-Soviet forces. Such an exercise in realpolitik does not commend itself on practical, let alone moral, grounds. South African chromium and other minerals will be important to the West well into the future. Considering the likelihood of political change in that country, it would be a mistake to complicate our relations with a successor regime by tying ourselves to a doomed status quo.

Fortunately, the analogy between oil and minerals is a little strained. Adapting to a hypothetical "minerals crisis" would be somewhat less onerous than alarmist reports lead one to believe, and a number of trends — in foreign investment, new domestic production, conservation and research into production from lower grade ores — point in the right direction. In the short term, more flexible use of the federal stockpile would increase our coverage without increasing our premiums; over the long run, deep-sea nodules are an ace that may remain in the hole in the absence of governmental inducements. The ore wars can be won without a project independence, large scale hoarding of stocks, or a tilt toward apartheid in South Africa.

50. *Aviation Week*, 5 May 1980, p. 44.