NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

F.h
Minerals & Materials

SCIENCE AND TECHNOLOGY
POLICY OFFICE

19 FEB 1975

MEMORANDUM FOR:

Jack Carlson, Department of Interior
Norman Ross, Domestic Council
S. Rosenblatt, Council on International Economic Policy

SUBJECT: Critical Imported Materials

Attached is a brief paper that Dr. Stever received recently from Mr. George A. Watson, Executive Director, The Ferroalloys Association, Washington, D.C., dealing with the question of national stockpiles for critical imported materials. I commend these views to your attention. As you know, Dr. Stever in his role as Science Adviser has had an interest in the technological aspects of ~~materials~~ minerals and materials policy issues. Dr. S. Victor Radcliffe of my office has been assigned staff responsibility for matters in this area and is available for further discussion of this topic.

Russell C. Drew
Director

Attachment

7-21

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

OFFICE OF THE
SCIENCE ADVISER

February 12, 1975

Mr. George A. Watson
Executive Director
The Ferroalloys Association
1612 K Street, N. W.
Washington, D. C. 20006

Dear Mr. Watson:

I have read with interest your letter of January 17, concerning recommendations for a national stockpile of critical imported materials.

As you are probably aware, an extensive Executive Branch study, Critical Imported Materials, was published recently by the Council on International Economic Policy which contains an assessment of the strategic and economic security roles of stockpiling. A copy of this report is enclosed. In addition, it seems clear that the new Commission on Supplies and Shortages involving the Administration, the Congress and the private sector in its membership will include the stockpile question as an early item in its work.

In order to ensure that your suggestions are taken into consideration in the current deliberations, I shall bring your paper to the attention of the appropriate Executive Office staff. Thank you for making your views available to me.

Sincerely,

/S/

H. Guyford Stever
Science Adviser

Enclosure

THE FERROALLOYS ASSOCIATION
1612 K Street, N.W.
Washington, D. C. 20006

(202) 659-4131

January 17, 1975

Dr. H. Guyford Stever
National Science Foundation
1800 G Street, N. W.
Washington, D. C. 20550

Dear Dr. Stever:

The Ferroalloys Association believes that a national stockpile of essential materials necessarily obtained, either totally or in large measure, from foreign sources is an imperative to ensure an adequate supply of materials for the strategic and basic industrial requirements of the United States. The members of the Association, therefore, respectfully submit for your consideration the enclosed document concerning the problem of materials shortages, the recommendation for a national stockpile and some goals, criteria and guidelines for the management of the stockpile.

Our industry has had years of experience in the procurement of raw materials from other countries and is well versed on the many aspects of associated problems. Ores and ferroalloys, particularly those containing chromium or manganese, have been included in the national stockpile of strategic and critical materials from its inception. The ferroalloys industry has participated and cooperated with the government in the acquisition and disposal of stockpile material on many occasions and has some appreciation for the problems of stockpile management by government.

For these reasons we feel that we speak with some knowledge on the problems that may be encountered in obtaining an adequate supply of imported materials in the future and on the importance and operation of a national stockpile.

The Association appreciates your consideration of our position and assures you that its members would welcome the opportunity for further discussions on the recommendation for a national stockpile as a solution to the basic problem of material supplies and shortages.

Very truly yours,

George A. Watson
Executive Director

THE FERROALLOYS ASSOCIATION
1612 K Street, N.W.
Washington, D. C. 20006
(202) 659-4131

RECOMMENDATIONS FOR U.S. STOCKPILE POLICIES

Introduction

The Ferroalloys Association represents virtually all the domestic producers of electric furnace ferroalloys and related materials containing chromium, manganese or silicon. The more than two million tons of annual production are used as essential materials for the production of iron, steel, superalloys, aluminum and chemicals.

World resources of the raw materials for ferroalloy production are large but, unfortunately, not equally distributed among the countries of the world. The industry's requirements for chromium and manganese in the form of ore have been supplied from distant countries because the United States does not possess economically viable deposits of these strategic elements. The importance of chromium and manganese to the national defense is clearly indicated by the continued inclusion of the ores and ferroalloys of both elements in the federal stockpile of strategic and critical materials.

The resource-rich countries of the world in the last several years have developed a new awareness of the value of their resources and the potential of their use for political advantage and/or economic gain. Resource diplomacy and economic profiteering by endowed countries is and will continue to be a major problem for the consuming nations of

the world. Whether such efforts with non-fuel minerals will be as successful for these countries as it was for the petroleum producers, remains to be seen. But such efforts will disrupt international trade and will threaten economic harm to countries dependent in whole or part upon imports.

The United States consumes large quantities of new mineral materials each year which in 1973 totaled about 4 billion tons. Fortunately, much of this requirement has been and will continue to be supplied from domestic resources, but each year the amount of material being imported from other countries grows steadily both in absolute tons needed and as a relative percent of total domestic requirements. These imports include a number of essential non-fuel minerals which are not found in economically workable concentrations in the United States or found in deposits so inferior to those located elsewhere in the world that their economic use is foreclosed. Accordingly, the ferroalloy industry is particularly concerned about the reliable continuity of its supply of imported chromium and manganese ores needed for ferroalloy production. Its concern, however, is not limited to these two materials but extends to all the minerals and materials of foreign origin needed to ensure the strategic and economic health of the nation and the strength of its basic industries.

Whenever the supply of essential foreign material is arbitrarily interrupted or made unreasonably expensive, a number of relief measures may be taken. Available low-grade domestic resources may be developed or

new deposits may be found by more intensive search. Substitutes may be found for some applications and new or different technology employed to replace or obviate the functions performed by the scarce material or the products dependent upon the material. Conservation measures to decrease the amount of material needed for satisfactory performance or to extend the useful life of products using the material may be invoked. Measures may be taken to minimize dissipative uses, to encourage efficiency during processing and to enhance recovery from the waste stream by recycling.

All of these steps may be effective in relieving shortages, but they require time for implementation -- more time than can be allowed if strategic and/or economic hardships are to be avoided or minimized. A reserve supply or stockpile of such materials is an obvious recourse for immediate relief and to provide the time necessary for the orderly development of other relief measures, as discussed above. A buffer stock of selected materials may be the only practical way to respond rapidly to changes in world trade inimical to the economic health of the nation. It is believed the existence of such a reserve will serve to act as a positive force to discourage mineral producing countries from employing resource diplomacy for political advantage or economic gain.

For these reasons, The Ferroalloys Association believes it is necessary for the United States to have and maintain a stockpile of critical materials essential to our economy in order to prevent external forces from adversely affecting national security and economic health. The

United States now has a federal stockpile of strategic and critical materials which should not be unduly dissipated until both strategic and essential industrial goals are determined and new criteria established for acquisition and release.

The Ferroalloys Association endorses the national stockpile concept as the only practical way to ensure an adequate supply of imported materials essential to our economy. Section I of the following offers some specific goals, criteria and guidelines that should be considered for a national stockpile and its effective operation.

The problem of an adequate supply of foreign source material can be approached by alternate programs, such as are presented in Section II. The concept of an industry held stockpile (1) encouraged by appropriate incentives can be considered as only complementary to a national stockpile. The development of domestic resources (2) may be suitable in certain cases, such as the replacement of bauxite with other aluminum bearing materials but may not be possible for other materials. An international stockpile (2) has some merit as an alternative to a national stockpile but may be very difficult to create and manage.

The Ferroalloys Association has not endorsed these other concepts as alternate solutions but does suggest that they may be complementary programs to a national stockpile.

SECTION I

A Federal Stockpile of Essential Materials

A. Goals and Objectives

The primary goal of a federal stockpile is to assure the military strength and the industrial health of the United States by ensuring an adequate and continued supply of materials necessarily obtained either totally or in large measure from foreign sources.

Other goals and objectives subsidiary to the primary goal are as follows:

1. Stockpile authority and administration must be as independent as possible to assure its use for national interests only.

2. To the maximum extent possible, stockpile operations must not interfere with normal marketplace activities, affect normal movements of price, affect normal relations in international trade nor displace normal inventorying by industry.

3. The stockpile is a reserve supply available for use only by domestic industries for domestic consumption and only for use because of actual or threatened supply interruptions or price discriminations by foreign producers inimical to the best interests of the United States.

B. Stockpile Authority

The national stockpile should consist of a limited number of materials that are both necessary to the economy and are obtained wholly or in large measure from foreign sources. Management of the national stockpile should be vested in the General Services Administration or some similar independent agency which ultimately is held accountable to an appropriate committee of Congress but whose functions are directed by the Executive branch of government.

Congress should provide general guidelines and criteria for the selection of materials for stockpiling, the amount to be stockpiled and the rules for acquisition and release of materials. Consideration should be given to the following suggestions for guidelines.

C. Stockpile Material Selection Criteria and Objectives

All raw materials that are items of import are eligible for consideration for stockpiling but qualification for stockpiling must incorporate the realistic appraisal of the following points:

1. Existence of domestic resources, their quality, quantity, availability and usefulness.

2. Proportion of supply from imports.

3. Essentiality to national defense.

4. Essentiality to the domestic economy.

5. Availability and practicability of substitutes, enhancement of domestic supply by economic recovery and recycling measures and restriction of demand by conservation in processing, fabrication and use.

6. Amenability to storage over a period of time without undue degradation.

The quantity of material to be stockpiled should be based on the stated criteria and other considerations such as the nature and political stability of the countries from which material is obtained. It is suggested that the Administrator periodically submit for Congressional approval the objectives of the national stockpile and the rationale for the materials selected and amounts recommended.

D. Stockpile Acquisitions

Fortunately, the existing national stockpile is substantial for many materials but new purchases to satisfy the conditions of the previous section should meet the following criteria:

1. Purchases should be at or near the prevailing market prices so as not to disrupt the domestic market nor to markedly affect the world market.

2. Purchases normally should be made when material is readily available and prices are nominal relative to the price history of the materials.

3. Purchases should be in the form of mineral ores, raw or beneficiated, suitable for processing by domestic industries or material in first processed form made from such raw materials by domestic producers.

E. Stockpile Releases

The real purpose of a stockpile is best served if never used, but releases may be made if one of the following conditions is found to exist and such action is approved by the Administrator.

1. A state of emergency, as declared by the Executive Branch of Government.

2. A sharp decrease in availability of imports traceable to other than normal market forces.

3. Petition by an industry or a segment thereof short of material because of foreign supply interruptions.

4. Import prices that are contrived in relation to free market prices or are relatively higher to the U. S. market than to some or all other world markets.

5. Surplus inventory based on revision of criteria for material selection and quantity stockpiled.

Rules governing releases are suggested as follows:

1. Releases to be made only to domestic processors or consumers for domestic consumption.

2. Releases should be offered equitably to the companies of an industry affected by a supply disruption or unreasonable prices.

3. Releases should be made under a system that attempts to accomodate to prevailing domestic market conditions.

F. Other Parameters and Considerations

1. The foregoing recommendations suggest that Congress may specify initially the particular materials to be stockpiled and the quantities to be held, both maximum and minimum and retain the right of approval for any changes proposed by the Administrator.

2. Materials currently in the national stockpile in processed form (as opposed to raw or beneficiated ore), should be retained intact insofar as possible as these materials represent an additional stockpiling of energy and labor that has already been expended and should be conserved.

3. Consideration should be given to a system for releasing material on "loan" at prevailing interest rates to domestic producers with replacement guaranteed in a reasonable time without regard to price but with full regard to quality and quantity. This could provide a degree of flexibility for industry and individual companies to cope with shortages without recourse to formal action by government.

SECTION II

Alternate Suggestions to Assure Supply of Materials

A. Industry may be encouraged to hold larger than normal inventories of foreign source raw materials by the enactment of legislation extending appropriate tax or other incentives for such additional accumulations. The quantity of materials in the national stockpile may then be appropriately adjusted with respect to the gain in industry's inventory of such material. This could provide lower costs for government overall and result in a more flexible and available supply to industry.

B. Consideration should be given to the possibility of developing presently uneconomic domestic resources that could remain in a stand-by status but ready for activation in the event of a supply interruption. Such a program may or may not be less costly than a national stockpile and will not offer the ready access of stockpiled material but may be a sufficient deterrent to discourage mineral-rich countries from unwarranted exploitation of their resources. Such a program may be a joint industry/government activity which could lead to the commercial development of domestic resources and a lessening of dependence on other countries for essential materials.

C. The possibility of cooperating in a stockpile program with other consuming nations may be explored. An international stockpile

will involve difficult political considerations but offers the possibility of greatly reduced stockpiling costs for participating nations and potentially a more effective arrangement to ensure and encourage an adequate supply of material from the producing nations. The International Tin Council has some desirable characteristics that may be emulated for an international stockpile.

THE WHITE HOUSE
WASHINGTON

Norm

TO: Mike Duval

FROM: Robert A. Goldwin RAG (RW)

COMMENTS: Attached is a paper I received on mineral shortages which I send to you for your review and consideration. I have sent an acknowledgment to Mr. Wilson.

5/8/75

5-12

May 8, 1975

Dear Mr. Wilson:

Thank you for sending Dr. Goldwin the paper concerning the shortage of mineral resources prepared by Dr. William Bryan. Since this subject is beyond our technical ability to evaluate, I have sent the paper to the appropriate people on the Domestic Council staff for their review and consideration.

Sincerely,

John H. King
Assistant to
Robert A. Goldwin
Special Consultant to
the President

Mr. Robert Wilson
Director of Public Relations
Franklin University
201 S. Grant Avenue
Columbus, Ohio 43215

S-P

Franklin University

201 S. GRANT AVE. COLUMBUS, OHIO 43215 TELEPHONE 224-6237

ASSISTANT TO
THE PRESIDENT

May 5, 1975

Mr. Robert A. Goldwin
Special Consultant to the President
White House
Washington, D.C.

Dear Mr. Goldwin:

The enclosed paper concerning the shortage of mineral resources presented by Dr. William Bryan of our staff might possibly be of interest to you and others delving into the economics and energy matter.

If you wish additional copies just let me know the quantity.

Sincerely,

Robert Wilson
Director of Public Relations

RW/dh

MINERAL RESOURCES SHORTAGES: IMPLICATIONS TO THE UNITED STATES ECONOMY

OHIO ASSOCIATION OF POLITICAL SCIENTISTS AND ECONOMISTS

OHIO STATE UNIVERSITY

COLUMBUS, OHIO

April 18 - 19, 1975

Dr. William Bryan, Chairman, Economics-Finance Department

Franklin University

Columbus, Ohio

INTRODUCTION

This study is an attempt to put into perspective the relationship of our growing mineral needs in terms of domestic and foreign availabilities. These accesses to these minerals, as well as their consumptions, have been long taken for granted both presently and in the past. However, the future availabilities will undoubtedly alter these assumptions.

An analysis is made of our needs and the sources of these minerals Implications of the forthcoming shortfalls are divided into domestic and international analyses. What will happen if we do not acquire our share of the world minerals is likewise explained.

Since this paper is presented in the energy category, emphasis has been placed on materials in light of this subject. Thus, the attention is given to the Middle East's role in the acquisition and using of world mineral resources. Their development will largely render ineffective the use of food as a weapon against them, thus altering the United States' economic and foreign policy with these Arab nations.

Statistics, heavily drawn from numerous Federal government publications, are used extensively and intensively to portray measures and relationships. Charts used were constructed by the author and based upon certain assumptions. Should these assumptions change, for example the projections of population increases, then a readjustment in mineral consumptions must take place.

In light of an accelerating changing world, the repercussions will be profound upon the United states in the next 25 years because of its

dominant world position. Therefore, forecasting and interpretations in this matrix carries with it a broad spectrum of thoughts and ideas. And the allowing of more colors through this spectrum adds to the controversy of the presentation.

Recognizably so, the paper should have been shorter. In spite of its length, much has been omitted. Yet to include these omissions would place the paper out of proportions for its intended purposes.

The opinions expressed here are those of the speaker and not those of Franklin University.

Economics, as theory goes, is grounded on scarcity of goods and service. Underpinning the entire approach of economics then is the availability of goods and services, being dependent on the supply of and demand for these goods and services at a given time, place, and price.

For the past number of months an over-emphasis on scarcities has dominated not only the economists' thinking but also government officials and consumers to the point of distortions and over-emotionalism. New headlines and lead stories, as well as conferences and papers, have centered on oil scarcities, gasoline shortfalls, fuel insufficiencies, anti-freeze deficiencies, food shortages leading to world famines, and a host of other shortages. Important as these may be, much attention has been diverted away from an equally important--in certain cases more--important shortage, that being a host of minerals especially those that are non-renewable.

Minerals are the sinews of American industries. They are the nutrient that provide for the strengthening and flexing of our industrial muscles. They, along with cheap sources of energies and fuels, have made possible the myriad of products that has standardized the American household. In addition to this, these minerals that feed our blast furnaces have contributed to the rising incomes, employment, standard of life, and the quality of living to many Americans. That is to say, minerals along with cheap energy has made possible the production and purchase of millions of durable goods that commonly

dominates the American way of life, namely, automobiles, refrigerators, automatic washers and driers, garbage disposal units, electric typewriters, electric shavers, blenders, toasters, hairdriers, electric stoves, power tools, and a host of other products. These outpourings have catapulted America into a dominate economic and military power throughout the world. Besides this, America's productivity is not only being aped by many nations throughout the world but also is being challenged by these countries.

This potpourri of goods and services has been made possible by two handimaids--cheap energy and the availability of abundant, low-prices minerals. However, a shortfall in these availabilities is evident today. And within the next decade these shortages will alter our economy to the point of affecting the fiber and fabric of our society. Today the United States with 5.4% of the world population consumes about 53% of the world resources, including minerals and fuels. Since 1913, the watershed in our economic power when the United States' gross national product was greater than those of Great Britain, France, and Germany combined, the United States has led the world in the production of goods and service. This stellar position of American's economic might was reflected throughout the 1950's but was seriously challenged in the 1960's. For example, in 1950 the United States with $546.9 billion gross national products (in 1973 dollars) was greater than Western Europe ($443.0 billion), Japan ($47.2 billion), and Canada's ($37.4 billion) combined. Stated in another dimension, the United States' output was greater than the combined production of USSR, Eastern Europe, Republic of China, and

India, being $535.6 billion combined. By 1960, United States' industrial muscles had become flabby. Evidence of the stresses and strains besetting the American economy was evident as reflected in its output relative to other areas of the world. Even though the United States pushed its output to $750.8 billion (in 1973 dollars) in 1960, it fell short of the Western Europe ($724.2 billion), Japan ($113.8 billion), and Canada ($59.8 billion) output combined of $897.8 billion (in 1973 dollars). By 1960 these countries combined burst of industrialization edged the American output by $147 billion of 20.9%. By 1970 the deterioration of the American economy in terms of production with other areas of the world was so obvious that little attention was paid to our posture in this respect. Western Europe's gross national product of $1,162.7 (in 1973 dollars) alone surpassed that of the United States' $1,112.2 billion. This dominancy of Western Europe persisted at least through 1973.[1]

Obviously, the scramble for minerals, cheap energy, and other resources was fairly well-defined by 1960. Our ferocious appetite for goods seemed unabated, depending to a certain degree on imports.

Other nations had more than a desire to whet their appetites, especially Japan, the EEC, and Russia. Lurking behind these great powers were the Red Chinese who should make a strong bid and demand for mineral resources in the early 1980's, especially with the completion of the largest railroad in Africa. Competition for resources was evident by the drop in the United States' share of world steel production from 47% in 1950 to about 25% in 1960 and 19% in 1973. By 1960 the EEC nations had surpassed the United States in steel production.

Russia commanded the lead in 1970 and in 1973 had still retained her dominancy in steel production. Obviously, the increase in steel production by Russia, the EEC, and Japan and the decline in the United States' share of world output was causing a radical scramble for resources. Likewise for aluminum which United States' share of world production was 44% in 1950 but slid to 34% in 1973. Ironically, the United States produced only about 3.5% of the world's bauxite yet consumed about 1/3 of the world's aluminim production.[2] This was attributed to the United States' careful, and not-too-tough policy with the Jamaican government. But that was to be short-lived.

However, our dwindling position as a leader in world production of heavily intensive mineral using products did not dampen U.S.'s appetite for more goods. Being so rich, demanding, unchallenged, unlimited in its wants, and so wasteful in its production and consumption played an important role in the extracting of resources from many lesser developed, as well as developed, countries. Contributing to these massive imports as the fact that Americans each year junked 7 million cars, discarded about 200 million tires, threw away about 60 billion tin cans, heaved away about 30 billion bottles, and tossed out over 1 trillion tubes lined with zinc and other metals. No count has been made on chucking away the refrigerators, air conditioners, washing machines, driers, garbage disposal units, toasters, blenders, and a host of other applicances having minerals.

These and other factors contributed to the heavy imports of the following with their percentage of imports and what lesser developed countries sourced these imports.

IMPORTS SUPPLIED SIGNIFICANT PERCENTAGES
OF TOTAL U. S. DEMAND IN 1973

Mineral	%Imported	Major lesser developed country source
Platinum metal group	100	South Africa
Mica	100	Malagary
Chromium	100	South Africa
Strontium	100	
Cobalt	100	Zaire
Tantalum	100	Nigeria, Brazil, Zaire
Columbium	100	Nigeria
Managanese	98	Gabon, Zaire, South Africa
Asbestos	95	South Africa
Aluminum	90	Jamaica, Surinam
Titanium	88	
Tin	85	
Mercury	85	Malaysia, Thailand
Bismuth	85	
Flourine	84	South Africa
Nickel	84	
Potassium	68	
Silver	66	Honduras
Tungsten	66	
Zinc	60	
Gold	60	
Antimony	55	Burma, South Africa
Barium	55	South Africa, Bolivia
Rhenium	50	

This list is by no means complete for the United States which is the world's largest importer and consumer of minerals and raw materials. Fortunately for the United States, its neighbor Canada accounts for over 27% of our non-fuel industrial raw materials and 27% of our fuel and lubricant imports. Canada is the third largest diversified minerals producer in the world after the USSR and the United States.[4] It is no wonder that we seek to maintain friendly relations with these two countries. United States, to assure itself a niagra of minerals from Canada, controls 65% of Canada's mineral fuels and 58% of the metal mining industries.[5]

However, Canada as a mineral oasis today is insufficient to satisfy our thirst. As we enter into a new technological revolution our depletion of resources will increase. More and more will we depend on imports to sustain our industrial economy. This source, said the Department of Interior, will supply us 9 out of the 13 basic raw materials--especially iron, tin, and bauxite--needed by 1986.[6] We therefore have to turn to non-industrialized countries for imports of vital raw materials and minerals. Our negotiating position will weaken; the terms of trade will probably shift against the United States. Domestic production can take place, but only at the price of increased economic and environmental costs. Such increase in costs of production will force prices up, bring distortions in the economy, and skrink job opportunities.

How does the future look for American imports of principal raw materials? According to the U.S. Department of Interior, the American consumer and manufacturer can look to the following increased dependency on foreigners for such industrial raw materials imports:

U. S. DEPENDENCE ON IMPORTS OF PRINCIPAL INDUSTRIAL RAW MATERIALS WITH PROJECTIONS TO YEAR 2000[7]

	Percent Imported		
Raw Materials	1970	1985	2000
Aluminum	85	96	98
Chromium	100	100	100
Copper	0	34	56
Iron	30	55	67
Lead	31	62	67
Managanese	95	100	100
Nickel	90	88	89
Potassium	42	47	61
Sulfur	0	28	52
Tin	n/a	100	100
Tungster	50	87	97
Zinc	59	72	84

Assuming a degree of veracity to these proportions, the United States is facing a shortage of a number of critical minerals. If these are sourced from a lesser developed country, the probabilities of their refusal to sell could well be a reality. They need the resources more than the United States, Japan, EEC, or any other nations. Malthus is already knocking on these lesser developed nations' doors. Selling their resources would be tantamount to letting him enter the house. Population experts predict that world population will rise to slightly over 7 billion by 2000 A. D.[8]

An analysis of population patterns would reveal the critical posture of these lesser developed nations. From 1900 to 1960, a sixty year span

population grew from 1 billion to 2.5 billion, an increment of 1.5 billion persons. Today world population is close to 4 billion. Should the population number 7.5 billion by 2000, then one can surmise that since 1960, the growth will be 5 billion persons in 40 years. Remember the 60 year period showed an increase of 1.5 billion. Can the world support an additional 5 billion persons by 2000? With famine, drought, pestilence stalking the land, United States, to feed the burgeoning population would be an undertaking tantamount to disaster. Predictions are that nearly every African country's population will double by 2000, except those in the Sub-Sahara. Would selling their resources resolve their problem? Or would using them internally help minimize their problems.

To determine the metal requirements of the United States (aluminum, copper, zinc, lead, and others) from 1972 to 2000 we would need yearly 1.4 billion tons in 1972 and rising to 2.0 billion tons by 2000.[8] This horrendous amount of raw materials in all probability must be sourced in large part from other areas. As depicted in Graph VI, Africa holds an important priority in the supplying of known mineral resources -- being diamonds, gold, bauxite, copper, managanese, cobalt and others.[9]

Imports thereupon will forefront our foreign economic policy, especially in relation to minerals. Estimated by the U. S. Department of Interior, our deficits in the balance of payments relative to imports over exports of mineral resources will soar from $6 billion in 1972 to $10 billion in 1978 and $18 billion in 1985. If metallic, non-metallic, and energy resources were included in our imports, then the deficits would be $10 billion in 1972 and balloon to $96 billion in year 2000.[10]

A staunch must be taken by the United States to meet this impending crisis. Recycling of discards is needed now. An important source of minerals are the 15 million junk cars strewing our alleys and streets and idling in garages. How much metal content is in an average car and the possibilities of recouping these from the 15 million junks littering our way and by-ways is:

Metal of an Average Car		Total 15 million Cars (in lbs.)
20 pounds of lead		300,000,000
30 pounds of copper		450,000,000
50 pounds of aluminum		750,000,000
55 pounds of zinc		825,000,000
500 pounds of Cast Iron		7,500,000,000
2,500 pounds of steel		27,500,000,000
3,135	Total	37,325,000,000

A factor contributing to the increasing competition for minerals will be the new demands made by the Organization of Petroleum Exporting Countries (OPEC) and more specifically the Organization of Arabian Petroleum Exporting Countries (OAPEC). Due to its increasing oil revenues the OAPEC will seek minerals and resources whose sales hitherto were dominated by the developed nations. Oil revenues estimates for 1973 and 1974 by these nations, along with their gross national products, are:

	Estimated Oil Revenues		Estimated Gross National Product[11]	
	1973	1974	1973	1974
Country	(in 1973 billions $)		(in 1973 billions $)	
Iran	$ 7.5	$ 18.0	$ 26.0	$ 40.0
Iraq	1.7	6.4	5.8	10.7
Kuwait	1.9	2.3	4.4	9.6
Libya	2.3	7.0	4.6	9.0
Qatar	0.4	1.5	0.5	1.6
Saudai Arabia	5.5	22.8	8.8	26.4
United Arab Emirates	1.1	4.1	1.2	4.3
TOTAL	$20.4	$ 67.1	$ 51.3	$101.6

With a rise in estimated revenues from $20.4 billion in 1973 to $67.1 billion in 1974, an increase of 329 percent, the Middle East nations have already redirected their efforts toward industrialization. Providing the leverage for this growth will be the research and development of a number of industrialized nations, especially Japan, Great Britain, Germany, Russia, and the United States, as well as the potential minerals that will be the key to unlock the future from the present. Realizing that the United States and other developed nations will ultimately arrive at a cheap source of energy that will eventually affect oil revenues, these Arab nations have embarked on an industrialization program to minimize their dependence on the United States and other nations for industrial and other goods. In March, 1975, Qatar, a small Arab nation whose oil revenue net about $2 billion a year and periphered by the Persian Gulf (a potential source of water), signed a contract with two Japanese firms for the construction of a steel mill and an aluminum smelter plant. Expectations are for a 300,000 ton annual export,[12] probably to the Middle East countries and African nations. Undoubtedly such a venture if successful would turn the heads of the theoretical economist and could be instrumental in rewriting chapters on the theory of economic development of a lesser developed country. Qatar joins the rank of other Arab nations--Egypt and Iran--as a steel producing nation. More striking than this is Iraq's imposing and grandiose industrialization plan. A country whose oil accounts for 90% of export revenue fully realized that today's oil and gas must be diversely used for its economic growth tomorrow. Iraq has discovered large phosphate rock deposits in the Western desert region and has

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natural sulphur deposits. Combined with natural gas, these minerals will provide the basis for a fertilizer plant to produce 1 million tons annually of high grade phosphates for Iraq's agricultural development. Out of this may come the knitting of the fabric of the Middle East world into a woven cloth. It is expected that Iraq's agricultural development would supply the necessary food for the Arab world.[13]

Supporting this program is the ambitious venture by Saudi Arabia's government which plans to expend $150 billion within the next five years for agricultural and industrial development. This program is expected to be pushed with vigor after the recent death of King Faisal. One facet of this industrialization and agricultural development program is the using of the gas flare offs at the well heads. In February, 1975, Abulhady Taher, head of Petromin, Saudi Arabia's petroleum development corporation, ordered the construction of two large fertilizer plants to be built by Shell Oil Company. These plants would be a part of a $5 billion system that will collect and convert more than the 3 billion cubic feet of gas flared off everyday in that country's oilfields. Instead of burning this useless product at the well head, the Arabs can cap enough gas to contribute heavily to meet the fertilizer needs of the world, stated Norman Berlaug, winner of the Nobel Peace Prize for pioneering the Green Revolution.[14] Further agricultural and industrial possibilities are in the making if Arab nations funnel oil revenues into tapping the Sahara Desert's underground water and lakes and reservoirs, which are claimed to be the largest in the world. Once this area was known as the most fertile agricultural lands in the world. Underneath this desert is a huge reservoir which hydrologists estimate to contain five times more water than all the fresh water lakes,

according to the U.S. Geological Survey.*

Iran's recent pact with the Russians entailing economic cooperation involves an estimated $3 billion adds to Iran's quenching her thirst for raw materials and contributes to the reallocations of world minerals. According to the Iranians, the agreement calls for the expanding of the Soviet-built steel plant at Isfahan to a capacity of 8 million tons of crude steel a year from the current 600,000 tons, building of an electrical power plant, constructing of four silos, expanding a heavy-machinery plant at Arak, and the building of a paper and pulp plant in the Soviet Union with Iranian oil revenues. In return, the Russians plan to supply the Iranians with a host of paper products.[15]

These ventures by the Middle East countries will undoubtedly call for supplies of minerals and other resources. Hitherto, the developed countries discounted the capabilities of this area to industrialize due to its lack of resources, skilled work force, capital, markets, and other indicators. However, with the tremendous inflow of oil revenues Arabian governments have embarked on varied industrialization programs that seemingly ignored many economic theories. Government-owned industries are, especially presently in the Arab world, in essence not profit motivated. Simply, they do not need the profits. Hence, their yen for economic development could be image building, status symbols, concern for the masses, bilateral agreements for their benefits, political power, and a host of other reasons.

Arabs increasing their food supply could render ineffective United States' strongest weapon against the Arabs and other developing countries.

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*Plain Truth Vol. XXXIX, No. 6. June - July, 1974, pp. 6-7.

With fertilizer plants being constructed, nutrients for the producing of fertilizers being available, heavy and farm machines being accessible, sufficient time, and abundant money, the Middle East nations increased food production could dike United States political and agricultural policies against Arab nations and even possibly certain African nations. With the coming of the "green revolution" in the Middle East then, increased food output could weaken America's powerful weapon in its arsenal against the Arabs. Equally important, Arab agricultural output could minimize the importance of bartering between these countries and Washington.

Coupled with these chains of events and Washington's lack of a well-defined foreign economic policy vis-a-vis with the Middle East nations, these countries are now in a favorable position to determine their future. For the first time in centuries, the Arab countries can embark on their OWN industrialization and commercialization programs without the interposition of foreign finance and pressure to fulfill their own objectives. Their plans and fruition of the industrialization and commercialization programs within the next ten years could well surpass any of those they personally and independently undertook within the past few hundred years. Economic development along with similar customs, money, languages, history, and culture could well provide the common cornerstones for the formation and development of the Middle East Common Market. Recent events have told the Arab leaders that one nation cannot stand alone to face the omnipotency of a big power nor can a nation singly face the world economic changes forthcoming in the next twenty-five years. Conjunctly,

they could invert the sands of time in their favor and against the developed countries.

What are the consequences of the mineral shortages facing the United States in the years ahead? Knowingly, the United States today produces about 85% of its dollar value of its mineral needs. There is an outcropping of serious deficiencies in a large number of metals--asbestos, cobalt, nickel, tin, zinc, fluorspar, bauxite, manganese, chrome, quartz crystal--to name a few. Another measurement of the shortfall in our metal needs is mirrored in the fact that in 1945, the United States consumed 60% of the world total of major eighteen minerals required for industrialization of these minerals.[16] In 1971, this consumption fell to 16%. Likewise, in 1945, we produced 46%, but in 1971 our share plummeted to 13%. These figures reflect that U. S. is no longer a dominant factor in world production of these 18 important minerals.[17] Paralleling this was our deteriation in crude petroleum output. In 1945 we produced 62% of the total world crude oil production and were nearly self-sufficient. By 1972, U. S. production had doubled, but we only produced 19% of the world total.[18]

Implications of mineral shortages can be placed in sharper perspective when future demands are considered in light of the past consumptions. In the period 1940-1970, the United States consumed more minerals than the entire world for all times before. Based on the United States forecasts for the year 2000 the total constant dollar value of U.S. demand for minerals is expected to increase from three to five times the 1970 level. This substantial increase will result from continuing economic and population growth and be characterized by

increasing affluence, urbanization and industrialization. Technological progress and innovation will continue to be the main influencing factors in the demand for all resources in the year 2000.[19]

A more penetrative statistical insight in our future demands for specific resources is in part provided by U. S. Department of Interior, Geological Division as follows for 2000.[20]

Commodity	Minimum Anticipated Cumulative Demand 1968-2000
Aluminum	290,000,000 Short Tons
Asbestos	32,700,000 " "
Barite	25,300,000 " "
Chromium	20,100,000 " "
Copper	96,400,000 " "
Iron	3,280,000,000 " "
Lead	37,000,000 " "
Manganese	47,000 000 " "
Nickel	16,200,000,00 " "
Tungsten	1,100,000 Lbs.
Zinc	57,000,000 "

What are the domestic and international implications of these shortfalls on minerals to the United States domestically. First, we must slash the horrendous waste that characterizes our economy. As population increases and the suburbs become enlarged, more and more minerals will be required to meet these changes. Second, we must realize that the major cities will become the slum centers of the United States. A lack of mineral resources and energies as well as money will force governments to reconsider the rebuilding of the inner cities. As the American government (assuming the eventual demise of state and local governments) becomes increasingly capitalistic--socialistic tilted, the government will lack raw materials, resources as well as funds to take care of

the increasing numbers in poverty and try to rebuild the cities at the same time. People vote, not buildings; and who has heard of any major political party winning an election on an austerity program? Chances of victory grows arithmetically with geometrical increases in spending. Such deficit spending (the over $100 billion as stated for the present Ford Administration) could well be tomorrow's headstones for the graves of the state, local and county governments as well as business enterprise.

This leads to a third implication--the growing numbers of poverty in America. What is presently known as the middle class today will be tomorrow's poor. And those people in the poor class today will be eventually corralled into the "poor-poor." Comprising the "poor-poor" will be a vast number of minorities and uneducated whites. Too, these "poor-poor" will have to be subsidized by food stamps, clothing stamps, shoe stamps, free medical and dental care and live in slum compounds, mainly the inner city. These vast government expenditures undoubtedly will deter government's rebuilding of these cities. Already, the uncontrollable and even acceptable sprawls and blights are benchmarks for Detroit, New York, Chicago, Los Angeles, Cleveland, Akron, and even Columbus. With our present mineral resources and anticipated deficiencies the tomorrow, then converting our present deteriorating cities into the architectural utopia is a myth. It is questionable that the golden age of senior citizens today can be recaptured by tomorrow's retirees.

A fourth implication to our present and future shortfalls in minerals is the rediscovery of new sources of cheap energy--be it solar, atomic, nuclear, thermal, or wind. For minerals converted into power require dosages of energy. And the cheaper the grade of materials, the greater or more powerful the form of energy.

A fifth implication will be the emergence of a technological revolution based upon this new source of energy. With a dwindling of our mineral resource availabilities, the modes of production will change radically. Machines will be operated by laser beams, memory banks, sophisticated tapes and programs, and even by light possessing various frequencies. Calibrations and measurements, especially those adapted from the space shots, will provide the know-how for the new technologies as well as the array of different products. Waste as known today will be minimal in the production process. New factories, modular in structure and mostly one floor (as in Plymouth Motor Company), will be standard benchmarks on our new industrial face.

Out of this order will come a new labor force--the technocrats who will provide the supportive efforts of the new scientists who will emerge out of our requalifying labor force. It will be the scientist--has he not always been--who will arise out of this present time lag to produce the electronic and industrial gear for the coming industrial order. And it will be the new scientist and the technocrats who will become the new rich--not the workers as we know of today. One wonders how the projected earnings of $90 billion in Ohio by 2000 will be divided among the projected 14.5 million people? Possibly the government

will see to it that the middle class will be free-enterprised while the rich will be socialized. A new result could be a multitude of unemployment that could make the present 9.2% rate (April, 1975) a land of prosperity. As the new technologies then emerge and dominate our economic order, most likely a shift will occur in our labor force. More and more jobs will be open to the females and less employment for males. Predominancy of the service sector--more so in the future than today --will beckon the females into the labor force. As for the males, a greater number, especially with college degrees, could well be the victims instead of the benefactors of our oncoming technological revolution.

Tied into this technology, in part due to a lack of resources--will be massive recyclings. Previous note has been made of our "discard" society. Recycling will be the order of the day--thanks to the ingenuity and efforts of the scientist. Surely, he has plenty to work with.

Educational systems will crunch under the new economic order largely due to mineral shortages. Today, thousands of college graduates are either unemployed or under-employed. Caught in a timelag of economic change, they too, can become as obsolete as the machinery in Ford, General Motors, United States Steel and others. Certainly, a certain amount of college education will be required. Much will come out of the up-to-date vocational and technical schools--both private and public--as well as schools bent more on practical education than the non-practical. Vocational, and to a certain degree, our technical

will see to it that the middle class will be free-enterprised while the rich will be socialized. A new result could be a multitude of unemployment that could make the present 9.2% rate (April, 1975) a land of prosperity. As the new technologies then emerge and dominate our economic order, most likely a shift will occur in our labor force. More and more jobs will be open to the females and less employment for males. Predominancy of the service sector--more so in the future than today --will beckon the females into the labor force. As for the males, a greater number, especially with college degrees, could well be the victims instead of the benefactors of our oncoming technological revolution.

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schools today are ineffective to a large degree. Who knows in the vocational-technical schools what the jobs will be five or ten years hence? Are curriculum schedules made today on future job markets for specific standard metropolitan statistical areas or on given regions so that these institutes can prepare the youths for tomorrow instead of yesterday? Job opportunities change, and these changes can be well accelerated by the turn of the century. Possibly on the pale of the economic order could be today's college graduate.

Finally, should the United States fail to obtain these resources peacefully from other nations, this country could well go to war for them. History has shown that wars have an economic basis. Has not Secretary of State Kissinger and Senator Fulbright, as well as the White House, openly or hiddenly talked about taking oil from the Arabs by force if necessary. Can such talk be made for iron ore? Copper? Zinc? Tin? And if the United States does go to war, do you have the mineral resources to fight another Viet Nam or Korea. Or do you have the minerals to support another Viet Nam, whose soldiers left a billion dollars in arms, fighter planes and other military hardware last week for the Reds to use?

International implications are more complicated than our domestic.

First, mineral deficiencies will force the United States to alter its foreign economic policy from one of plenty to one of scarcity. Second, our international trade posture will have to change. Being more competitive, producing a better quality product, becoming more capital-intensive, seeking new markets in Africa, Latin America, Middle East, and

the far East on a more aggressive basis by the United States is needed. Whether the U. S. can convey their well-intentions to the Africans and the Arabs is a hard-core question. Many African nations who have natural resources are not prone to welcoming Americans. They have long known who Stanley and Livingston were and are. Third, the United States will have to learn to handle and contend with cartels based upon minerals rather than geography and nationalism. Organization of Petroleum Exporting Countries has become a showcase for other countries to ape. Recently, countries, to increase their mineral prices, have formed together into cartels such as Organization of Bauxite Exporting Countries, Organization of Copper Exporting Countries, and those for tin, iron ore, and others. Such divergences in memberships will add problems to the United States when trying to deal with these organizations whose members should increase in numbers as well as in their strength. Fourth, United States will have to devise some methods of converting the huge amounts of soft currencies piled up under PL 480, Title I to obtain raw materials. Fifth, arrangements should be formulated to encourage bartering of United States food for raw materials of any lesser developed nations who are short in agricultural products. Sixth, a new look should be taken at the United States' foreign aid programs. Some form of indexing in terms of rising raw material prices should be used in relation with the prices and the amounts and kinds of foreign aid to be dispersed. Seventh, perhaps a modified plan of United States governemnt subsidizing private investments which would permit profit-sharing and part ownership of mines or plants by the mineral-holding lesser developed countries.

Eighth, needed is an assessment of our bilateral trade agreements so as to increase our trade with countries who have resources. Ninth, perhaps following the Japanese, encourage mineral surveys in other countries, help in extraction, and we receive a share of what is mined.

Tenth, we must recognize the development of the fourth world. This new entity is a split off from the Third World countries who have become the new rich. As to the Fourth World, this area is presently comprised of 40 nations having over 1 billion people who in essence are destitute and desolate.

Eleventh, the United States should endeavor to strengthen the dollar in world markets. Weakening of the dollar has created problems for the United States, and especially so when trying to purchase or barter for raw materials. Recent divorcing of the Iranian and other Arab countries' currencies from the dollar will continue to undermine our posture in the world's economic relationships.

Twelfth, some attempt should be made to create a new international body, hopefully with some teeth in it, to bring about an equitable share of the distribution of raw materials of the lesser developed countries with the developed nations.

Thirteen: United States should develop positive counter measures to minimize the emulation of Arabs by mineral producing countries in terms of price increases, shortage creations, and power politics.

In conclusion, minerals,-their amounts, kinds and qualities--will largely determine our course within the next 25 years, Like the present the future is fraught with problems for the United States and the rest of the world brought about largely through redistribution of mineral and

other resources.

Trying to forecast the future is like adjusting the lens in the telescope so that the universe of the unknowns can be a galaxy of the knowns. Perhaps I have not adjusted the lens properly to peer far enough into this universe of the unknowns. Let us hope some one will construct a more sophisticated telescope with more powerful lens and minimize our myopia.

NONRENEWABLE NATURAL RESOURCES

Resource	Countries or areas with highest reserves (% of world total)[1]	Prime Producers (% of world total)	Prime Consumers (% of world Total)	U.S. Consumption as % of World Total
Aluminum	Australia (33) Guinea (20 Jamaica (10)	Jamaica (19) Surinam (12)	US (42) USSR (12)	42
Chromium	Rep. of S. Africa (75)	USSR (30) Turkey (10)		19
Coal	US (32) USSR-China (53)	USSR (20) US (24)		22
Cobalt	Rep. of Congo (31) Zambia (16)	Rep. of Congo (51)		32
Copper	US (28) Chile (19)	US (20) USSR (15) Zambia (13)	US (33) USSR (13) Japan (11)	33
Gold	Rep. of S. Africa (40)	Rep. of S. Africa (77) Canada (6)		26
Iron	USSR (33) S. Am (18) Canada (14)	USSR (25) US (14)	US (28) USSR (24) W. Germany (7)	28
Lead	US (39)	USSR (13) Australia (13) Canada (11)	US (25) USSR (13) W. Germany (11)	25
Manganese	Rep. of S. Africa (38) USSR (25)	USSR (34) Brazil (13) Rep. of S. Africa (13)		14
Mercury	Spain (30) Italy (21)	Spain (22) Italy (21) USSR (18)		24

Table 1

Resource	Countries or areas with highest reserves (% of world total)[f]	Prime Producers (% of world total)[g]	Prime Consumers (% of world total)[h]	US Consumption as % of World Total[l]
Molybdenum	US (58) USSR (20)	US (64) Canada (14)		40
Nickel	Cuba (25) New Caledonia (22) USSR (14) Canada (14)	Canada (42) New Caledonia (28) USSR (16)		38
Platinum Group[m]	Rep. of S. Africa (47) USSR (47)	USSR (59)		31
Silver	Communist Countries (36 US (24)	Canada (20) Mexico (17) Peru (16)	US (26) W. Germany (11)	26
Tin	Thailand (33) Malaysia (14)	Malaysia (41) Bolivia (16) Thailand (13)	US (24) Japan (14)	24
Tungsten	China (73)	China (25) USSR (19) US (14)		22
Zinc	US (27) Canada (20)	Canada (23) USSR (11) US (8)	US (26) Japan (13) USSR (11)	26

Limits to Growth
by Meadows, Meadows, Randers and Beherns, III
Universe Books, New York, New York
1974

Table 2

PER CAPITA REQUIREMENTS 1972

(13,400 POUNDS PER CAPITA)

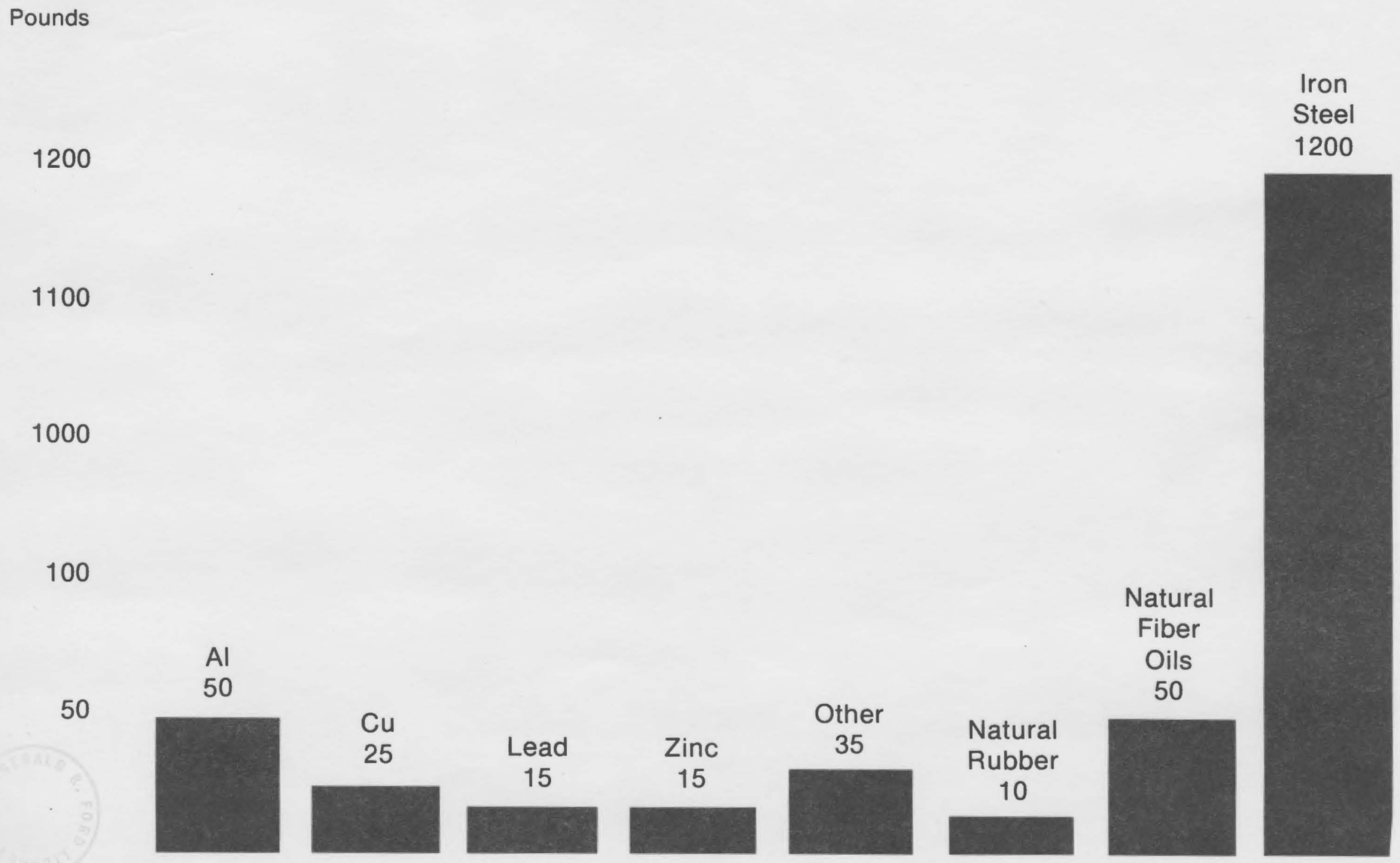

Chart I

METAL REQUIREMENTS OF UNITED STATES 1972-2000

(Al, Cu, Zinc, Lead, Others)

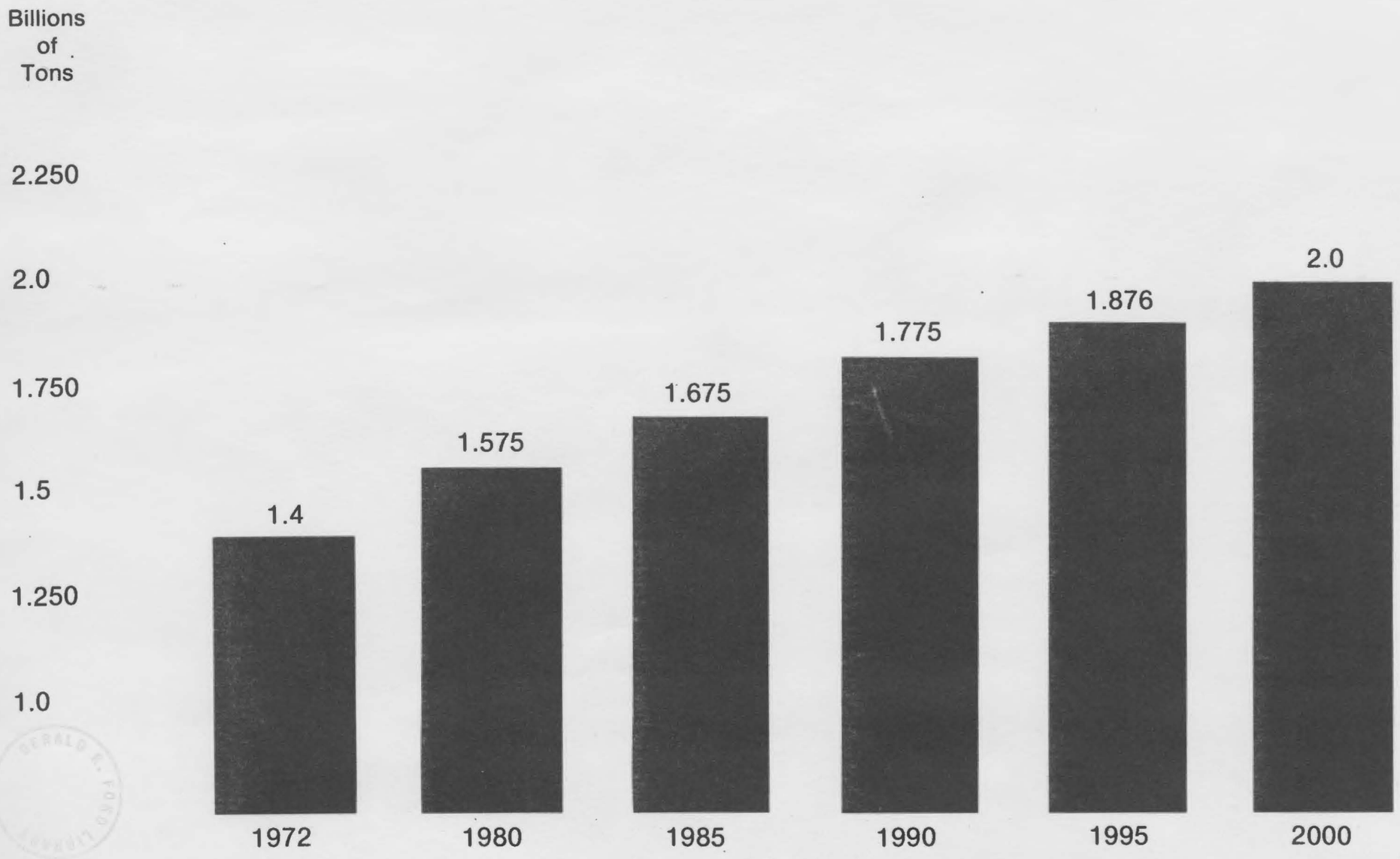

Chart II

RAW MATERIALS REQUIRED BY U.S. POPULATION
1972-2000

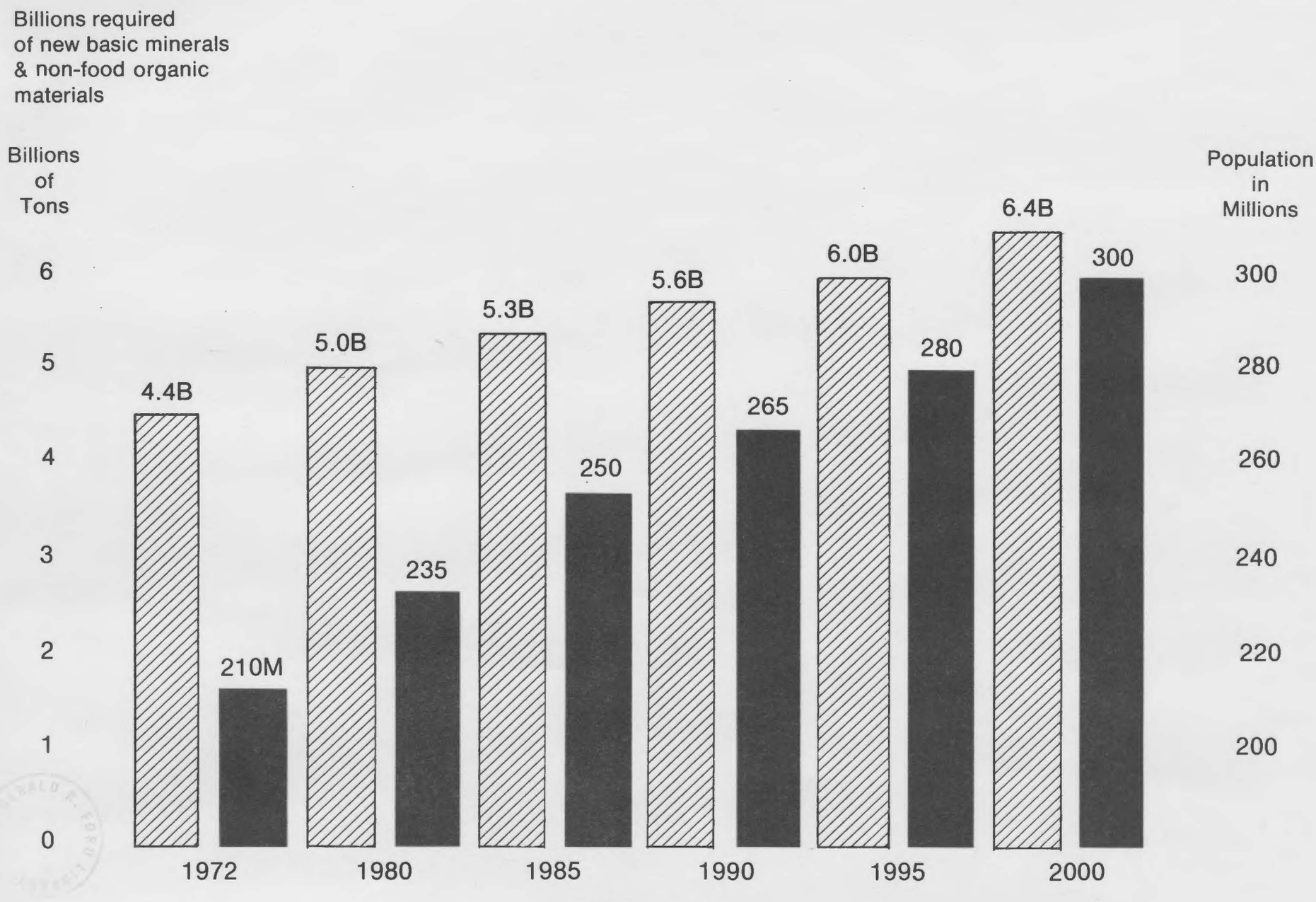

Chart III

METALS IN AVERAGE JUNK CAR 1974

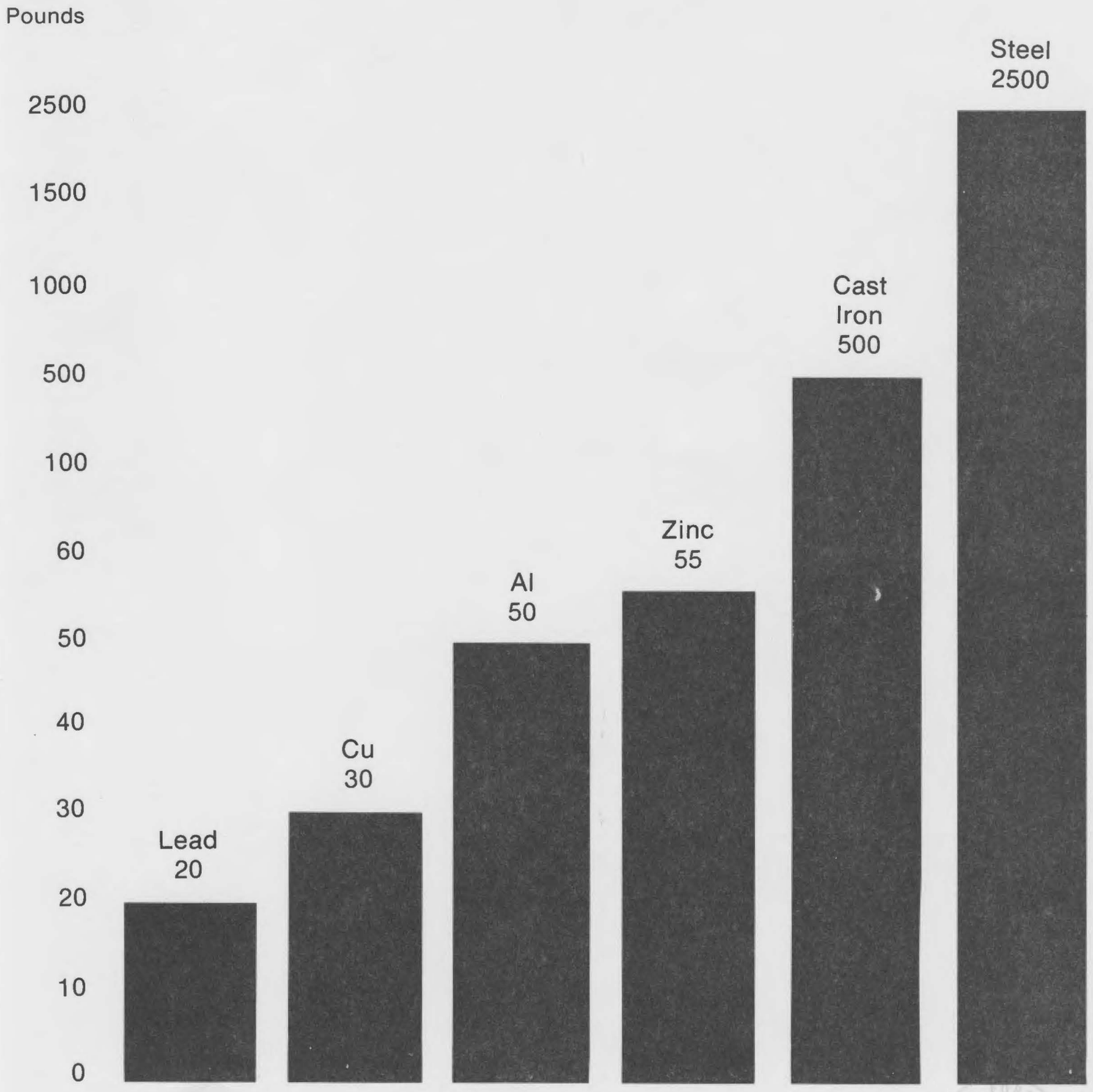

Chart IV

METALS IN 15 MILLION JUNK CARS

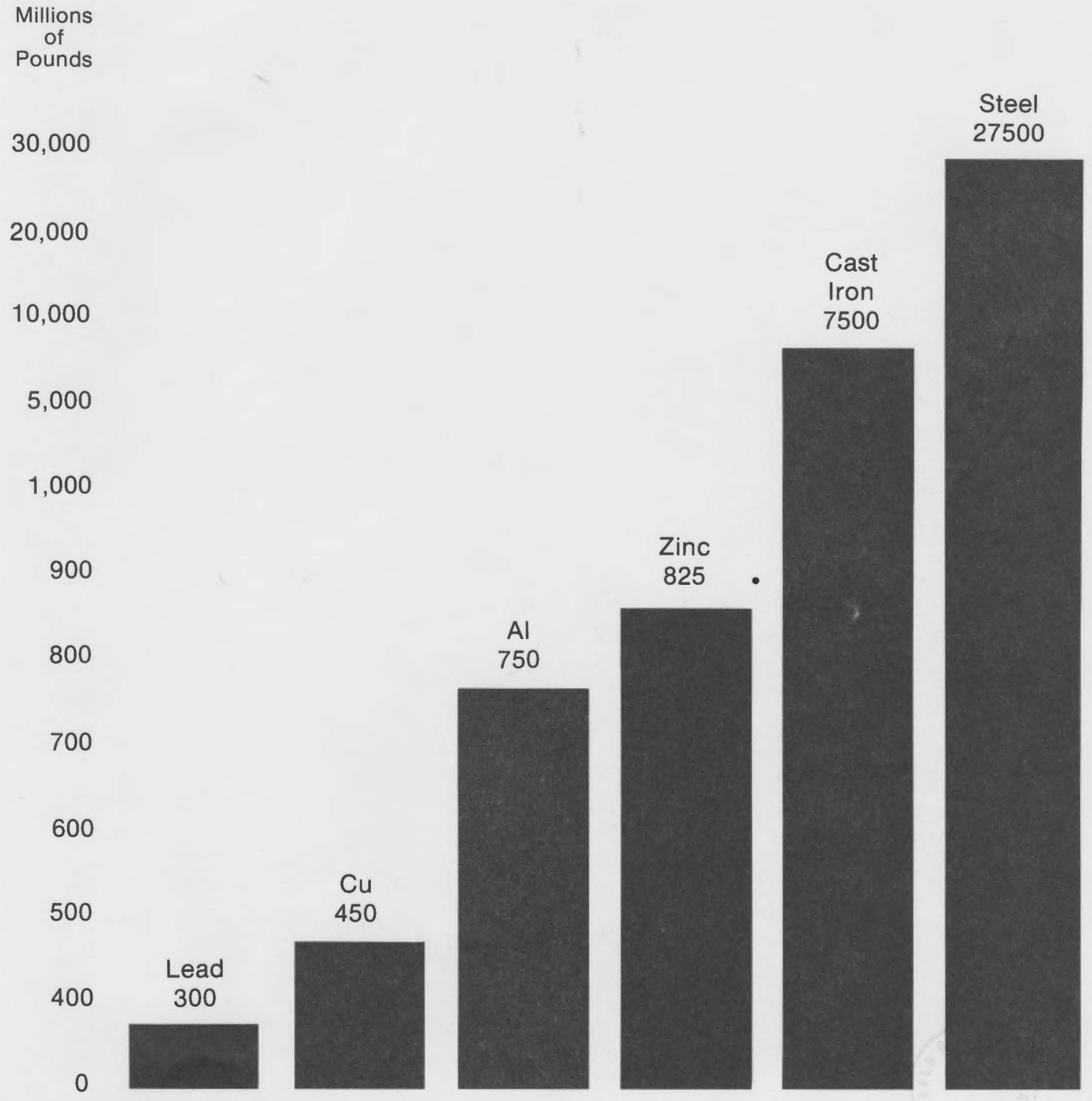

Chart V

AFRICA'S PRODUCTION & RESERVES OF MINERALS
% OF WORLD

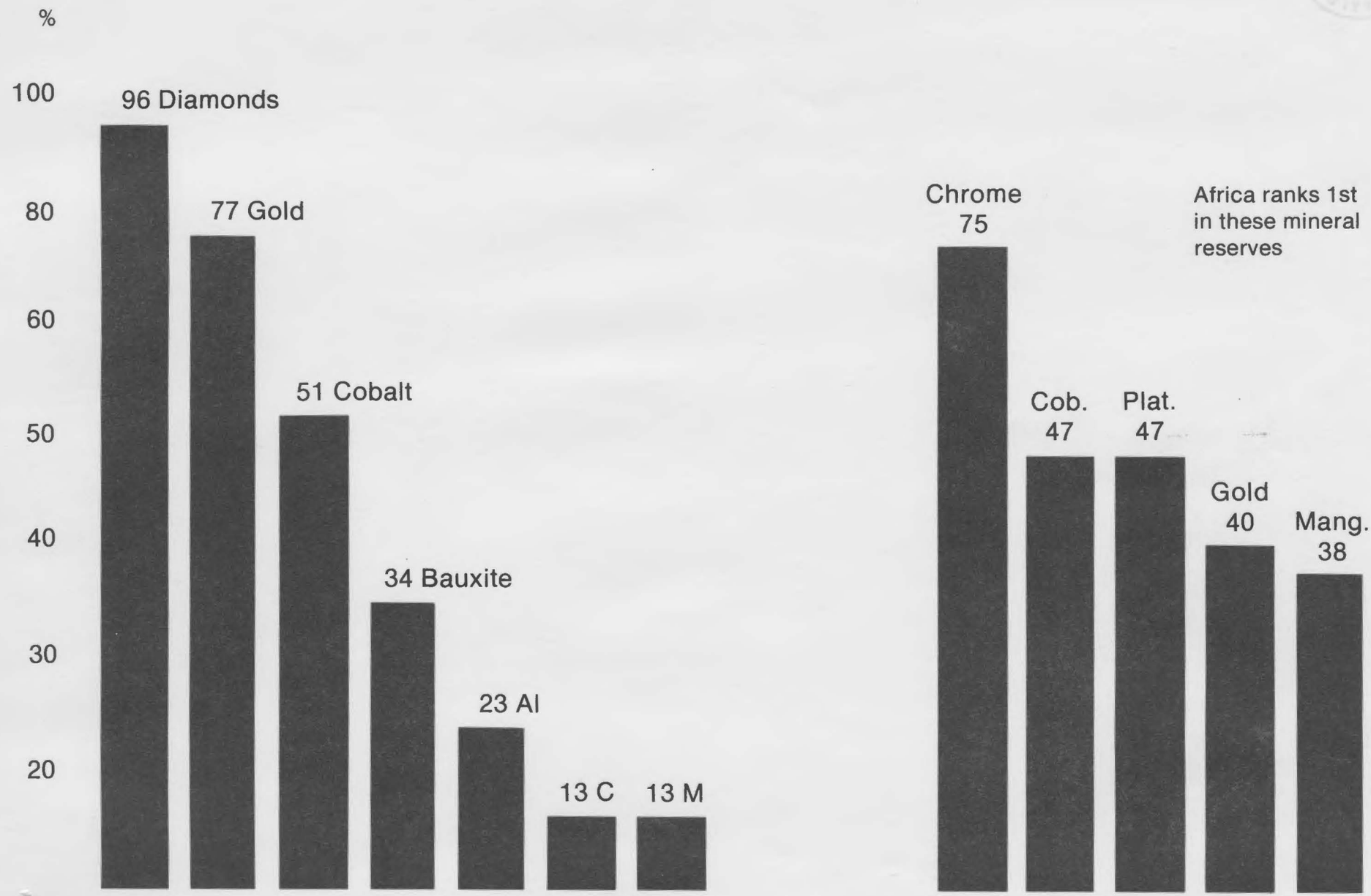

Chart VI

1. World Military Expenditures and Arms Trade, 1963-1973. U. S. Arms Control and Disarmament Agency. Washington, D. C. Publication 74. Washington: Government Printing Office 1975.

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5. Ibid. P. 247.

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8. Cameron, Eugene, Editor. The Mineral Position of the United States, 1975-2000. Madison, Wisconsin: University Press, 1973. P. 35.

9. See Graph II, appendix: Africa's Production and Revenues of Minerals % of the World. Source: The Limits to Growth, D. H. Meadows, D. C. Meadows, J. Randers and W. Behren III. New York: Universe Books, 1974. pp. 58-59. See Chart I Appendix.

10. Cameron, op. cit.

11. The Planetary Product in 1973: Special Report, No. 11, Bureau of Public Affairs, Department of State. Office of Media Service, December, 1974. Washington, D. C.

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15. Wall Street Journal, February 26, 1975. p. 6.

16. Cameron, op. cit. p. 17.

17. Ibid. p. 19.

18. Ibid. p. 21.

19. U. S. Bureau of Mines, Mineral Facts and Problems, 1970. Washington U. S. Department of the Interior, Bureau of Mines, 1970. Bulletin 650. P. 6.

20. U. S. Department of Interior. Geological Division. United States Mineral Resources. Geological Survey Professional Paper 820 Washington: U. S. Government Printing Office, 1973, p. 7.