WORLD MINERALS
AND
WORLD PEACE

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PREFACE

This volume is the joint product of specialists in the fields of mineral resources and economics. The study was suggested by Dr. C. K. Leith, distinguished geologist of the University of Wisconsin. Dr. Leith's interest in the relation of minerals to the prevention of war dates from World War I when he was mineral adviser to the War Industries Board and to the American Commission to Negotiate Peace. It has been intensified by his experience during World War II as Consultant on Minerals to the War Production Board. Because of the complex economic issues involved in the world mineral problem, Dr. Leith felt that the investigation required the collaboration of mineral specialists and economists.

The Institution welcomed this opportunity for collaboration with mineral experts. Dr. Cleona Lewis, author of several of our volumes in the field of international economic relations, was freed from other responsibilities in order to work on this project with Dr. Leith and J. W. Furness, formerly Chief of the Economics and Statistics Branch of the Bureau of Mines. Dr. Louis Marlio and the undersigned have acted as a consulting committee.

HAROLD G. MOULTON
President

The Brookings Institution
January 1943

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Mr. Leith and Mr. Furness wish to express their personal appreciation of the collaboration offered by the Brookings Institution.

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Cleona Lewis

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INTRODUCTION

While minerals have been used since the days of the stone ax and flint implements, it was not until the industrial revolution inaugurated the machine age a little more than a century ago that minerals began to be used in large volume and variety. Minerals are the raw materials both of the machine and of the power to run it. The burst of industrialization since the opening of the present century has intensified the use of minerals, both in volume and variety. In this 40-year period of industrial expansion the world has used more of its mineral resources than in all preceding history.

Industrial power has become to a large extent the measure of modern political and military power. Since industrialism is largely based on mineral resources, the control of essential mineral supplies inevitably has become a subject of international rivalry and controversy. The control of minerals is thus regarded by many as an essential part of any program for the prevention of war.

The exploration and development of minerals in recent times has extended to nearly all parts of the world, and therefore the world geography of mineral resources is now pretty well known. Further discoveries will here and there modify the picture, but are unlikely to change its salient features.

Mineral resources are very unequally distributed among the nations, both in volume and variety. No nation is fully endowed. Industrial self-sufficiency for any nation would require that it have free access to minerals in nearly all parts of the world. Division of the world into smaller self-sustaining units is physically impossible. It follows that minerals must move internationally on an ever-expanding scale if industry is to be supplied. Nations have become physically interdependent as to minerals in a way which has no precedent in history.

These facts present a problem which will become more acute

as world industry expands. Nations have tried to meet it in various ways.

To facilitate the international flow of minerals on the scale required in recent decades, various commercial and political measures have been tried. These include world monopolies, cartels, and trade arrangements of one kind or another. To date, no machinery has been perfected that is really adequate from all points of view for ensuring the necessary flow of minerals among the nations.

To avoid the necessity of international movement and dependence on other countries, many nations have adopted measures to make themselves self-sufficient in mineral supplies. This effort has included intensive exploration and development of mineral supplies at home, the use of lower-grade ores, improvements in the technology of processing and using minerals, and the development of substitutes. But self-sufficiency in mineral supplies has not been attained by any nation, through any of these measures, even under the pressure of war conditions. Indeed, the efforts in this direction have gone far enough to prove that, in spite of local and technological successes, self-sufficiency within national boundaries is impossible, in peace or war, even at excessive cost. Yet the effort persists and there has been no general realization that the international movement of minerals is inescapable if industrial power is to be attained by any nation.

Another means used by nations for escaping dependence on other sovereign powers has been the acquisition of political and commercial control over minerals in foreign countries. It is this effort which has played a leading role in the destruction of world peace. The principal avowed objective of the Nazi group of nations is to secure adequate raw materials.

The world mineral problem began to take form during World War I, and since then it has taken on new phases and has become ever more acute. It is now recognized as one of transcendent importance for the future peace of the world. What are the possibilities for its solution? Is it possible to guarantee equality of access to all nations? Would removal of trade barriers bring

this result? What can be expected from the revision and extension of various methods of international control which have been tried in the past, both in peace and war? Are sanctions necessary? Can they be made effective?

The purpose of this book is to present a factual study of trends in the mineral field—physical, economic, and political—and in the light of these trends to analyze the possibilities of controlling minerals to prevent preparation for war.

In reviewing trends in the mineral industry, attention will be directed mainly to the developments of the past twenty years, but where necessary to gain a longer perspective the review will include earlier developments. In order to tell the story simply, much of the supporting statistical material is relegated to the appendixes.

In view of the current public interest in "geopolitics," it may be well to outline briefly the relation of this book to that field of thought.

The essential thesis of geopolitics was originated by Friedrich Ratzel, a German, and Rudolf Kjellen, a Swede, about the end of the last century, and later was developed into an applied science by Sir Halford Mackinder, an Englishman. Still later it was utilized by a German named Karl Haushofer, who collected a great mass of factual details which he used in developing war plans for Germany.

According to these writers, control of the great land masses of Eurasia and Africa, with adjacent islands, called the World Island, would make it possible to control the seas and thus the world. Further, they postulated that the control of the World Island would lie in the "Heartland," including about one-half of European Russia, all of Siberia, Mongolia and western China, Afghanistan, Baluchistan, and Iran, as well as Arabia and most of Africa, and that the "Heartland" in turn could be controlled by whoever gained command of Western Europe. (For a popular discussion and maps see *Life*, December 21, 1942.) The lands of the Western Hemisphere were considered as outer islands and left out of account. And, of course, the effect of air power was likewise left out.

This geopolitical thesis was discussed by Hitler in "Mein Kampf" and is supposed to have influenced his plan of campaign in the present war.

Other concepts of geopolitics have put the basis of world control primarily in sea power, in air power, and in the United States, with domination in the Western Hemisphere.

The geopolitical thesis of the present book is that potential world control is not necessarily afforded by control of any of the great land masses, but that it lies in the control of mineral resources, wherever they are, backed up by control of the air and the sea. It further emphasizes the fact that the combined mineral resources controlled by the United States and the British Empire far outweigh the mineral resources of the World Island as envisaged in the German geopolitical concept, and afford a much broader and more powerful base for world control, both for peace and war.

PART I
PHYSICAL AND COMMERCIAL TRENDS

The first division of this study sets forth the essential factors with reference to world mineral production. It sketches the growth of mineral output in the world as a whole, and presents the salient features of the world mineral picture of the present.

The analysis reveals: 1. The sources of production of, and the international trade in, the principal mineral raw materials; 2. the present mineral position of leading countries and areas; 3. the mineral production of the United States as compared with the rest of the world; and 4. the mineral position of the two great belligerent groups in the present world struggle. Finally, consideration is given to the geographical shifts now under way —as a result of new explorations and discoveries and the exhaustion of older resources, the development of new technologies, and the use of substitute materials—and the bearing of these changes on the mineral picture of the future. The conclusion is reached that although there may be new discoveries and developments, there is not likely to be any great modification in the present geography of mineral production; that no nation can become self-sufficient in minerals; and that there will be no lessening of the interdependence of nations for mineral supplies.

CHAPTER I

THE GROWTH OF WORLD MINERAL PRODUCTION

As a background against which to consider the mineral situation in the world today, it will be useful to show how mineral production has grown during the past 60 years. The fact is, of course, that the vast industrial expansion of modern times would not have been possible without a corresponding expansion in the output of basic minerals.

In this review, the first section will sketch world trends from 1880 to 1940—for mineral production as a whole in relation to the growth of industry, and for fuels and metals as separate groups. The second section will show the expansion of mineral production in the United States in comparison with the rest of the world. The last section will summarize the various factors affecting the growth of mineral production.

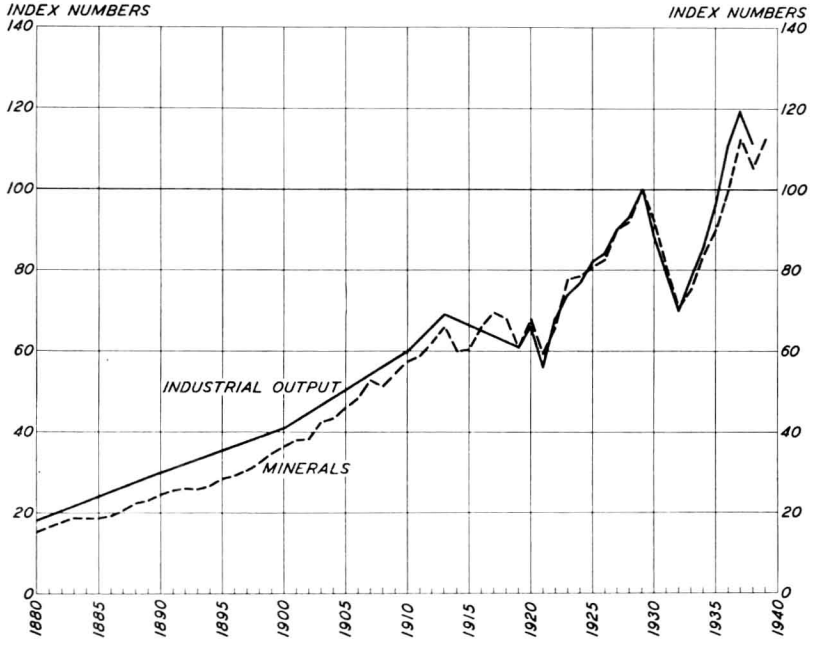
WORLD TRENDS

The mineral output of the world has long kept pace with the expanding volume of industrial production. Metallic minerals have been produced in increasing amounts to meet the demands of the manufacturing, transportation, and communication industries. Coal, petroleum, and natural gas have been required to meet the tremendous expansion in world consumption of power, light, and heat.

Expansion in output has not been at the same rate for all minerals nor for all countries. From time to time the production of various minerals has changed abruptly—rising or falling with changes in political and economic conditions, or in response to the discovery of new uses and new resources, or under the impact of competition from new substitute materials. Some nations are still in the expanding stage of production, others are on the down grade. However, for the world as a whole the trend has been upward.

During the past 60 years the increase in mineral output has closely paralleled the growth in world industry. This is shown by the chart given below. This chart compares world industrial production (as measured by the Institut für Konjunkturforschung and the League of Nations) with world output of the eleven minerals most widely used in industry. While the two series are not strictly comparable, they are reasonably satisfactory for present purposes.

INDUSTRIAL AND MINERAL OUTPUT OF THE WORLD, 1880-1939[a]
(Indexes, 1929 = 100)



[a] Basic data for the chart are given in App. A.

As the chart indicates, there was a steady increase in industrial and mineral output during the long period from 1880 to 1913. Then came the interruption of World War I—a period of some eight war and reconstruction years when the two production curves followed downward trends, reaching a low for this move-