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NEVADA BUREAU OF MINES

VERNON E. SCHEID, DIRECTOR

REPORT 12

SELECTED READINGS IN MINERAL ECONOMICS

By WALTER H. VOSKUIL

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MACKAY SCHOOL OF MINES
UNIVERSITY OF NEVADA

1966

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FOREWORD

The economic aspects of the mineral industry are receiving close scrutiny by mineral producers, officials in government, and students in the field of international relations and economic development.

The mineral industry is world-wide, and mineral developments in or near one continent may affect mining conditions and prospects in another. Economies in deep-sea transport of ores and fuels have served to intensify competition among mineral-producing districts and nations. Continued research in the mineral potential of our oceans, new methods of exploration, the development of new minerals, and new uses for known minerals are but a few of the major areas which may change the mineral economics of the world. A continuing knowledge of changes in the mineral industry is essential to persons engaged in mineral exploration, production, processing, transportation, and marketing.

This selected list of readings on the economic aspects of the mineral industries is intended as a survey of the essential characteristics of major mineral commodities in the United States and in the world at large over recent years. It is not an exhaustive bibliography on the subject, nor does it pretend to cover all phases of mineral economics relating to the mineral industry. The list is designed mainly as a guideline for teachers of mineral economics to suggest supplementary readings to accompany their lectures. Students and others interested in the subject may also find it useful.

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February, 1966
Mackay School of Mines
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SELECTED READINGS IN MINERAL ECONOMICS

By Walter H. Voskuil

INTRODUCTION

MINERALS FOR AN EXPANDING ECONOMY

A knowledge of the economic aspects of the mineral industry in world economic and political affairs is of primary importance today. Specialists in various branches of the mineral industry have recognized this fact and have given it expression in many excellent contributions to the field of mineral economics.

The list of references on mineral economics presented here is not intended to be exhaustive; rather, it is comprised of contributions which the author has found useful as supplementary readings for student and teacher alike in connection with courses in mineral economics, mining, and geology.

Although the publications cited are primarily of recent date, certain important references of earlier date have been included for standard background reading.

The list includes, also, publications dealing comprehensively with one mineral or group of minerals. Notable among these are the U. S. Steel's exhaustive volume on the "Making, Shaping, and Treating of Steel"; the 1962 report of the National Fuels and Energy Study Group to the Senate Committee on Interior and Insular Affairs; the materials surveys on metals and minerals of the U. S. Bureau of Mines; and the annual surveys of the several technical journals.

Background readings on mineral economics and mineral resources in general are presented under separate headings. Reference material for information on taxation and marketing is also given in a separate section.

Other readings are grouped according to their particular or dominant contribution to the productive processes. These groups include iron ore and ferroalloys, fuels, nonferrous metals, light metals, minerals of construction, chemical minerals, and precious and semiprecious metals.

The core of the mineral productive pattern is the iron-ore and fuel group of minerals. If a society is to be highly productive, it must be equipped lavishly with power-driven machinery, which means it must have abundant supplies of iron. Iron therefore assumes a major role among the metals; in fact, iron accounts for nine-tenths of all metal used. But iron is a product of iron ore and fuel -- a special fuel. The coke used to process the iron ore is made from high-quality coal, and coking coal is restricted in distribution. About one-fourth of the total fuels used in all manufacturing is used in this first step of converting iron ore into pig iron. The great tonnages and the special quality of fuel needed tend to localize pig iron production at points where the sum of transportation costs of ore, fuel, and finished product to market are lowest.

The ferroalloys comprise a group of metals which, added to iron, change the properties of the resulting steel in various ways. Manganese, chromium, nickel, molybdenum, tungsten, and vanadium are used primarily as alloy materials in making steel. Aluminum and copper, as alloys, give steel certain important properties, but these metals are important in their own right.

The nonferrous metals include aluminum, copper, lead, magnesium, zinc, and tin. Their usefulness is based upon their particular properties and their role in special nonferrous alloys. Copper, as the most efficient low-priced conductor of electricity, is the basis of the electrical industry. Lead, the most widely used metal for cable coverings, cooperates with copper in conducting electricity through oceanic cables. In these and many other ways the nonferrous metals function with steel as vital agents of production.

The light metals are aluminum, magnesium, and titanium. Their ores are abundant in nature. These metals have aroused much interest because of high public expectations regarding their possibilities in consumer goods as well as productive machinery.

Minerals of construction include asbestos, asphalt, cement, clays, sand and gravel, sandstone, gypsum, lime, slate, and stone. The multiplicity of building requirements calls for a great variety of minerals, which are needed in enormous tonnages every year for industrial structures to house the machinery of production, for factories and office buildings, and for extensive transportation facilities.

Chemical minerals include a wide variety of minor metals and minerals which have limited or special functions. One such group is the fertilizer group -- nitrate, phosphate, potash, and sulfur -- which contributes chiefly by increasing agricultural crop production.

The basic pattern of mineral economy has not changed much since man first developed a process of producing iron and steel cheaply. The rise of the light-metal industry was added to the list of industrial raw materials that compete in some degree with iron, copper, lead, and tin. However, new materials have not altered the pattern of production set by steel, nor is any major change probable. Neither is there apt to be any radical change in power supply in the immediate future, in spite of developments in nuclear physics and the release of nuclear power.

GEOGRAPHIC FACTORS IN MINERAL USE

Mineral resources are located randomly by nature. Some kinds of minerals are so widely distributed that nearly all countries have adequate supplies within their boundaries or near at hand. Other minerals are so distributed that some countries have more than they need and others do not have enough. No country is self-sufficient in regard to either resources or markets for all minerals.

The history of industrial development shows that only a few localities in this world have the right combinations of mineral supplies to favor establishment of industries. These industrial districts must necessarily buy some of the minerals they need from remote quarters of the globe. Thus the geographic distribution of minerals leads inevitably to international trade in minerals. In order to cut the high cost of transporting bulky raw materials, however, it is important to concentrate, refine, and fabricate them as near to the source of supply as possible.

POLITICAL FACTORS IN MINERAL USE

Political factors come into the industrial picture because the minerals needed by industry are under divided political control. The world industrial pattern is such that minerals flow into a few centers for processing and manufacture. Nations outside of the industrial centers function as suppliers of mineral raw materials.

Out of this economic relationship various political situations arise. Minerals necessary to the manufacture of steel become the object of rivalry among industrial powers. Nations that own mineral resources may set up tariffs and export or license fees; they may restrict the right to explore or develop their resources; and they frequently make special trade agreements in order to drive bargains with the nations that must buy the minerals.

The need among nations for cooperation, based on comprehension and continued research, is self-evident. In one area of human need alone, that of increasing the world's food supply, the use of minerals will play an expanding role in providing plant food for the soil, chemicals to protect the growing plant, and machines to increase man's efficiency in producing the food.

The purpose of this work is to suggest to the student of mineral economics specific sources of up-to-date material to assist him in his effort to understand the problems of the mineral industry and to serve it in his respective field.

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