Human civilization since its inception has been tied to mineral extraction in some form or the other and mineral wealth has been considered by many as the starting point of economic growth. Thus, from the early days of Natural Science to the complex science and technology that foster human societies today, the discipline of Earth Science has played a key role in human development. During the eighteenth and nineteenth centuries, the fledgling science of Geology provided the basic inputs for the exploitation of coal and other raw materials which brought about the Industrial Revolution and subsequently, rapid economic growth in Europe and North America. During the twentieth century the increasingly robust Geoscience fuelled the “Hydrocarbon Age” and facilitated the so-called second industrial revolution based on microelectronics and information technology. This period saw unprecedented energy consumption and massive advancement in transportation and communication, which has shrunk our globe in relative terms. It also guided the exponential growth in the recovery of various metals and other mineral commodities for the development of infrastructure for our increasingly prosperous societies. Changes in some fields in the last century have been more substantial than those that occurred during the entire preceding millennium. On the flip side, however, along with the obvious benefits there were many negative side effects. The pattern of growth in so-called developed, actually “overdeveloped” countries requires excessive, often wasteful consumption of natural resources entailing damage to the world’s ecosystem and environment. It is also easily overlooked that these georesources which are essential for poverty alleviation and in achieving a better quality of life in the developing world, as well as for all modern technologies that we are so dependent upon, have to be searched, found and finally extracted from different levels in the earth’s crust.

From the initial stage of exploration to mining, processing and finally marketing, the exploitation of georesources is fraught with several critical issues. First, the georesources are distributed unevenly globally and also regionally, within a large country like India. To keep up the continuous supply of these resources according to the growing needs of the society, it is not only essential to know where they occur and their geological characteristics, but also why, how, and when did they
form. This understanding will form the basis for most of the future discoveries that will ensure the long-term availability of these essential commodities. Second, to satisfy the ever-increasing demand of raw material in different industries, as well as to augment the foreign exchange reserve of the country, large-scale mining and increase in necessary imports are usually preferred. Besides, with exponential growth of mineral production in the last century, most near-surface deposits have either been exhausted or are nearing exhaustion. Consequently, exploration and exploitation at greater depths are fast becoming essential though they are rather expensive. For some commodities, improved technologies allow lower grade, high tonnage, and near-surface deposits to be exploited, but obviously at the cost of higher energy consumption. All these factors make the large producers (often multinational corporates) the most suitable players in the georesource extraction industry. Consequently, sustainability is an important issue and can be achieved by such players only by embracing ideas of corporate and social responsibility and by internalizing the costs of mineral production. Third, metal deposits and thick forest cover have a close association in many parts of the world, as in the five mineral-rich states of Chhattisgarh, Odisha, Andhra Pradesh, Jharkhand and Madhya Pradesh in east-central India. This region hosts extensive deposits of iron, manganese, chromium, and aluminum – all important metals that drive the consumer industries. But these forests also provide habitat to wildlife and forest dwellers, mostly indigenous people. In many places, the hills with forests containing the deposits within also act as the catchment areas for important rivers. Though a developing country like India needs its mineral resources, including energy resources, for its industrial growth, and water and fertile soil for food security of its growing population, the complex relationship that emerges between mining, forests, wildlife, change in life and livelihood, and displacement of tribals, along with rampant environmental degradation of air, water, and soil in mining areas produce an extremely complex socioeconomic challenge. Lack of inclusive growth of poverty-trapped people in mining areas over protracted periods and large land acquisition for mining and its infrastructure have fuelled discontent and even anger in large parts of peninsular India turning a socioeconomic problem into a political one through the ultra-left Maoist (Naxalite) movement. Mineral industry, however, can play a vital role in turning the situation around provided there is good and fair governance and sustainable mineral resource development.

This book attempts to look at the georesources of India in a holistic way. Georesources are first defined as the nonrenewable materials in the earth’s crust which are essential for human civilization and human sustenance. Nonrenewability is here estimated against average human life-span. Thus, water and soil that we have long overlooked, along with the common minerals and industrial rocks, as well as energy-producing (both organic and inorganic) commodities come under the ambit of this treatment in the first two parts of the book, comprising eight chapters. The content is organized in a format that will help the reader to extract information on any aspect readily. For the uninitiated reader, an introductory chapter will look into some basic definitions as well as nature and characteristics of mineral deposits followed by a chapter on the different crustal processes that produce the various ore
deposits in the endogenous and exogenous environments. The third part of the book containing three chapters will reflect on the issues of sustainability and their relevance to the mineral industry of the country. Sustainability in this context is not only the durability of a deposit but also its relation with the ambient society. The various socioeconomic as well as regulatory and environmental issues that face the Indian mining industry today are highlighted and analyzed in the backdrop of different contemporary case studies. Finally, a roadmap of sustainable mining framework, which may not be free of the authors’ logical bias and prejudices, is put forward. The environmental issues related to the exploitation of various energy resources are also discussed at length.

We have included Indian illustrations as examples in fair number in the interest of Indian students. However, we have not overlooked classical examples from around the world to aid our discussions.

The authors’ efforts will be amply rewarded if the scientific fraternity finds the book useful.

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