

## Mining And Geography

*Mining* is defined as the extraction and concentration of metallic and nonmetallic minerals for use in a variety of human activities. As a distinctively human pursuit, the extraction and use of resources from the surface of the Earth is essential for most industrial production and the provision of a wide variety of materials. Geographers have long examined mining activities, primarily by focusing on the distribution of resources, the expansion of mining activities, the development of technologies to extract elements from the Earth, and the environmental and social impacts of mining operations.

### The Mining frontier

According to the U.S. Geological Survey, more than 70 chemical elements and dozens of minerals are currently mined from more than 100 different types of deposits. According to the Raw Materials Group, in 2005, the value of global mining production was approximately \$800 billion, with metals accounting for roughly 27% of the total, industrial minerals and diamonds 7%, coal and uranium 52%, and crushed rock 14%. Of the many metals that are currently being mined around the planet, gold, iron, copper, nickel, zinc, and lead production account for more than 80% of all production. These metals are extracted primarily by large international mining corporations operating in numerous countries. In contrast, coal is extracted primarily within countries for domestic consumption and energy production.

Mining is inherently a geographic dilemma because many elements created by geologic processes are unevenly distributed across the Earth. Moreover, concentrations of these elements that humanity has deemed important are often located in remote areas, far away from where they can be refined or will be incorporated into manufactured items. This dilemma forms one of the most important focal points for geographers as they have labored to identify the locations of these resources. Consequently, the frontier for mineral exploration has continually expanded over time. In addition, as new mining activities have been established along this frontier, they have led to the creation of many new social, economic, and political relationships among different places and societies.

Since antiquity, miners have explored and exploited hillsides, streambeds, and subterranean depths in pursuit of the rarest and most valuable minerals, such as gold, silver, copper, and diamonds. During the earliest human civilizations in Asia, Africa, Latin America, and Europe, the frontiers for minerals such as gold, silver, and copper were generally located within the economic and political domains of each society and formed the basis of most international trading networks. By the 15th century, the mining frontier rapidly expanded as the European powers conquered the Western Hemisphere, Southeast Asia, and several parts of Africa. Alongside this expansion of the mining frontier, many European powers also established colonial mining settlements and forced local populations to work in their mines. Since then, a series of discoveries of rich mineral deposits in places such as California, Alaska, Peru, and Central Asia have incorporated ever more remote areas into the mining frontier. Along this frontier, new cities and mining settlements have rapidly appeared, often as part of far-flung empires or as part of growing nation-states.

### Mining Technologies

The productive capacity of mining operations is a function of the relative concentration and quantity of a particular element that is being exploited and the technologies used to extract it. Researchers have illustrated that for many millennia, human labor (often in the form of brutal slavery) and rudimentary tools constituted most mining technologies. Since then, innovations in technologies such as geographic information systems, heavy machinery, and explosives have dramatically increased the productive capacity of large-scale mines and have gradually reduced the role of human labor in extractive activities. These new technologies are critically important because many of the richest and most readily accessible deposits of valuable minerals have been exhausted and because they allow mining companies to extract very small concentrations of elements from very large volumes of earth. As these new types of mining are very expensive, the mining sector has increasingly become dominated by corporations with access to large quantities of capital, the most sophisticated technologies, and global transportation and production systems. Geographers have increasingly focused their attention on these global mining production systems

through the use of new spatial technologies as well as research focused on economic globalization, shifting patterns of employment and production, commodity networks, and the spread of large transnational mining corporations to new regions.



A 20-foot-diameter ball mill rotates at a copper mine's underground processing facility in Chile. This process breaks copper-bearing ore from golf-ball-sized pieces into dust. Chile's economy is buoyed by Chinese demand for its copper, much of it mined by state-owned Chilean companies.

Source: Michael Fuller/iStockphoto.

## **Mining and the Environment**

The mining sector has historically been one of the dirtiest industries and is also the subject of contentious debates about the role of mining in fostering sustainable economic development. Abandoned mining installations are the source of environmental problems such as toxic acid mine drainage. In addition, because large companies now engage in vast, open-pit mining operations that deploy new and untested technologies such as cyanide heap leaching and deep-water tailings disposal, many researchers have increasingly focused their attention on the environmental legacies of mining as well as the potential threats that these activities pose for fragile ecosystems and human health. Furthermore, because many transnational mining operations are now being located at the most remote fringes of the mining frontier, and often where human populations are impoverished, their role in fostering economic and sustainable development has been a topic of debate across many disciplines. This issue, which is often referred to as the "resource curse" hypothesis, has become even more relevant since the mining sector expanded rapidly at the end of the 20th century.

Recent geographic research focusing on the human and environmental dimensions of mining often draws on development studies or cultural and political ecology approaches to understand the multiscalar and complex social and environmental transformations that mining activities are initiating. In addition, critical geographic research has begun to address the role of mining in local struggles over natural resources, the formation of social movements, and social change.

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## Further Readings

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