

6. MINING

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Mining was one of the first sectors of the economy to be modernized in early Meiji as part of the new government's industrial policy. Sasaki points out that mining played an important role in Japanese industry from the Edo period onward. Mining activity first flourished in Japan during the seventeenth century. At this time, gold, silver, and copper mines were excavated throughout the country. The Tokugawa shogunate made all mines government property and placed the excavation, smelting, and circulation of metals, which would become important for negotiating foreign trade and coining money, under its control. Those who took up mining were segregated from farm villages and made to live in mining towns, and new technology was introduced to mines throughout the country.

Until the Meiji Restoration, mining was done by hand, with hammer and chisel. Drainage was also performed by hand, and pits where seepage was particularly bad were simply abandoned. The "early European," or nanban, refining and cupellation methods were used for smelting, but these were not suitable for low-grade ores. For this reason, rich ore deposits were sought out, and when these had been exhausted, they were deserted, leading to the decline of mining.

The Meiji government took two important steps to develop mining. It first hired foreign technical experts and dispatched them to government-run mines where they introduced advanced mining technology. Then, under the Japanese Mining Law (1873), it nationalized all mineral resources. Although the government allowed private enterprises to excavate mineral ores, mine development was placed off limits to foreign interests, a proscription that remained in effect for many years. These policies bore fruit, and up until the end of the Second World War, copper and coal mining were one of the mainstays of the Japanese economy.

Yoshiki notes that with the introduction of modern mining technology to government mines, the subcontracting of excavation and smelting operations became a problem. Two foreign engineers, François Coignet and Curt Netto, pointed to the conventional mining practices of subcontractors (yamashi or kanako) who were interested only in excavating rich veins, as the principal cause of mining's decline. In order to mechanize mining, they

proposed that the subcontract system be abolished, that mine managers draw up their own development plans, and that labour be hired directly.

Subcontractors opposed these plans strenuously. They were joined by miners who feared that mechanization would put them out of work. Nonetheless, the government proceeded to do away with subcontracting and introduced Western excavation and metallurgy techniques. However, while the yamashi and kanako disappeared, the bunkhouse (hanba) or barn (naya) system, set up to recruit and control subcontracted mine workers, persisted into the early twentieth century.

The government then established the Imperial College of Engineering and the Faculty of Science at Tokyo University, and staffed these institutions with foreign scholars and technical experts to provide the technical and managerial skills needed to develop mining. Outstanding students were selected for advanced training abroad, and upon their return, they replaced their foreign teachers.

Murakushi has studied the modernizing of the coal mining industry. In Japan, coal was mined primarily for salt manufacturing. An endogenous industry, it was centred around the northern Kyushu region. The modernization of coal mining got under way as the demand for fuel to run steam engines grew following the opening of Japanese ports in 1854. Japanese coal mines proved difficult to mechanize. Underground springs, numerous strata, thin coal seams, and similar obstacles impeded the introduction of modern machinery. The first operations to be mechanized were therefore restricted to drainage, ventilation, and carting. The progress of mechanization spurred the domestic development of specialized mining machinery.

Mine modernization made rapid strides following the Sino-Japanese War when big private capital stepped into take over mining operations. These large corporations had already acquired considerable experience in modern management in metal mining. Most had a pool of professional Japanese technicians to draw from. Coal mines were run with the help of the tōryō, a subcontractor. In many instances, the tōryō co-operated with management in modernizing the mines, but as the corporations learned how to run operations themselves, the subcontractors, no longer needed, were dispensed with.

Kasuga has studied the special features of coal mine development in Hokkaido, which the Meiji government had just begun to colonize. Unlike the old mining regions of northern Kyushu, Hokkaido was extensively opened up to Japanese settlement particularly after the closing years of the Tokugawa regime. There were no indigenous industries there, and labour power was in short supply. Moreover, there was no system of transportation once the coal was mined, and no market for it. For these reasons, the Tokugawa and Meiji governments played a central role in

developing Hokkaido's coal resources. From the very start, foreign experts were called upon to introduce modern coal mining technology to the region. As a result, both the scale of mining operations and the degree of mechanization far surpassed those found in other parts of Japan at the time. The government-run Horonai mine was provided with a railroad soon after it commenced operations. Turned over to a private enterprise, it became one of Japan's most productive mines.

The tōryō system was not found in Hokkaido mines. Instead, prison labour, the bunkhouse system, and direct hiring were the chief means of recruiting scarce workers. After the 1920s, however, most miners were employed directly by mine companies, and the other forms of recruitment disappeared.

Murakushi's research shows that while the modernization of mining enabled miners to go deeper into the earth to get at coal seams, it also saw a dramatic increase in the incidence of cave-ins, gas explosions, and other mine disasters. The companies' unwillingness to invest in necessary safety equipment and the inexperience of many recently employed miners are two of the reasons that explain the rise in mine accidents, but disaster-prevention technology also had not yet been perfected at that time. With the appearance of militant labour unions and the government's own labour safety legislation, the accident rate subsided.

In the early twentieth century Japan's coal industry, having succeeded in modernizing itself, branched out into Japan's newly acquired colonies, where it began mine exploration and development. Murakushi has analysed the case of the Fushun Coal Mine run by the South Manchuria Railway Company following the occupation of Manchuria by the Japanese army (1905).

China's indigenous coal industry had attained a technical level comparable to that of Japan's by the late nineteenth century, and after the 1870s, Chinese capital made the first attempts to modernize mining operations. But national capitalists were too small to modernize effectively, and large-scale modern mines were built at Kailuang by British capital and at Fushun by Japanese capital. In the early twentieth century, about half of the total coal output was produced by foreign capital, most of it at the Kailuang and Fushun mines.

Murakushi points to three factors that enabled the Fushun Coal Mine to modernize rapidly. The South Manchuria Railway Company, a state company, drew up and executed a long-term comprehensive development plan. Chinese workers were used as intermediate and lower-level technicians and managers. Finally, instead of hiring mine labour directly, management made use of the baotou, a local (Chinese) labour boss who took care of the hiring. The system was very similar to the Japanese hanba, or bunkhouse, arrangement. In the 1930s, with Japan at war with

China, coal mining in Manchuria suffered a decline, and Japan's defeat in 1945 put an end to the South Manchuria Railway Company's control of the coal industry.

Hoshino points out in his essay that despite the considerable progress in mechanizing Japanese mining, and particularly copper mining, after the mid-1950s, domestic ore production reached its limit. Thereafter, Japan imported mineral ores and refined them.

Following the Second World War, on the advice of the occupation forces, Japan surveyed its mineral deposits scientifically and standardized its methods for measuring yields, giving industry greater access to domestic mineral resources. As a result, large-scale equipment was introduced to active mines, and production increased appreciably. Chemical plants were outfitted to produce chemical fertilizers by recovering sulphur dioxide gas, a noxious by-product released during mining operations, which they transformed into sulphuric acid. Refining equipment, such as the fluosolid roaster, and flush smelting technology were imported from the United States and Finland respectively. Recently, the Japanese mining industry has begun to develop its own techniques, such as oxygen copper refining and continuous copper smelting.

These technical innovations induced a remarkable boom in copper production in the 1960s and 1970s, but most of the ore smelted in Japanese furnaces was imported from abroad. Famous mines, such as Ashio and Besshi, were forced to close down at this time, and smelters turned to joint participation in overseas resource-development projects. Despite the high sophistication attained by its smelting technology, Japan, Hoshino indicates, would sooner or later have been required to heavily rely on imported refined copper.

7. FINANCIAL INSTITUTIONS

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In his first paper, Shibuya mentions three points as characteristic features of the development of the Japanese financial system.