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## Coal in Modern Japanese History

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### Abstract

This study investigates the relationship between coal and the modern Japanese economy from a historical perspective. Because Japan has utilized coal since the dawn of industrialization, we focus on various aspects, such as a primary energy source, a trade good, and a substance of environmental burden.

(1) Coal was not only an export good but also the most important primary energy source for Japan's industrialization. However, coal imports grew after WWI. After all, the amount of imported coal surpassed domestic coal production in the late 1960s. (2) In the end of the 19th century, major coal mines abandoned the butty system and employed miners directly. Furthermore, the coal mining industry had introduced and improved foreign technologies to increase and rationalize production. (3) There were social impacts of coal usage. First, the policy for rationalizing the coal mining industry was one of postwar Japan's most significant industrial policies. Second, coal combustion caused severe environmental problems, which were gradually resolved after the 1960s. Third, the decline of the coal mining industry after the 1950s resulted in the collapse of miners' communities.

### Keywords

Coal mining, Intra-Asian trade, Pacific Rim Trade, Economic History, Labor History

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## Coal in Modern Japanese History

Tomoki Shimanishi<sup>※</sup>

### Abstract

This study investigates the relationship between coal and the modern Japanese economy from a historical perspective. Because Japan has utilized coal since the dawn of industrialization, we focus on various aspects, such as a primary energy source, a trade good, and a substance of environmental burden.

(1) Coal was not only an export good but also the most important primary energy source for Japan's industrialization. However, coal imports grew after WWI. After all, the amount of imported coal surpassed domestic coal production in the late 1960s. (2) In the end of the 19th century, major coal mines abandoned the *butty* system and employed miners directly. Furthermore, the coal mining industry had introduced and improved foreign technologies to increase and rationalize production. (3) There were social impacts of coal usage. First, the policy for rationalizing the coal mining industry was one of postwar Japan's most significant industrial policies. Second, coal combustion caused severe environmental problems, which were gradually resolved after the 1960s. Third, the decline of the coal mining industry after the 1950s resulted in the collapse of miners' communities.

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### 1. Introduction

This study investigates the relationship between coal and the modern Japanese economy. In Japan, coal began to be widely extracted after the country opened up in the late 19th century. The coal mining industry grew as the demand for coal increased and coal imports increased after the beginning of the 20th century. Before World War II, coal mining was a core business of the *Zaibatsu*<sup>1</sup> and generated considerable profits. However, the industry and mining areas declined rapidly after the late 1960s. Nevertheless, in the recent decarbonization trend, Japan imports over 100 million tons of coal for generating electricity, making iron, and so on. In comparison, it produces a mere 700,000 tons of coal per annum. Coal has been an important energy source in Japan since the dawn of industrialization.

Many studies have investigated mining and utilization of coal (Shimanishi, 2011). In particular, historians have recently tended to focus on specific microscopic themes, such as labor issues, management issues, and technological developments (Thomann, 2018; Kikuchi, 2019, 2023; Kitazawa, 2019a, b; Shimanishi et al., 2023). Based on these earlier works, this study presents an overall view of the relationship between coal and the modern Japanese economy from a historical perspective. This will contribute to considering the choices of energy sources and their impacts.

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<sup>1</sup> *Zaibatsu* is a large family-owned business group. A parent company is at the core of the group and its subsidiaries operate a variety of businesses, some holding monopolistic positions in their respective industries (Miyamoto et al., 2023: 106).

## 2. Production and Market of Coal

### (1) From exporter to importer

The modern Japanese coal mining industry began to develop because the demand for bunker coal increased after the opening of trade ports to foreigners in the 1850s. Because of its high quality and reasonable price, Japanese coal was also exported to Shanghai, Hong Kong, and Singapore as bunker fuel by European and Japanese merchants (Sugiyama, 1988: 170-190). In 1900, coal production was over seven million tons (Figure 1). Approximately 45% of the coal produced was exported, while the remainder came to be consumed in domestic industries like salt making, thermal power generation, and railroad (Figure 2)

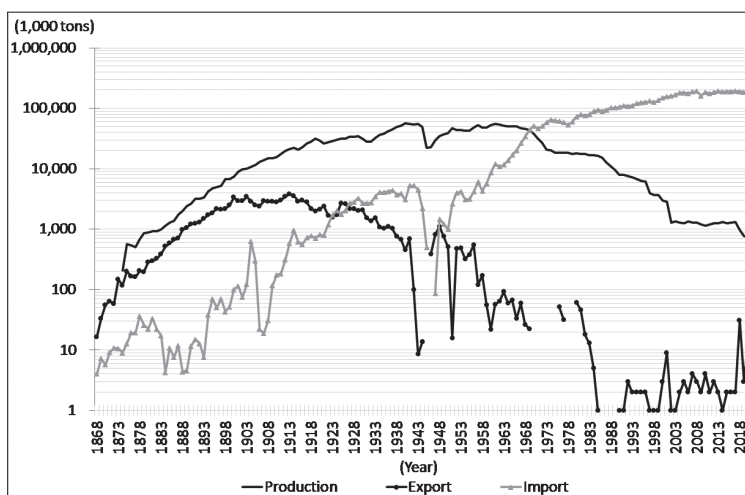


Figure 1 Coal Supply in Japan, 1868-2020

*Note:* “Year” in “Production” after 1941 and in “Import” from 1947 to 2000 means a financial year.

*Source:* Toyo Keizai Shimposha (ed.) (1935: 106-107, 268-269); Nihon Sekitan Kyoukai (ed.) (1950: 6-9); Research and Statistics Department of Minister’s Secretariat of the Ministry of International Trade and Industry (ed.) (1963: 738-739, 766-767); Sekitan Seisakushi Hensan Iinkai (ed.) (2002a: 30-37, 54-57); Coal Frontier Organization (2022: 20-22, 30).

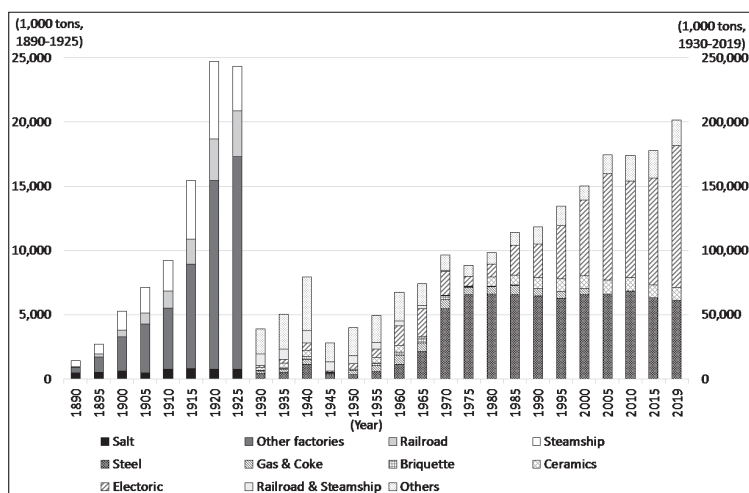


Figure 2 Coal Demand in Japan, 1890-2019

*Note:* “Year” means financial year after 1940. “Gas & Coke” and “Briquette” are unknown after 2005.

*Source:* Nihon Sekitan Kyoukai (ed.) (1950: 53-55); Sekitan Seisakushi Hensan Iinkai (ed.) (2002a: 50-53); Japan Coal Frontier Organization (2022: 20-22, 30).

In the early 20th century, Japan was the largest coal producer and exporter in the Asia Pacific region. For instance, coal production increased to approximately 21 million tons, 30% of which was exported in 1913 (Mining Bureau of Ministry of Agriculture and Commerce (ed.), 1914: 120-121)<sup>2</sup>. Coal was one of the most important export goods for Japan until World War I.

When WWI broke out, Japan experienced an economic boom, which increased the coal demand from domestic industries. Imports of coal, especially from Manchuria, increased because the price of domestic coal also rose following the boom. Coal imports grew yearly, reaching approximately five million tons in 1941 (Figure 1)<sup>3</sup>. In contrast to the late 19th century, Japan became an importer of coal.

Although it collapsed just after WWII, coal production began to recover in the late 1940s through government-led policies. During the rapid economic growth period from the mid-1950s, the Japanese coal mining industry rationalized production organizations to produce coal more efficiently (see section 3). Japan’s coal production, approximately 50 million tons, was the second or third largest among Asian countries in the late 1950s (Research and Statistics Department of Minister’s Secretariat of the Ministry of International Trade and Industry (ed.), 1963:462-463). However, it could not satisfy the demand for coal because rapid economic growth strongly stimulated the demand for a primary energy source. Additionally, after the late 1950s, the price of domestic coal exceeded that of imported fossil fuels, such as petroleum. This is because Middle Eastern petroleum was exported to Japan at a low price and the production cost of the Japanese coal mining industry increased because of an increase in wages and deterioration in production condition (Shimanishi, 2011: chapter 2, 4, 6). Therefore, steam coal was replaced with petroleum from the Middle East and imports of coking coal from the U.S., Canada, and Australia increased (Bowden, 2012; Bowden and Insch, 2013)<sup>4</sup>. In 1969, the amount of imported coal increased and surpassed domestic coal production (Figure 1).

The electric power industry began to increase the consumption of imported steam coal after the oil crisis of the 1970s in terms of price and energy security (Figure 2). The number of coal-fired power plants also increased<sup>5</sup>. In 1988, the amount of imported coal, including coking coal, reached 100 million tons. This documents that Japan was the world’s largest coal importer from the 1970s to the early 21st century (Coal Department of Agency for Natural Resources and Energy, 1979; International Energy Agency, 2023; Shimanishi et al., 2023).

## (2) Changes in market and distribution

By the 1880s, coal was consumed for steamships and salt making, with the largest consumer being the salt industry in the Setouchi area of western. After the 1890s, manufacturing factories like cotton spinning became the largest coal consumer because they began to use steam engines as Japan’s industrialization progressed. As illustrated in Figure 2, various industries and households consumed coal until the mid-1950s.

<sup>2</sup> It includes bunker coal for foreign vessels.

<sup>3</sup> It includes the amount of coal from Japan’s colonies and Manchukuo.

<sup>4</sup> Until 1992, the Japanese government imposed an import quota on steam coal to protect the coal mining industry.

<sup>5</sup> It should be noted that the efficiency of Japan’s coal-fired power generation technology is the highest in the world and it has contributed to reducing coal consumption and CO<sub>2</sub> emissions.

However, manufacturing industries, transport industries, and households changed fuel from steam coal to imported petroleum thereafter. In contrast, despite the higher price of domestic coal compared to imported coal, the steel, electric power, and gas industries continued to consume domestic coal following the Japanese government's requests. This was partly because the steel industry needed domestic coking coal with a unique quality and because the electric power industry, which operated coal-fired power plants in coalfield areas, could use low-quality coal with low prices (Shimanishi, 2011: chapter 2, 4, 6). The demand for domestic coal converged to specific demands but rapidly decreased owing to the decline in the Japanese coal mining industry after the late 1960s. On the supply side, only a few large-scale coal mines could survive. This market structure was sustained until the steel industry abandoned domestic coking coal due to the widening difference between domestic and foreign coal prices in the mid-1980s.

Coal was shipped to consumers before the railroad industry emerged. In the early 20th century, coal was subsequently transported by train from coal mines to cargo stations or ports, and most of the coal was shipped to consumption areas such as Osaka, Nagoya, and Tokyo. A total of 60% of coal was transported by ship before WWII. However, most was forced to be transported by train because of shipping shortages during the wartime period and the Occupation of Japan (Shimanishi, 2011: chapter 1, 2).

Major coal consumers such as the steel and electric power industries began operating their oceanfront plants after the 1950s. On the other hand, the transportation capacity by train was tightened owing to rapid economic growth. Therefore, most of the coal came to be transported by ship again. Bulk coal carriers for inland trade were introduced in the late 1950s to rationalize coal distribution following government support (Shimanishi, 2011: chapter 2, 4).

Regarding the distribution of coal, the control of the coal market must also be investigated. Coal mines generally sold coal directly to consumers or trading houses. To cope with the recession after WWI, the major coal mining companies organized a cartel, or *Sekitan Kogyo Rengokai*, to stabilize the supply and demand relationship by adjusting the amount of coal shipment in 1921 (Kitazawa, 2006a,b; Nagahiro, 2009). Furthermore, in 1938, the Japanese government began to control the coal market. The production, allocation, and pricing of coal were finally under governmental control by 1941, which continued even after WWII and ended with the abolition of the controlled economy in 1949. However, the free coal market did not continue long. In 1955, the Japanese government implemented a kind of pricing control on steam coal, mainly for power plants, to stabilize the coal market. As previously mentioned, the government also restricted imports of steam coal. The loose control of the coal market continued from the period of rapid economic growth to the early 21st century (Sekitan Seisakushi Hensan Inkai (ed.), 2002b).

### 3. Coal Mining Industry

#### (1) Labor organizations

Coal mines generally employed full- and part-time miners, such as farmers until the 1880s<sup>6</sup>. As the coal mining industry grew in the 1890s, major coal mines needed more full-time miners to promote production. They exploited a *butty* system, or a kind of indirect employment system, to conveniently manage dispersed workplaces and cost-cutting. However, they abandoned the *butty* system and employed miners directly in terms of centralized labor and production management after the development of mining

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<sup>6</sup> Some mines such as Miike and Horonai were dependent on prison labor.

mechanization and longwall mining toward the end of the 19th century (Ichihara, 1997: chapter 1, 2). Furthermore, in the interwar period, the major coal mines of Zaibatsu established miners' organizations to develop a feeling of belonging to their mines, although labor unions were not legalized until 1945 (Ichihara, 1997: chapter 3). On the other hand, the number of miners from Korea and prisoners of war increased during WWII.

After WWII, coal miners successively established labor unions, and the coal mining industry became the center of the postwar labor movement. Some labor unions regulated the management of the labor organization including allocation of miners, assessment of the standard workload, wage setting, and so on. In addition, some skilled miners, such as veteran coal hewers, conducted the operation at the workplace on behalf of underground supervisors (Ichihara, 1997: chapter 5; Ichihara, 2012; Shimanishi, 2011: chapter 3, 5, 6).

The piece wage system for coal hewers and drillers was standard in the Japanese coal mining industry except during WWII<sup>7</sup>. This bloated the number of payments because the output assessment was inappropriate owing to regulation by the labor union and a lack of management ability (Ichihara, 1997: chapter 5; Shimanishi, 2011: chapter 3, 5, 6; Shimanishi, 2012). The mechanization of mining accelerated such bloat because mining efficiency increased. Therefore, despite the rationalization through mechanization after the 1960s, the industry suffered from soaring production costs.

## (2) Mining mechanization to technology transfer

Coal production was generally labor-intensive as mining methods, such as drifting, picking, supporting, and dressing, were not generally mechanized until the 1870s. After that, imported drainage pumps came to be introduced at many coal mines after the 1880s. During the interwar period, major coal mining companies introduced production equipment. Coal pick, rock drill, cutter machine, and chain conveyor were introduced while the longwall mining method became common. However, coal hewing depended on hand-picking and blasting because cutter machines were only used to undercut the coal face to ease the blast mining process (Shimanishi, 2018).

Various types of mining equipment were introduced after WWII. A prime example in the 1950s was the innovation of supporting by using steel link bars and steel props, which were introduced from West Germany. They enabled the installation of mining machines because there was no need to directly support working faces. Therefore, steel link bars and steel props were immediately produced domestically. In some undersea mines like Taiheiyo Coal Mine, continuous mining machines, which enabled mechanization of tunneling drifts, were introduced from the U.S. (Ibid.).

The coal plow with the face conveyor was the first popular mining machine introduced in coal mines<sup>8</sup> and spread widely from the late 1950s to the mid-1960s. Furthermore, the drum shearer gradually replaced the coal plow after the mid-1960s and some coal mines introduced hydraulic mining technology from the Soviet Union (Ibid.). In the late 1960s, Taiheiyo Coal Mining Company combined drum shearers with powered shield supports into the "SD system," which enabled the mechanization of not only hewing and loading coal but supporting the coal face<sup>9</sup>. The improved SD system and related technologies began

<sup>7</sup> Taiheiyo Coal Mining Company introduced the job wage system in the 1960s, which was another exception (Shimanishi, 2011, 2018).

<sup>8</sup> The coal plow was generally called "Hobel" in Japan because it was imported from West Germany. Hobel means "plane" in German.

<sup>9</sup> Powered shield support originated from the Soviet Union and drum shearer originated from the Western nations.

to be exported to Asia, Australia, and the U.S. after the 1970s (Shimanishi et al., 2023).

During this period of rapid economic growth, the Japanese coal mining industry received technical trainees from abroad, especially Asian countries. The Ministry of International Trade and Industry (MITI) institutionalized the technology transfer program as a support policy for coal mining companies' business in the 1990s. In recipient countries, the program contributed to the production rationalization of the industry, for example, an increase in production efficiency, a decrease in the mine accident occurrence rate, and heightened awareness of technology improvement and mine safety. Therefore, the technology transfer project continues today (Ibid.).

### (3) Mining accidents

Since the early 20th century, some mining engineers have studied mine safety problems, such as preventing the spread of coal dust. Coal mining companies such as Mitsui Mining implemented the safety movement campaign as part of the industrial rationalization movement after the interwar period (Ogino, 1979; Nishio, 2018). Mitsui Mining has also contributed to promoting the study of occupational diseases (Kikuchi, 2019).

Nevertheless, several severe accidents have occurred in Japanese coal mines. The worst accident occurred at Mitsubishi's Hojo coal mine, known as "Hojo Dai-Hijou," in 1914, with a death toll of over 600. Mine accidents continued to occur after WWII. The second worst accident occurred at Mitsui's Miike coal mine in 1963, with a death toll exceeding 400. Both accidents were caused by an explosion of coal dust, but methane gas explosion was the leading cause of accidents in Japan's coal mines (Shimanishi, 2018). The rate of casualties from accidents began to constantly decrease only in the late 1960s (Shimanishi, 2023).

## 4. Social Impact of Coal Usage

### (1) Policy for rationalization

The policy for rationalizing the coal mining industry (Coal Policy) was one of postwar Japan's most significant industrial policies regarding budget and range (Shimanishi, 2011: introductory chapter). The policy was implemented in 1955 when the Act on Temporary Measures Concerning the Rationalization of the Coal Mining Industry was established. The Coal Policy was revised eight times and continued until the end of the financial year 2001. It was characterized as a "Scrap and Build Policy" to promote scrapping inefficient coal mines and building efficient ones. In addition, the MITI requested the purchase of domestic coal from major coal consumers such as the steel, electric power, and gas industries. The Coal Policy also regulated the installation of heavy-oil-fired boilers from 1955 to 1967. Furthermore, the MITI implemented policies for the redevelopment of coalfield areas, displacement and employment of coal miners, and mine pollution control (Sekitan Seisakushi Hensan Iinkai (ed.), 2002).

The MITI could not implement drastic measures for the Coal Policy because most were compromises between stakeholders (Samuels, 1987; Kume, 1998; Garside, 2005). Finally, it managed the rapid decline of the coal mining industry until the late 1960s but failed to make it self-reliant (Shimanishi, 2011: final chapter).

### (2) Environmental problems

The smoke and soot from coal combustion caused severe environmental problems. However, this was resolved when major coal consumers installed equipment to suppress smoke and soot when the



Japanese government regulated such emissions in the early 1960s. In the mid-1960s, the emissions of sulfur dioxide from the combustion of fossil fuels increased and caused health problems such as asthma. Following the establishment of the Basic Act for Environmental Pollution Control in 1967, the Japanese government implemented regulations on the sulfur dioxide emissions density in 1969. This caused the rapid decrease in domestic coal consumption, which led to the rapid decline of the coal mining industry. Furthermore, even in the mid-1970s, the equipment for suppressing sulfur dioxide became widely installed (Shimanishi, 2011: chapter 5, 6).

In the meantime, coal mine pollution control was one of the most important measures in the Coal Policy as the budget accounted for a 36% share of the total budget, which is equal to that for production rationalization in coal mines. Coal mining in modern Japan has resulted in many mine pollution problems. Surface subsidence was the most serious. The collapse of soil banks and water pollution were also severe. However, there was no compensation law for pollution from the late 19th century to 1935; therefore, some coal mine owners voluntarily compensated victims for pollution. After 1939, the Japanese government revised the mining laws to oblige mine owners to compensate for pollution. However, it became difficult for coal mine owners to do so owing to mine closures or deficit operations as the industry declined after the late-1950s. Therefore, the Japanese and local governments began to compensate the aggrieved party. At the same time, “*Kougai-ya*<sup>10</sup>,” or illegal brokers, began to use intimidation or violence to force public servants to increase the amount of compensation paid to the victims. Some brokers were gangsters, local politicians, and ex-union leaders (Sekitan Kougai Jigyoudan (ed.), 1989; National Graduate Institute for Policy Studies (ed.), 2003).

### (3) Decline of coal mining areas

Following the closures of coal mines from 1956 to 2002, the number of displaced coal miners reached over 200,000. As previously mentioned, under the framework of the social insurance program, the Japanese government supported ex-miners, many of whom worked in major mines, to change careers or find a job in another mine. However, many miners displaced by small coal mines could not benefit from such government support because their employers did not pay social security premiums. They were forced to find new jobs themselves, take temporary jobs in relief works, or accept public assistance (Shimazaki, 2018).

Mine closures led to the decline of coal mining areas. Chikuho region of Kyushu was known as the “Black Belt of Unemployment,” because many small coal mines in the region closed in the 1950s (Shimazaki, 2018; Fujino, 2019). To cope with this, the MITI established the Act on Temporary Measures Concerning the Development of Coal Mining Areas in 1961. Some coal-mining towns in the region recovered to some extent by attracting factories or universities after developing industrial complexes under the support of policies for the redevelopment of coalfield areas.

In Hokkaido, where there were fewer coal mines than in Chikuho, closures of major coal mines caused severe social problems after the 1960s. Many ex-coal-mining towns in Hokkaido have suffered from depopulation and fiscal difficulties since the closures of coal mines increased (Culter, 1999). Some ex-coal-mining towns, such as Yubari, have attempted to develop the tourism industry under the support of policies for the redevelopment of coalfield areas. However, these attempts failed because they were overly optimistic.

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<sup>10</sup> “*Kougai*” means “mine pollution” and “*ya*” is a suffix that means “seller,” “dealer,” “broker,” et cetera.

On the other hand, the closure of a coal mine resulted in the disappearance of a community. The most extreme example is Shakubetsu Coal Mine (Shakubetsu), operated by Yubetsu Coal Mining Company in Hokkaido. Shakubetsu began to operate in a frontier settlement in mountains and forests in the early 20th century. Over 4,000 people lived in a coal-mining town until Shakubetsu was closed in 1970. At the end of the year, all those involved left, and the town was abandoned. There are now forests and a few ruins in the ex-coal mining area (Shimazaki et al., 2020).

## 5. Conclusion

From a historical perspective, coal has had various relationships with the modern Japanese economy. They are summarized in the following three points:

Coal was one of the production goods characterizing the economic development of Japan as a maritime and trading country. Coal was an important primary energy source fueling economic growth and an important trade good after the late 19th century. Structural changes in the supply and demand reflected Japan's economic transition from a developing country exporting primary products to a developed country importing them.

Process of technological development. The coal mining industry had imported foreign technologies to increase and rationalize production since the late 19th century. In the late 1960s, it developed technologies such as the "SD system" by combining and improving foreign technologies. Furthermore, it implemented technology transfer in cooperation with the government in addition to technology exports. This process of technological development resembles that of other industries, such as the manufacturing and electric power industries.

Economic prosperity and stagnation in Japan. Many coal mines operated in mountains and forest areas, some of which were developed as coal-mining towns. The growth of the coal mining industry brought prosperity to such areas on the one hand and sometimes mine pollution on the other. Eventually, the industry's decline during rapid economic growth resulted in the collapse of their communities because people living in coal-mining towns were deeply involved in coal mining. In contrast, industrial and urban areas have enjoyed the benefit of coal in the form of electricity or manufactured goods, although they have suffered air pollution caused by sulfur dioxide and carbon dioxide. The history of the coal mining industry documents the geographical unevenness of economic development in postwar Japan.

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