From a Tiny Matchstick Does a Mighty Forest Fall: Hokkaido Wood Products in Japan's Modern Economic Development

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Introduction

Japan's modern economic growth was much in debt to products that could be readily exported: tea, silk and copper. At the turn of the twentieth century, just as Japan was making the transition from light (silk and cotton products) to heavy industry (the Yawata Steel Works were opened in 1901) and the military was winning wars (the Sino-Japanese War 1894–95 and the Russo-Japanese War 1904–05), matches joined the ranks of Japan's largest export industries.[1] In fact, between 1900 and 1920 Japan competed with Sweden and the United States as the world's leading manufacturer of matches. This paper traces the history, the rise and fall, of Japan's match history. In 1890, Japan produced just over 250,000 cases of matches (one case consisted of 7,200 matchboxes); production peaked in 1907 (just over 1.4 million cases) and thereafter declined, especially after WWI, to 480,000 in 1925. (Chart 1) What happened? Who were the champions of Japan's match industry and what were some of the causes of its decline? What comparisons can be made with other of Japan's export industries?

The paper also seeks to links the manufacture of matches to environmental issues that accompanied rapid industrialization, in particular, the destruction of forestlands. In 1850, predating the so-called development of Hokkaido, around 90 percent of the island was forest; by the 1920s, this percentage had fallen to 76 percent—and the composition of the forest had changed radically; reforestation favored trees from the south, particularly Japanese larch (*Karamatsu/Larix kaempferi*).[2] The match industry played a major role in this transformation. The Japanese poplar (*Doro-no-ki/Populus maximowiczii*), found primarily in Hokkaido, was the timber of choice for good matchsticks. My rough calculation for the number of trees consumed in 1907, the peak year of matchstick production (493.5 trillion) is about 1.25 million trees—in other words, many little sticks add up to many big trees. I should note that here I am primarily concerned with the cutting of trees (poplars and aspens) that were used to make matchsticks; I have not taken into account the matchbox industry that also relied on wood, in this case, black pine; nor with matchbox labels made from wood pulp.

It is easy to highlight environmental problems caused by mining and heavy manufacture, such as the soil and water pollution produced by the Ashio Copper Mine in the 1890s and the early years of the twentieth century; but, as we will see, industrial modernity was particularly unkind to forests. As Yamaguchi Asuka notes:

"Wood demand accelerated with advancing industrialization; not only did the demand for firewood by traditional industries increase but demand for wooden material also emerged in modern industries. It was a challenge for industries to secure stable supplies of wood over the long term."[3] Yamaguchi studied the demand for "big sticks" such as railroad sleepers, utility poles, and mining timber; here I focus on the demand for little sticks (matchsticks) that arose at much the same time and that equally placed pressure on domestic, and especially Hokkaido's forest reserves, leading to exploitation of timber from Japan's colonies and eventually, dependency on foreign wood supplies.

The conclusion of the paper examines the complex relationship between wood and modernity, at once victim of industrial capitalism, but also, as Japan's most abundance natural and renewable resource, wood products, big and small, point Japan in the direction of a more sustainable economic future. An appendix includes a more detailed accounting of the rise and fall of Japan's match industry.

Chart 1: Match production and export statistics 1890–1925
1 case = 7,200 matchboxes (60 matches per box) = 432,000 match sticks

Year	Production (cases)	Export (cases)
1890	250,293	134,482
1895	424,503	338,281
1900	427,096	386,360
1905	776,859	754,121
1907	1,142,515 (peak)	671,442
1910	763,776	998,944 (peak)
1915	984,750	880,732
1920	896,295	568,280
1925	482,785	256,200

Source: *Matchi kōgyō tōkei nenkan*, 1965.

Origins of the Match Industry

Matches, like bicycles and sewing machines, were simple inventions, but nonetheless inventions that radically changed the world. And like bicycles and sewing machines, matches were developed in the early nineteenth century.[4] John Walker's "Friction lights" appeared in 1827 and were sold under the brand name "Walker Match." They sometimes ignited spontaneously, so it was not until the invention of the Swedish Safety Match in 1855 that match use began to spread widely. Safety Matches were in common use in Europe and America in the 1860s. They came to Japan as a product associated with civilization and enlightenment. Along with the gas lamp, the match was equally a symbol of a new bright age. (Figure 1)

Figure 1: The Match as Symbol of Civilization and Enlightenment, 1875. This page from the *Meiji Taishō Shōwa dai-emaki* (The Great Meiji, Taisho, and Showa era Picture Scroll) issued by *King* magazine in 1931 is devoted to the major events of 1875, including a new name for Tokyo's famous neighborhood fire-fighting squads (into a more modern-sounding Tokyo Fire Department), the first issue of the daily Yomiuri Newspaper, and the introduction of matches. The caption relating to matches reads: "People used to have to strike a flint, over and over again to get a spark and light a fire. So, when matches were introduced people were really surprised thinking them to be magic. Some people call them rapid-fire-catching sticks (*haya tsukete*), but they were also a bit dangerous and it wasn't easy to get them—you just couldn't go out to a nearby shop to buy them as we can now. That will give you some idea of how scarce they were. High class gentlemen would walk down the street and stop and use a match to light their rolled cigarette, thereby showing everyone that they were 'civilized and enlightened' (*bunmei kaika*). That's how it was in those days." (Image courtesy of tanken.com)

Shimizu Makoto (1846–1899) is known as the father of the match industry in Japan. He was born in Kanazawa into a samurai family and ordered by domain government to study Western military science.[5] In 1865 he travelled to Yokohama and Nagasaki and studied under Léonce Verny, the French naval engineer in charge of the construction of the Yokosuka arsenal. After the Meiji Restoration, in 1869, Shimizu continued to study under Verney in Paris. He was admitted into the École Centrale Paris in 1873 to study science and engineering. There, by chance, he met an officer of the imperial household, Yoshii Tomomi, who, concerned about Japan's dependency upon imported matches, encouraged Shimizu to consider the domestic manufacture of matches in Japan. Shimizu began to study chemical engineering

Figure 2: Monument to the Father of Japan's Match Industry: Shimizu Makoto (1846–1899). Kameido Shrine, Tokyo. The inscription reads, in part: "The ability to freely use fire is said to be the beginning of human civilization. Japan's modern civilization began with the introduction of matches from the West." (author's photograph)

and match making technologies and returned to Japan in 1875 to establish Japan's first match company, Shinsuisha, the "new fire flint." (Figure 2) Ōkubo Toshimichi, then Minister of Industry, and known for his advocacy to "increase production and encourage industry (*shokusan kōgyō*), is reported to have told Shimizu: "Shipbuilding is important, but that time will come. Right now, the match industry is calling."[6] Indeed, in 1877, Shimizu was awarded the Homon (Pheonix) medal for the matches displayed at the First National Industrial Exhibition in Ueno.

Shimizu's factory, supported with government funds, was not without problems. His yellow phosphorous matches were smelly and dangerous, but lacking competition, sold well domestically and exports were begun, primarily to China. In 1879, Shimizu spent time at the Jönköping Match Works in Sweden to learn the latest matchmaking technology, including the chemistry and production of safety matches. Inspired by his success, Japan's matchmaking industry began to prosper, especially in the Osaka-Kobe region; by the mid-1880s, Japan's dependency of imported matches had disappeared and export of matches "made in Japan" increased rapidly, especially in Asia.

By 1900 match making was big business. According to a report on the match industry in Japan compiled by the British consul at Yokohama (and published in the 1899 edition of the *British Board of Trade Journal*) there were over 200 match factories in operation (112 of them in Osaka and Kobe), producing 436,532 cases (one case = 7,200 matchboxes). Some 78 percent of total output, valued at 6,300,000 yen, was exported, primarily to Asian markets. The rough total of people employed in matchmaking was given as 60,000 of which 28,700 were factory workers (6,500 men and 22,200 women) and an additional 32,000 workers (largely women) employed at

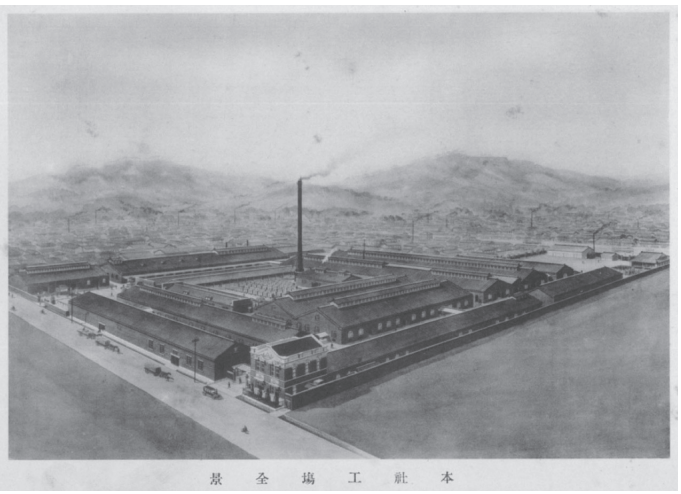

Figure 3 (Left): Takigawa Benzō (1851-1926), Japan's Match King: "He tried his utmost for the improvement of his merchandise, and the extension of the market. The hard labour was rewarded at last, and business gradually flourished. His market has extended not only throughout Japan but also to China, Korea, India, and even to Australia."[10)]
Figure 4 (Right): The state-of-the-art Tōyō Match Factory in Kobe. It began production in 1917. (Collection of the Tobacco & Salt Museum)

their own homes. According to the report: "This industry would appear to be one well fitted for the Japanese, whose manual dexterity is well known; it is, moreover, one that specially appeals to the poorer classes in the country." The 1899 report also commented on the matchstick industry: "The match sticks are obtained mainly from the Hokkaido. They are delivered to factories in straw-covered bales, containing 400 bundles, called in Japanese 'wa.' The wood from which they are manufactures is a kind of willow, called 'toro' in Japanese, and this industry would appear to be an entirely separate one."[7)]

In 1880, Takigawa Benzō (1851–1925), a former samurai turned venture capitalist, established the Seisuisha Match Company in Kobe; thirty years later, from his state-of-the-art factory, as "King of Matches," (Figure 3) he presided over Japan's growing match empire.[8)] In addition to matches, he was active in a variety of modern industries: gas, water, electricity, cement, banking, warehousing, insurance, and banking. His industrial wealth led to political appointment; he served in the House of Peers from 1915 until his death in 1925.

Takigawa was born in 1851 in Yamaguchi prefecture, the former Chōshū domain, and grew up in the shadow of young "men of determination" from his hometown who played a major role the revolution that resulted in Japan's modern transformation. In 1868, at the age of 18, he joined a Chōshū squad of young patriots, the Hōkokutai, in the war against Aizu and other pro-Tokugawa supporters. Like many other former samurai, he struggled in the early 1870s; he studied telegraphy, and after a series of unsuccessful stints working as a telegraph operator, returned to his home town, sold all his belongings and with the proceedings moved to Kobe in 1880 to enter the new and risky match making business. His company, the Seisuisha, was

not immediately successful. According to a portrait of Takigawa written in 1910: "He labored hard mixing the chemicals by hand; he also tried his utmost to sell his merchandise, struggling with all sorts of difficulties that came in his path. The times were bad, however, and each year saw further decline of the enterprise." Finally, in 1885, sales began to pick up, especially in the export market. From 1887 he began to expand his business; he bought up competition and established factories that manufactured exclusively for export. The 1910 bio-sketch of the Match King noted that he "has 8 match factories of his own, producing some 3.5 million cases per year. He also oversees the production of 10 other factories producing another 7 million cases. He thus presides over one-fourth of the entire production of Japan's match industry. His business principle is to manufacture the best goods and to sell as low as possible, and in order to attain this object he must get the best materials at as low a price as possible."[9] The Tōyō Match Company, set up in 1917 as the successor to the Seisuisha, became Japan's largest manufacturer of matches. (Figure 4)

The Hokkaido Matchstick Industry

A major problem confronting the early match industry was securing supplies of wood suitable for splints or matchsticks. Experiments with bamboo and Japanese paper failed. The matchwood had to be straight grained and white, porous enough to absorb chemicals, but strong enough not to bend or break when sticking. Shimizu, when visiting the mountains around Nikko, found what he thought to be the perfect tree, the Japanese poplar (*Populus maximowiczii*), known by several names: *doro-no-ki*, *hakuyō*, and *yamanarashi*.[11] The Japanese aspen (*Populus sieboldii*) also produced good matchwood. These trees liked cold climates and flourished in swampy areas or along river banks. The Nikko poplars were quickly exhausted and in the early 1880s, Shimizu, Takigawa and others turned to Nagano, Tohoku and finally to Hokkaido and its abundant forests of deciduous trees in order to supply the raw materials necessary to manufacture matchsticks. (Figure 5)

Lacking capital, technical expertise and government support, the Hokkaido Match industry necessarily developed along different lines.[12] (Figure 6) Tamamura Jiuemon, while serving a sentence in a Hakodate prison in the 1870s, not only studied matchmaking, but began to manufacture them on the prison grounds. He was originally a samurai from Ōzu domain in Shikoku. In the 1860s he studied Western learning under Sugita Gentan. On the losing side in the wars that led to the Meiji Restoration, he made his way to Hakodate and made a living as a small merchant dealing with the foreign community. For failure to repay debts, he was imprisoned in 1872 but quickly established himself as a model prisoner and was allowed access to foreign books. Around the same time that Shimizu, with the encouragement of high government officials, was studying the latest match making technology in Paris and later in Sweden, Tamamura (from prison) proposed to Hakodate authorities that access to local supplies of sulphur, phosphate rock (a source of phosphorous) and timber suitable for match sticks, made Hakodate an ideal place for match making. Not only that, he argued in broad terms that a domestic match industry would help Japan combat foreign imports and, at the same time, provide much needed employment for impoverished people. He began experiments and managed, by 1875, to

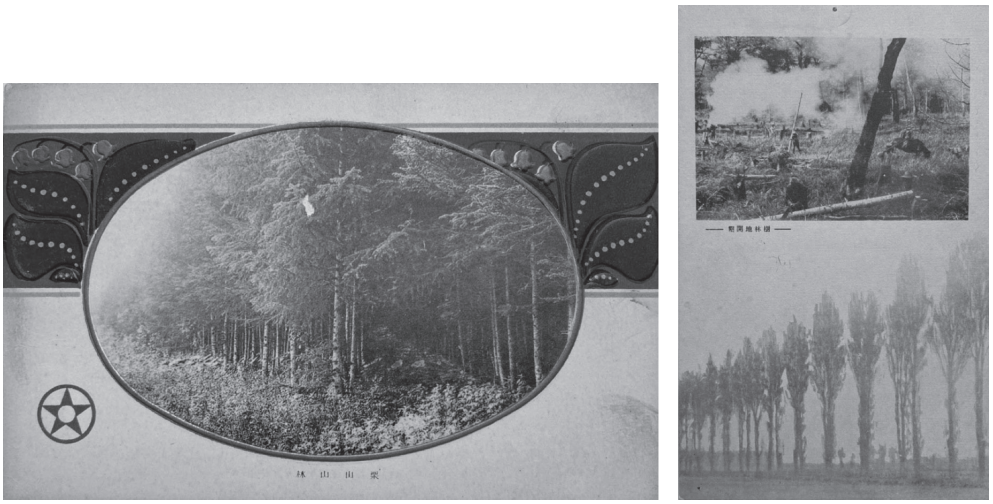

Figure 5: Hokkaido Forests and their modern fate (postcards, author's collection)
(in oval picture) Forested areas near Kuriyama, south of Sapporo.
(in two parts) Cutting down trees to develop new agricultural land (*Jurinchi kaikon*).

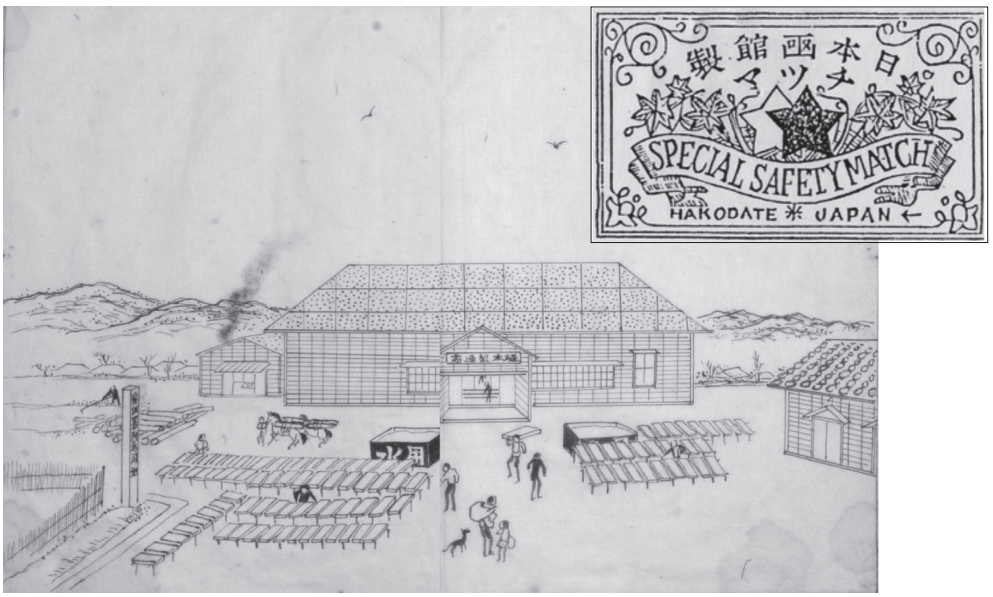

Figure 6: Tamamura Jiuemon and the Hakodate Match Company, 1879.
(Collection of Hakodate City Central Library)

Figure 7: Maruki Match Stick Manufacturing Factory close to the port city of Tomakomai. The factory was established in 1904 by Kasahara Kakuichi and Shigeki Sakai and there were 94 employees. The photograph was taken around 1907 (Collection of Tomakomai City Museum).

produce his first lot of phosphorus matches and later perfected his own band of safety matches. In 1879, he was pardoned and was able to establish the Hakodate Match Factory.[13)]

Tamamura's factory, however, was short-lived. It could not compete with the match industries that had begun to flourish in dense population centers, Tokyo and Osaka (with their abundance of cheap labor), or in port cities like Kobe that had easy access to foreign trade. But while the Hakodate Match Factory folded in 1881, Tamamura had succeeded in bringing Hokkaido's vast timber resources to the attention of the mainland industrialists. A factory specializing in the manufacture of matchsticks opened in Sapporo in 1881. That same year, another matchstick company was established in Shukunobe village near the port at Hakodate, thereby taking advantage of easy transport to mainland factories. Soon mainland merchants began to invest heavily in Hokkaido timber products, leading to an explosion of matchstick factories in Hokkaido.[14)] Takigawa Benzō, for example, purchased a matchwood processing plant in Sapporo and, at its peak, ran four mills with an annual production of some 60,000 bags.[15)] By the 1890s, the Kobe-Osaka match makers had nearly exhausted supplies of locally available wood suitable for matchsticks and turned to the poplar forests of Hokkaido. In 1898 alone some 17 matchstick factories were established in the Kayabe district in southern Hokkaido, close to Hakodate. By that time there were 68 factories in Hokkaido specializing in the production of matchsticks, some exporting logs to mainland factories, but most processing the logs on the spot into matchsticks.[16)] (Figure 7)

As Yanagizawa Fujitaka notes in his study of the depletion of timber resources in Hokkaido during the early twentieth century, this matchmaking boom did not last long. Only a few varieties of trees were suitable for matchwood, including poplars and aspens. Makeshift matchstick facilities were set up close to stands of Hokkaido poplars, but these were quickly cut, forcing factories to move to a different location or close down. In 1893, for example, a matchstick factory was set up in Kutchan,

about 50 km west of Sapporo, where poplar groves thrived along the banks of the Shiribetsu river. In a few years, however, the plant was forced to close; all trees in easy access had been harvested. By 1906, only 40 of the 68 factories in existence in 1898 remained in operation.[17)]

The search for accessible timber resources close to ports led to demand to conduct logging on protected national forests. In 1890, the Yamada Matchstick company, with headquarters in the port city of Abashiri, on the northeastern coast of Hokkaido and close the extensive poplar reserves in the Kitami district, was able to negotiate a contract with the central government allowing it to buy and harvest poplars on lands that were previously off-limits. In ten years this one company managed to cut some 3 million trees from government lands, an average of 300,000 trees each year.[18)]

The harvesting of Hokkaido forests for matchsticks peaked around 1910. According to Yanagizawa, in 1909 the matchstick industry consumed a total of 418,000 *koku* of raw timber but the harvest began to decline thereafter. No major replanting of Japanese poplars took place; as fewer and fewer trees became available for cutting, the Hokkaido matchstick industry declined precipitously. Factories closed. A horrific forest fire in 1911 in the rich Kitami region contributed to the decline. In 1912, the production of matchwood in Hokkaido was 360,000 koku; in 1917 this had declined to 270,000 koku, and by 1922, to a mere 50,000 koku.[19)] As can be imagined, Japan's match industry was in trouble.

The Search for New Sources of Wood for Matchsticks

By 1910, Japan's match industry was one of the largest, if not the largest, in the world. Having exhausted supplies of inexpensive raw timber from Hokkaido, the Osaka-Kobe match tycoons began to explore alternatives, including the import of matchwood from Siberia and Karafuto, the southern half of the island of Sakhalin that had been ceded to Japan in 1905. The April 2, 1913 issue of the *Hokkaido Times* reported that Hokkaido matchstick makers were shocked to learn of plans by mainland match entrepreneurs to transfer their matchstick business from Kushiro, an area well-known for its poplar forests, to Vladivostok and Karafuto.[20)]

In the end, unable to meet the growing demand for match sticks from Hokkaido and other domestic sources, the industry began to look overseas; first to Siberia and Karafuto, then to Korea, Manchuria and even Canada and the United States. In some wood-dependent industries, especially those that were of obvious strategic importance, attempts were made at conservation and replanting—but not so with matchwood. Thus, while plans were made to cultivate hardwood trees necessary for the production of railroad sleepers and utility poles (those large sticks), little attention was given to re-planting domestic poplar forests. Not only was foreign wood imported for the making of matchsticks, but overseas plantations of poplars were contemplated. The July 3, 1918, *Osaka Asahi* reported on plans to develop tree farms along the banks of the Yalu River in Northern China as one way to deal with declining supplies of Hokkaido matchwood. "The popular tree is an important raw material for the matchstick industry derived primarily from Hokkaido. However, in recent years the production/harvesting of such trees in Hokkaido has year by year

gone down. Moreover, the current situation (WWI) makes it difficult to import poplar from Siberia. This is troubling since the match industry has grown spectacularly. Therefore, it is necessary to find other sources for poplar wood. The Toyo Match Co. and the Nihon Match company, joining together, have developed a project to cultivate poplar trees in Andong Province in an area close to banks of the Yalu River, thinking this is an excellent place to for popular trees and other trees suitable for matchsticks to grow."[21)]

The First World War (1914–1918) era in fact proved profitable for the Japanese match industry, especially since the Asian market was cut off from European supplies. When the war ended, however, the boom years ended. European match makers quickly returned to the Asian market. At the same time, the Japan match industry failed to expand supplies of matchwood. As the *Kobe Shinbun* reported on February 20, 1920: "Supplies of poplar originally derived from Hokkaido or were imported from Siberia, but since the match industry flourished during the war years, supplies of poplar wood in Hokkaido have become almost exhausted—the trees have all been cut down. Moreover, in Siberia there is much unrest including banditry, making rail transportation almost impossible. As a result, ships from Vladivostok carry less and less timber. The match industry is bracing for a major downturn knowing that it is almost impossible to expect sufficient supplies of raw wood for matchsticks."[22)]

The Rise and Fall of the Matchstick Industry

The Japanese match industry, both in terms of production and export, flourished during the years of World War I. Sweden, Japan's chief competitor in the world match market, lost access to Russian trees and export trade with Asia. Japan quickly took over the Indian market. A trade reporter commented on the profitable Japan match industry: "Marches were produced in 1916 to the extent of 50,000,000 gross, 41,000,000 of which were exported. The plentiful supply of wood and sulphur makes the match industry of Japan a particularly profitable one."[23)] In fact, however, Japan's supply of matchwood was not plentiful and reliance on colonial sources was fraught with risk. As soon as the war ended, Japan's match industry rapidly declined. Between 1910 and 1919, Japanese match exports averaged over 800,000 cases each year; in 1920, however, the export volume began to decline precipitously: 1920: 569,000; 1922: 417,000; 1924: 269,000; 1926: 244,000. In addition to dwindling supplies of matchsticks, economics and politics played a role in the rapid decline of "Made in Japan" matches. Swedish and American matches returned to the Asian market while China and later India began to develop their own domestic match industries. Moreover, nationalist movements in Asia often fueled anti-Japanese sentiment and boycott of Japanese goods. The golden years of Japan's match industry were an at end.

Conclusion: Wood and Modernity

From the view point of environmental history, Japan's forests were also at a crossroads. During the years of Japan's modern economic takeoff, there was little attention to what is today called "sustainability." There was, however, a great deal attention to profit-making in line with Takigawa Benzō's advice "to get the best materials

at the lowest price and make the greatest profit." Beginning in the 1870s, the national project to "develop" (*kaitaku*) Hokkaido demanded the clearing of forests to create land for agriculture and pasture. Brett Walker has shown how so-called "scientific agriculture" resulted in the extinction of the Japanese wolf, "sacrificed on the bloody alter of modernity."[24] Hokkaido's forests were similarly sacrificed, and not just for Hokkaido's development. From the 1880s, trees were cut in increasing numbers for development of Japan as a modern industrial state: lumber for housing and buildings, firewood and charcoal for fuel, pulp for making paper, railway sleepers, utility poles, mining timber—and matchsticks, leaving, by the 1920s, only trees in wild and inaccessible areas where the cost of cutting and transportation was prohibitive.[25] It is no wonder that Japan's first cement telephone pole, a substitute for the usual wooden pole, was erected in Hakodate in 1923, a port city from which much wood had been exported to the match factories in the big cities Tokyo, Nagoya, Osaka and Kobe.[26]

But the forests of Hokkaido—and of Japan—were not simply victims of industrial modernity. Wood also played a creative role in the construction of modern Japan. It not only, as elsewhere in the world, helped to kick-start Japan's industrial revolution but kept it going as well. Wood was burned to power Japan's steam locomotives before supplies of coal were plentiful. Japan's tea and silk industries, both major export items, similarly depended on wood for fuel. Until the 1920s, housing and other buildings to accommodate a rapidly growing population were almost entirely of wood. Moreover, Japan's victories in war required vast quantities of wood alongside iron and steel. Paper and newsprint were equally indispensable for the development of Japanese politics, economics, education, and intellectual inquiry.

The match industry is but one tiny episode in the much larger story of wood and its engagement with modernity. The creative potential of wood goes well beyond the extraordinary convenience lighting of cigarettes, candles, lamps, and cooking stoves; it relates to transformations in transportation, communications and power (electricity); indeed, wood remains today as the most commonly used raw material.[27] The excessive cutting of trees did create and continues to create problems. Japan, by the end of the Second World War, was anything but the Green Archipelago touted by some people today. Thanks to systematic replanting from the 1950s, largely plantations of Japanese cedar (*Cryptomeria japonica*) and cypress (*Chamaecyparis obtuse*), Japan today is, at close to 70 percent, one of the more forested countries in the world. Nonetheless, Japan continues to rely on foreign supplies (primarily from China) to meet a still growing demand for wood and wood products.[28]

Even the wood for tiny remains Japan's once great match industry is imported: poplar and aspen from China and Sweden.[29] The problem and potential of little sticks, however, remains. According to a 2019 report, Japan consumes an estimated 25.8 billion sets of disposable wooden chopsticks (*waribashi*) every year, equal to roughly 200 pairs per person—and 97 percent of these little sticks are imported and of those 99 percent come from China.[30] Until the 1990s, *waribashi* produced by domestic makers accounted for half of the market, but were taken over by the cheaper and higher quality Chinese counterparts. A *Japan Times* article from 2006 calculated that China's annual production of disposable wooden chopsticks exceeded 45 bil-

lion pairs, equivalent to about 25 million trees, dwarfing by far the estimated 1.25 million trees that were consumed in peak production of Japanese matches in 1907.

But while the example of disposable chopsticks lends itself to negative narratives, akin to the story of environmental damage caused by plastic bag use, the growing use of other "little sticks," wood pellets for example, generates more positive accounts. Timber, after all, is a renewable resource able to play a substantial role in the transition to a more sustainable, resource-efficient economy, especially in areas of construction and energy. The use of biomass wood pellets readily supplements alternative energy sources such as solar and wind. According to the *Global Timer Outlook 2020*, biomass pellets (in 2019) provided 12 percent of Japan's energy needs, and was expected to more than double by 2029, to 31 percent.[31] Wood has emerged as modernity's savior. The UN Food and Agriculture Organization reported that in 2018 global production of wood products posted record growth. "The increased production of renewable forest products provides an opportunity to replace fossil-based products that have a higher carbon footprint, thereby contributing to the Sustainable Development goals."[32] From a little stick does a mighty forest fall; yes, but at the same time, wood, both giant logs and little sticks, have much to offer to the well-being of the world and its inhabitants.

Appendix: Some match and matchstick related statistics

Match production and export statistics
1 case = 7,200 matchboxes (60 matches per box) = 432,000 match sticks

Year	Production (cases)	Export (cases)
1883		195
1884		194
1885		3,768
1886		24,367
1887		67,686
1888		67,042
1889	203,293	104,507
1890	250,293	134,482
1891	256,820	160,599
1892	522,126	184,841
1893	380,907	270,826
1894	374,429	276,860
1895	424,503	338,281
1896	359,597	502,672
1897	480,779	390,763
1898	444,526	441,567
1899	512,955	392,563
1900	427,096	386,360
1901	658,028	499,812

1902	548,010	545,817
1903	647,855	572,577
1904	706,029	665,813
1905	776,859	754,121
1906	1,096,046	772,250
1907	1,142,515 (peak)	671,442
1908	787,954	677,479
1909	999,441	828,142
1910	763,776	998,944 (peak)
1911	878,967	748,906
1912	1,056,905	897,438
1913	1,035,620	880,185
1914	981,005	790,460
1915	984,750	880,732
1916	1,012,260	826,440
1917	1,050,631	883,200
1918	967,289	789,348
1919	1,044,148	831,012
1920	896,295	568,280
1921	846,134	463,080
1922	560,534	416,740
1923	483,934	305,000
1924	495,740	268,740
1925	482,785	256,200
1926	481,746	243,900

Match Stick Production and Export 1900–1927

Year	Production (*kin*) / 千束	Export (*kin*)
1900		6,533,940
1901		7,810,923
1902		7,816,904
1903		9,643,027
1904		8,662,419
1905	165,124,138	4,685,522
1906	7,917,308	5,600,217
1907	71,548,713	6,436,568
1908	88,207,211	7,012,524
1909	73,128,219	8,339,023
1910	73,406,566	7,683,801
1911	81,031,225	6,617,346
1912	84,714,198	25,763 (千束)

1913	81,830,470	26,638
1914	75,859,829	35,654
1915	93,744,599	80,921
1916	107,478,390	74,826
1917	101,406,784	95,569
1918	102,072,590	131,239
1919	104,040,968	213,384
1920	223,878,954	261,731
1921	65,921,489	188,985
1922		180,311
1923		168,494
1924		127,644
1925		95,708
1926		84,439
1927		98,386

Source for both tables: *Matchi kōgyō tōkei sōran*, 1965.

Notes

1) There is little work in English on the economic and environmental importance of the match industry in Japan. Barbara Molony, in her book on the Japanese chemical industry, briefly discusses the importance of the Japanese match export industry: *Technology and Investment: The Prewar Japanese Chemical Industry*, Harvard East Asian Monographs, 1990, p. 22. In his book on poverty during the Meiji period, James Huffman describes labor input of women and children in the match industry: *Down and Out in Late Meiji Japan*, University of Hawai'i Press, 2018, pp. 52–55. In Japanese, most published research focus either on the exploitation of female and juvenile labor or on collections of match box labels. In addition to biographies of prominent match entrepreneurs (noted below), Ishii Kendō's 1903 illustrated primer provides useful background information on the early development of the match industry in Japan: *Matchi no maki*, Hakubutsukan, 1903. Several websites are informative and well documented: *Virtual World Match Museum*, created by the Japan Match Manufacturers' Association (in Japanese and English): http://server18.joeswebhosting.net/~xx9185/english/info/index.html; *Tanaka Match Museum* (in Japanese), created by the Tanaka Match Company: http://www.tanaka-match.co.jp; *Matchi no hanashi* (The Match Story with focus on the history of Japanese matches), created by Daiwa Sangyō, successors to Shimizu Makoto's match manufacturing (in Japanese): http://www.daiwagroup.co.jp/match/rekishi.html; *Matchi no bunka-shi* (A Cultural History of Matches), (in Japanese): https://tanken.com/match.html.
2) Yanagisawa Fujitaka, *Midori no Hokkaidō kaitaku* (The Development/Exploitation of the Green of Hokkaidō), online journal *Sapporo Jiyū Gakkō "Yū"* (Chōsa kōza), 2005, Section 2, "Kaitaku mae no kankyō" (The Environment before Development): http://www.sapporoyu.org/modules/sy_html/index.php?f=chosa-yanagisawa
3) Asuka Yamaguchi, "The Government Railways and the Procurement of Railway Sleepers in Prewar Japan," Chapter 2 in S. Sugiyama, *Economic History of Energy and Environment*, Monograph Series of the Socio-Economic History Society, Japan, 2015, pp. 31–32. See also Yamaguchi Asuka, *Shinrin shigen no kankyō keizai-shi: Kindai Nihon no sangyōka to mokuzai* (An Environmental Economic History of Forest Resources: Wood Products and Modern Japanese Industrialization). On the importance of wood in Japan's transition to a modern industrial society, see Gregory Clancey, "Seeing the Timber for the Forest: Wood in Japanese Capitalism," in G. Bankoff and P. Boomgaard, *A History of Natural Resources in Asia: The Wealth of Nature*, Springer, 2007, pp. 129–31.
4) As with the Japan match industry, there appears to be little academic research on the history of

matches and the match industry in general. The *Wikipedia* site is well written and researched: *Match https://en.wikipedia.org/wiki/Match.*

5) For details on the life of Shimizu Makoto, see his biography: Matsumoto Mitsumasa, *Shimizu Makoto den: honkoku no matchi no sōshisha*, Kanazawa: Shimizu Makoto Sensei Kenshōkai, 1965.

6) Quoted in Namiki Mutsuboan, *Matchi Seisui-ki* (The Rise and Fall of the Match Industry), serialized in the *Kōbe shinbun*, 5 installment, April 14–July 7, 1927. This series of articles is a valuable source on the history of the match industry in Japan. Available online in the *Shinbun jiji bunko*: http://www.lib.kobe-u.ac.jp/das/ContentViewServlet?METAID=00218358&TYPE=HTML_FILE&POS=1&LANG=JA.

7) "The Japanese Match Industry," in Bureau of Statistics, Treasury Department, *Monthly Summary of Commerce and Finance of the United States* (No. 1 Series 1899–1900), Washington, D.C.: Government Printing Office, 1899, pp. 68–69. Text available online: https://books.google.co.jp/books?id=w6dIAQAAIAAJ&pg=PA68&dq=japan+match+industry&hl=en&sa=X&ved=2ahUKEwjvrbDQ_sLrAhXRad4KHUQyD10QuwUwBHoECAQQBg#v=onepage&q=japan%20match%20industry&f=false

8) The biography of Takigawa Benzō's son, Gisaku (who succeeded his father to preside over growing Takigawa match empire), doubles as a biography of Benzō and the development of the Japanese match industry: Yokota Kenichi, *Nihon no matchi kōgyō to Takigawa Gisaku kō*, *Nihon no matchi kōgyō* to Takigawa Gisaku kō Kankōkai, 1963.

9) Kotarō Mochizuki, *Japan To-day: A Souvenir of the Anglo-Japanese Exhibition held in London 1910*, pp. 577–79. This section is available online: https://archive.org/details/japantodaysouven00mochrich/page/600/mode/2up

10) *Ibid.*

11) For discussion of the ideal wood for matchsticks and Shimizu's discovery of poplar trees in Nikko, see Ishii Kendō, *Matchi no maki*, pp. 33–37. The text continues with an illustrated description of the matchstick making process, pp. 37–46.

12) On the Hokkaidō match industry, see section 5.2 "Matchi sangyō ni yoru yūyōju no shūchū bassai" (Concentrated cutting of trees suitable for the match industry), in Yanagisawa Fujitaka, *Midori no Hokkaido kaitaku*, posted in the online journal *Sapporo Jiyū Gakkō "Yū"* (Chōsa Kōza), 2005: http://www.sapporoyu.org/modules/sy_html/index.php?f=chosa-yanagisawa

13) Details on Tamamura's life and his match making enterprises are included in the *Hakodate shishi* (Hakodate City History), *Tsūshi-hen*, vol. 2, section 4, pp. 1032–1034; this section is available on the digital version of the Hakodate City History: http://archives.c.fun.ac.jp/hakodateshishi/tsuusetsu_02/shishi_04-09/shishi_04-09-01-01-03.htm. Tamamura's story is also related in "Tamamura Jiuemon no hatsumei," in Kikuda Renzaburō, *Kinsei Hokkaidō kibun*, 1881; NDL digital version available online: http://dl.ndl.go.jp/info:ndljp/pid/880910/4?tocOpened=1.

14) For details, see the matchstick section in Yanagisawa, *Midori no Hokkaidō kaitaku.*

15) Mochizuki, *Japan To-day*, p. 577.

16) Yanagisawa, matchstick section, *Midori no Hokkaidō kaitaku.*

17) *Ibid.*

18) *Ibid.*

19) *Ibid.*

20) "Hondō (Hokkaidō) hakuyō no zento," *Hokkaidō taimuzu*, April 2, 1913, online Shinbun kiji bunko: http://www.lib.kobe-u.ac.jp/das/jsp/ja/ContentViewM.jsp?METAID=10075942&TYPE=IMAGE_FILE&POS=1&LANG=JA

21) "Jikuki genryō Saibai keikaku," *Ōsaka Asahi shinbun*, March 20, 1918, online Shinbun kiji bunko: http://www.lib.kobe-u.ac.jp/das/jsp/ja/ContentViewM.jsp?METAID=00217971&TYPE=IMAGE_FILE&POS=1&LANG=JA

22) "Matchi jikuki seisan genjō," *Kōbe shinbun*, February 12, 1920, online Shinbun kiji bunko: http://www.lib.kobe-u.ac.jp/das/jsp/ja/ContentViewM.jsp?METAID=00218022&TYPE=IMAGE_FILE&POS=1&LANG=JA

23) Frank R. Eldridge, *Trading with Asia*, D. Appleton and Co., 1921, p. 99. Online archive edition: https://archive.org/details/tradingwithasia00eldr/page/n5

24) Brett Walker, *The Lost Wolves of Japan*, Seattle: University of Washington Press, 2005, p. 157
25) See Yamaguchi Asuka, *Shinrin shigen no kankyō keizai shi: kindai Nihon no sangyōka to mokuzai* for details on wood products such as sleepers in the development of Japan's railroads (Chapter 2), utility poles in the development of telegraph, telephone, and transmission of electricity (Chapter 3), pit props or mine timber in the Japan's mining industry, focusing on coal mines in Kyushu (Chapter 4) and in Hokkaido (Chapter 5) and the pulp industry in Hokkaido that sought to meet an increasing demands for paper products, including newsprint (Chapter 6). Yamaguchi shows how wood products played an essential role in Japan's modern economic growth, but at the same time placed great burdens on its forest resources, causing significant deforestation and reliance of imported wood.
26) For description and short video of the first concrete utility pole, see the Hakodate City Tourism Bureau website; https://www.hakobura.jp/firststory/2011/07/post-2.html
27) According to a 2019 report of the UN Food and Agriculture Organization (FAO).
28) In 2018, Japan's self-sufficiency rate of wood was around 37 percent. See Section 4 (Wood Product Demand and Use of Wood) of the 2018 Annual Report on Forest and Forestry in Japan prepared by the Japan Forestry Agency: https://www.maff.go.jp/e/data/publish/attach/pdf/index-169.pdf
29) On the Kobe Match Company and its new "aroma" matches: https://brandlandjapan.com/story/project/p13.php
30) It is difficult to find highly reliable statistics regarding disposable wooden chopsticks; these numbers come from a 2019 environmental activist site: https://note.com/motomirevels/n/n7cfab87a9d0d; a Pennsylvania State University site gives similar data: https://cgs.la.psu.edu/teaching-resources/k-12-resources-1/cgs-k-12-curricular-materials/elementary-school-level-k-5/japan-sustainability-and-home-lifestyle/day-1-resource-comsumption/chopstick-economics-and-the-201cmy-hashi201d-boom
31) Gresham House, *Global Timber Outlook 2020*, p. 36: https://greshamhouse.com/wp-content/uploads/2020/07/GHGTO2020FINAL.pdf
32) Food and Agriculture Organizaion of the United Nations, "Global production of wood products posts highest growth in 70 years," December 19, 2019: http://www.fao.org/news/story/en/item/1256261/icode/