

Japan's Poison Gas Legacy: Industrial Disease, Environmental Remediation, and the Challenge of Abandoned Chemical Weapons (ACW) in East Asia

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During the Second World War, Japan was a significant producer of chemical weapons (CW) ranging from tear and mustard gases to lewisite and diphenylcyanoarsine, a lethal vomiting agent. Although the military services had only a few major facilities dedicated to CW research and development, related manufacturing plants and storage sites were located throughout Japan and its empire. Mass production of chemical weapons entailed significant risks to workers and the environment and gave rise to various industrial diseases. Moreover, Japanese military units used chemical weapons extensively in the China Theater and, at the end of the war, abandoned large caches of chemical weapons in occupied areas throughout Asia and the Pacific, most notably in northeast China, where even today hapless farmers and unsuspecting citizens occasionally unearth them and suffer CW related illnesses and death due to exposure. This paper examines two aspects of the legacy of Japan's wartime manufacture and deployment of chemical weapons: the medical issues that arose among workers in Japan's chemical industry related to weapons manufacturing and the long-term environmental impact of abandoned chemical weapons (ACW) in China and Japan.

The essay argues that these issues have received inadequate attention from the Japanese and Chinese governments due largely to three primary factors: the secrecy imposed upon the matter beginning in the immediate postwar period; the bureaucratic inertia that characterized the Japanese government's attitude toward industrial workers during and after the war, as well Chinese victims, whom the Chinese government has also been slow to compensate; and specific political constraints imposed by postwar agreements. Consequently, the victims – both Chinese and Japanese – have not been sufficiently compensated by either government. Nor has this subject received much attention in Korea, another site of Japan's chemical manufacturing for the war effort, largely because these industrial plants were predominantly located

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in what is today the communist north. The subject of CW related illnesses and deaths remains a politically charged issue even today, despite recent efforts of the Organization for the Prohibition of Chemical Weapons (OPCW) and the Chemical Weapons Convention of 1997 to address them.

Chemical Warfare and Japan in Two World Wars

Although chemists had long been involved in developing weapons of war in the modern era, it was not until World War I that chemical weapons were manufactured on an industrial scale and widely used in combat. French troops used grenades filled with tear gas as a harassing agent against the Germans in August 1914 and again in the Argonne sector in March 1915, thus setting the world powers on a slippery slope toward applying modern chemistry to war. The Germans upped the ante on 22 April 1915, releasing lethal chlorine gas from 5,730 cylinders along a four-mile front in the Second Battle of Ypres. Although Allied claims that the attacks killed some 5,000 soldiers and left another 10,000 or more wounded were likely exaggerated for propaganda purposes, the number actually killed and wounded was no doubt in the thousands.¹

By 1916, all the principal belligerents had mobilized industrial resources for the development and production of poison gases, and tactical doctrines for their use evolved as new weapons were introduced.² But the worst was yet to come. On 12 July 1917, the German Army introduced mustard gas – once again at Ypres. Mustard gas was particularly insidious because, although it could be detected by its distinct odor, a soldier could inhale or come into contact with a debilitating or even lethal dose without realizing it until several hours later.³ Lewisite, a blistering agent similar to mustard gas but more effective, was developed in the waning days of the war in 1918 but, fortunately, it was not used in this conflict.⁴ Chlorine, phosgene, hydrogen cyanide or “Prussic Acid,” mustard gas, and lewisite – the most commonly used poison gases in WW I – all had distinct characteristics in terms of their odors, consistency, and physical impact upon the human body. Whether exposure came about as a result of combat, an industrial accident, or environmental exposure years later,

¹ Edward M. Spiers, *A History of Chemical and Biological Weapons* (London: Reaktion Books, 2010), 30-31; Jonathan B. Tucker, *A War of Nerves: Chemical Warfare from World War I to Al-Qaeda* (New York: Random House, 2006), 9-18.

² Spiers, *A History of Chemical and Biological Weapons*, 36.

³ Frederic J. Brown, *Chemical Warfare: A Study in Restraints*, with a new introduction by Jeanne Guillemin (New Brunswick and London: Transaction Publishers, 2006), 11.

⁴ Some 150 tons of lewisite were en route from the U.S. to Europe when the armistice was signed. Robert Harris and Jeremy Paxman, *A Higher Form of Killing: The Secret History of Chemical and Biological Warfare* (New York: Random House, 2002), 34.

often made little difference.⁵

The legacy of poison gas warfare in WW I left an indelible impression upon the belligerents. The numbers vary according to sources, but it is estimated that some 113,000 tons of chemical weapons were used during WW I, and about 1.3 million men were casualties of poison gas attacks, many of whom were left blind, debilitated by permanent respiratory illnesses, or otherwise disfigured. Of these, 91,000 died during the war.⁶ These obscene numbers led to calls for the elimination of chemical weapons in the interwar period. Building upon the condemnation and calls for prohibition expressed in the Treaty of Versailles signed in 1919, and the Washington Naval Treaty of 1922, the Geneva Protocol of 1925 was a direct outcome of the international consensus to ban poison gases. However well-intentioned the protocol may have been, in the end, it effectively only prohibited the “first use” of chemical and biological weapons. It did not prohibit their manufacture or possession, and there were no clear consequences indicated for violations nor any means to enforce them. Moreover, although most every League of Nations member signed the protocol, the U.S. and Japan refused to ratify it.⁷ As a result, like the League itself, the Geneva Protocol was effectively rendered toothless. This turn would have grave implications in the years to follow.

Despite calls for disarmament and the prohibition of chemical weapons, many of the advanced industrial nations continued to research, develop, and manufacture them during the lead up to World War II. Japan was no exception. Having observed and studied the use of poison gases by Western powers in WW I, the Imperial Japanese Army began to invest in chemical weapons research and development in the interwar period. Military interest in chemical weapons originated with reports of the German use of poison gas at Ypres in April 1915 and, shortly thereafter, the Army Technology Review Board, which was responsible for monitoring innovations in weaponry, began to investigate the potential of developing an array of chemical weapons, poison gas launchers, and gas masks. Throughout the 1920s-1930s, Japan's chemical weapons program grew slowly “in fits and starts,” remaining constrained largely due to limited allocations of military spending in the national budget. Both the Imperial Japanese Army and Navy established research and development programs at this time. The legal prohibitions against poison gases established by the Geneva Protocol of 1925 did not deter Japan from further committing resources to

⁵ Tucker, *A War of Nerves*, 34-35.

⁶ Harris and Paxman, *A Higher Form of Killing*, 34.

⁷ In the U.S. Senate, the debate over chemical weapons began with a focus on disarmament, but it eventually turned to deterrence instead. See, Roy MacLeod, “The Genie and the Bottle: Reflections on the Fate of the Geneva Protocol in the United States, 1918-1928,” in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences*, eds. Bretislav Friedrich, Deither Hoffmann, Jürgen Renn, Florian Schmaltz, and Martin Wolf (Cham, Switzerland: Springer, 2017), 189-211.

chemical weapons development programs.⁸

One of the first to take up serious research in CW potential was Koizumi Chikahiko, a physician at the Army Medical College's (*Rikugun Gun'i Gakkō*) School of Hygiene. After being commissioned at the rank of Second Surgeon in 1909, Koizumi's first assignment was as an industrial physician at the Tokyo Army Arsenal, which employed over 10,000 workers, both male and female, young and old. During his two years at the arsenal, Koizumi observed that workers frequently became ill and injured. After a brief study, he concluded this was due to the poor nutrition of the workers. In 1911, while still a graduate student at the School of Hygiene, Koizumi initiated a more formal investigation of the relationship between nutrition and workers' health at the arsenal.⁹

According to Tsuneishi Keiichi, a prominent scholar of chemical and biological warfare in Japan, Koizumi continued to focus on labor conditions in the munitions industry "out of his sympathy for workers"; a decision that ironically would lead him ultimately to poison gas research.¹⁰ Koizumi's interests next turned to incidents of picric acid poisoning among munitions workers in arsenals around Tokyo, and he sought to develop prophylactic measures and devices for handling toxic chemicals during the manufacturing process.¹¹ Koizumi recommended several protective measures to authorities at the arsenals, including having the workers wear masks and gargle daily to remove toxic dust. But these were not implemented, and Koizumi did not then have the authority to force reform.¹² That the army was alerted to the issue

⁸ Japan was not unique in this regard. Most nations with a sufficiently developed chemical industry – even signatories to the protocol – continued to engage in CW R&D and production, ostensibly for "defensive" purposes. See, Julian Perry Robinson, *The Rise of CB Weapons*, Stockholm International Institute for Peace and Conflict Research, series editor, *The Problem of Chemical and Biological Warfare: A Study of the Historical, Technical, Military, Legal, and Political Aspects of CBW, and Possible Disarmament Measures*, vol. 1 (Atlantic Highlands, NJ: Humanities Press, 1971), 287-289; Harris and Paxman, *A Higher Form of Killing*, 43-54; and Murata Tadayoshi, et al., *Nihongun no kagakusen* [Chemical Warfare of the Japanese Army] (Tokyo: Otsuki Shoten, 1996), 16-31. For a comparative overview of the CW programs of the principal belligerents leading up to World War II, see Walter E. Grunden, "Chemical and Biological Warfare," in *Secret Weapons & World War II: Japan in the Shadow of Big Science* (Lawrence: University Press of Kansas, 2005), 165-196, from which this section borrows liberally.

⁹ The resulting study was awarded best paper of the year by the Medical Society of Tokyo. See, Tsuneishi Keiichi, "C. Koizumi: As a Promoter of the Ministry of Health and Welfare and an Originator of the BCW Research Program," *Historia Scientiarum* 26 (1984), 95-113.

¹⁰ *Ibid.*, 98.

¹¹ As early as 1911, Koizumi was also engaged in clandestine research for the Army Technology Review Board, but the nature of that work remains uncertain. The Army Medical College's official history of these years states only that Koizumi was involved in "secret research." See, *Rikugun gun'i gakkō* [The Army Military Academy], *Rikugun gun'i gakkō gojūnenenshi* [The Fifty-Year History of the Army Military Academy] (Tokyo: Rikugun gun'i gakkō, 1936), 89.

¹² Tsuneishi, "C. Koizumi," 98-99.

by a credible expert but did nothing to implement such safety measures in its own arsenals illustrates the utter lack of concern military authorities apparently had for workers at this time. Industrial laborers were easily replaceable, and so there were no significant incentives to implement potentially costly safety measures on their behalf. This attitude resulted in a type of bureaucratic inertia regarding workers' safety that would continue for many years.

Having learned of the use of chemical weapons in the war, in 1915, Koizumi took up research on asphyxiating gases for the Army Technology Review Board. Finding his laboratory at the School of Hygiene inadequate for the task, he lobbied for better facilities. By May 1918, the Army Medical College under the auspices of the Ministry of War finished construction of a dedicated Chemical Weapons Laboratory for research and development, at which time Koizumi was named "Chief of Research on Protective Devices." He would go on to develop a gas mask that was adopted for general use by the army and later distributed by the thousands to the civilian population, thus demonstrating once again his general concern for protecting the health and welfare of the people of Japan at that time.¹³

In March 1919, the army dispatched Koizumi on a tour of Europe and the United States to investigate chemical weapons. He returned to Japan later that year with a bundle of documents and publications to advance his research, but he soon learned that the director of the Hygiene Laboratory had passed away and Koizumi was now expected to fill his post. With his time quickly occupied with administrative matters, Koizumi was unable to return to his research, and he settled into a career as a bureaucrat, eventually being appointed Army Surgeon General in 1934.¹⁴ Although his direct involvement in CW research had come to an end, he was now in a better position to implement reforms to improve the health and safety of workers in the munitions industry. But he did not. Instead, he turned his efforts toward establishing a new government agency, the Ministry of Health and Welfare.

Meanwhile, the military services continued to invest in poison gas research and development. In April 1919, the Army Technical Headquarters (*Rikugun Gijutsu Honbu*) assumed jurisdiction over the army's CW program and established the Institute of Scientific Research (*Rikugun Kagaku Kenkyūjo*) to serve as its central R&D facility. Lieutenant Colonel Hisamura Taneki assumed oversight of the program. As a member of the Allied Committee on the Enforcement of the Versailles

¹³ *Rikugun gun'i gakkō, Rikugun gun'i gakkō gojūnenenshi*, 89-90; Tanaka Hiroaki, "Kagaku heiki kenkyū taiseishi no kōsō (ue)" [The Story of the History of the Chemical Weapons Research System, Part I], *Il Saggiatore* 30 (2001), 64-75; Tsuneishi Keichi and Asano Tomizō, *Saikin-sen butai to jiketsu shita futari no igakusha* [The Bacteriological Warfare Unit and the Suicide of Two Physicians] (Tokyo: Shinchōsha, 1982), 51-56.

¹⁴ Tanaka Yuki, "Poison Gas: The Story Japan Would Like to Forget," *Bulletin of the Atomic Scientists* (October 1988), 10-19; Tsuneishi, "C. Koizumi," 102-105; Tsuneishi and Asano, *Saikin-sen butai*, 57-62, 97-98.

Treaty, Hisamura participated in overseeing the dismantling of chemical weapons production facilities in Germany. In 1921, Hisamura returned to Europe under army auspices to further study chemical warfare and, upon his return to Tokyo, advocated for increased support in order that Japan might not fall too “far behind” the other powers. In turn, the army allocated ¥25,000 for the construction of a new laboratory and approved a ¥50,000 research budget.¹⁵ In June 1925, the army elevated Hisamura’s CW office at the institute to department level, designating it “Department Three” in charge of CW research and development. Department Three was now responsible for research on chemical warfare agents, hygiene and treatment of gas casualties, offensive weapons, and protection from poison gas.¹⁶

The Imperial Japanese Navy also began to investigate chemical warfare around this time, but its program remained small in comparison. In 1923, the Navy Technical Research Institute established a section for CW research in the Tsukiji district of Tokyo to undertake preliminary studies. In 1931, responsibility for CW R&D was transferred to the Navy Powder Arsenal at Hiratsuka in Kanagawa prefecture. And, in 1934, the navy upgraded the program and established a new office to manage CW research, the Naval Chemical Research Division, which then subsumed the research functions of the Hiratsuka Arsenal.¹⁷ Although the army and navy did not collaborate on CW R&D in any significant way and conducted their work “concurrently and independently,” nonetheless, by the outbreak of war with China in July 1937, the Japanese military services had developed a significant CW arsenal.¹⁸

The Imperial Japanese Army made a more serious investment in the industrial

¹⁵ It was rumored that Hisamura offered Koizumi a research post at the new facility, but Koizumi did not accept. Quotations are from Tanaka, “Poison Gas,” 10-11.

¹⁶ Office of the Chief Chemical Officer, GHQ, AFPAC, Tokyo, Japan, “Intelligence Report on Japanese Chemical Warfare,” vol. II, “The Chemical Warfare Research and Development Work of the Japanese,” 1 March 1946, RG 319, Assistant Chief of Staff for Intelligence, Document Library Branch, Entry 82, Publications File, 1946-51, Box 1798, U.S. National Archives, College Park, Md., 3. [Hereafter cited as Chief Chemical Officer, “Intelligence Report on Japanese Chemical Warfare,” vol. II.]

¹⁷ Chief Chemical Officer, “Intelligence Report on Japanese Chemical Warfare,” vol. II, 11; and General Headquarters, United States Army Forces, Pacific, Scientific and Technical Advisory Section, “Report on Scientific Intelligence Survey in Japan: September and October 1945,” 1 November 1945, vol. IV, *Chemical Warfare*, RG 165, Box 2056, U.S. National Archives, College Park Md., 19, 22, and Appendices CW-3-1, CW-4-1, and CW-8-5. [Hereafter cited as GHQ, “Report on Scientific Intelligence Survey.”]

¹⁸ Office of the Chief Chemical Officer, GHQ, AFPAC, Tokyo, Japan, “Intelligence Report on Japanese Chemical Warfare,” vol. I, “General Organization Policies and Intentions, Tactics,” 15 May 1946, RG 319, Assistant Chief of Staff for Intelligence, Document Library Branch, Entry 82, Publications File, Box 2097, File: “Japanese Chemical Warfare Policies and Intentions – U.S. Army Forces, Pacific,” U.S. National Archives, College Park, Md., 21. [Hereafter cited as Chief Chemical Officer, “Intelligence Report on Japanese Chemical Warfare,” vol. I.] See also the brief overview in Robinson, *The Rise of CB Weapons*, 287-289.

manufacturing of chemical weapons in the late 1920s. In August 1927, the army appropriated the island of Okunoshima, located in the Seto inland sea in Hiroshima prefecture. Okunoshima became the army's primary facility for poison gas production. To oversee production there, the army established a branch of the Army Arsenal Bureau in the city of Tadanoumi on the main island of Honshū, which served as the central debarkation point for Okunoshima some three kilometers across the inland sea. During the 1930s, Okunoshima began to disappear from official maps of the area to ensure secrecy. According to a chemical engineer employed there at the time, "ordinary civilians" were no longer allowed access to the island.¹⁹ Okunoshima's production complex consisted of several factories, a power plant, various warehouses and office buildings, and a hospital. By 1944, the army employed some 6,000 workers at the industrial complex, including chemists and technicians, but mostly laborers.²⁰ According to one U.S. intelligence report, Okunoshima was capable of producing 200 tons of mustard gas (H), 50 tons of lewisite (L), 80 tons of diphenylcyanoarsine (DC), 50 tons of hydrocyanic (Prussic) acid (HCN), and 2.5 tons of chloroacetophenone (CN) per month when operating at peak capacity.²¹ A variety of test animals were raised and used for research there as well, including mice, guinea pigs, pigeons, and, more than likely, rabbits.²²

While Okunoshima became the army's premier production site for poison gases

¹⁹ Tanaka, "Poison Gas," 12-13. The original source of the quote is Hattori Tadashi, *Hiroku: Okunoshima no ki* [Secret Memoir: The Record of Okunoshima] (Tokyo: Nihon Bunkyo Shuppan, 1963), 3. For more on the role of Okunoshima in wartime, see Takeda Eriko, *Chizu kara kesareta shima* [The Island That Was Erased from the Map] (Tokyo: Domesu Shuppan, 1987), *passim*.

²⁰ Tanaka, "Poison Gas," 12-14.

²¹ For primary source documentation of Japan's wartime chemical weapons program in English, see, General Headquarters, United States Army Forces, Pacific, Scientific and Technical Advisory Section, "Report on Scientific Intelligence Survey in Japan: September and October 1945," November 1, 1945, vol. IV, *Chemical Warfare*, *op. cit.* For production data see, Appendix CW-2-2, CW-6-1, and CW-6-2. See also, United States Military Intelligence Service, *Enemy Capabilities for Chemical Warfare* (Washington, DC: U.S. War Department, 1943), 89-90.

²² The origin of the many rabbits now inhabiting Okunoshima is disputed. One popular account claims that children on a school trip brought the original mating pair and abandoned them there. Other accounts state the rabbits were brought there to serve as an added attraction for tourists visiting the Poison Gas Museum and recreational facilities built on the island in the 1970s-1980s. A more prosaic explanation, however, is that the first rabbits were brought there to serve as laboratory test animals during the 1930s. Rabbits were commonplace test animals "chiefly used" in all CW R&D facilities, in contrast to the less frequently used (and more costly to raise) dogs and monkeys. There is no reason to believe Okunoshima was an exception in not using rabbits, or that the original experiment population did not produce the many rabbits there today. On the use of rabbits in CW research, see, Chief Chemical Officer, "Intelligence Report on Japanese Chemical Warfare," vol. II, pp. ii, 71, and 102. On the controversy concerning the origins of the rabbit population, see Emily Alpert, "A Grim Military Past on Japan's Cuddly 'Rabbit Island'," *Los Angeles Times*, July 7, 2013, <http://articles.latimes.com/2013/jul/07/local/la-me-bunny-island-20130708>.

during the war, the army also manufactured chemical weapons at arsenals in Osaka and Oji. A private firm, the Hodogaya Chemical Company, manufactured phosgene, chlorine, bromine, and benzoic acid on a limited basis for the army from the early 1930s, while the Sumitomo Chemical Company produced arsenic derivatives.²³ The Sone Filling Plant located in Kokura, Fukuoka prefecture, was primarily responsible for producing smoke and toxic munitions.²⁴ According to postwar U.S. intelligence investigations, for the most part, it was the policy of the army to restrict the manufacture of poison gases and the filling of artillery shells, canisters, and grenades to army arsenals, while responsibility for the production of non-toxic raw materials, protective gear, such as gas masks, and some weapons, such as flame-throwers, was generally assigned to private industry.²⁵ But the examples of the Hodogaya and Sumitomo chemical companies demonstrate this was not always the case.²⁶

Although the ill health effects of poison gas manufacturing continued to be apparent during the war, nothing was done to address it. Koizumi Chikahiko, the onetime ostensible champion of workers' health and safety who played a supportive role in establishing the Ministry of Health and Welfare in January 1938, and who was subsequently appointed Minister of Health and Welfare himself in the Konoe Cabinet in 1941, ultimately failed to develop or implement any policies to significantly improve the conditions of workers in the munitions industries. Tsuneishi writes, "As World War II became worse for Japan, [Koizumi] could not do anything at all for the Japanese health and welfare. The only thing he did was to authorize Tojo's policies which would bring disagreeable results to Japanese health and physical strength."²⁷ Why he "could not do anything" – whether he was unable to gain traction with the military services to implement such priorities or whether his priorities simply changed – Tsuneishi does not say. Either way, this inertia on behalf of the government and military bureaucracies led to a generation of industrial workers being irreparably harmed.

All the principal belligerents of WW II produced massive stockpiles of chemical

²³ U.S. Military Intelligence Service, *Enemy Capabilities for Chemical Warfare*, 89-90.

²⁴ Office of the Chief Chemical Officer, GHQ, AFPAC, Tokyo, Japan, "Intelligence Report on Japanese Chemical Warfare," vol. III, "The Manufacture of CW Materials by the Japanese," 1 March 1946, RG 319, Assistant Chief of Staff for Intelligence, Document Library Branch, Publications File, Entry 82, Box 1798, U.S. National Archives, College Park, Md., 2.

²⁵ *Ibid.*, 2.

²⁶ The Mitsui Mine and Miike Dye Factory also may have been involved in aspects of poison gas production for the military services. See, Minpei Arino, *Oshiete Gensan!*, "Nihon no dokugasusen" [Japan's Poison Gas Battle/Poison Gas Production by Private Companies], http://www.oshiete-gensan.com/war-history_g/. Although written by an amateur researcher, this website appears to be factual, though citations are sparse. I am indebted to Professor Daqing Yang for bringing this source to my attention.

²⁷ For reasons not disclosed, after the war, on 13 September 1945, Koizumi committed suicide. Tsuneishi, "C. Koizumi," *Historia Scientiarum*, 112-113.

weapons during the war, but only Japan used them in combat.²⁸ Imperial Japanese Army forces began to deploy smoke and tear gases almost immediately following the outbreak of war in China with the Marco Polo Bridge Incident on 7 July 1937. The first incident of Japanese use of poison gases was reported just over a week later, on 18 July 1937, and similar reports steadily increased thereafter.²⁹ By the summer of 1941, there were reports of “lethal gases” being used to support Japanese counter-attacks against Chinese forces.³⁰ A U.S. Chemical Warfare Service (CWS) investigation confirmed that mustard and CN gases had been used in the “Ichang Incident” on 8 October 1941 and use of lewisite was also suspected. There were over 1,600 confirmed casualties in the incident, 600 of which were fatalities caused by poison gases.³¹ Japanese military dependence upon chemical weapons grew steadily in the China Theater even after the US entry into the war in December 1941. From 1942 through 1943, Japan’s use of poison gases – ranging from vomiting and blistering agents to mustard gas and lewisite – increased on the China front.³² The Imperial Japanese Army may have used chemical weapons on as many as 2,091 separate occasions, with estimates of casualties ranging from 36,968 to 80,000, including both military personnel and civilians.³³

²⁸ Hitler’s Nazi regime used a variety of poison gases to exterminate Jews and others in numerous death camps located throughout Poland and Germany, including the nerve gases *sarin* and *tabun*, but refrained from using these on the battlefield. See, Robinson, *Rise of CB Weapons*, 155-156; and Harris and Paxman, *Higher Form of Killing*, 62-68.

²⁹ Office of the Chief Chemical Officer, GHQ, AFPAC, Tokyo, Japan, “Intelligence Report on Japanese Chemical Warfare,” vol. III, “The Manufacture of CW Materials by the Japanese,” 8. On Japanese use of chemical weapons in China during WW II, see, Yoshimi Yoshiaki, *Dokugasusen to Nihongun* [Poison Gas Warfare and the Japanese Army] (Tokyo: Iwanami Shoten, 2004); Murata Tadayoshi, *Nihongun no Kagakusen* [Chemical Warfare of the Japanese Army] (Tokyo: Otsuki Shoten, 1996); and Bob Tadashi Wakabayashi, “Documents on Japanese Poison Gas Warfare in China,” *Sino-Japanese Studies* 7 (1994), 3-33.

³⁰ “Condensed Statement of Information Available Concerning Japanese Use of War Gas,” RG 319, Publications File, Entry 82, Box 2098, U.S. National Archives, College Park, Md., 1. [Hereafter cited as “Condensed Statement.”]

³¹ *Ibid.*, 1-2.

³² “Reports of Incidents of Use of Gas by Japanese,” October 6, 1944, RG 319, Publications File, Entry 82, Box 2098, NARA, 1-5.

³³ The figures given for incidents of poison gas attacks range widely from at least 886 to 2,091 separate occasions. See, “Condensed Statement,” 1; see also, Awaya Kentarō, “Japanese Mustard Gas in China: Then and Now,” *Sino-Japanese Studies* 4 (1992), 3-6. Documentation of such numbers remains problematic even after the release of numerous seminal documents concerning Japanese Chemical Warfare in China. See, for example, Awaya Kentarō and Yoshimi Yoshiaki, eds., *Jyūgonen sensō gokuhi shiryōshū 18: Dokugasu sen kankei shiryō* [Collection of Top-Secret Documents on the Fifteen-Year War, Volume 18: Documents Concerning Poison Gas Warfare] (Tokyo: Fuji Shuppan, 1989); and Edward Drea, et al., *Researching Japanese War Crimes Records: Introductory Essays* (Washington, DC: Nazi War Crimes and Japanese Imperial Government

By September 1944, however, the Imperial Japanese Army had greatly reduced its use of chemical weapons and restricted their deployment to the front lines. A sternly worded declaration from U.S. President Franklin D. Roosevelt issued in June 1942 warning of “retaliation in kind and in full measure” seemed to have had little impact in the China Theater at first, though it likely had a significant influence on determining Japan’s policy toward using chemical weapons against Allied forces in the Pacific. When Roosevelt repeated the warning in April 1943 threatening retaliation with “overwhelming force” should poison gas continue to be used against American allies, the Imperial Japanese Army then responded by significantly reducing its reliance on chemical weapons in China. The production of poison gases in Japan fell off dramatically in 1944. The Okunoshima facility, for example, was retooled and converted over to the manufacture of conventional explosives for the remainder of the war.³⁴ By early 1945, it was becoming increasingly apparent that Japan would lose the war and, having been the first to initiate the use of chemical weapons in the China Theater, Japan’s military leaders feared they may suffer severe consequences for having done so. Preparations would soon be underway to hide their deeds.

Postwar Secrecy, Discovery, and Remediation

With the emperor’s announcement of surrender on 15 August 1945, the Japanese government issued orders to destroy all evidence pertaining to the conduct of war in China and the Pacific. Japanese military leaders throughout China scrambled to hide or destroy their stockpiles of chemical weapons. Hundreds of thousands of chemical laden artillery shells, mortar rounds, and gas grenades were buried, disposed of in lakes and rivers, or set ablaze, including also large drums of chemical agents yet to be weaponized. Such activities were especially frantic in China’s northeast, where the majority of Japan’s biological and chemical warfare testing took place. At the headquarters of Unit 516, Japan’s primary chemical weapons detachment, located in the city of Qiqihar, Heilongjiang province, soldiers carried out orders to destroy all documents and any base infrastructure that might serve as incriminating evidence of having engaged in chemical warfare. In their haste, however, they were unable to

Records Interagency Working Group, 2006). On military policy concerning Japan’s use of chemical weapons, see Walter E. Grunden, “No Retaliation in Kind: Japanese Chemical Warfare Policy in World War II,” in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences*, ed. Bretislav Friedrich, et al. (Cham, Switzerland: Springer, 2017), 259-279.

³⁴ Target No. 635, “Manufacture of Poison Gases,” RG 319, Entry 85A, MIS#: 235950-1, NARA, 1; Grunden, “No Retaliation in Kind,” 267-270.

secure all caches of chemical weapons and to effectively destroy, neutralize, or otherwise dispose of them properly.³⁵

Postwar investigations conducted by the U.S. Chemical Warfare Service under the auspices of the International Military Tribunal for the Far East (IMTFE) found plentiful evidence to indict Japanese military leaders for having used poison gases in China, but such charges were never brought. Two lawyers with the International Prosecution Section (IPS) for the Tokyo Trials, Colonel Thomas Morrow and David Nelson Sutton, conducted extensive research throughout China that revealed widespread use of chemical weapons by the Japanese. Evidence provided by Chinese sources indicated that no fewer than 26,968 people had been casualties of Japanese poison gas attacks with 2,086 fatalities. In a memorandum submitted to Chief of Counsel Joseph B. Keenan, Morrow argued that Japan's war in China was "characterized by gross violations of international law and treaties, by massacre of civilians and Chinese soldiers, prisoners of war, and by the outlawed use of poison gas."³⁶

But the use of poison gas ultimately was downplayed during the trial. Parallel investigations revealed a close connection to Japan's wartime biological warfare research program under Unit 731, headquartered near the city of Harbin in China's Heilongjiang province in the northeast, and U.S. Military Intelligence (G-2) had secretly offered Unit 731 director, Lieutenant General Ishii Shirō, and his top doctors, immunity for prosecution in exchange for their research data. The Cold War imperative of keeping such data out of the hands of the Soviet Union trumped the search for justice. Moreover, while being interrogated about Japan's chemical warfare in China, General Tojo Hideki made direct references to the U.S. use of nuclear weapons against Japan, weapons that he argued were far more "outrageous" than poison gases. The implication was that "if chemical warfare charges were made against Japan, the defense would have leeway to introduce the Hiroshima and Nagasaki bombings as a way of undermining the legitimacy of American prosecutors."³⁷ For these reasons, charges of violating the Geneva Protocols concerning the use of poison gases were not pursued further, and the issue of Japan's chemical warfare in China began to fade into obscurity.

Not long after the Tokyo Trials were concluded, in the early 1950s, Chinese farmers and construction workers began inadvertently and quite accidentally unearthing

³⁵ George Wehrfritz, Hideko Takayama, and Lijia MacLeod, "In Search of Buried Poison," *Newsweek* 132:3 (July 20, 1998), 27-28.

³⁶ Jeanne Guillemin, "The 1925 Geneva Protocol: China's CBW Charges Against Japan at the Tokyo War Crimes Tribunal," in *One Hundred Years of Chemical Warfare: Research, Deployment, Consequences*, ed. Bretislav Friedrich, et al. (Cham, Switzerland: Springer, 2017), 280-281.

³⁷ Guillemin, "The 1925 Geneva Protocol," 282. For the broader study of the miscarriage of justice against Ishii and members of Unit 731, see Jeanne Guillemin, *Hidden Atrocities: Japanese Germ Warfare and American Obstruction of Justice at the Tokyo Trial* (New York: Columbia University Press, 2017).

chemical weapons that the Japanese military had hastily abandoned at the end of the war.³⁸ Over the next few decades, as incidents of accidental discovery and exposure to the abandoned chemical weapons (ACW) accumulated, Chinese citizens began to file legal claims against Japan. They also pressured their own government to compensate the victims of exposure and to address the problem of environmental remediation of the ACW sites discovered since the end of the war. Ironically, it was not until the 1970s and 1980s, however, when journalists and historians began to expose the clandestine activities of Unit 731 that the Japanese government began to face more serious scrutiny from the international community over the poison gas issue.

Under increasing political pressure resulting from the Conference on Disarmament, in 1991, Japan dispatched the first of what would be a series of no fewer than 75 investigatory missions working with Chinese counterparts to determine the extent of the abandoned chemical weapons problem.³⁹ But, as might have been predicted, the issue remained highly politicized, and the two nations could not readily agree upon a *modus vivendi* for going forward. For one, they could not agree upon the scale or scope of the environmental and human threat the ACW problem posed. For example, the Chinese government, for its part, claimed that Japan had abandoned nearly two million chemical weapons in Jilin province alone, while Japan, on the other hand, estimated the number to be much lower at around 700,000.⁴⁰ The issue of which disposal method was best suited to the situation in China was also a contentious factor, due largely to the cost of constructing incineration facilities in remote areas. Determining the division of labor and anticipating potential problems arising from the mixing of Japanese and Chinese personnel in work crews were also issues to be negotiated.⁴¹

As these investigations proceeded, a series of international disarmament talks were held in Paris and the Hague under the aegis of the Conference on Disarmament to address the global threat of chemical warfare. The Chemical Weapons Convention (CWC) that resulted on 29 April 1997, touted as “the world’s first multilateral disarmament agreement to provide for the elimination of an entire category of weapons

³⁸ Many specific incidents have been recorded dating back as early as 1953. See, Hongmei Deng and Peter O’Meara Evans, “Social and Environmental Aspects of Abandoned Chemical Weapons in China,” *The Nonproliferation Review* (Spring-Summer 1997), 101-108.

³⁹ John Hart, “Looking Back: The Continuing Legacy of Old and Abandoned Weapons,” *Arms Control Today*, March 1, 2008, https://www.armscontrol.org/act/2008_03/Lookingback.

⁴⁰ Wehrfritz, et al., “In Search of Buried Poison,” *Newsweek*, 27-28; and Conference on Disarmament, “Some Information on Discovered Chemical Weapons Abandoned in China by a Foreign State,” CD/1127, February 18, 1992.

⁴¹ See Mure Dickie, “Legacy of Japan’s Chemical Warfare Still Alive in China,” *The Financial Times Limited*, 3 August 2005, <https://www.proquest.com/docview/229044970?accountid=26417>; and Peter O’Meara Evans, “Destruction of Abandoned Chemical Weapons in China,” Paper 13 (Bonn International Center for Conversion, September 1997), 1-46.

of mass destruction,” provided an international legal framework in which the investigations and remediation of ACW in China could proceed.⁴² To head the international chemical weapons disarmament regime, the CWC established the Organization for the Prohibition of Chemical Weapons (OPCW), whose mission statement is defined as fulfilling the Convention’s mandate “to end the development, production, stockpiling, transfer and use of chemical weapons; to prevent their re-emergence; to ensure the elimination of existing stocks of such weapons; and, in doing so, to make the world safe from the threat of chemical warfare.”⁴³ At last it appeared the ACW problem in China might be recognized and managed as an issue of global concern.

On 30 July 1999, representatives of the governments of Japan and the People’s Republic of China (PRC) met in Beijing and, in accord with the CWC of 1997, signed the “Memorandum of Understanding between Japan and China on the Destruction of Abandoned Chemical Weapons (ACW) in China.” The memorandum affirmed Japan’s commitment to “provide all necessary financial, technical, expert, facility as well as other resources for the purpose of destroying the ACWs” remaining in China. In the case of accidents or injuries occurring in the remediation process, the Japanese government promised to “take satisfactory measures for both sides in order to provide necessary compensation.”⁴⁴ Remediation, according to CWC guidelines, was to be completed within ten years. Not included in the memorandum agreement, however, was any mention of how to compensate those already injured by their encounters with ACW sites prior to the signing of the protocol.

Why did China wait so long to press the abandoned chemical weapons issue with Japan? And, why did the People’s Republic not demand compensation sooner? The

⁴² OPCW, “History: Looking Back Helps Us Look Forward,” <https://www.opcw.org/about-us/history>.

⁴³ *Ibid.*

⁴⁴ The Memorandum stated the following: 1) the governments of China and Japan through joint investigations have determined and concurred that “huge amounts” of chemical weapons were abandoned in China by the Imperial Japanese Army; 2) Japan will fulfill its obligation to destroy the ACWs in China; 3) Japan “will provide all necessary financial, technical, expert, facility as well as other resources for the purpose of destroying the ACWs” and China will provide “appropriate cooperation for the destruction”; 4) Japan will abide by the laws of the PRC, the “utmost priority will be given to preventing the ecological environment of the People’s Republic of China from being contaminated,” and China consents to “the destruction operations to be carried out inside its territory”; 5) the location of ACW destruction facilities are to be determined by mutual consent and environmental-impact assessment and monitoring will be conducted according to China’s standards; 6) both parties will agree on the rules and time limit for destruction of the ACW; 7) “mature” (i.e. advanced) destruction technologies will be used; and 8) in case of accident or injury, “the Japanese side will take satisfactory measures for both sides in order to provide necessary compensation.” See, Ministry of Foreign Affairs of Japan, “Memorandum of Understanding between Japan and China on the Destruction of Abandoned Chemical Weapons in China,” 30 July 1999, <https://www.mofa.go.jp/announce/announce/1999/7/730.html>. See Appendix A for complete wording of the original text.

answers are complex and may have much to do with Cold War geopolitics. First, it must be recognized that China renounced any and all demands for war reparations from Japan with the signing of the “Joint Communiqué of the Government of Japan and the Government of the People’s Republic of China” on 29 September 1972.⁴⁵ The Communiqué capped a successful diplomatic mission to China headed by Japan’s Prime Minister Tanaka Kakuei accompanied by Foreign Minister Ohira Masayoshi. Meetings held with Chairman Mao Zedong and Premier Zhou Enlai between 25 and 30 September 1972 resulted in the establishment of formal diplomatic relations between the PRC and Japan. Tanaka’s mission followed U.S. President Richard M. Nixon’s visit in February 1972, which opened the era of détente between the United States and China. Nixon’s trip came only months after the United Nations General Assembly voted to admit the People’s Republic into the U.N. on 25 October 1971, which simultaneously excluded the Republic of China (Taiwan) and signaled the move toward a “One China” policy internationally.⁴⁶ Prior to U.N. recognition of the PRC, the legal standing of China’s government arguably remained in question. Therefore, whether or not the PRC had the ability to sue Japan for compensation over matters concerning the war was unclear. Although the question of why China did not press the ACW issue sooner and more vociferously remains to be answered more definitively,⁴⁷ it is unlikely the PRC would have gained much traction in an

⁴⁵ Article Five of the Communiqué states: “The Government of the People’s Republic of China declares that in the interest of the friendship between the Chinese and the Japanese peoples, it renounces its demand for war reparation from Japan.” See, Japan Ministry of Foreign Affairs, “Joint Communiqué of the Government of Japan and the Government of the People’s Republic of China,” September 29, 1972, <https://www.mofa.go.jp/region/asia-paci/china/joint72.html>.

⁴⁶ On the Nixon visit to the PRC and the Cold War context, see Chen Jian, *Mao’s China and the Cold War* (Chapel Hill & London: University of North Carolina Press, 2001), 249-276.

⁴⁷ Some scholars attribute China’s “lenient approach” to Japan in the postwar era – whether it was the Republic of China under Chiang Kai-shek or the PRC under Mao – to the desire to forge stronger diplomatic relations with its former enemy. This attitude was adopted in large part due to geopolitical considerations arising from the Cold War. In the 1960s, Mao sought closer relations with Japan to counter the perceived threat of Soviet military and political influence in East Asia after the Sino-Soviet split. Political scientist James Reilly argues: “The 1972 normalization of relations ushered in a decade-long honeymoon in China-Japan relations during which discussion of Japanese wartime atrocities in China was suppressed as ‘harmful to the Sino-Japanese friendship’.” Thus, the years 1945-1982 may be characterized as a period of “benevolent amnesia” on China’s part. See, James Reilly, “Remember History, Not Hatred: Collective Remembrance of China’s War of Resistance to Japan,” *Modern Asian Studies* 45:2 (March 2011), 463-490. For a broader discussion of postwar Sino-Japanese relations in this context, see Daqing Yang, “Mirror for the Future, or the History Card? Understanding the ‘History Problem’,” in *Chinese-Japanese Relations in the Twenty-First Century: Complementarity and Conflict*, ed. Marie Söderberg (London: Routledge, 2001), 10-31; and Akira Iriye, *China and Japan in the Global Setting* (Cambridge, MA: Harvard University Press, 1992).

international court of law prior to October 1971, and after signing the Joint Communiqué with Japan in September 1972 and renouncing claims to war reparations, the point became legally moot for the foreseeable future. Thus, Chinese survivors of Japan's wartime chemical warfare and those injured from accidental exposure to ACW sites continued to suffer in relative silence for much of the postwar period.

By one estimate, over 2,000 Chinese have been severely injured or have died from accidental exposure to ACW, with most such incidents occurring in the northeast provinces. For example, in February 1953, in the Angangxi district near the city of Qiqihar in Heilongjiang province, some 70 laborers suffered injuries when attempting to transport abandoned munitions they had salvaged as scrap metal, resulting in "one of the largest accidents involving ACW in China."⁴⁸ Several more incidents involving farmers being injured while digging up ACW or encountering them while dredging rivers occurred with more frequency in the 1970s and continued into the 1990s.⁴⁹ Following the signing of the "Memorandum of Understanding" in 1999, the government of Japan began to hear cases brought by Chinese victims. In 2003, a Tokyo court determined the government had been negligent in remediating ACW sites in China and awarded one group of complainants the equivalent of \$1.7 million.⁵⁰ But this decision did not prove to be a turning point in resolving the ACW issue. Luo Lijuan, an ACW victim lawyer and advocate, states that although the Japanese government has "provided a certain amount of relief payment or consolation money" to some victims, such payments have never taken the form of "compensation in a legal sense." According to Luo, the money they received were [sic] never enough to cover their medical bills.⁵¹ Moreover, some victims have alleged Beijing itself does too little to ensure adequate health care for its citizens suffering from ACW related injuries and illnesses.

Beyond injury to humans, the threat to the natural environment posed by ACW has become even greater in recent years as the metal containers of the munitions corrode and leak toxic chemicals into the soil and local water supplies. And the problem is widespread. Thousands of ACW munitions have been discovered as far south as Zhejiang province along the south-central coast, and as far inland as Wuhan and Beijing, while the vast majority – possibly hundreds of thousands – remain buried in the Haerbaling district in the city of Dunhua in Jilin province in the northeast. In addition to their various poison gas contents, many ACW also contain high concen-

⁴⁸ Deng and O'Meara Evans, "Social and Environmental Aspects of Abandoned Chemical Weapons in China," 102.

⁴⁹ *Ibid.*, 102.

⁵⁰ Dickie, "Legacy of Japan's Chemical Warfare Still Alive."

⁵¹ "China Focus: Victims of Japan's Abandoned Chemical Weapons Continue to Suffer," XINHUANET, 3 May 2018, http://www.xinhuanet.com/english/2018-05/03/c_137153845.htm.

trations of arsenic and picric acid, the latter having been used as a “booster or bursting charge” for the gas shell, which only becomes more sensitive with age and more prone to exploding when disturbed. According to one report, “how to treat and dispose of the arsenic contained in the chemical agents” remains one of the most important aspects of ACW remediation.⁵² In many areas, leaking ACW have contaminated the topsoil and disrupted the ecosystem resulting in farmers being forced to abandon land rendered infertile. Urban water supplies are also threatened, particularly as compounds such as hydrogen cyanide are soluble in water and can easily contaminate local rivers and water tables if carried downstream by rain.⁵³

Back in Japan, the postwar coverup and public silence concerning wartime chemical weapons manufacture and use continued into the early 1960s, at which time former workers at Okunoshima suffering ill health petitioned the government for compensation and were finally acknowledged. Journalist Jon Mitchell reports that “Nine out of ten workers involved in Okunoshima’s wartime production and postwar cleanup suffered serious health damage, especially respiratory tract cancers and chronic bronchitis; others committed suicide.”⁵⁴ In 1965, the government finally offered compensation to some of the families of the deceased as well. Ten years later, the government began to offer free medical treatment for those who met “strict screening criteria.”⁵⁵

As journalists and historians began to reveal the extent of Imperial Japan’s wartime chemical and biological warfare activities in the decades that followed, an activist movement emerged to focus attention on the environmental and human costs of this legacy. For example, from 1970 to 1983, photojournalist Higuchi Kenji interviewed and photographed former workers at Okunoshima, carefully documenting their struggles with debilitating diseases linked to their years of employment there. Only a fraction of them ever received government assistance or compensation for the injuries they sustained while working at Okunoshima. Because the production of poison gases was a military secret and documentation of Okunoshima’s wartime activities was destroyed at the end of the war, until only recently, only full-time laborers in military uniform were eligible to receive government assistance from the Army Mutual Aid Union, which left over 4,000 civilian workers without assistance or compensation after the war. By the end of 1981, even with increasing pressure

⁵² Technology Study Group for the Destruction of Abandoned Chemical Weapons, “Study Report,” May 1999, 1-42, <https://fas.org/nuke/guide/japan/cw/990706studyreport.pdf>.

⁵³ Deng and O’Meara Evans, “Social and Environmental Aspects of Abandoned Chemical Weapons in China,” 105.

⁵⁴ Jon Mitchell, *Poisoning the Pacific: The US Military’s Secret Dumping of Plutonium, Chemical Weapons, and Agent Orange*, Foreword by John W. Dower (Lanham: Rowman & Littlefield, 2020), 17.

⁵⁵ *Ibid.*, 17.

from citizen activists, only 735 of the former laborers at Okunoshima had been officially recognized as having a legal claim for compensation, and 201 of those had already died. Survivors received only ¥122,000 per month while they remained living.⁵⁶

Illnesses and diseases suffered by former workers at Okunoshima ranged from seborrhea (dry skin) and other chronic skin conditions, ophthalmic edema (swelling of the eye), chronic watery eyes, acute visual impairment, recurring acute bronchitis and chronic sore throat, to fatal conditions such as cancers of the skin, eyes, esophagus, liver, colon, lungs, and so on. Shirakawa Fumiko was sent to Okunoshima as a young girl of only fourteen years of age to help manufacture balloon bombs and suffered chronic bronchitis for the rest of her days. Izumi Masakatsu was recruited as a laborer when he was only seventeen years old and was sent to Okunoshima to manufacture mustard gas (i.e. Yperite). He suffered from frequent blistering of the skin while working there and was permanently scarred. After the war, Izumi continued to suffer from chronic skin rashes and bronchitis. Yamamoto Tsuruo worked to fill CW cannisters, and although she was not directly involved in poison gas manufacturing, she stated the whole island was filled with poison gas, so it was impossible not to be affected by it. She suffered from asthma and chronic bronchitis ever since. And these were the “lucky” ones. Far more died prematurely from various forms of cancer and respiratory ailments.⁵⁷ All were victims of the legacy of Koizumi Chikahiko, the putative “father of Japanese chemical warfare,” who was largely responsible for initiating poison gas research in Japan and who as Minister of Health and Welfare failed utterly to introduce safety measures to protect industrial workers at Okunoshima and the many other military arsenals engaged in munitions and chemical weapons production in Japan.

Equally disconcerting is the potential environmental catastrophe that still looms in Japan both on land and offshore at former CW production and storage sites, of which 30 have been identified. At the end of the war, and in the early days of the Allied Occupation, hasty measures were taken to dispose of Japan's remaining chemical weapons supply. From 17 to 20 August 1945, some six tons of mustard gas and lewisite stored at the Army's Narashino School were “neutralized” with a chemical solution and buried, apparently with no concern for potential groundwater contamination. In Aomori prefecture, from August 20 to 23, the navy disposed of some two or three thousand 60-kilogram shells filled with mustard gas and lewisite by dropping them into Mutsu Bay. At Yokosuka, some 30,000 cannisters of tear gas

⁵⁶ Higuchi Kenji, *Dokugasu no shima* [Poison Gas Island] (Tokyo: Kobushi Shoten, 2015), 213.

⁵⁷ *Ibid.*, 70-71 and 90. See also the many personal testimonies of former workers on the island as given in Yukutake Masato, *Hitori hitori no Okunoshima: Dokugasu kōjō kara no shōgen* [Okunoshima One by One: Testimony from the Poison Gas Factory] (Tokyo: Domesu Shuppan, 2012).

were summarily dumped into the sea. Worse yet was the “clean up” at Okunoshima, which entailed little more than U.S. and Australian military engineers simply dumping the remaining stockpiles of metal drums and chemical-laden shells – some three tons of them – into the surrounding waters. Even today, mustard gas and lewisite, among other varieties of poison gases, still lie at the bottom of the inland sea in these rotting metal containers.⁵⁸ Since September 1945, there have been 822 incidents of accidental contact with abandoned chemical weapons across Japan, which has resulted in twelve deaths and over 400 injuries of Japanese citizens.⁵⁹ As of the year 2020, the water on Okunoshima remained toxic – contaminated with excessive amounts of arsenic – and all drinking water had to be delivered weekly from the mainland.⁶⁰

While investigations prompted by the CWC and OPCW have shed much light on the ACW situations in China and Japan, much less is known about the environmental impact and toll on industrial workers in the related chemical and munitions industries elsewhere throughout Japan’s former colonial empire. The port city of Hungnam, located in the northern half of the Korean peninsula, for example, was a major industrial center and munitions manufacturing site under Imperial Japan. Although it has not been confirmed that any poison gases were produced there during the war, it is well documented that the Hungnam industrial complex was a major site for chemical production, as well as synthetic fertilizer and munitions manufacturing. In the 1930s, Noguchi Jun, a brash “upstart” entrepreneur and founder of the Japan Nitrogenous Fertilizer Company (Nippon Chisso Hiryō, or *Nitchitsu*), began to build a sprawling industrial complex at Hungnam that included factories dedicated to the manufacture of butanol, hydrogen peroxide, ammonia, ammonium nitrate, nitric acid,

⁵⁸ Yoshimi, *Dokugasusen to Nihongun*, 273-279; Mitchell, *Poisoning the Pacific*, 14-18; and H. Kurata, “Lessons Learned from the Destruction of the Chemical Weapons of the Japanese Imperial Forces,” in Stockholm International Peace Research Institute, *Chemical Weapons: Destruction and Conversion* (London: Taylor & Francis, 1980), 79-83. More recently updated official figures from the Japanese government are given in Japan Ministry of the Environment, “Shōwa 48-nen no ‘Kyūgun dokugasudan nado no zenkoku chōsa’ fuorō-appu chōsa hōkoku-sho, Heisei 15 11 28 (Heisei 16 3 31 kōshin-ban),” [“Follow-Up Survey Report, November 28, 2003 (Updated March 31, 2004) on the 1973 ‘National Survey of Former Military Poison Gas Armaments’”], 17-20, <http://www.env.go.jp/chemi/report/h15-02/005.pdf>. For a summary overview of this report, see Sato Ryo, “Sea-Dumped Chemical Weapons: Japan,” Global Green USA, U.S. Affiliate of Green Cross International, Washington DC (June 2010), 1-18, <https://www.yumpu.com/en/document/read/45611641/sea-dumped-chemical-weapons-in-japan-global-green-usa>.

⁵⁹ Japan Ministry of the Environment, “Shōwa 48-nen no ‘Kyūgun dokugasudan nado no zenkoku chōsa’,” 23-45, <http://www.env.go.jp/chemi/report/h15-02/006.pdf>; and Sato, “Sea-Dumped Chemical Weapons,” 11-12.

⁶⁰ Mitchell, *Poisoning the Pacific*, 17.

black powder, and glycerine, among other compounds used in the production of explosives, munitions, and highly flammable fuels. One of these plants that specialized in manufacturing explosives could produce 40 tons of dynamite per day. By the outbreak of war with the U.S. in 1941, Noguchi's Hungnam complex and affiliated works had grown to become "Japan's largest civilian producer of arms and munitions."⁶¹

If working conditions in the armaments industry were poor for laborers in Japan, there is no reason to expect they would have been better in any of the factories in the colonies. In plants responsible for the production of synthetic fuels and munitions, there were frequent accidents and many work-related fatalities. As the war raged on and the pool of managers, technicians, and laborers with the requisite expertise and experience in manufacturing gradually diminished, dangerous production processes were left in the hands of increasingly less experienced managers and workers. When machines broke down, there were too few experts left to repair them, which often left production at a stand-still.⁶² Over time, Korean laborers with less training and technical skills came to replace the Japanese. In 1938, 37% of the workers in one of the primary Nitchitsu factories in Hungnam were ethnic Koreans, but by 1945, that number had increased to 80%.⁶³ Under such conditions, safety was often sacrificed for productivity.

The toxic conditions in which laborers in the munitions and chemical weapons industries toiled in Japan, and the long-term health effects they suffered, only came to light decades after the war when journalists and activists began to take up their cause. There was no such recognition of the thousands of Korean laborers who suffered in a similar manner in the factories of their Japanese colonial overlords. Most of those who labored in Noguchi's industrial empire in Hungnam are now all but forgotten, and there is no advocacy for them. The city of Hungnam, located on the eastern coast of the Democratic People's Republic of Korea (DPRK), or North Korea, and much of its history, remain similarly shrouded in mystery since the occupation of the north by communist forces of the Soviet Red Army in the summer of 1945.

Although no direct link has been established between Japan's wartime chemical

⁶¹ Barbara Molony, *Technology and Investment: The Prewar Japanese Chemical Industry* (Cambridge, MA: Harvard University Press, 1990), 224-225. For a detailed description of the Hungnam industrial site, see Walter E. Grunden, "Hungnam and the Japanese Atomic Bomb: Recent Historiography of a Postwar Myth," *Intelligence and National Security* 13:2 (Summer 1998), 32-60. For a more comprehensive history of Hungnam and its industrial development by Noguchi during the Japanese occupation, see Yang Jihye, "Iljeha Ilbon jilsobiryo (ju) ui Heungnam geonseol gwa jiyeg sahoe" [Heungnam City Construction of Nitchitsu and Local Societies in Korea Under Japanese Rule] (PhD. diss., Hanyang University, 2020).

⁶² Kamata Shōji, ed., *Nippon Chisso shi e no shōgen* [Testimony of the History of Nippon Chisso], Vol. XXIV (Tokyo: 1991), 17-18.

⁶³ Yang, "Heungnam City Construction," 12.

weapons production and the city of Hungnam, it may not be entirely coincidental that Hungnam today is one of eight key sites in North Korea's chemical weapons program where a major chemical weapons research facility and at least two production plants are located.⁶⁴ According to the website GlobalSecurity.org, the Hungnam Chemical Engineering College "trains officer cadres for chemical warfare troops and at the same time performs functions of an NBC [nuclear, biological, chemical] center." Moreover, U.S. intelligence agencies suspect that the Hungnam Fertilizer Complex is presumably involved in the production of "one or more of the agents... sarin, tabun, phosgene, adamsite, prussic acid and a family of mustard gases" beyond the manufacture of the more common asphyxiating and tear gases.⁶⁵ Given the advanced industrial development of this city under Japanese colonization, it is not coincidental that it should emerge after the war as an important industrial site for the manufacture of munitions and chemical weapons. But exactly what Japan may have left there as a legacy of its poison gas history remains unknown.

Conclusion

Over 75 years after the war, the ACW problem in China and Japan remains far from resolved. While the OPCW may claim great success in the remediation of ACW worldwide, with nearly 95 per cent of all chemical weapons stockpiles declared by possessor states having been destroyed under OPCW verification by 2017,⁶⁶ the situation in China and the relatively slow pace of its resolution stands out as a significant outlier.⁶⁷ Despite the optimistic assessment of Ambassador Sheikh Mohammed Belal, Permanent Representative of Bangladesh to the OPCW and Chair of the OPCW Executive Council, who praised the "good level of cooperation between China and Japan" and the "high level of commitment to complete this task," much work remains to be done. Although some 46,000 of the approximate 56,000 ACW-related items discovered in over 90 locations in 17 different provinces in China were verified as destroyed in the first decade of remediation, there remain an estimated 330,000 items yet buried at Haerbaling alone, not to mention the untold thousands

⁶⁴ Joseph S. Bermudez, Jr., "North Korea's Chemical and Biological Warfare Arsenal," *Jane's Intelligence Review* 5 (May 1993), 225-228.

⁶⁵ "Weapons of Mass Destruction (WMD): Hungnam," GlobalSecurity.org, <https://www.globalsecurity.org/wmd/world/dprk/hungnam.htm>.

⁶⁶ "OPCW Executive Council and Director-General Review Abandoned Chemical Weapons' Destruction Progress in China," OPCW News, 21 June 2017, <https://www.opcw.org/media-centre/news/2017/06/opcw-executive-council-and-director-general-review-abandoned-chemical>.

⁶⁷ Mike Brombach, "Abandoned Chemical Weapons in China: The Unresolved Japanese Legacy," Global Green USA, U.S. Affiliate of Green Cross International, Washington DC (May 2011), 4, <https://static1.squarespace.com/static/5548ed90e4b0b0a763d0e704/t/55548b35e4b031f59111a514/1431604021283/publication-183-1.pdf>.

declared and yet to be recovered at numerous other locations.⁶⁸

Moreover, the word on the ground from local officials in the northeast provinces is much less favorable. While it is understood that a façade of good relations must be maintained at the international level, many local representatives feel Beijing has not done enough to pressure the Japanese government to complete the remediation process. Administrators at the provincial and local levels express concerns that the remediation process is insufficiently proactive, that the work of environmental clean-up has taken too long, and that the Japanese only respond when threatened with new lawsuits from injured parties. Furthermore, they express exasperation that Beijing has done too little to support local efforts at environmental remediation. Local and provincial administrators must work through Beijing for redress, but the response has been frustratingly slow and disappointing. To this day, many known and suspected caches of ACW remain buried underground or are hidden in local rivers and lakes where they are left to decay, in essence, rendering them nothing less than environmental time-bombs waiting to burst with catastrophic consequences.⁶⁹

Perhaps one reason more has not been done to address the continuing problem of environmental remediation of abandoned chemical weapons and related production sites in East Asia is that the OPCW lacks the power of enforcement. According to the OPCW treaty, signatories (i.e. states-parties) are required to destroy 100 percent of ACW “under their jurisdiction or control” within ten years of entering into the agreement. Penalties for non-compliance include the OPCW recommending “collective punitive measures to other states-parties” and, in cases of “particular gravity,” it may “bring the issue before the UN Security Council and General Assembly.”⁷⁰ But this effectively leaves enforcement to third parties, or the UN, and renders the OPCW little more than an advisory body. In any case, Japan has long since failed to meet the original deadline of ten years. In May 2006, as the deadline approached for ACW remediation in China, Japan and China jointly applied for an extension, which the OPCW Executive Council granted with a new compliance date set for 29 April 2012. However, as that deadline approached, in February 2012, the Executive Council reconsidered the case and extended the deadline once more, this time, until the end of 2022. In the case of the ACW in China, the OPCW Executive Council determined that, legally, “there has arguably been no failure to comply” as remediation efforts are ongoing and a loophole in the CWC provisions allows for extensions if agreed

⁶⁸ *Ibid.*

⁶⁹ In one case, a local official reported that a large cache of ACW is thought to be buried in a river upstream from a densely populated city through which the river flows. The river serves as a local drinking water supply for the city, and locals commonly fish and engage in recreational activities there. But as late as 2019, Beijing had yet to begin the removal of this particular ACW cache. Information gathered from interviews with anonymous sources in Heilongjiang province, China. Names withheld by request.

⁷⁰ “The Chemical Weapons Convention at a Glance,” *Arms Control Today* 33:3 (April 2003), 45-46.

upon by the states-parties concerned.⁷¹ Thus, there appear to be no consequences for Japan in not meeting the deadlines, and none will likely be incurred so long as China continues to agree to extensions.

Currently, destruction of known and collected ACW continues in China, but at a frustrating pace. Legal representatives of Chinese victims have argued that the Japanese government has mostly left it to the Chinese themselves to discover unknown burial sites, and they have accused Japan of doing too little to initiate investigations of its own – another form of bureaucratic inertia – which the Japanese embassy in Beijing has vehemently denied.⁷² Cooperation between the two states-parties remains problematic. As Dominique Anelli, head of the OPCW's chemical demilitarization branch, stated at the 2014 London Chemical Weapons Demilitarization Conference, “as you can imagine, Japan want[s] to give as little as possible and China want[s] to get as much as possible.”⁷³ In short, the success of the OPCW depends largely upon the willingness of each states-party to comply voluntarily with the agreement. As yet, there have been no serious consequences dealt for the failure to comply for either party.

Arguably, the ACW issue has become yet another political football in the postwar geopolitics of East Asia. The subject remains an embarrassment for the government of Japan and a political “ace-in-the-hole” for Beijing to wield when it is politically expedient. Leadership at the national level of China may express satisfaction or dissatisfaction with the progress of environmental remediation as circumstances dictate. The concerns of local leaders in China are often not heard or addressed in the process, and the government of Japan has not yet been held fully accountable for compensating victims or for the complete remediation of all contaminated ACW sites. As well intentioned as the OPCW may be, and as successful as it has been elsewhere, to date,

⁷¹ Paragraph 18 of the Verification Annex, Part IV(B), stipulates: “States Parties may conclude between themselves agreements or arrangements concerning the destruction of abandoned chemical weapons. The Executive Council may, upon request of the Territorial State Party, individually or together with the Abandoning State Party, decide that selected provisions of such agreements or arrangements take precedence over provisions of this Section, if it determines that the agreement or arrangement ensures the destruction of the abandoned chemical weapons in accordance with paragraph 17.” According to legal scholar Asada Masahiko, “These provisions of paragraph 18 allow the *Executive Council* to decide that a bilateral destruction arrangement (China-Japan in this case) takes precedence over any provision of Part IV(B)(C) of the Verification Annex (the section on abandoned CWs)...” For a legal analysis of the case, see the source quoted here, Asada Masahiko, “The OPCW’S Arrangements for Missed Destruction Deadlines under the Chemical Weapons Convention: An Informal Compliance Procedure,” *The American Journal of International Law* 108:3 (July 2014), 448-474.

⁷² Dickie, “Legacy of Japan’s Chemical Warfare Still Alive.”

⁷³ As quoted in Nina Notman, “Explosive End for Japan’s Second World War Chemical Weapons,” *Chemistry World*, 9 June 2014, <https://www.chemistryworld.com/news/explosive-end-for-japans-second-world-war-chemical-weapons/7449.article>.

it has arguably failed to hold both parties accountable for the full and effective clean-up of the remaining ACW in China.

Moreover, the OPCW provisions do nothing to force the environmental remediation of ACWs in Japan, which is considered a separate issue for Japan to address. Literally tons of toxic chemicals lie in wait on nearly every shoreline; yet, until recently, the Japanese government has seemed content to leave them deeply buried, along with other evidence and memories of its wartime past. Ironically, Koizumi Chikahiko, the very person who was once so concerned with improving the health and safety of industrial workers in the munitions industry, once he became Minister of Health and Welfare and was finally in a position to implement policy to do so, failed to act. Whether this was due to bureaucratic inertia or an inability to influence military superiors is not entirely clear. But, in many ways, the postwar Japanese government's attitude toward the issue of abandoned chemical weapons, whether in China or Japan, has historically been no less insidious where Japan's poison gas legacy is concerned. The ACW sites in East Asia remain as yet one more disaster waiting to happen.

This essay has examined two significant aspects of the legacy of Japan's chemical weapons manufacture and deployment during World War II – the impact on industrial workers' health and the long-term environmental impact of abandoned chemical weapons in China and Japan. The essay argues that three primary factors explain why the Japanese and Chinese governments were slow to address these issues, namely, secrecy, bureaucratic inertia, and political constraints imposed by postwar agreements. The U.S. government's complicity in abetting the Japanese in covering up the activities of the nefarious Unit 731 led to potential charges of war crimes against the militarists responsible for conducting chemical warfare in China being dropped and the matter being buried in the immediate postwar era. It was not until the 1970s and 1980s when journalists and citizen activists began to expose the story of Unit 731 that Japan's wartime CW activities were also brought to the wider attention of the general public. Until then, no government had a particular interest in pursuing the matter further, resulting in a kind of "bureaucratic inertia" regarding the redress of victims and environmental remediation, an attitude that had its roots in the Japanese government's mindset towards workers during the war, and as perpetuated by the PRC government's position of "benevolent amnesia" toward wartime atrocities adopted in the postwar era to the 1980s. Political agreements between the PRC and Japan in the postwar period essentially indemnified Japan against being sued in an international court of law for reparations. As a result, these problems festered until the OPCW brought further pressure to bear in the 1990s, though the matter remains unresolved still in 2021. Whether the OPCW and the agreements of understanding signed between China and Japan can successfully resolve the issue of abandoned chemical weapons remains to be seen.

Abstract

This essay examines two aspects of the legacy of Japan's manufacture and deployment of chemical weapons (CW) in World War II: the medical issues that arose among workers in Japan's chemical industry related to weapons manufacturing and the long-term environmental impact of abandoned chemical weapons (ACW) remaining in China and Japan. The essay argues that these subjects have received inadequate attention due largely to three factors: the secrecy imposed upon the matter beginning in the immediate postwar period; the bureaucratic inertia that characterized the Japanese government's attitude toward industrial workers during and after the war as well Chinese victims who suffered injuries as a result of ACW in China; and political constraints imposed by postwar agreements. Consequently, the victims – both Chinese and Japanese – have not been adequately compensated by either government. Nor has this subject received much attention in Korea, another site of Japan's industrial manufacturing during the war, largely because the munitions plants in question were predominantly located in what is today North Korea. The issue of ACW related illnesses and deaths remains politically charged and controversial, despite efforts of the Organization for the Prohibition of Chemical Weapons (OPCW) and the Chemical Weapons Convention of 1997 to address it.

Keywords: Abandoned Chemical Weapons, Poison Gas, Environmental Remediation, Industrial Disease, OPCW, Chemical Weapons Convention