

Major Security Aspects of Destruction of Chemical Weapons in the World

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Abstract

The article focuses on the complex and long process of liquidating the world's chemical weapons stockpiles under the control and supervision of the Organization for the Prohibition of Chemical Weapons, headquartered in The Hague. The main possessors of chemical weapons from the end of World War II until their complete destruction were the United States of America and the Russian Federation (formerly the Soviet Union). The process of destroying chemical weapons by the main owners is described in detail. Surprisingly, the completion of the destruction of chemical weapons in the Russian Federation was announced already in 2017, while the United States of America announced the completion of the destruction of its chemical weapons only in mid-2023. A significant fact remains that in 2013, the Organization for the Prohibition of Chemical Weapons was highly honoured by receiving the Nobel Peace Prize. The last part contains official announcements about the end of destruction of chemical weapons in the world.

KEY WORDS: *chemical weapons, Convention on the Prohibition of Chemical Weapons and on their Destruction, national legislation, destruction of chemical weapons, toxic chemicals, precursors for the production of chemical weapons, Organization for the Prohibition of Chemical Weapons (OPCW), State Office for Nuclear Safety (SÚJB)*

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1. Introduction

The expert article is devoted to the destruction of chemical weapons in the world, which took place as a demanding and complex process for more than a quarter of a century. The modern chemical weapons during the First World War and subsequently the adoption of the so-called Geneva Protocol in 1925 are recalled. The expert article recalls the beginning of the massive use of chemical weapons during World War I (1915-1918). It also provides many statistical data on the use of chemical weapons and chemical warfare agents, previously called "poisonous substances".

In World War II, chemical weapons were not used on a mass scale on the European battlefield, only a few episodes are known. In contrast, Japan used both chemical weapons and bacteriological warfare in China from 1932 to 1945. Chemical weapons were also used extensively in the Vietnam War, after the US entered the conflict. In the 1980s, it was the Iran-Iran War, where chemical weapons were used unilaterally only by Iraq, despite being a signatory to the 1925 Geneva Protocol. The United States of America, together with the Russian Federation, have been the main and largest owners of chemical weapons in the world since the end of World War II. In the 1980s, bilateral negotiations on the destruction of chemical weapons were taking place between the USA and the former Soviet Union, and later the Russian Federation, even before 1990. Of professional interest is the fact that the main nerve agent in the US military arsenal was sarin, while in the former Soviet Union and later the Russian Federation it was surprisingly soman.

The preparation of the Chemical Weapons Convention itself required over two decades of sustained multilateral negotiation under United Nations auspices. Legal scholars, chemical security experts, disarmament diplomats, and national delegations worked tirelessly to build consensus around core principles: prohibition of

development and use, declaration of stockpiles and production facilities, destruction under international supervision, and a robust system for verification and compliance.

The universal and important International Convention on the Prohibition of Chemical Weapons was adopted in 1993 and entered into international force in April 1997, kicking off all the looming deadlines. It was both a declaration of ownership of chemical weapons stockpiles, but mainly it was deadlines for the destruction of chemical weapons. Furthermore, the complete destruction of chemical weapons in the world is described, focusing on the Russian Federation and the USA, as the largest owners of chemical weapons.

2025 marks 110 years since the first large-scale use of modern chemical weapons during World War I. Since their battlefield debut near Ypres, Belgium, on April 22, 1915, chemical weapons have claimed the lives of thousands and inflicted long-lasting health and environmental consequences. Chemical weapons are categorized as weapons of mass destruction (WMDs), alongside biological, radiological, and nuclear weapons. They are uniquely defined by their ability to kill or incapacitate through toxic chemical reactions, often without immediate physical destruction of infrastructure. [1]

It is interesting that the State Office for Nuclear Safety [2] has within its competence: the prohibition of chemical weapons, the prohibition of biological weapons, the non-proliferation of nuclear weapons in the conditions of the Czech Republic. The website then contains both international and national legislation, implementing regulations and a number of expert questions on individual areas in the mentioned security areas.

This professional paper briefly describes the emergence and beginning of the massive use of chemical weapons in battles on the battlefields, mainly during World War I. A brief mention is also made of the so-called Geneva Protocol of 1925 [3], which was created as a response to the massive use of chemical weapons in World War I. The international legal regulation from 1993 (i.e. almost 70 years after the Geneva Protocol) and its subsequent strict implementation into the legal system of the Czech Republic are presented in more detail. The main focus of the technical paper is on the complex and demanding safety-chemical process of destroying chemical weapons according to the international Chemical Weapons Convention [4], which was opened for signature on 13 January 1993 and entered into international force in April 1997.

The complete destruction of chemical weapons in the world is then described from a security-political perspective, including the announcement by the US President of the completion of the destruction of the United States' chemical weapons, the announcement and confirmation of this significant security fact by the international Organisation for the Prohibition of Chemical Weapons [5], and finally the announcement of the completion of the destruction of chemical weapons by the national State Office for Nuclear Safety in Prague.

2. A Brief Overview from the History

In recently published book *"Death in the Yellow Fog"* by Tomáš Dosoudil [6] presents a concise reflection that briefly explains the birth of modern chemical warfare as follows:

"There have been attempts to use chemical substances in warfare for a long time. But real chemical warfare was born only with the legendary chlorine attack carried out by the Germans during the First World War near the Belgian town of Ypres on April 22, 1915. Since then, the father of modern chemical warfare has been considered the German chemist of world importance, Nobel Prize winner in Chemistry Professor Fritz Haber (1868-1934). He was a university professor of democratic principles, a scientist, technician and manager, and at the same time a patriot, who did not hesitate to help his warring homeland with a controversial means of warfare."

A modern prominent domestic author, Professor Jiří Matoušek, one of the best experts in the Czech Republic, but also in the former Czechoslovakia, in his professional publications (e.g. [7]) also mentions as a modern emergence of chemical weapons the wave chlorine attack by Germany against the French on April 22, 1915, i.e. during World War I. At that time, German military units released about 180 tons of chlorine gas on French military positions. The consequences of the wave chlorine attack were devastating and catastrophic. Out of a total of about 15,000 French soldiers, about 5,000 soldiers died from chlorine poisoning within the first few days. This data can be found in many more recent domestic professional monographs and publications. [8-12]

Undoubtedly, interesting statistical data were provided in 1937 by the American Colonel Augustyn M. Prentiss, when he stated in his extensive book *"Chemicals in War"* [13] the total number of people affected by chemical weapons during the First World War (WWI): 1,296,853 soldiers affected, of whom 91,198 died. The aforementioned book *"Chemicals in War"* could easily be called the *"Chemical Bible of World War I"*. At the beginning of the book, three new ways of warfare during WWI are listed as follows:

"The three outstanding developments of the World War were the military airplanes, the combat tanks, and chemical warfare"

It is also interesting that about 80-85% of the fatalities were caused by the poisonous gas phosgene, which causes severe oedema (swelling) of the lungs with subsequent death. [13] The start of chemical weapons in modern history, therefore, on April 22, 1915, is a significant event in the history of mankind. The so-called *"trench warfare"* during the First World War was essentially very static and new effective methods of warfare were sought during this period. Therefore, chemical weapons were used en masse by Germany as a new weapon, but gradually all the warring parties in the war conflict joined them, tanks were also used as a new weapon (the British were the first to come up with this) and last but not least, the newly emerging air force began to be used for war purposes.

The American author A. M. Prentiss is undoubtedly the most quoted regarding the use of chemical weapons during the World War I (WWI). What data does he provide in his book on the use of chemical weapons? He writes, for example, overview of the use of chemical warfare agents during WWI.

The overview data in the tables are given both in the original work of A.M. Prentiss [13], and also in the recently published monograph in the Republic of San Marino (November 2025). [1]

The following overviews are given here:

- *Overview of the use of chemical warfare agents during WWI (in tons) for individual warring parties,*
- *Partial affected soldier losses after the use of chemical weapons during WWI.*
- *Total numbers of fatal losses after the use of chemical weapons during WWI.*

Although the tactical advantages of chemical weapons diminished with the advent of gas masks and improved defences, their symbolic and humanitarian impact permanently altered the laws of war. The horror of chemical warfare in World War I led to a global outcry and set the stage for international legal efforts to restrict or ban these weapons—efforts that culminated in the 1925 Geneva Protocol, and later, the 1993 Chemical Weapons Convention.

The Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare was signed in Geneva on 17 June 1925 and entered into force on 8 February 1928 [3]. It prohibited the use of “chemical weapons and bacteriological methods of warfare” in international armed conflict. However, the Protocol did not address the development, production, transfer, or stockpiling of chemical weapons. Moreover, it lacked enforcement and verification mechanisms. While politically significant, the agreement was limited in legal scope and left numerous loopholes that would later be exploited. The fundamental impetus for accelerating the issue of chemical weapons destruction in the 1980s is attributed to French President Francois Mitterrand, who in 1987 proposed the organization of an international security conference before the UN General Assembly. This initiative was a response to the then massive use of chemical weapons in the Iraq-Iran war (1980-1988, sarin, tabun, mustard gas, etc.). The French president organized a major international security conference in Paris, which took place from 7 to 11 January 1989 with the participation of 149 UN states. Here, the French president pledged that France would renounce chemical weapons, commit to their destruction and non-use. The aim of the 1989 conference in Paris was to restore the authority of the Geneva Protocol of 1925, which prohibits the use of poison gases in war and also bacteriological methods of warfare, but unfortunately does not prohibit the production, storage and transfer of chemical weapons. The resulting Paris Declaration of 1989 clearly confirmed the determination of the international community to reach a new international agreement. It was to include a complete ban on the use of chemical weapons and chemical warfare agents, but also a ban on the production, storage, and transfer of chemical weapons, and was to address the complete destruction of all military chemical arsenals.

In modern international law, the Geneva Protocol has since been supplemented, and to a large extent surpassed, by the Chemical Weapons Convention of 1993 [4]. The CWC, which was negotiated within the framework of the United Nations over more than two decades and advanced under the leadership of diplomats such as Germany’s Ambassador Hermann von Wagner, offers a much more comprehensive structure. It prohibits not only the use, but also the development, production, and possession of chemical weapons, and requires the verified destruction of stockpiles and production facilities. In retrospect, the Geneva Protocol 1925 represents a foundational but incomplete chapter in the history of chemical disarmament. While it laid the moral and legal groundwork for later treaties and helped to codify the idea that chemical weapons are illegitimate tools of warfare, it lacked the necessary provisions to ensure effective compliance. Its legacy, however, remains vital—as a symbol of post-WWI humanitarian resolve and as a precursor to the far more robust regime established by the Chemical Weapons Convention [4].

A landmark in the history of arms control, the Chemical Weapons Convention represents the most technically detailed and universally endorsed disarmament treaty ever adopted in the field of chemical warfare. Unlike earlier instruments such as the Geneva Protocol of 1925 [3], which banned use but permitted development and stockpiling, the 1993 Convention addresses the entire life cycle of chemical weapons, from research and development through production, transfer, storage, and destruction, placing all activities under binding international regulation. It contains robust verification mechanisms, structured security procedures, and strict timelines for compliance. Its implementation has been continuously supervised since 1997 by the Organisation for the Prohibition of Chemical Weapons (OPCW), headquartered in The Hague, a specialized independent institution recognized as a related entity within the United Nations system [5].

The Convention required all States Parties to destroy their declared chemical weapons stockpiles and production capacities within ten years of its entry into force within their national legal frameworks. While this timeline had to be extended in the case of certain states facing logistical and environmental challenges, the Convention's goals have now largely been fulfilled. States Parties declared a total of 8,680,079 munitions and containers filled with toxic chemicals, amounting to 71,195 metric tons at the time of original declaration. This figure was later revised to 72,304 metric tons as newly acceding states submitted additional declarations [4]. The destruction of these materials has been carried out under close OPCW supervision, verified through on-site inspections and a standardized reporting regime.

The Chemical Weapons Convention is both technically rigorous and politically inclusive. As of today, it has been signed and ratified by 193 states, representing near-universal adherence. A small number of states remain outside the treaty framework. Israel has signed the Convention but not ratified it. Three countries, Egypt, North Korea, and South Sudan, have neither signed nor acceded to it. [5] These outliers continue to pose challenges to the goal of a world completely free of chemical weapons and are the subject of sustained international diplomatic efforts.

The Czech Republic signed the Convention on 14 January 1993 and ratified it on 6 March 1996. The Czech Republic fully ensures its obligations arising from the Convention. The implementation of the Convention is consistently implemented on the basis of the legal and institutional framework. The national authority and manager for the implementation of the Convention in the Czech Republic is the State Office for Nuclear Safety. [2] Since its entry into force on 29 April 1997, the Chemical Weapons Convention has served not only as a disarmament mechanism but also as a model of verification and transparency. Its success is widely recognized as a benchmark for arms control agreements and a major achievement of multilateral diplomacy. The Convention's impact has been reinforced by the effective functioning of the OPCW, which received the Nobel Peace Prize in 2013 for its work to eliminate chemical weapons and promote the peaceful uses of chemistry, see expression: *"for its outstanding efforts to eliminate chemical weapons in the world"* [5].

3. Final Destruction of Chemical Weapons & Chemical Warfare Agents

The destruction of chemical weapons constituted one of the most complex and high-risk undertakings in modern disarmament history. These weapons, often referred to as "super-poisons" or "super-toxic substances," are not only lethal in minute quantities but also pose significant dangers during handling, storage, transportation, and disposal. Their elimination demanded the highest levels of technical expertise, environmental safeguards, and occupational safety protocols. The process was conducted under the framework of the Chemical Weapons Convention (CWC) [4], with oversight and verification provided by the Organisation for the Prohibition of Chemical Weapons (OPCW). [5]

The destruction process itself was extraordinarily demanding. Each country selected its own destruction technologies based on its national circumstances, chemical agents, and environmental regulations. Common methods included incineration, chemical neutralization, and hydrolysis, often followed by secondary treatment of reaction by-products. The Convention also required the destruction or irreversible conversion of all chemical weapons production facilities (CWPFs) to ensure they could never again be used for prohibited activities [4]. Verification of destruction was conducted through regular inspections, real-time monitoring, and detailed reporting, coordinated by the OPCW Technical Secretariat. Although the CWC originally stipulated a 10-year deadline for complete destruction, neither the United States nor the Russian Federation was able to meet this requirement due to the sheer size and complexity of their arsenals. These countries requested and received extensions, which were granted under the Convention's provisions and subject to strict conditions and transparency.

The process of chemical weapons destruction:

United States: The United States began construction of its first prototype incinerator at Johnston Atoll in the 1980s. In 1990, it began destroying 1,842 tons of chemical weapons that had been secretly shipped from forward deployments in Germany and Okinawa many years earlier. When the Chemical Weapons Convention entered into force in 1997, the United States was already operating its first two incinerators, at Johnston Atoll and at Tooele, Utah, the largest U.S. stockpile of chemical weapons at 12,353 tons. Before entry into force in April 1997, the U.S. military had destroyed 1,436 tons, about 5% of the total chemical weapons stockpile, at these two sites.

The U.S. Congress banned the transport of chemical munitions for security reasons, which prompted a plan to build a chemical weapons destruction facility at each of the nine U.S. sites where chemical weapons were stored.

When the U.S. Senate finally approved the Chemical Weapons Convention on April 25, 1997, after a long and contentious debate, the ratification articles stipulated, among other conditions, that the U.S. President give the highest priority to protecting public health and the environment and that the military develop non-combustion technologies for the destruction of chemical weapons. The United States has thus progressively built and operated five large incinerators: at Johnston Atoll and Tooele, Utah, as previously noted; at Umatilla, Oregon; at Anniston, Alabama; and at Pine Bluff, Arkansas. The Johnston Atoll incinerator ceased operations in 2000; four other operations were completed in 2012. In addition, neutralization facilities were built in Newport, Indiana, and Edgewood, Maryland. The remaining two chemical weapons stockpiles at Pueblo, Colorado, and Blue Grass, Kentucky, were destroyed by chemical neutralization, followed by a second stage of biodegradation and supercritical water oxidation. The Pueblo facility began operations in 2016, and Blue Grass began shortly after, in June 2019.

Russian Federation: When Russian officials ratified the Chemical Weapons Convention in 1997, they made it clear that they would need technical and financial support from other members of the Convention to meet their treaty deadlines for the complete and environmentally sound destruction of their chemical weapons. During a 1994 visit to the United States, Russian military officials and the chairman of the Duma Defence Committee rejected a U.S. offer by the Assistant Secretary of Defence for Nuclear, Chemical, and Biological Defence Programmes to build an incinerator at Shchuchye. Russian officials wanted to use their own technology for demilitarization.

The first Russian chemical weapons demilitarization facility, built and financed as a prototype by Germany for the neutralization of Lewisite (the only stockpile in the Russian Federation), is located at Kambarka, Udmurt Republic in the Russian Federation. For older arsenic-based chemicals, a destruction facility was opened in 2002 at Gorny, Saratov Oblast. Since then, Russia has been able to open five more destruction facilities, the most recent at Kizner in the Udmurt Republic.

Most of these facilities have been financially supported by the Global Partnership against the Proliferation of Weapons and Materials of Mass Destruction, established by the Group of Eight at their summit in Kananaskis, Canada

in 2002. As of 2010, the United States, through the "Cooperative Threat Reduction Program", has allocated more than \$1 billion since the mid-1990s for the planning and construction of the neutralization facility at Shchuchye, while Germany has allocated \$475 million (€340 million) for construction at Gorny, Kambarka and Pochep. Canada and the United Kingdom have contributed \$82 million and \$39 million, respectively, while at least 10 other countries have contributed \$25 million.

On 27 September 2017, the Organization for the Prohibition of Chemical Weapons officially announced that the Russian Federation had completed the destruction of its chemical weapons arsenal.

Libya declared its chemical weapons stockpiles and completed the destruction of its Category 1 chemical weapons in January 2014. With the assistance of the Organization for the Prohibition of Chemical Weapons and other member states including Canada and Denmark, Libya removed all remaining chemical precursors from its territory and subsequently destroyed them in 2016.

The Syrian case, which set a precedent for the destruction of chemical weapons outside the country of origin, opened the way for the transport of remaining chemicals from Libya for destruction in Germany. Libya completed the destruction of all its chemical weapons in January 2018.

Iraq joined the Chemical Weapons Convention in early 2009 and declared two large sealed "Al Muthana" bunkers in the Fallujah area containing chemical weapons and related equipment and debris from the 1991 Gulf War. Because at least one of these bunkers was hit by aerial bombs during the war, there is no definitive inventory of the weapons, substances and materials, nor a thorough assessment of the potential risks of chemical weapons or unexploded ordnance in the bunkers. The bunkers contained toxic substances and precursors for the production of chemical weapons, as well as possible damaged chemical munitions and remnants of the UN Chemical Weapons Destruction Program. The bunkers had concreted entrances and there was no record of what was inside. The Organization for the Prohibition of Chemical Weapons has approved pouring the bunkers' interior as a possible method of destroying chemical weapons. The Organization for the Prohibition of Chemical Weapons declared the destruction of Iraq's chemical weapons complete in March 2018.

Albania was the first possessor state to destroy its stockpiles. It did not acknowledge its possession of 16 tons of mustard gas (as well as small quantities of lewisite and other chemicals) until 2003. The Organization for the Prohibition of Chemical Weapons declared the destruction of Albania's chemical weapons complete in July 2007.

The Republic of Korea has refused to acknowledge its stockpiles in any public presentations, including annual speeches by its ambassador to the OPCW, and has requested full confidentiality ("top secret") under the Chemical Weapons Convention's Confidentiality Annex; South Korea completed the destruction of its chemical weapons in 2008.

India declared a stockpile of 1,044 tons of sulphur mustard in 1997 after ratifying the Chemical Weapons Convention in 1996. India completed the destruction of all its chemical weapons stockpiles in 2009.

The author team of the expert article created and subsequently used literature searches on the issue of chemical weapons destruction, focusing on technological procedures, the international legal framework, and the historical context of the chemical disarmament process.

Common destruction technologies include:

Incineration: This method uses extremely high temperatures (over 1,000°C) in controlled furnaces to decompose toxic chemicals into harmless or controllable end products such as ash, water vapor, and carbon dioxide. Prior to incineration, weapons are robotically disassembled, the agent is drained and burned, while the metal parts are melted.

Chemical Neutralization (Hydrolysis): The toxic agent is mixed with hot water and/or other neutralizing agents such as sodium hydroxide to destroy it or convert it into less toxic by-products. The resulting mass is then subjected to secondary processing, such as biological degradation, or disposed of in hazardous waste disposal facilities.

Explosive Destruction Systems (EDS): These mobile units are used to destroy smaller quantities of weapons or ammunition that are dangerous to transport. The weapons are placed in an armoured chamber where a controlled explosion destroys them and often incinerates the chemical agent.

Other advanced methods: Other technologies include plasma pyrolysis, supercritical water oxidation, electrochemical oxidation, or biodegradation (microbial decomposition).

Importantly, under the Chemical Weapons Convention, methods such as ocean dumping, land burial, and open burning are prohibited. All permitted methods must prioritize the protection of public health, the environment, and workers.

Despite these delays, the destruction mission ultimately succeeded. On 27 September 2017, the OPCW formally announced that the Russian Federation had completed the verified destruction of its entire declared chemical weapons stockpile [5]. This marked a historic milestone for the Convention and for global disarmament more broadly.

The final and most symbolic milestone occurred on 7 July 2023, when the last declared U.S. chemical weapon, a munition stored at the Blue Grass Chemical Agent-Destruction Pilot Plant in Kentucky, was permanently destroyed. With this final act, the OPCW confirmed that all chemical weapons declared by States Parties under the CWC had been destroyed, fulfilling one of the Convention's most ambitious and consequential goals after 26 years of implementation [5]. Despite the destruction of declared stocks, there are concerns about the re-emergence of chemical weapons (the risk of use by terrorists or in conflicts). The OPCW continues to carry out inspections and monitoring situation at the area of chemical weapons.

Old and abandoned weapons in foreign territory: There are still old chemical weapons (e. g. from World Wars I and II) or chemical weapons abandoned by other countries (e. g. Japanese chemical weapons in China) that are still being destroyed.

4. Announcements on the Elimination of the World's Chemical Weapons Stockpiles

Only three official statements are listed here: the US President's, followed by a statement from the Organization for the Prohibition of Chemical Weapons, and the final third statement is the announcement by the State Office for Nuclear Safety in Prague on the destruction of chemical weapons in the world. Although the first two statements are originally in English, an unofficial translation of the entire statements is provided here to maintain the authenticity of these important messages.

Statement by President Joe R. Biden on the Completion of the Destruction of the United States' Chemical Weapons Stockpile:

For more than 30 years, the United States has worked tirelessly to eliminate our chemical weapons stockpile. Today, I am proud to announce that the United States has safely destroyed the last munitions from that stockpile—bringing us one step closer to a world free of the horrors of chemical weapons. Successive governments have determined that these weapons should never again be developed or deployed, and this achievement not only fulfills our long-standing commitment under the Chemical Weapons Convention, but marks the first time that an international body has verified the destruction of an entire category of weapons. I am grateful to the thousands of Americans who have dedicated their time and talents to this noble and challenging mission over more than three decades. Today—as we announce this significant milestone—we must also renew our commitment to creating a future free of chemical weapons. I continue to encourage the remaining nations to join the Chemical Weapons Convention so that the global ban on chemical weapons can reach its full potential. Russia and Syria should return to compliance with the Chemical Weapons Convention and acknowledge their undeclared programs that have been used to commit blatant atrocities and attacks. We will continue to stand with the Organization for the Prohibition of Chemical Weapons to prevent the stockpiling, production, and use of chemical weapons around the world. And together with our partners, we will not stop until we can finally and forever rid the world of this scourge.

Organization for the Prohibition of Chemical Weapons [5]

The Netherlands – 7 July 2023 – The Organisation for the Prohibition of Chemical Weapons confirms that the last chemical weapon from the declared stockpiles of all States Parties to the Chemical Weapons Convention (CWC) has been verified as destroyed. The last chemical munition from the declared chemical weapons stockpiles of the United States of America was irreversibly destroyed in accordance with the CWC on Friday, 7 July 2023, at the Blue Grass Chemical Agent-Destruction Pilot Plant in Kentucky.

“I congratulate all States Parties, and in this case the United States of America, on this significant achievement by the international community. The completion of the destruction of all declared chemical weapons stockpiles is an important milestone for the Organisation. It is a crucial step towards achieving its mission to permanently eliminate all chemical weapons,” said OPCW Director-General, Ambassador Fernando Arias.

“This represents a historic achievement for multilateralism in the field of disarmament and the work of a generation of diplomats and experts over the past 26 years. However, further challenges lie ahead, requiring the continued attention of the international community. Four countries have yet to accede to the Convention. Abandoned and obsolete chemical weapons still need to be recovered and destroyed,” the Director-General stressed. *“Recent uses and threats of use of toxic chemicals as weapons demonstrate that preventing their re-emergence will remain a priority for the Organization. Rapid developments in science and technology, new dangerous toxic chemicals, more sophisticated equipment and production methods, improved delivery methods, and the interaction between chemistry, biology and artificial intelligence are other factors that will increase the relevance of the Chemical Weapons Convention. These provide the Organization with new and challenging tasks and an agenda for our joint work that will remain open.”*

“The OPCW Centre for Chemistry and Technology, which became operational in May 2023, is an essential tool for strengthening the Organization’s capabilities to confront these threats. The international community can count on the Secretariat’s independence, expertise and readiness to play its role,” concluded the Director-General.

Since the CWC entered into force in 1997, the OPCW has verified the destruction of 72,304 metric tons of chemical weapons stockpiles declared by countries around the world. The OPCW will continue to monitor the closure of the last two destruction facilities in Pueblo and Blue Grass, USA, including the disposal of the waste generated during the destruction process.

As the implementing body of the Chemical Weapons Convention, the OPCW, with its 193 Member States, oversees global efforts to permanently eliminate chemical weapons. Since the Convention entered into force in 1997, it is the most successful disarmament treaty, eliminating an entire class of weapons of mass destruction.

For its extensive efforts to destroy chemical weapons, the OPCW was awarded the Nobel Peace Prize in 2013.

State Office for Nuclear Safety (Czech Republic-National Authority)

Last chemical weapon destroyed (July 18, 2023)

On 7 July 2023, the last chemical weapon declared under the Chemical Weapons Convention was destroyed at a dedicated chemical destruction facility in Blue Grass, Kentucky, USA.

The destruction of the last chemical weapons from ammunition stockpiles is considered a significant step towards their complete elimination. This has achieved one of the objectives of the Chemical Weapons Convention, after

26 years of its validity. However, it remains necessary to ensure that chemical weapons are not re-produced and that chemicals are used only for purposes not prohibited by the Convention.

The destruction was confirmed by an inspection team from the Organization for the Prohibition of Chemical Weapons (OPCW), which will continue to monitor the closure of the last chemical destruction facilities in the USA.

The Chemical Weapons Convention entered into force in 1997 and was signed by 193 states, including the Czech Republic. Thanks to the Convention, over 72,000 metric tons of chemical weapons have been destroyed from stockpiles declared by Member States.

The website of the Organization for the Prohibition of Chemical Weapons provides this interesting and important summary: [5]

- *Entry into force of the Convention: 29 April 1997*
- *Number of States Parties to the Convention: 193*
- *Israel has signed (signatory state), but has not ratified it, so is not a State Party to the Convention*
- *Non-signatory states: 3*
- *World declared chemical weapons stockpiles destroyed: 100%*
- *Total declared chemical stockpiles: 72,304 metric tons*
- *Total destroyed chemical stockpiles: 72,304 metric tons*
- *Chemical weapons production facilities declared: 97*
- *Chemical weapons production facilities destroyed: 74*
- *Chemical weapons production facilities converted for peaceful purposes: 23*

5. Conclusions

The announcement by U.S. President Joseph R. Biden in July 2023 regarding the final destruction of the last declared chemical weapon in the United States marked the culmination of one of the most significant achievements in modern disarmament history. This declaration was swiftly followed by formal confirmation from the Organisation for the Prohibition of Chemical Weapons, which verified that all declared chemical weapons stockpiles by States Parties to the Chemical Weapons Convention had been irreversibly destroyed. With this milestone, the international community successfully completed the elimination of an entire category of weapons of mass destruction, a goal first envisioned when negotiations on the Convention began in the 1970s.

The journey to this point was long and fraught with technical, legal, political, and logistical challenges. The preparation of the Chemical Weapons Convention itself required over two decades of sustained multilateral negotiation under United Nations auspices. Legal scholars, chemical security experts, disarmament diplomats, and national delegations worked tirelessly to build consensus around core principles: prohibition of development and use, declaration of stockpiles and production facilities, destruction under international supervision, and a robust system for verification and compliance.

Among the most feared chemical agents are nerve agents such as sarin, soman, tabun, cyclo-sarin, and VX, which are especially insidious because of their invisible, odourless, and highly lethal properties. These substances, typically stored as colourless liquids, can be dispersed through vapour or aerosols, modes of delivery that enable mass exposure with devastating efficiency. Even small-scale attacks using these agents can cause hundreds or thousands of casualties and provoke panic far beyond the immediate impact zone. Fortunately, the occurrence of such events remains rare, and international counter-terrorism efforts continue to focus on monitoring precursors, protecting chemical facilities, and strengthening detection and response systems. [1]

Despite these challenges, the verified destruction of declared chemical weapons worldwide remains an extraordinary success in the history of diplomacy and international law. It reflects the triumph of cooperation, science, and reason over militarism and fear. It is also a testament to the vision and persistence of generations of experts and negotiators who refused to accept the normalization of weapons capable of causing indiscriminate suffering.

Unfortunately, the issue of chemical weapons is not completely closed. This is due to the fact that the misuse of chemical weapons and chemical warfare agents for chemical terrorism and hostile use is possible and real. A detailed history of the use of chemical weapons during World War I was published in Czech as early as 1993 in a special army historical journal called *History and Military Affairs* (in Czech: *Historie a vojenství*). [14]

Chemical terrorism represents a serious security threat in the Czech Republic in the present, near and distant future. Its relevance and danger result from many facts that are detailed in the habilitation work. [15] These are many industrial chemical toxic substances, which are relatively easy to misuse for chemical terrorism; selected substances are modelled from the perspective of accident consequences for easier comparison of their destructive toxic effectiveness.

When it comes to victims of terrorist attacks, they are not only direct human victims (killed and poisoned people), but also indirect victims (survivors, friends, acquaintances, but also the informed public). Above all, contemporary terrorists rely on an informed public and prepare their actions as cruel, brutal and very violent in order to shock and stress the peaceful public. The probability of an adverse chemical event or incident or even a chemical terrorist attack is relatively low, despite the turbulent international events of the present time. Unfortunately, *the consequences in the form of killing people, serious damage to their health and other consequences, such as contamination of the infrastructure of society, or contamination and damage to the environment, can have very serious and even catastrophic impacts on the society of each state.* The human victims themselves would then not be counted in tens or hundreds, but sometimes in thousands or more. Therefore, it is necessary to prepare thoroughly for these very serious emergencies.

The necessity of the present time is the need for intensive involvement of state intelligence and secret services, which must permanently deal with the detection of preparations for terrorist attacks in order to prevent the implementation of such violence or extortion in cooperation with the police and other state administration bodies. The basic question arises as to what all is required for thorough preparedness for possible possibilities of chemical terrorism, or for threats of chemical terrorism. It is necessary to emphasize that a full answer to this question can only be provided by a well-founded scientific and research security study by a team of civilian and military experts who are very familiar with the physical, chemical and toxicological properties of hazardous toxic chemical substances, the possibility of their misuse against the civilian population, the principles of chemical detection, identification and monitoring and chemical reconnaissance, individual and collective protection of persons, decontamination of chemical contamination, diagnostics of chemical exposure and treatment of affected and disabled persons. The completion of the destruction of chemical weapons on a global scale must be considered a great success for the United Nations, the peace movement, and the vast number of people who participated in the entire process. From the initial diplomatic negotiations at the highest level, to the professional personnel of the participating countries who participated in the destruction of chemical weapons. [16]

However, the entire security area is more complicated. This is unfortunately due to the current possibilities of chemical terrorism. Not only toxic “military” chemicals can be misused for chemical terrorism, but also, and much more easily, toxic “industrial” chemicals. [8,14]

In conclusion, we can only wish that humanity is never again exposed to the enormous destructive power of chemical weapons and chemical warfare agents, that such use will forever remain history.

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