



Verification Diplomacy and the Chemical Weapons Convention in the Hybrid Warfare Era

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ABSTRACT

The Chemical Weapons Convention (CWC) has been described as the "gold standard" of multilateral disarmament because of its success in ensuring destruction of 99% of the world's declared stockpiles and for its verification regime, which is non-discriminatory. The modern advent of hybrid war (deniable military intervention by means of proxy operations, targeted covert poisonings and the strategic weaponization of disinformation) has brought the Convention to an unprecedented test of its architectural presumptions of the 20th century. This paper examines the development of the notion of "Verification Diplomacy" and the pivotal juncture at which forensic science and high-stakes geopolitical negotiations intersect. Through the lens of 'weaponization of sovereignty', 'procedural lawfare' and 'attribution authority gap' revealed in the conflict in Syria and the employment of fourth-generation nerve agents, this study uncovers a conflictual tension between the cooperative nature of the CWC's history and the adversarial character of the current 'gray zone' conflicts. In order to help sustain the chemical weapons taboo, the Organisation for the Prohibition of Chemical Weapons (OPCW) needs to shift from being a reactive monitoring organization to a proactive forensic investigator, the research said. The paper concludes that the survival of the CWC relies on a thorough structural change that would focus on forensic purity instead of political convenience, and ensure the treaty is a binding international rule in a more polarized world and a more technologically asymmetric international order.



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Introduction

The Chemical Weapons Convention (CWC), which came into force in Geneva in 1997 after over decades-long negotiations, is a unique and unprecedented success in international law.

The CWC is, essentially, a disarmament treaty that prohibits the development, production, stockpiling, transfer and use of chemical weapons, that were first used in the horrific gas attacks of World War I and used widely in the Iran-Iraq War of the 1980s (Price, 1997). Drafting the treaty was a complex process facing extreme suspicion during Cold War and led to a treaty that had the goal of removing an entire class of weapons from the global arsenal for good. CWC is strictly non-discriminatory where equality of the approach is significant because the world's most powerful military powers are held to the same standards as the world's smallest developing ones (Martin, 2015). It bans an entire class of weapons of mass destruction (WMD) for all signatories, irrespective of their military or economic capability, and imposes the same obligations on everyone.

The norms were institutionalised by the Organisation for the Prohibition of Chemical Weapons (OPCW) in The Hague, Netherlands. In 2013, the organization was awarded the Nobel Peace Prize, marking its immense achievements in the area of verified destruction of more than 99% of the world's declared chemical stockpiles (CWCC, 2025). In July 2023, the OPCW confirmed the verified and irreversible destruction of all declared chemical weapons stockpiles—totalling 72,304 metric tonnes of chemical agents across all 193 States Parties since 1997—making the CWC the first multilateral disarmament treaty to effectively eliminate an entire class of weapons of mass destruction (CWCC, 2025). This milestone shifted the OPCW's focus from stockpile elimination to preventing re-emergence and addressing use in active conflict zones. The unprecedented technical rigour and transparency are the foundation of this 'gold standard' of disarmament (Walker, 2024). The verification regime was to be intrusive and proactive. Under the CWC, states gave up a considerable amount of their traditional Westphalian sovereignty (Zanders, 2003). They allowed international inspectors to be given the right to access sensitive military and industrial facilities to ensure adherence, an access that has never been previously allowed in international relations. The "anywhere, anytime" approach was a very effective confidence building mechanism, that moved from a "trust but verify" to a "permanent, technical transparency" framework (Thakur & Haru, 2006). This transparency was not limited to military depots, but extended to the chemical industry, where a network of control was established that brought private business and international security concerns together.

Hybrid Warfare Challenge

The security landscape in the 21st century has changed dramatically and now favours strategic competitions in the area sandwiched between normal state practices and full-scale war know as "gray zone" operations (Hoffman, 2007). The distinction between war and peace became blur in this period, with the new paradigm being a range of conflict in which military force is used to attain strategic ends without setting off conventional military action. The advent of hybrid warfare has made the CWC's "technical-first" approach more difficult. It has added a strategic dimension that intentionally combines the use of conventional forces with unconventional ones, such as cyber warfare, economic pressures, and manufactured social disruption (Hoffman, 2007). This has turned the threat from using the battlefield to targeted and deniable attacks within the due process of international institutions.

These mixed jurisdictions are designed in such a way as to introduce a level of "plausible deniability" between state and non-state actors. Aggressors often rely on proxy forces, from local militias to private military contractors, to carry out chemical attacks and shift the legal and political responsibility for the effects of a chemical attack to the proxy (Wither, 2020). The theatre of operations has ceased to be a well-defined line of contact and now includes civil infrastructure, digital networks, etc. This decentralization is not very conducive to traditional stockpile auditing. The employment of industrial chemicals, such as chlorine, in

urban environments in conflict areas is to be seen as information warfare and not as an attempt to achieve a military victory (Coleman, 2005). More recently, allegations of Russian forces deploying chloropicrin and other toxic chemicals across the frontline in Ukraine since 2022 have introduced a new dimension to hybrid chemical warfare, where state military forces employ riot-control agents and incapacitating chemicals in conventional combat settings under the cover of plausible deniability (Govt of UK, 2026). These attacks tend to be relatively small scale and yet very effective, intended to create fear or to convey a message of the powerlessness of international law. The aim of hybrid actors is to overwhelm the international community with conflicting claims about the same chemical event, forcing an international investigation into a state of perpetual "alternative facts" (Schemeil, 2013).

Defining Verification Diplomacy

The term "Verification Diplomacy" is used to describe the specific and intense diplomatic process needed to maintain, negotiate, and implement the technical aspects of an arms control regime (Walker, 2024). It's the art of keeping a working investigative process going in a very polarized political climate. It works as a bridge between the lab coat-clad world of the chemist and the suit-and-tie world of the diplomat. Technical data is not treated in isolation in this framework, but rather must be interpreted in the context of the process of negotiations and its timing, that will also soon be translated into policy. Interpretation, timing, and change of technical data into policy are subject to complex international negotiations (Kruttsch, Myjer, & Trapp, 2014). Verification diplomacy helps to maintain the integrity of the OPCW's technical work even when consequences are massive, like the triggering of sanctions or even military interventions, as is the case with the OPCW's findings regarding Syria.

Verification diplomacy has become more defensive and reactive in the era of hybrid warfare. It's not simply a matter of arranging routine inspections anymore, it's a matter of operating in a "post-truth" world where scientific truths are considered partisan policy decisions and not empirical truths (Warf, 2023). The OPCW has been stepping up pressure on its technical staff over its efforts to attribute attacks to the perpetrators, and is now on the path to more such moves. The states that want to stop being held accountable now are conducting sophisticated reputational warfare that succeeds in undermining the verification regime from within (Cull, 2023). This includes well-planned campaigns against the samples' chain of custody, attacks on the reputations of individual inspectors and a fierce and drawn-out battle over the procedural aspects of the CWC to delay investigations. In this situation, verification diplomacy is a perpetual effort to avoid the polarizing nature of the international order today from eating away the substance of the treaty's technical aspects.

The Chemical Weapons Convention and Verification Architecture

Core Principles

The CWC's working success is dependent on four interconnected components: 1) Destruction, 2) Non-proliferation, 3) Assistance and Protection, and 4) International Cooperation. The ***Destruction*** pillar is the foundation of the historical treaty that requires the complete, permanent, verifiable and irreversible destruction of all chemical weapon stockpiles monitored continuously (Article V: Chemical Weapons Production Facilities). The process entails highly specialised facilities that are known as "incineration" or "chemical hydrolysis" plants. All of these are engineered to destroy scheduled chemicals of CWC (Schedule 1, 2 and 3) and ensure they can never be used again in any military campaigns (OPCW, 1993). The ***Non-proliferation*** pillar focuses on the problem of dual-use and tracks the life cycle of industrial chemicals with legitimate commercial applications (e.g. in the

production of fertilizers, plastics, pharmaceuticals), making sure they are not used for weapons (Article VI – Activities Not Prohibited under this Convention). This entails a delicate balancing act between safeguarding legitimate commercial secrets, yet being transparent enough to identify illegitimate diversions.

The two other pillars offer the essential “carrots” which complement the “stick” of verification, and make the Convention a mutually beneficial instrument for all State Parties. The *Assistance and Protection* pillar serves as a collective security pledge, committing the international community so they act under international law to deliver rapid emergency medical assistance, decontamination analytical equipment for complete analysis of used schedule chemicals and technical expertise to any State Party being attacked or even threatened with chemical weapons (Article X – Assistance and Protection against Chemical Weapons). It is not just a moral obligation, it is an operational responsibility, a need to maintain a Voluntary fund and to coordinate the activities of specialist response teams that can work in contaminated environments. At the same time, pillar of *International Cooperation* helps to ensure that scientific knowledge, equipment and chemicals are shared in a legitimate manner for peaceful purposes (Article XI – Economic and Technological Development). This pillar encourages economic and technological progress, especially in under developed states, to support the chemical-industrial development, and provides safety and regulatory certainty for this development in the international arena (Cvetković, Renner, & Jakovljević, 2024). Cooperation is reflected in capacity building workshops and laboratory twinning that are raising global forensic standards. These four pillars form an all-encompassing, self-reinforcing system that encourages compliance because of the tangible security benefits and developmental advantages it provides, yet has an unyielding minimum level of behavioural demands.

The OPCW Verification Toolbox

The verification regime is structured into a number of different mechanisms, some of which increase in stringency in accordance with the degree of suspicion or type of facility. The system is structured around transparency levels, with the routine audits providing the foundation of institutional trust, and more in-depth and time-sensitive instruments available to address those situations where the “taboo” on chemical use is directly contested (Zanders, 2003). This is an intensity of scaling that will assure that resources are used efficiently and there is a credible threat of high stakes review for potential defectors.

- **Routine Inspections:** This includes scheduled and regular inspections of military storage facilities and industrial chemical plants. They are, in essence, confidence-building inspections to confirm declarations made by the state with reality (OPCW, 1993). The aim is to ensure that “Schedule 1” chemicals (those that have only limited or no civilian uses) are properly controlled, and that “Schedule 2” and “3” chemicals are not being diverted from their intended commercial channels (OPCW, 1993).
- **Challenge Inspections:** This is a very strong provision that gives any State Party the right to ask for immediate inspection of any site, declared or undeclared, of another State Party (OPCW, 1993). It acts as a dissuasive to clandestine activities. But it has not yet been officially declared since the diplomatic threshold is very high and if it fails or is characterized as politically motivated, it may result in the permanent deterioration of bilateral relations or the loss of the cooperative spirit of the CWC (Hart & Fedchenko, 2009).
- **Investigations of Alleged Use (IAU):** Emergency response mechanism that is activated when reports are received of chemical weapons use in conflict. It includes the deployment of Fact-Finding Missions (FFM) to gather environmental and biomedical

samples and witness interviews. In 2018, it was radically changed by the creation of the Investigation and Identification Team (IIT) (OPCW, 2018). It shifted the OPCW from simply a technical monitoring body (which was able to say whether a weapon has been used) into the field of international criminal attribution, where it was able to say who was responsible (Kelle, *The CWC at 25: from verification of chemical-weapons destruction to attribution of their use*, 2021). This has been the most contentious development in recent years, with the potential for states to face international prosecution for their actions, thus marking a change from "technical fact-finding" to "legal attribution".

Comprehending the nature of "Hybrid Warfare" in the 21st Century

Ambiguity is the hallmark of hybrid warfare, which is employer of "strategic asset" and whose prime goal is to reach political ends without transcending the threshold of traditional military war (Hoffman, 2007). But this is not a lack of will, it is a tactics of undermining the international rules-based order, operating in the "legal gaps" between war and peace. In this context, the use of Proxy Forces from local ethnic militias to transnational private military companies is a key multiplicative. Outsourcing the use of chemicals to these irregular actors enables patron states to have plausible deniability, effectively removing any direct link between the use of the chemical and the patron state's decision-maker. This makes the lawful "attribution chain" used by international law more complicated since traditional treaties were based on a premise of clear national militaries with unified command. This "tactical layering" between chemical event and sovereign state often leaves the international investigators in a "no-man's-land" in which the proof of state complicity is virtually impossible to secure (Kelle, 2025). The result is a "fragmentation of responsibility" whereby no individual is responsible and the deterrent effect of international norms is undermined.

At the same time, Misinformation campaigns are being deployed to lead to "truth decay," which is a phenomenon where the difference between what is actually true and made up (Kavanagh & D. Rich, 2018). Such campaigns do not necessarily try to persuade people of a single, unified falsehood; they are about "a fire hose of falsehoods" being thrown at the public (Waqas, 2025). These hybrid actors try to drown out the other side with dozens of theories that vary from accusations of staged "false flag" operations to claims of diverted industrial accidents. The ultimate aim is that the technical conclusions drawn by the OPCW will be viewed not as a forensic determination, but as one of many "competing opinions" in a marketplace of ideas. This psychological warfare aims at destroying what is essential to verification. It damages the belief in objective truth, which is the basis for political action and moral outrage being mobilized by the evidence given by inspectors, no matter how scientifically rigorous.

Moreover, Covert Action has resurfaced as a favoured instrument for targeted, high-profile assassinations, moving away from the battlefield and into the daily lives of global citizens. The deployment of special military-grade nerve agents like the Novichok variety in non-military environments like international airports, shopping areas or residential streets is intended to intimidate and project power against domestic or international opponents without the "face" of a "conventional" military attack (Charejoo, Arabfard, Jafari, & Nourian, 2023). These incidents constitute a calculated risk, where chemical signature is both distinct and elaborate enough to convey a clear, fearsome message to targeted audiences, and yet is still covert enough to be denied at the international level while diplomatic politics continue.

Verification Diplomacy: Conceptual Framework

Verification is seldom "just technical, as the site for an inspection and when a report is published are arranged to either maximize or minimize the impact on other peace talks (Walker, 2024). The OPCW Technical Secretariat is frequently operating in an environment where science's probity and integrity must overcome geopolitical tensions and pressures in this high-stakes environment. For example, the timing of a mission deployment to a sensitive area is frequently the subject of much negotiation and is a matter that can be delayed by a state which can claim to be cleaning up a site, or which can be considered by a state as an infringement on its sovereignty to arrive first.

Moreover, the linguistic strategies that are selected in technical reports themselves are a type of diplomatic negotiation. States that do not wish to take escalatory action or go to military force have important off-ramps in the form of semantic ambiguity, with terms such as likely or consistent with used instead of confirmed beyond doubt (Meyer, 2021). This calculated uncertainty enables the international community to recognize a violation without having to be immediately drawn into a situation of *casus belli*. This same lack of clarity can also be used by hybrid players to argue that the results are inconclusive and thus provide a form of reduction in the normative impact of the CWC. It is the diplomat's job, therefore, to convert forensic certainty into a political language that will maintain the character of the agreement while not destroying the delicate balance that ensures its sustainable operation.

The dialectic also entails the Speed vs. Rigor trade-off. After an attack, there is a huge need of delivering quick results to justify political action. The scientific process, however, that involves the laboratory analysis of the same sample by several appointed laboratories, is naturally time-consuming. Verification diplomacy is the handling of this time lag, where the need for political "quick wins" does not compromise the scientific standards that endow the OPCW its final authority. A hurriedly prepared report with technical inaccuracies affords an opportunity for the hybrid actors to discredit the entire organisation.

The CWC was originally designed as a confidence-building, cooperative effort in the post-Cold War optimistic period, but has been adapted to become more confrontational and focused on enforcement (Zanders, 2003). During the first 20 years, the OPCW was essentially a technical examiner of the 'peace dividend' as states cooperated and destroyed vast quantities of Cold War munitions, each working in partnership with the Secretariat and the other member states towards a clear and visible objective. But with the spotlight increasingly turning from auditing inventories declared by companies to investigating active and undeclared chemical use in volatile conflict areas, the "partnership" model increasingly fractured. It has turned the Executive Council of the OPCW into a place of intense geopolitical rivalry. Previously debating the logistics of incineration facilities, the Council is now having to grapple with high stakes votes on non-compliance, where procedural debates are often being masked for underlying security rivalries and ideological differences attack (Charejoo, Arabfard, Jafari, & Nourian, 2023).

This transition suggests that the purpose of verification isn't limited to creating a sense of trust by being transparent, but it's about the management and perpetuation of a state of institutionalized distrust. This new age is not about verification as a typical check on friends but as a tool for "norm enforcement" of recalcitrant players. This change has translated into the development of "Parallel Diplomacy" which is an outcome of what has been perceived as a lack of movement in the formal structures of the OPCW. Unable to draw consensus in the Executive Council, a handful of states have started working around the council to establish ad hoc coalitions, like the International Partnership against Impunity for the Use of Chemical

Weapons (Crowley, 2018). These alliances, and their nature is dynamic, fracturing the landscape for norm enforcement, which is taking place beyond the formal CWC framework. Thus potentially leading to a "two-tier" system of international law, in which some states are subject to enforcement by a portion of the members, while others remain protected by the procedural vetoes of their geopolitical patrons.

Stress Points: CWC Verification in Hybrid Warfare

The Lasting Detentions of the LORD's Anointed Serving as the Nation's Guardians

While many different reasons have been offered as excuses, "security concerns" and "ongoing military operations" are often used to paralyze international oversight, and are the intentional weaponization of Westphalian sovereignty (Horn, Mert, & Müller, 2023). If a country can frame a foreign inspection as a threat to national security or a violation of territorial integrity, then it can provide a "legalistic wall" which it can use to shield what it is not allowed to do. This is especially harmful for investigating volatile industrial agents. When confrontations like that in Douma or Khan Shaykhun occur, the primary evidence, dubbed the "smoking gun," literally disappears from the atmosphere, one hour at a time, while negotiating access to a checkpoint or whether a route is safe or not.

These are not the only physical barriers states employ, however; they also have a complex array of "Administrative Interdiction" methods. This can include the inexplicable loss of flight clearances for specialized analytical machinery, or the need for extremely specialized joint sampling plans. These protocols often involve the presence of state-aligned "minders" at each interview and the splitting of all physical samples, which means that the host state can monitor, influence, and/or even compromise the chain of custody. The procedural bubbles are not accidental, they are an attempt to lower the quality of the forensic file. The ultimate aim of the hybrid actor is that when an inspection does come the issue has become circumstantial evidence, at best, and not sufficient to warrant international sanctions or legal condemnation, according to the "beyond reasonable doubt" standard.

Information Warfare and Epistemic Contestation

In the 21st century, state sponsored disinformation campaigns are not just about dominating people with propaganda, they seek to bring about epistemic contestation, which is defined as a situation where truth, as a verifiable, objective reality, is questioned or denied (Reporters Without Borders, 2024). The OPCW puts out a finding and it is answered by a "fire hose of falsehoods" from state-aligned media outlets. OPCW Secretariat sends in confidential internal assessments or "engineering assessments" which are then leaked to the press, sometimes before the final peer-reviewed assessment is issued. The campaigns are not solely a counter-narrative, but rather an attack on the individual reputations of the inspectors, with personal past employment, political views or private messages made public and the inspectors portrayed as agents of a hostile agenda (Council, 2021). The aggressor attacks the man, rather than the science itself, because he does not need to deal with the science.

Procedural Lawfare and the Loss of Neutrality

The complex rulebook of the CWC has been used to stall and thereby delegitimize CWC's basic activities, introducing the era of "Procedural Law fare", which is a strategy that states would employ through the CWC's own rules. There is no open violation of the treaty, but rather a continuous litigation of the "process" which would have high normative costs. This includes inundating the Technical Secretariat with thousands of finely detailed technical questions, questioning the accreditation of certain international labs, or budgetary restrictions

on certain investigative groups, such as the IIT, forcing them to remain without the resources to undertake field missions. These banal administrative tools can be used by the aggressors to effectively paralyse the organisation and appear "cooperating" with international law.

This approach is a heavy burden on the Director General of the OPCW, as well as the legal department. They're stuck in a defensive mode and are always forced to defend themselves, their methodology, and their neutrality against bad faith arguments. The result is an erosion of neutrality (accusations of bias by the accused state), because the organization is being used to work against them, and by others because it is not being active enough or too "soft" (Sargana, et al., 2023). This "neutrality trap" is the ultimate bait of procedural law fare. The more the organisation is perceived as "partisan" the less its technical conclusions have universal credibility and the more its gold standard status is undermined from within.

The Technological Asymmetry Gap

The new "Technological Asymmetry Gap" may be the most frightening stressor. There's a growing gap between the high-tech "stealth" chemical signatures that are created in state-funded advanced labs and the more basic kits that can be used by international inspectors in the field. Aggressors are now investing in binary agents and new delivery systems that are specifically designed to circumvent the CWC's historical detection strategies. The verification regime may turn into a "Maginot Line," a structure that stands still and that is easily outsmarted by the more mobile and innovative chemical arms of its enemy if OPCW is not able to identify and detect the next generation of Chemical agents and modified industrial chemicals.

Case Studies

Syria

The Syrian conflict is the most serious stress test in the history of the CWC, turning the OPCW from a technical monitoring organization into a high-stakes forensic investigator (Ham, Meer, & Ellahi, 2017). After the 2013 Ghouta attack, the UN, spearheaded by the US and Russia, managed to secure Syria's swift ratification of the CWC, following the use of Sarin gas in the attack which caused hundreds of fatalities due to its exposure. At first, the mission had been a success where the OPCW inspected and destroyed 1,300 metric tons of declared chemical agents during an active civil war (Ham, Meer, & Ellahi, 2017). But the next case in "Double Challenge" and the Syrian case dashed the hopes. First, the Syrian declaration was discovered to be incomplete, with discrepancies in missing precursors and mobile production units have not been resolved in more than 10 years. Second, the war witnessed the use of industrial chemicals, such as chlorine, in urban areas on many occasions, including in the cities of Douma and Khan Shaykhun (al-Maghafi, 2020).

The establishment of the Investigation and Identification Team (IIT) in 2018 was a direct reaction to the apparent deadlock on the United Nations (UN) Security Council regarding extension of the previous joint UN-OPCW mechanism for investigation. The reason for its establishment was the perceived stalemate on the United Nations (UN) Security Council concerning the extension of the previous joint UN-OPCW investigative mechanism, which had been repeatedly vetoed by Russia (BBC, 2017). One of the key points of the Syrian case is the "Forensic Stalemate": the IIT's reports have repeatedly identified Syrian military units as the perpetrators of multiple attacks. In response, Syria and its allies have been conducting unprecedented "institutional lawfare", demonizing the OPCW as a "tool of Western imperialism", and trying to limit the OPCW budget. This case study shows how technical conclusions, when they are inconsistent with the fundamental security needs of a state and/or

patron of the CWC, may result in an entire breakdown of consensus-based decision-making, which was historically the basis of the CWC.

The Novichok Challenge: Salisbury and Navalny

The poisons used in Salisbury in 2018 against Sergei Skripal and in 2020 against Alexei Navalny were "fourth generation" nerve agents (Novichok) (Wiaderek, et al., 2025). The incidents were quintessential examples of what is known as hybrid warfare, a term for the use of agents who have the capability of military operations in civilian society and for the objectives of targeted assassination and psychological intimidation. In both cases the agents used for verification were not originally on the "Schedules" of restricted chemicals on the CWC. This resulted in a legal loophole in that the agents were banned under the general prohibition of the Convention, but were not covered by the regular declaration and inspection mechanisms of the Convention.

The OPCW's Technical Assistance Visits (TAVs) to the UK and Germany were important to give the domestic forensic results an independent international seal of approval, but the Russian response was typical of the "Disinformation Loop" (OPCW, 2018). They not only asserted that the agents did not exist, but that they were made by the West and that the victims poisoned themselves. This case resulted in the first updating of the CWC's Annex on Chemicals since 1997 and was an important diplomatic success, for successfully adding Novichoks to the list of controlled substances. Even with this technical achievement, however, the political consequences are not yet clear, and it is hard to see how a state can be persuaded to accept the results of verification diplomacy when it is still determined to deny a category regardless of the evidence.

ISIS and the Non-State Actor Dimension: The Marea Attack

The 2015 chemical attack by the Islamic State (ISIS) in Marea, Syria, marks a pivotal moment in the CWC's history and shifted the attention towards Non-State Actors (NSAs) (IIT, 2024). In contrast to state actors who typically rely on industrial precursors or military stores to produce a complex agent, ISIS showed they could use decentralized, improvised lab setups. This reveals the Non-State Blind spot in the original CWC design, which focused on monitoring national military stockpiles, rather than mobile terror cells in ungoverned spaces. Thus, the OPCW was forced to change its verification diplomacy in a non-cooperative context in which there was no central government to provide security or logistical support (Makdisi & Hindawi, 2017). Many of the indicators required for an inspection used to be indirect, such as the use of remote sensing, victim interviews in third countries, and the analysis of soil samples smuggled across borders. In this case, it also presented challenging questions of "Sovereignty vs. Security". The Marea attack has demonstrated that the 'chemical taboo' is being undermined from below by the use of WMDs by irregular forces as weapons of mass terror, and therefore the need for a new concept of 'transnational verification', which is outside the traditional state-centric framework.

The Al-Safir Diversion: Industrial "Dual-Use" Exploitation

The Al-Safir facility in Syria exemplify the susceptibility of the Pillar of Non-proliferation to "Dual-Use" misuse. Al-Safir was a huge manufacturing facility that was officially claimed to be making agricultural chemicals but, according to intelligence sources, was being used to produce chemical weapons precursors (ICT, 2013). This case study is an example of the "Commercial Cloak" strategy where hybrid actors use legitimate international trade networks to acquire "dual-use" equipment like, specialized glass-lined reactors, scrubbers and other precursors such as thionyl chloride for the purpose of civil industrial development.

The "Commercial Confidentiality" clauses of the CWC brought verification diplomacy to a standstill at Al-Safir (CWC, 1993). States are not likely to accept even more intrusive inspection of their chemical industries because of the protection of trade secrets and economic competitiveness. Between the two, "Profit and Protection", hybrid actors can play with military production in the din of commerce and international business. The Al-Safir case illustrates that the OPCW's regular inspections of Other Chemical Production Facilities (OCPFs) are too cursory to uncover the existence of a state-supported chemical diversion scheme and that such inspections, as currently conducted, are no guarantee of chemical security.

Analysis

Systematic gaps in accountability, verification and enforcement in the CWC exist due to fundamental legal, institutional and technical issues impacting its effectiveness in the hybrid warfare era. The obstacles are immense problems with the treaty that was originally conceived for a world of fixed borders and state-controlled militaries, and which now needs to be adapted to a decentralized threat environment in the 21st century. These are the traditional legal premises of the Convention being used in a systematic way as warfare moves into the "gray zone. Hybrid actors take advantage of the procedural formalism of international law and technological imbalance in order to produce a situation in which technical facts do not necessarily correlate with political effects. This structural friction not only slows forensic responses, but it also opens up the door to international community's high impact but low trace chemical aggression, undermining the collective security guarantees that the OPCW was established to ensure

The original text of the CWC, negotiated in 1993, was very careful not to make it a criminal investigation body; it was a cooperative disarmament tool. It therefore did not explicitly provide the Technical Secretariat with the authority to determine who is the perpetrator (attribution). The IIT brought this about in 2018, but its legality is one of the burning issues of contention. Opponents say the IIT is an ultra vires extension of the OPCW's mandate, pointing out that the determination of responsible parties is a political process, which should be the prerogative of the UN Security Council. This results in a "legal limbo" in which detailed and well researched conclusions are considered valid, but for the accused, non-binding, because they are, in essence, "political hit jobs".

While article IX (Consultations, Cooperation and Fact-Finding) retains the notion of national sovereignty, it is often used as a legal tool to limit the ability for verification in hybrid situations. The CWC does not have a set of automatic sanctions for failure to cooperate, when a state takes the convenient cover of the 'sensitive national security information' excuse. This has turned the required "consultation period" to clean up crime scenes, to move illegal materials, or to intimidate prospective whistleblowers into a "sovereignty loophole", and has removed the "anywhere, anytime" inspection as a reality and made it a theoretical possibility.

The CWC is a state-centric treaty based on the assumption that only sovereign states are able to have the infrastructure to produce chemical weapons. It has no clear and established laws or regulations to manage verification missions in areas outside the control of a State Party (e.g. areas in Northern Syria controlled by ISIS or similar insurgent groups or proxy militias). This jurisdiction uncertainty results in a serious "responsibility gap" that needs to be addressed. Forensic investigation within the CWC is ad hoc and legally fragile, if it is possible at all, without a clear legal track for holding non-state actors accountable within the framework of the CWC.

Lab's need for “scientific certainty” versus the political body's need for a “legal standard of proof.” OPCW scientists strive to establish very precise technical thresholds, but international political actors may require a “beyond reasonable doubt” standard that is, in effect, impossible to meet in active contaminated battlefields where the chain of custody is constantly threatened. Hybrid aggressors know how to adeptly work this loophole, incorporating advanced information operations to transform “highly likely” or “consistent with” technical findings into “legally inconclusive” or “unproven.”

The legal framework for the revision of the “Schedules” of controlled chemicals (Annex on Chemicals) is slow, reactive and sensitive to bureaucratic inertia. Changes take many years, and new synthetic agents and chemically modified industrial precursors often slip through the formal regulatory cracks for years because they require a broad consensus among almost 200 State Parties. This “legislative lag” opens up a “legal gray zone” in which “hybrid actors” can investigate, create and even introduce new toxins that are not on the restricted list of toxins in the treaty annexes, which will enable them to claim that they are not breaking the specific protocols of the Annexes.

Article XII of the CWC requires the OPCW to refer instances of “particular gravity” to the UN Security Council for enforcement. But today's reality is the “Great Power Competition” that has made this referral a dead-end. Under the P5 veto power, the patron states can legally and indefinitely veto enforcement measures such as targeted sanctions, travel bans or referral to the International Criminal Court (ICC). This institutional stasis makes for a very hollowed-out treaty when it comes to what it can do against well-connected aggressors: the technical “guilt” rarely leads to any real geopolitical or legal consequences.

The CWC's verification regime was designed for the time of physical samples and on-site visual evidence. It currently does not have a legally binding framework to consider admission, authentication and weighting of electronic evidence, including OSINT, geolocated social media footage and private satellite data. Without such a system, State Parties have the power to call “fabricated” or “deepfaked” or “unauthentic” any form of damning digital evidence. This leaves OPCW with no formal way of incorporating the extensive ecosystem of contemporary “citizen forensics” into its official reports, and thus highly reliant on being able to enter the country, which hybrid actors are well-known for being adept at blocking.

One of the critical technical difficulties is the loss of chemical signatures in the field. Nowadays, hybrid tactics frequently include the use of industrial chemicals such as chlorine or volatile nerve agents that have a very small environmental impact. The current OPCW forensic toolkit is quite thorough but is designed to deal with long-term military-grade agents. This causes a “detection gap” because the time taken to negotiate access to, and transport the samples to, certified laboratories, may be longer than the half-life of the evidence. The technical Secretariat has no on-site, real-time analytical “lab-on-a-chip” capacities to the standards required within the international evidentiary framework, and is at a major disadvantage against those who use the clock as a tactic of obfuscation.

The revolution of Artificial Intelligence and automated chemical synthesis (chemputing) poses a new technical challenge for the CWC's Non-proliferation pillar. The traditional verification method is to check the known precursors and large scale industrial equipment. But now, AI is able to predict novel toxic molecules that have different chemical structures to the scheduled agents, but are functionally lethal. This “digital-to-biological” or “digital-to-chemical” pipeline, together with the miniaturization of production (dispersal of complex agents in small-scale modular laboratories), makes the traditional industrial audits

superfluous. The CWC can't survive when it cannot transform and progress from auditing “chimneys and tanks” to monitoring “algorithms and data streams.”

Strategic recommendations for the CWC Framework

To adequately close this vast chasm, a radical change in structure is necessary, one that addresses the 21st century's dynamic, non-symmetrical, hybrid tactics, rather than the static, on-state transparency of the 20th century. CWC's strategic recommendations are aimed at taking the CWC beyond a reactive approach and focus directly on the Institutional, Legal, and Technical Challenges. These offer a strategy for the technical heart of the organization to resist political corrosion, while also extending the organization's investigatory capabilities, particularly beyond the state and into the digital space, to keep the chemical taboo from becoming a museum exhibit.

- State Parties should strive to develop a formal interpretive resolution to define the process of identifying perpetrators as essential "technical forensic extension" of the Fact-Finding Mission, rather than a political act. The Technical Secretariat can protect the Investigation and Identification Team (IIT) from ultra vires attacks by making the attribution a purely evidentiary requirement for a scientific complete report. This codification would help make clear the mandate of the OPCW is to pursue the molecular trail wherever it goes, including the specific command structure involved in weaponization, and would bring attribution into the “normal” reporting of an investigation, instead of making it an extraordinary political move.
- The OPCW should implement a "Fast-Track Challenge Protocol. This would make the diplomatic heat a lower threshold for implementation of Article IX inspections, by establishing a “Evidence Preservation Emergency” condition. But when the agent is not persistent, such as chlorine, the concept of sovereignty has to be restated as a responsibility to cooperate in good faith. In this protocol, if access is denied for more than 24 hours during the critical time, this would be a presumption of non-compliance. The assumption would have a direct impact on the procedures, including the freezing of certain chemical trade rights, or referral to an emergency session of Executive Council, which would serve to make obstruction more expensive than transparency.
- The CWC framework requires an additional protocol to enable the Secretariat to consider territories held by insurgent groups as "active forensic zones. This "Territorial Transnationalism" model would allow the OPCW to make purely technical arrangements with local councils, NGOs or even non-state organisations, just for the purpose of collecting evidence and taking samples. Most importantly, these technical accords must be legally separated from any kind of political recognition. This would guarantee that the use of chemicals in “ungoverned spaces” or by proxy militias can be investigated as rigorously as state-sponsored attacks, so that the perpetrators can't use the uncertainty of civil collapse or the legal limbo of unrecognized borders to evade accountability.
- The international community should recognize the difference between the standards of criminal prosecution and institutional safeguarding in terms of “Preponderance of Evidence” for diplomatic action. The "beyond reasonable doubt" standard is required for the ICC, but the OPCW’s diplomatic enforcement (e.g. suspension of a state's voting rights and/or privileges at its industry) should be based on the "preponderance of evidence" standard. The change would enable more rapid institutional separation from non-compliant actors. The view that "high forensic probability" is enough for diplomatic countermeasure means the organization can take more action to defend the

integrity of the chemical taboo before it can be turned into irrelevance by bad-faith litigators.

- The Annex on Chemicals needs to be put in a "dynamic listing" system. Regulatory Lag can be addressed by implementing a "dynamic listing" system for novel agents. This would enable the Scientific Advisory Board (SAB) to add any toxins of concern and/or any new toxins to a temporary "Precautionary Watch List. These chemicals would be subject to the same immediate reporting and export control obligations as other chemicals on the list, but would not have to go through the several-year consensus-building process that would be involved with a formal schedule change. This proactive approach would take away the "novelty shield" and keep the verification regime moving in line with chemical innovation, not in tandem with diplomatic compromise.
- Member States may institutionally formalize and make permanent a parallel enforcement mechanism (the "International Partnership against Impunity"). This panel may come up with a list of "automatic sanctions" up front which would include specific financial sanctions against military officials involved, and the cancellation of chemical-industrial relations, etc. if an IIT is made. This results in a "dual-track" enforcement situation: the UN track would be blocked by a P5 veto, but the "Parallel Track" would still have a direct and inescapable geopolitical impact, keeping the deterrence floor from being lowered.
- OPCW to work with specialized tech NGOs and legal experts to create a "Technical Standard for Citizen Forensics. This includes establishing secure "witness upload" portals, verified by blockchain, for witnesses and OSINT investigators to upload and submit digital evidence that is geo-located and time-stamped. In doing so, the CWC establishes the rules and procedures to weight this data and "modernize" the "remote verification" methods within its legal framework. Under this scheme, States would be unable to dismiss damaging digital evidence as "fabricated," and citizens would become an unofficial and permanent arm of the OPCW's investigations, worldwide.
- Development of Real-Time Lab-on-a-Chip Field Kits; in order to address Technical Forensic Decay the Technical Secretariat needs to be equipped with advanced, field-deployable detection technologies capable of real time isotopic analysis in the field. The lab-on-a-chip kits would enable inspectors to get official and tamper-proof forensic signatures on the spot, even if a full lab extraction of the plant is deferred by checkpoints. The organization can eliminate the tactical use of the clock by hybrid actors by digitizing the sample signature on-site and send it to multiple designated labs at once, meaning that the evidence will be captured before environmental destruction or site sanitization.
- To address the AI and Synthetic Chemistry Revolution, the OPCW needs to take the next step from physical verification to "Algorithmic Verification. Pillar Two must transition from a "watch list" to a "digital safeguards" approach that will track suspicious online buying patterns, AI-based molecular design databases and modular synthesis software. Inspectors ought to be given the powers to ensure that data flows within a facility are logical, not only has a physical stock counted. The OPCW can audit the "digital recipes" and automated instructions in high-end chemical reactors in the "cloud" before any toxic agent is synthesized, enabling it to detect a shift from peaceful production to weaponization.

Conclusion

The Chemical Weapons Convention is in the most precarious place in its 30-year history. The treaty, which had been hailed as the most successful international military arms control

accord to date—with the destruction of the declared stockpiles of industrial-scale arms once considered the highest point of mutual cooperation—is now being brought to the “gray zone” of hybrid warfare. A world in which the concept of victory has been superseded by a constant process of destabilisation, in which warfare is conducted in a way that is seen as acceptable on the condition of being carried out by proxy, in which covert poisonings are selectively used, and in which absolute lies are weaponised. As this research has shown, the "gold standard" of disarmament is no longer a fixed barrier but is being attacked by institutional warfare and technological disparities that were not fully anticipated by its early proponents in the rosy glow of the Cold War's final decade. The 'technical insulation' that used to surround the OPCW has been removed, allowing the Organisation to become the centre of an "adversarial, attribution-based" investigator, and to be caught in the middle of a "corrosive geopolitical struggle" over the nature of empirical truth.

This fight is not just about administration, it's about life or death. The successful institutionalization of “Verification Diplomacy”, a proactive approach which recognizes the indisputable connection between forensic science and international politics is the only way for the future of CWC to be determined. The Convention needs to become more flexible, technologically-oriented and enforcement-focused to be relevant in an age of deliberately sketchy lines of responsibility. This is not the end of neutrality, but the strengthening of it. It takes the gumption to cast aside the "sovereignty shield" and let those who haven't been satisfied with the washing away of crime scenes in the name of national security get off the hook. Open-source intelligence, real-time field forensics and algorithmic monitoring of the new synthetic chemistry reality could mean that the OPCW can shift from being a reactive historical archive of norm erosion, to instead being a proactive global security guard, able to anticipate threats before they reach the point of mass casualty.

Above all, we need to acknowledge that the chemical weapons taboo is a feeble political arrangement that needs constant, rigorous and sometimes challenging protection. The consequences of failure are grave: If the international community lets the technical findings be successfully turned into irrelevance by hybrid actors, the deterrent effect of the CWC will disintegrate. It would almost certainly lead to a resurgence of chemical normalization in world war in which chemicals are again considered as “just another weapon” in the military and intelligence arsenal. To preserve the integrity of this key norm, there must be a collective consensus to put the value of the molecular evidence of an attack ahead of the carefully-managed political rhetoric to muddy the waters. Either the CWC has to evolve its architecture to respond equally as sophisticated to the new threat of hybrid warfare or else it has to admit that it is slowly becoming hollow and procedure driven.

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