

The Use of CBRN Weapons in Armed Conflict

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1 Introduction

One of the bedrock rules of international humanitarian law (IHL) is that the right of parties to an armed conflict ‘to choose methods and means of warfare is not unlimited’:¹ limitations exist. While, intuitively, the goal of warfare is to overcome the enemy, IHL imposes certain constraints on parties to a conflict: their ultimate rationale is to curb State and non-State actors’ tendency to resort to whatever tactic or weapon to succeed in their effort. The whole history of IHL – also known as *jus in bello* or, as it is still referred to, Law of Armed Conflict (LOAC) – is thus a history of *limitation*.²

This is made clear by the evolution of this branch of international law through the last century and a half, a period in which the limitation of tactics and weapons has literally blossomed: a quick tour of the International Committee of the Red Cross (ICRC)’s online databases suffices to make one aware of the large number of treaties and customs regulating hostilities.³ What is more, the rules on methods and means are held to be drafted ‘in a peremptory manner’ (thus qualifying as *jus cogens*) and to apply to situations of both international armed conflict (IAC) and non-international armed conflict

1 Convention (IV) respecting the Laws and Customs of War on Land and its annex: Regulations concerning the Laws and Customs of War on Land (adopted 18 October 1907, entered into force 26 January 1910) 187 CTS 227 art 22; Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (adopted 8 June 1977, entered into force 7 December 1978) 1125 UNTS 3 (hereinafter: AP I) art 35(1).

2 H McCoubrey, *International Humanitarian Law. Modern Development in the Limitation of Warfare* (2nd ed, Routledge 2019); A Alexander, ‘A Short History of International Humanitarian Law’ (2015) 26 EJIL 109; ME O’Connell, ‘Historical Development and Legal Basis’, in D Fleck (ed), *The Handbook of International Humanitarian Law* (2nd ed, OUP 2013).

3 See <<https://www.icrc.org/en/icrc-databases-international-humanitarian-law>> (all links accessed on 20 May 2021). As for customary law, see JM Henckaerts and L Doswald-Beck (eds), *Customary International Humanitarian Law* (CUP 2005), and also <<https://ihl-databases.icrc.org/customary-ihl/eng/docs/home>> (hereinafter CIHL).

(NIAC).⁴ The advent of new technologies, while a constant challenge throughout the history of IHL, is more worrisome today than ever before due to the rapid development of weapons and the unprecedented capabilities they give their users.⁵

The purpose of the present chapter is to provide a fresh appraisal of how Chemical, Biological, Radiological and Nuclear (CBRN) weapons are regulated by existing IHL. To begin with, the extent to which CBRN 'agents' can be considered as 'weapons' or 'means of warfare' pursuant to IHL will be tackled, and relevant definitions will be provided that build upon the premises laid down at the beginning of the present book.⁶ The analysis will then turn to IHL rules and principles of IHL dealing with *specific* weapons and prohibiting (or restraining) *specific* means of warfare, without losing sight of general rules and core principles. Finally, the chapter will deal with current challenges posed by new technologies in the specific field of CBRN weapons, including considerations of up and coming advancements in military applications of CBRN agents, and will identify and discuss a normative tool for addressing them (4), before turning to conclusions (5).

Before raising anchor, some coordinates are due. First, this chapter is interested solely in armed conflict: uses of CBRN weapons in different scenarios, such as the no less turbulent waters of law-enforcement operations, are left for other contributions.⁷ Second, accepting the traditional difference between *jus ad bellum* and *jus in bello*, little reference will be made to norms regulating whether and to what extent force can be used in international relations, as this will be addressed in chapters dealing with norms on disarmament and arms control.⁸ The main (but not exclusive) normative framework this chapter is concerned with is IHL; however, the reader must be alerted to possible docking at other ports of international law. Third, the topic of CBRN weapons in armed conflict may intersect with the issue of the protection of the natural environment, which again, is the subject of a specific contribution in this volume and will not be tackled here.⁹

4 Y Sandoz, C Swinarski, and B Zimmermann (eds), *Commentary on the Additional Protocols of 8 June 1977 to the Geneva Conventions of 12 August 1949* (Martinus Nijhoff 1987) (AP I Commentary) para 1405.

5 W Wallach, *A Dangerous Master. How to Keep Technology from Slipping Beyond Our Control* (Basic Books 2015).

6 See ch 1 by Frulli.

7 See Part 4 on horizontal issues.

8 See ch 20 by Magi and ch 23 by Poli.

9 See ch 22 by Saluzzo.

2 Setting the Stage: CBRN 'Agents' as 'Weapons'

It may come as a surprise that, despite the fact that wars are naturally fought through them and they are integral to the use of force (and thus a mainstream term in literature on that topic), the term 'weapon' has never been made the object of a universally-accepted definition in IHL.¹⁰ While intuitively understood as an instrument designed or used for inflicting harm or damage, either offensively or defensively, no specific definition is provided either by customary or treaty IHL, to the point that the ICRC has claimed that any guidance is to be sought not 'across the international community' but, rather, within domestic legal orders.¹¹

A distinction that is accepted in IHL is between 'weapons' and 'means' of warfare, and 'methods' of warfare.¹² The first two categories may be treated as synonyms, as they both refer to the *instruments* through which force is used in hostilities.¹³ However, the term 'methods' refers to the *tactics* that are employed in those contexts.¹⁴ To put it differently, the rules dealing with the former relate to the 'is the tool *itself* lawful?' question, while rules dealing with the latter relate to the (subsequent) 'is *the way* in which that tool is employed lawful?' question.¹⁵ According to a definition proposed by the United States Department of Defence (US DoD), the term 'weapon' would include 'all arms, munitions, materiel, instruments, mechanisms or devices that have an intended effect of injuring, damaging, destroying or disabling personnel or property'.¹⁶ The very fact that so many terms are employed demonstrates that, rather than the object in itself, what matters is the *purpose* for which the

10 S Casey-Maslen, 'Weapons', in B Saul and D Akande, *The Oxford Guide to International Humanitarian Law* (OUP 2020). See also W Boothby, *Weapons and the Law of Armed Conflict* (OUP 2009).

11 ICRC, 'A Guide to the Legal Review of New Weapons, Means and Methods of Warfare: Measures to Implement Article 36 of Additional Protocol I of 1977' (Geneva, 2006) (hereinafter: ICRC Guide) 47.

12 AP I, art 36.

13 S Haines, 'The Developing Law of Weapons. Humanity, Distinction and Precautions in Attack', in A Clapham and P Gaeta (eds), *The Oxford Handbook of International Law in Armed Conflict* (OUP 2014).

14 MN Schmitt, 'International Humanitarian Law and the Conduct of Hostilities', in Saul and Akande (n 10).

15 Haines (n 13) 277 (using the example of white phosphorous).

16 Cited in ICRC Guide, 8. The term 'weapon' is not included in the recent US DoD, 'DoD Dictionary of Military and Associated Terms' (June 2020) <<https://www.jcs.mil/Doctrine/DOD-Terminology-Program/>>. This definition is only partially satisfying as it leaves outside weapons causing damage to the environment as such, which is a topical issue today: see ch 22 by Saluzzo.

object is used, namely to project force against human or non-human targets. Consequently, it has been argued that any working definition of ‘weapon’ must be sufficiently open-textured, so as to include, for instance, devices that cause harm by means of kinetic energy (eg bullets) and those that do so by other means (eg heat, sound, electricity or electromagnetism, bacteria).¹⁷ Long story short, for an ‘object’ to qualify as a weapon, the essential feature is its capability of directly causing harm.

Turning now to CBRN agents, the ICRC has proposed a definition that – while acknowledging the differences in nature, origins and properties of various agents, as well as in the type of injury or illness the exposure to them can produce – identifies four common properties, namely: (i) toxicity, (ii) latency, (iii) persistency, and (iv) transmissibility.¹⁸ Although conceived for training purposes only, this definition has the merit of highlighting ‘toxicity’ as the first common property of all CBRN agents, *ie* the ‘ability [...] to cause harmful effects or death’.¹⁹ The above definition of ‘weapons’ immediately rings in the ears: CBRN agents are *inherently* capable of causing harm, and thereby make a formidable weapon to be used against an enemy. As a confirmation of this, the very notion of ‘Weapons of Mass Destruction’ (WMD) – though not a term of art in IHL – is commonly employed to identify CBRN weapons capable of causing high orders of destruction and mass casualties.²⁰ In other words, no one would question that CBRN agents are extremely suitable for ‘weaponisation’.

Therefore, IHL regulates the use of CBRN agents as ‘weapons’ and, from a theoretical standpoint, it makes sense to investigate CBRN weapons through the lens of IHL. To date, however, there is no treaty or customary rule addressing the use of CBRN weapons in armed conflict *as a whole*; rather, their regulation is scattered in various legal instruments that consider the use of those ‘agents’ separately.

3 IHL Norms Regulating CBRN Weapons

In the landmark Advisory Opinion rendered in the *Nuclear Weapons* case, the International Court of Justice (ICJ) fixed the two ‘cardinal principles [...] constituting the fabric of [IHL]’.²¹ The first one is the principle of discrimination,

17 Casey-Maslen (n 10) 261.

18 ICRC, ‘Chemical, Biological, Radiological and Nuclear Response. An Introductory Guidance’ <<https://www.icrc.org/en/publication/4175-chemical-biological-radiological-and-nuclear-response-introductory-guidance>>.

19 *Ibid* 8.

20 US DoD (n 16); see also ch 1 by Frulli.

21 *Legality of the Threat of Use of Nuclear Weapons* (1996) ICJ Reports 66, para 78.

including both the prohibition against directly targeting civilians and civilian objects,²² and the prohibition on using indiscriminate weapons, namely those 'that are incapable of distinguishing between civilian and military targets'.²³ The second principle also prohibits using weapons that cause legitimate targets superfluous injury or unnecessary suffering (aka the 'SIrUS rule' in the ICRC's jargon),²⁴ or, in other words, cause 'a harm greater than that unavoidable to achieve legitimate military objectives'.²⁵ As is evident, these rules enshrine the idea of limitation as illustrated above, and have to be read in conjunction with other key principles of IHL applicable to targeting, namely proportionality and precautions in attack.²⁶

These rules establish *general* prohibitions on the use of certain weapons: provided that it is demonstrated that a weapon is inherently indiscriminate (eg poison),²⁷ or that its use causes superfluous injury or unnecessary suffering (such as explosive projectiles weighing less than 400 grammes),²⁸ that weapon cannot be used in conformity with IHL, even absent a specific prohibition. There is also a general prohibition on the use of weapons that are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment.²⁹ Last but not least, the overarching principle of humanity as encapsulated by the so-called Martens Clause deserves mention. By placing combatants and civilians 'under the protection and authority of the principles of international law derived from established customs, from the principles of humanity and from the dictates of public conscience',³⁰ the Martens Clause proscribes weapons recognised as abhorrent, even absent specific treaty rules.³¹

In addition to these general rules, IHL also prohibits and restricts *specific* weapons or means of warfare, both in separate treaties and in customary

22 AP I, art 48; CIHL rule 1.

23 AP I, art 35(2); CIHL, rule 71.

24 Convention (IV) (n 1) art 23(2); AP I, art 35(2). As for the ICRC, see R Coupland and P Herby, 'Review of the Legality of Weapons: A New Approach. The SIrUS Project' (1999) 81 IRR 583.

25 *Legality of the Threat of Use of Nuclear Weapons* (n 21) para 78.

26 AP I, arts 51(5)(b) and 57(2); CIHL, rules 14 and 15.

27 AP I Commentary, para 1402.

28 Declaration Renouncing the Use, in Time of War, of Explosive Projectiles under 400 Grammes Weight (adopted 11 December 1868, entered into force 11 December 1868) 138 CTS 297.

29 AP I, arts 35(3) and 55; CIHL, rule 45. See more extensively ch 22 by Saluzzo.

30 AP I, art 1(2).

31 Literature on the Martens Clause and its legal implications is immense: see A Cassese, 'The Martens Clause: Half a Loaf or Simply Pie in the Sky?' (2000) 11 EJIL 187.

norms. An interesting example is provided by the 1980 Convention on Certain Conventional Weapons (CCW), an 'umbrella' treaty composed of only a few procedural obligations and completed by its Protocols.³² This variable-geometry instrument is supposed to encourage the participation of as many States as possible, leaving them free to choose which Protocols to ratify; in addition, it really renders the CCW a living instrument, capable of adapting to new technologies.³³ Weapons specifically prohibited in their own Protocols include those leaving non-detectable fragments, booby-traps, landmines, incendiary weapons, blinding lasers, explosive remnants of war, and cluster munitions.³⁴ Most of these instruments have been adopted on the basis that the weapon under scrutiny was found to be in contrast with the general rules above, to the point that a clear and explicit prohibition by way of treaty was considered as the optimal normative choice: overlaps between general and specific rules are thus unavoidable and even auspicious, as they reinforce the prohibition on certain weapons.

With this distinction between general and specific prohibitions in mind, let us now tackle each weapon in turn.

3.1 *Chemical Weapons*

The prohibition on the use of chemical agents as weapons is probably among the most ancient ones in IHL. In addition to being indiscriminate in nature, chemical weapons produce lifelong damage whose effects on the human person and the environment remain after the end of the conflict. The fact that, if air is contaminated with chemical agents, people can simply not breathe was a sufficient ground for invoking a ban on those weapons.

'Asphyxiating gases', such as chlorine and sulphur mustard (having a blistering effect on skin or the moisture in lungs), were first prohibited by the 1899 Hague Declaration (IV, 2), yet with two major limitations.³⁵ First, the prohibition concerned the use of projectiles the 'sole' object of which was the diffusion of such gases, while it was questionable whether projectiles causing their release as a side-effect were lawful. Second, the prohibition ceased to have effect if one party to the conflict was joined by a State that had

32 Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects (adopted 10 October 1980, entered into force 2 December 1983) 1342 UNTS 137.

33 Haines (n 13) 281.

34 For more details, see N Melzer, *International Humanitarian Law. A Comprehensive Introduction* (coordinated by E Kuster) (ICRC 2016) 111ff.

35 Declaration (IV,2) concerning Asphyxiating Gases (adopted 29 July 1899, entered into force 4 September 1900) 18 CTS 453.

not been a Contracting Party to the Declaration: this is a typical example of a *si omnes* clause ('either every one or no one'), an expression of the logic of *reciprocity* that used to animate IHL back then,³⁶ and was subsequently abandoned during the nineteenth century.³⁷

Due to these limitations, and in spite of a strong international movement against them, chemical agents were employed as weapons in WWI. Under the auspices of the League of Nations, a new binding instrument dealing specifically with these weapons was negotiated at an international conference in Geneva, namely the 1925 Geneva Protocol.³⁸ The Protocol extended the scope of the prohibition by including 'asphyxiating, poisonous or other gases, and all analogous liquid materials or devices', as well as 'bacteriological methods of warfare'. However, more than 20 States made reservations to the Protocol, declaring that they maintained the right to use these weapons in retaliation.³⁹ Again, a logic of reciprocity – *de facto* reducing the prohibition to a ban on first use – re-surfaced. After WWII, most of these reservations were withdrawn, and the UN General Assembly repeatedly invited all States to accede to the Protocol. Several (bilateral, multilateral, regional and universal) instruments have been proposed and adopted to ban not only the *use* of chemical weapons but also their development *lato sensu*.⁴⁰

A key turning point was represented by the adoption of the Chemical Weapons Convention (CWC) in 1993.⁴¹ This instrument establishes the first and most comprehensive regulatory regime for chemical weapons, which is relevant not only from the standpoint of IHL (in that it prohibits the *use* of chemical agents as weapons) but also from the standpoint of disarmament law (in that the prohibition covers also the development, production, stockpiling, and transfer).⁴² To begin with, the CWC defines 'chemical weapons' as 'toxic chemicals and their precursors, except where intended for purposes not

36 T Meron, *The Humanization of International Law* (Martinus Nijhoff 2006) 9ff.

37 See, for instance, AP I, art 96(2); AP I Commentary, para 3753.

38 Protocol for the Prohibition of the Use of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare (adopted 17 June 1925, entered into force 8 February 1928) 94 LNTS 65. The prohibition on these weapons had already been re-stated by Article 171 of the Treaty of Versailles *vis-à-vis* Germany, and in other peace treaties in the aftermath of WWI: see <<https://ihl-databases.icrc.org/applic/ihl/ihl.nsf/INTRO/280>>.

39 Casey-Maslen (n 10) 272.

40 CIHL, rule 74.

41 Convention on the prohibition of the development, production, stockpiling and use of chemical weapons and on their destruction (adopted 13 January 1993, entered into force 29 April 1997) 1974 UNTS 317.

42 CWC, art 1. See Casey-Maslen (n 10) 272; Melzer (n 34) 120.

prohibited', munitions and devices designed to cause death and injury through the toxic properties of the substances above, and other connected equipment.⁴³ Mortal agents such as nerve agents (sarin, or VX) and blood agents like cyanide – both causing death from suffocation – are included in the definition.⁴⁴ Herbicides as a method of warfare are included as well, at least when they amount to chemical weapons.⁴⁵

Among the CWC's strengths, it is important to mention that Article I establishes that the prohibitions apply 'under any circumstances', that is, not only with regard to IAC but also NIAC (where many contemporary abuses, such as Saddam Hussein's use of chemical weapons against the Kurds in 1998 and more recently their use in Syria, have infamously occurred).⁴⁶ This is in line with a recent trend towards the gradual overcoming of the differences between rules and principles applicable to IAC and NIAC.⁴⁷ Another important innovation is the institution of a body tasked with overseeing the implementation of the CWC, namely the Organisation for the Prohibition of Chemical Weapons (OPCW).⁴⁸ The OPCW has been endowed with verification and inspection powers, and it represents – at least in principle – a key tool for ensuring respect for the obligations set forth by the CWC.⁴⁹

As for its weakness, while the use of riot control agents (such as tear gas) is specifically prohibited as a 'method of warfare',⁵⁰ an exception is made for law-enforcement purposes, 'including domestic riot control'.⁵¹ In other words, what is prohibited during the conduct of hostilities may be allowed in law-enforcement scenarios. Due to the 'grey areas' between armed conflict and law enforcement – more frequent than ever, in an era characterised by asymmetrical conflicts – the regime established by the CWC may provide unclear

43 CWC, art II.

44 ICRC, 'An effective killer: Five things you need to know about chemical weapons' (9 April 2018) <<https://www.icrc.org/en/document/effective-killer-five-things-you-need-know-about-chemical-weapons>>.

45 CWC, Preamble; CIHL, rule 76.

46 CWC, art I(1). For more on the situation in Syria, see UNSC Res 2118 (27 September 2013) UN Doc S/RES/2118 (2013); M Sossai, 'Come assicurare la punibilità dell'uso di armi chimiche in Siria?' (2017) 11 *Diritti umani e diritto internazionale* 419.

47 *Prosecutor v Tadić* (Decision on Defence Motion for Interlocutory Appeal on Jurisdiction) IT-94-1-AR72 (2 October 1995) paras 65–142. See also K Watkin, 'Chemical Agents and "Expanding" Bullets: Limited Law Enforcement Exceptions or Unwarranted Handcuffs?' (2006) 82 *Int'l L Studies* 196.

48 CWC, art VIII.

49 Melzer (n 34) 120. For a critical assessment of the OPCW's action in Syria, see Casey-Maslen (n 10) 273, and more extensively Sossai (n 47).

50 CWC, art I(5).

51 CWC, art II(9). See also CIHL, rule 75.

guidance, in particular, in cases of internal disturbances of a level of violence that approaches (but does not reach) the threshold of NIAC.⁵²

Lastly, it is important to recall that the use of chemical weapons is also a war crime pursuant to the Statute of the International Criminal Court (ICC).⁵³ In light of all of the above, today, the prohibition on chemical weapons – including, with some disagreement, herbicides – is considered part of customary IHL.⁵⁴

3.2 *Biological Weapons*

As the (sadly still ongoing at the time of writing) SARS-CoV2 pandemic teaches, it is hard to prevent viruses and bacteria from spreading. This demonstrates the inherently indiscriminate nature of biological weapons, whose effects ‘cannot be limited’ to the legitimate target of an attack.⁵⁵ Moreover, biological (or bacteriological) agents contain living organisms that reproduce and release toxins that are dangerous not only to humans but also to animals, plants, and the environment at large.⁵⁶

The first IHL instrument on biological weapons dates back to the 1925 Geneva Protocol.⁵⁷ In addition to the previous prohibitions on poison and asphyxiating gases, the Geneva Protocol banned ‘bacteriological methods of warfare’; however, the instrument had a limited impact on the reality of warfare, as illustrated above.⁵⁸ Immediately after WWII, numerous resolutions and declarations, mostly adopted within the UN framework, restated the prohibition on biological weapons.⁵⁹ The subject was also dealt with in the context of proposals for general disarmament but, through the 1950s and 1960s, this remained inconclusive.⁶⁰

52 Watkin (n 48). More extensively, compare N Ronzitti, ‘La Convention sur l’interdiction de la mise au point, de la fabrication, du stockage et de l’emploi des armes chimiques et sur leur destruction’ (1995) 99 RGDIP 881, and M Pedrazzi, ‘The Chemical Weapons Convention and International Humanitarian Law: A Brief Overview of Some Critical Issues’, in International Institute of Humanitarian Law, *The Chemical Weapons Convention: Between Disarmament and International Humanitarian Law* (2008).

53 Rome Statute of the International Criminal Court (adopted 17 July 1998, entered into force 1 July 2002) 2187 UNTS 3, arts 8(2)(b)(xviii) and 8(2)(e)(xiv). See ch 32 by Vierucci.

54 CIHL, rules 74–6.

55 AP I, art 51(5)(c).

56 See ch 22 by Saluzzo.

57 See Casey-Maslen (n 10) 272.

58 See *supra* 3.1.

59 CIHL, rule 73.

60 J Goldblat, ‘The Biological Weapons Convention – An overview’ (1997) 318 IRRC 251.

A major development occurred when, in late 1969, the US unilaterally renounced biological weapons and decided to destroy its entire stockpile. Subsequent negotiations at the Conference of the Committee on Disarmament (CCD) led to the adoption, some 30 years before the CWC, of the Convention on Biological Weapons (BWC).⁶¹ The BWC prohibits the development, production, stockpiling, acquisition and retention of 'microbial or other biological agents, or toxins' in such qualities and quantities that they have no justification for 'peaceful purposes', as well as 'weapons, equipment or means of delivery' designed to spread those agents.⁶² Like the CWC, the BWC also prohibits such conduct 'under any circumstances', in a general and *absolute* fashion.⁶³ Contrary to the CWC, the BWC failed to establish any independent monitoring and verification authority;⁶⁴ however, the continuing need to ensure its effectiveness led the parties to adopt subsequent agreements that established, *inter alia*, consultative processes; annual exchanges of information to enhance transparency and build confidence among States; and, eventually, an Implementation Support Unit (ISU).⁶⁵

Admirable though the above prohibitions are, one may question whether they make the BWC effective as an IHL instrument, as at no point is the 'use' of such agents proscribed. As a matter of fact, any reference to the 'use' of biological weapons is confined to the Preamble, where – as befits preambular clauses – it is solemnly proclaimed that the use of such weapons 'would be repugnant to the conscience of mankind'.⁶⁶ Preambles are a formidable hermeneutical tool, but they could hardly be used to argue for the existence of obligations that are absent from the text. This major shortcoming has, however, been fixed by the Final Documents of the fourth, sixth and seventh Review Conferences, which affirmed that 'the use by States Parties, in any way and under any circumstances, of [biological agents]' that cannot be justified as above 'is effectively a violation of Article 1'.⁶⁷ Furthermore, in all cases, it is acknowledged that the use of biological weapons is prohibited by customary

61 Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction (adopted 16 December 1971, entered into force 26 March 1975).

62 BWC, art 1.

63 Ibid.

64 Casey-Maslen (n 10) 273. See also L Vierucci, 'Offensive Military Applications of Biotechnologies: Loopholes in the Law?', in F Francioni (ed), *Biotechnologies and International Human Rights* (Hart Publishing 2007), at 377.

65 BWC Implementation Support Unit, 'Additional agreements reached by previous Review Conferences relating to each article of the Convention' (28 September 2011).

66 BWC, Preamble.

67 'Additional agreements' (n 65) para 8.

IHL.⁶⁸ By the same token, as a matter of customary law, the violation of that prohibition amounts to a war crime, even though it was not specifically included in the Statute of the ICC.⁶⁹

Lastly, while it sounds entirely reasonable that the prohibition on biological agents employed as weapons should have no prejudicial effect on the 'peaceful' uses of such agents (eg to produce vaccines, to fight against diseases, to enhance health security), the reality is that it is not that easy to keep permissible ('peaceful') and impermissible ('military') uses of biological agents clearly distinct. One of the major challenges that the BWC is facing right now is how to ban the 'weaponisation' of biological agents without hampering biological research in other fields.⁷⁰ All things considered, it appears that an effective regulation of biological hazards can be ensured only through a comprehensive and multi-disciplinary legal approach, going beyond IHL: the point will be further explored below.

3.3 *Nuclear Weapons*

Radiological and nuclear agents are radioactive materials that are ultra hazardous both for humans and for other living organisms. While the former are generated typically as by-products and waste from the mineral processing industries or occur naturally in the environment, the latter are generated from nuclear fission or fusion.⁷¹ This sub-paragraph will tackle nuclear weapons and will leave radiological weapons for later.

When weaponised, nuclear agents bestow an unprecedented power upon their users – a power so destructive that the nuclear bomb conjures up the image of 'the absolute weapon', developed by 'wizards' eager to drag the entire planet to an 'Armageddon' scenario and consign mankind to 'oblivion'.⁷² And it was precisely because of the impact that nuclear weapons had on targeted populations and, broadly, on public opinion that the doctrine of nuclear deterrence was born.⁷³ After the terrifying experiences of Hiroshima and Nagasaki, States, international organisations (first and foremost, the UN) and other

68 CIHL, rule 73.

69 CIHL, rule 156.

70 P Millett, 'The Biological Weapons Convention: Securing Biology in the Twenty-first Century' (2010) 15 *Journal of Conflict & Security* L 25.

71 ICRC (n 18) 7.

72 B Brodie, *The Absolute Weapon: Atomic Power and World Order* (Harcour, Brance and Company 1972); F Kaplan, *The Wizards of Armageddon* (Stanford University Press 1991); HF York, *Race to Oblivion: A Participant's View of the Arms Race* (Simon and Schuster 1970).

73 D Jordan and ors, *Understanding Modern Warfare* (2nd edition, CUP 2016), 405 ff (explaining historical bases and dynamics of deterrence, with a focus on platforms designed to carry nuclear weapons but intended to avoid their use, instead of incentivising it).

actors (such as the ICRC) strove to prohibit all recourse to such weaponry,⁷⁴ beginning by halting nuclear proliferation through an ad hoc binding instrument, the Nuclear Non-Proliferation Treaty (NPT).⁷⁵ More recently, the Treaty on the Prohibition on Nuclear Weapons (TPNW) has been adopted with the aim of providing, for the first time in history, a comprehensive ban on nuclear weapons on a global scale.⁷⁶

It is hard to think of a weapon whose use in armed conflict is more likely to fail to discriminate between permissible and impermissible targets, to provoke superfluous injury and unnecessary suffering, and to cause widespread, long-term and severe damage to the natural environment, than nuclear weapons. In sum, nuclear weapons stand in the most stark opposition to IHL rules and principles. One might thus expect a written prohibition on such weapons, clearly spelled out in a binding instrument; yet, and maybe surprisingly, this is not the case.

When the drafting process of Additional Protocol I (AP I) was about to start, the ICRC clearly stated, in its first submission, that ‘problems relating to atomic, bacteriological and chemical warfare [would remain the] subject of international agreements or negotiations by governments’, thus it was considered more appropriate not to tackle them.⁷⁷ Some States – such as the US, the UK, and other NATO Members – understood the rules contained in the Protocols as ‘not intended to have effect’ on nuclear weapons, as their application was limited to ‘conventional’ weapons.⁷⁸ To an extent, this view was confirmed by scholars who, after surveying customary IHL in depth, were able to conclude, as late as the mid-1980s, that ‘the wartime use of nuclear weapons [was] not categorically prohibited under the existing rules of positive international law’.⁷⁹

An important contribution was given by the ICJ in the famous *Nuclear Weapons* case.⁸⁰ The ICJ had received two requests to render an Advisory Opinion, from the World Health Organization (WHO) and from the UN General Assembly. The Court declined the former and delivered its opinion only with

74 Boothby (n 10) 215–6.

75 Treaty on the Non-Proliferation of Nuclear Weapons (adopted 1 July 1968, entered into force 5 March 1970) 729 UNTS 169.

76 Treaty on the Prohibition of Nuclear Weapons (adopted 7 July 2017, entered into force 22 January 2021) CN.478.2020.TREATIES-XXVI-9. See M Pedrazzi, ‘The Treaty on the Prohibition of Nuclear Weapons: a Promise, a Threat or a Flop?’ (2018) 27 *Ital YIL* 215.

77 Boothby (n 10) 216.

78 *Ibid.*, at 217. More extensively, see J Gaudreau, ‘The Reservations to the Protocols Additional to the Geneva Conventions for the Protection of War Victims’ (2003) 849 *IRRC* 143.

79 F Kalshoven, ‘Arms, armaments and international law’ (1985-II) 191 *Recueil des Cours* 271.

80 *Legality of the Threat of Use of Nuclear Weapons* (n 21).

regard to the latter.⁸¹ The Opinion is a complex piece of international law, touching upon various issues – *jus ad bellum*, the relationship between IHL and human rights law, even the qualification of the use of nuclear weapons as a crime of genocide – that cannot be discussed here due to space constraints.⁸² For our purposes, two key findings – both adopted with the President’s casting vote – tackled the use of nuclear weapons in armed conflict. First, the Court found that ‘the threat or use of nuclear weapons would *generally* be contrary to the rules of international law applicable in armed conflict, and in particular the principles and rules of humanitarian law’.⁸³ Second, the Court found that ‘[h]owever, in view of the current state of international law [...] the Court cannot conclude definitively whether the threat or use of nuclear weapons would be lawful or unlawful in an *extreme* circumstance of self-defence, in which the very survival of a state would be at risk’.⁸⁴ Most commentators – both in favour of and against the existence of a customary norm prohibiting nuclear weapons in IHL – have expressed their discomfort *vis-à-vis* this actual *non liquet*.⁸⁵

The Advisory Opinion depicts the proverbial image of an elephant in the room: everyone sees how the use of nuclear weapons contravenes the core rules and principles of IHL, yet States are reluctant to recognise the prohibition in customary law, let alone in treaty instruments. However, a recent and important step forward deserves to be mentioned. As already discussed, the TPNW, which entered into force in January 2021, contains a legal obligation to refrain from using or threatening to use nuclear weapons, which applies also during hostilities.⁸⁶ In this sense, the TPNW can be considered not only as a key disarmament treaty but also as an IHL instrument. This contention is also confirmed by the Preamble, where rules and principles applicable to armed conflict are expressly cited. In particular, it is remarkable that reference is made to a bedrock rule of IHL, namely that the right of parties to a conflict to

81 Boothby (n 10) 220.

82 E Louka, *Nuclear Weapons, Justice and The Law* (Edward Elgar Publishing 2011) 308ff. See also D Akande, ‘Nuclear Weapons, Unclear Law? Deciphering the Nuclear Weapons Advisory Opinion of the International Court’ (1997) 68 BYBIL 165.

83 *Legality of the Threat of Use of Nuclear Weapons* (n 21) para 105(2)(E), italics added.

84 *Ibid*, italics added.

85 C Greenwood, ‘The Advisory Opinion on Nuclear Weapons and the Contribution of the International Court to International Humanitarian Law’ (1997) 316 IRR 65 (arguing that to say that nuclear weapons cannot be used lawfully under any circumstances would be an unwarranted contention); S Casey-Maslen, ‘The use of nuclear weapons under rules governing the conduct of hostilities’, in G Nystuen, S Casey-Maslen, and A Golden Bersagel (eds), *Nuclear Weapons under International Law* (CUP 2014).

86 TPNW, art 1(1)(d).

choose means and methods of warfare is not unlimited.⁸⁷ However, the TPNW, despite having been adopted by a vote of 122 States in favour in 2017 (84 of which are signatories) and ratified by 50 States, is far from enjoying universal support, especially from nuclear weapons States.⁸⁸ On the contrary, and quite tellingly, the US has recently engaged in a man-marking tactic to push States that have already ratified the TPNW to withdraw their ratifications.⁸⁹ Thus, there is a very real risk of the Treaty being sabotaged and it is highly doubtful that the prohibition on the use of nuclear weapons will make its way into customary IHL any time soon; indeed, even the ICRC was unable to elaborate a customary rule on nuclear weapons.⁹⁰

At the root of such stubborn resistance is that nuclear weapons States want to retain the capabilities to react in self-defence in case of nuclear attack and to employ tactical nuclear weapons. With particular regard to the latter, one may think of equipping missiles with nuclear explosives in order to target submarines or other naval targets located far from civilians and civilian objects, or enemy military installations situated in a desert. While in such scenarios – curiously, taken into account by Judge Schwebel in his separate opinion in the *Nuclear Weapons* case, as an argument for the non-existence of a general prohibition on nuclear weapons under IHL⁹¹ – there would be little risk of using such weaponry in an indiscriminate manner,⁹² it must be recalled that nuclear blasts cause long-lasting effects on human health and on the environment. These begin soon after the fireball and the initial release of neutron radiation, and continue with a significant increase of cancer mortality throughout the life of survivors and those who happened to be in the blast radius.⁹³

87 See n 1.

88 At the regional level, there are treaties containing the prohibition on the use of nuclear weapons in any circumstances. See Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Tlatelolco Treaty) (adopted 14 February 1967, entered into force 25 April 1969), reproduced in UN Doc A/6333 (23 February 1967), art 1(1)(a); Treaty on the Southeast Asia Nuclear-Weapon-Free Zone (Bangkok Treaty) (adopted 15 December 1995, entered into force 28 March 1997) 1981 UNTS 129, art 3(1)(c).

89 G Lythgoe, 'Nuclear Weapons and International Law: The Impact of the Treaty on the Prohibition on Nuclear Weapons' (2 December 2020) EJIL: Talk! <<https://www.ejiltalk.org/nuclear-weapons-and-international-law-the-impact-of-the-treaty-on-the-prohibition-of-nuclear-weapons/>>.

90 ICRC, 'Nuclear Weapons', <https://ihl-databases.icrc.org/customary-ihl/eng/docs/v1_rul_nuwe>.

91 *Legality of the Threat of Use of Nuclear Weapons* (n 21), Separate Opinion of Judge Schwebel at 98.

92 *Legality of the Threat of Use of Nuclear Weapons* (n 21), Written Statement of the United States (20 June 1995) at 23.

93 International Law and Policy Institute and Geneva Academy of International Humanitarian Law and Human Rights, 'Nuclear Weapons Under International Law: An Overview' (October 2014) 5–6.

In sum, while it may be argued that resistance *vis-à-vis* the prohibition of nuclear weapons in *jus ad bellum* may end up reflecting on *jus in bello*, the case can be convincingly made that, from the IHL viewpoint, nuclear weapons – even the most tactical ones – could hardly be used in a lawful way.

3.4 Radiological Weapons

In contrast to the attention that scholarship has dedicated to nuclear weapons, far fewer pages have been written on radiological weapons. Explanations for this include, on the one hand, the fact that no treaty has ever been adopted on the topic and, on the other hand, that the weaponisation of radiological agents is not at the top of the list of priorities of States' departments of defence.

As a matter of fact, discussions on radiological weapons were started by the then Committee (today Commission) on Disarmament back in 1979, with the inclusion of 'radioactive material weapons' in the definition of WMD.⁹⁴ At that time, the US and the USSR were negotiating a treaty prohibiting the development, production, stockpiling and use (merging, as usual, disarmament and IHL perspectives) of radiological weapons, understood as any device other than nuclear explosives that is capable of disseminating radioactive material.⁹⁵ Due to disagreements relating to the object and scope of the treaty, as well as to the definition of radiological weapons, the proposal was eventually dropped. After the 9/11 attack, a last attempt was made at reviving the issue in the Commission on Disarmament, but with limited success.⁹⁶

A combination of radiological and chemical agents is present in depleted uranium (DU), which is the by-product of the manufacture of enriched uranium from uranium ore. According to some States, DU weapons can be regarded as strategic weapons with limited impact on health and environment due to their limited radiation hazard. For instance, the US Air Force considers that its proportional use does not violate relevant IHL.⁹⁷ On the opposite side, it has been argued that DU weapons' effects have to be evaluated against the precautionary principle, to the point that, even if their negative impact on human life and environment is scientifically uncertain, their use may be limited nonetheless.⁹⁸

94 Report of the Committee on Disarmament (9 October 1979) A/RES/34/27 at 17.

95 J Herbach, 'The Evolution of Legal Approaches to Controlling Nuclear and Radiological Weapons and Combating the Threat of Nuclear Terrorism' (2014) 17 Yb IHL 45, 61.

96 Ibid 61–2.

97 Boothby (n 10) 243.

98 L Wexler, 'Limiting the Precautionary Principle: Weapons Regulation in the Face of Scientific Uncertainty' (2006) 39 UC Davis LR 459.

DU weapons aside, no State has been known to develop radiological weapons for use in armed conflict. Rather, as technically speaking radiological agents can be efficiently employed to build a so-called 'dirty bomb' (where conventional explosives are used to detonate the bomb and provoke the release of radiation), such technology is believed to be more attractive to terrorist groups.⁹⁹ While this could suggest that this topic would be better dealt with in other fields of international law (such as the use of force against non-State actors), it is important to recall that non-State groups engaged in NIAC – commonly referred to as 'organised armed groups' – are under the obligation to respect relevant IHL norms. Even though Article 3 common to the Geneva Conventions and the Second Additional Protocol to them do not contain any provisions on the use of specific weapons in NIAC, the 'cardinal principles' discussed above (distinction and the SIrUS rule above all), which are of a customary nature, continue to govern the law applicable on weapons even absent a specific treaty.¹⁰⁰ This is confirmed also by the International Criminal Tribunal for the former Yugoslavia in a key passage in the *Tadić* case: '[w]hat is inhumane, and consequently proscribed, in international wars cannot but be inhumane and inadmissible in civil strife'.¹⁰¹

Against this background, any use of radiological weapons – in the most known forms of DU weapons or 'dirty bombs' – is actually regulated by existing IHL, namely by rules and principles that apply generally to all kinds of armed conflict. The absence of specific treaty provisions on them, commensurate with the scarce State practice of employing such weapons, does not affect that general regulation. It may be true that radiological weapons are likely to raise less alarming issues than nuclear weapons, but parties in a conflict that decide to resort to them remain bound by IHL.

4 How to Address Future Technologies in the Field of CBRN Weapons?

Our journey across the 'four quadrants' of CBRN weapons may appear fragmented: each agent, when turned into a weapon, is subject to a specific set of rules. However, the analysis above has shown that this might be true only *prima facie*. On closer inspection, those weapons are regulated by rules and principles constituting the 'bedrock' norms of IHL, such as the principle of

⁹⁹ Ibid.

¹⁰⁰ Melzer (n 34) 128.

¹⁰¹ *Prosecutor v Tadić* (n 48) para 119.

distinction and the prohibition on the use of indiscriminate weapons and those causing superfluous injury or unnecessary suffering. Those norms came to the fore not only with regard to weapons that are not *per se* prohibited or limited by dedicated legal instruments (eg nuclear and radiological weapons), but also with regard to weapons that treaty and customary IHL have prohibited, or significantly limited, for decades now (eg chemical and biological weapons). In sum, there are norms providing interpreters with basic coordinates to navigate safely through all four quadrants.

These same coordinates are all the more needed when sailing the waters of emerging military technologies. Current scientific research is making tremendous progress in CBRN-related technologies. Just to give a few examples, one may think of nanotechnology and, more generally, synthetic biology, which study how to ‘assemble’ natural and synthetic materials to engineer functional organisms.¹⁰² Advances in the field of biochemistry make it possible to develop non- or less-lethal agents to be employed as weapons. Along the same lines, another emerging (and promising) field of research relates to microfluidics and nanofluidics, which allow for enhanced control over potentially ultra-hazardous reactions (that occur on a microscopic scale).¹⁰³ Little to no attention has been dedicated to such advances, from either a disarmament or IHL perspective.

In light of this, and bringing the discussion to a more general level, the question remains on how IHL regulates new technologies, that is, weapons that do not (apparently) fit in existing legal categories. A mainstream approach to new technologies is to present – and thus study – them as if they were something of a totally unprecedented nature: the newness of a weapon, or a weapon system, is believed to be enough to justify dedicating many time and energy-consuming pages. However, to the siren song of those who predict legal ‘singularities’ (that is, the impossibility of adopting legal categories as we know them) with respect to new military technology (for instance, technology associated with the exponential development of autonomous weaponry),¹⁰⁴ this writer prefers remaining lashed to the mast of the ship, that is, to stick with the existing norms of IHL – even when ploughing the waters of CBRN-related technologies.

102 H Nasu, ‘Nanotechnology and the Future of the Law of Weaponry’ (2015) 91 *Int’l L Stud* 486.

103 C Jabbari and PC Bleek, ‘Honey, I Shrunk the Lab: Emerging Microfluidics Technology and its Implications for Chemical, Biological, and Nuclear Weapons’ (May 2019) *Emergence & Convergence Research Paper No 5* 1.

104 B Kastan, ‘Autonomous Weapons Systems: A Coming Legal “Singularity”’ (2013) *Journal of Law, Technology and Policy* 45.

As a matter of fact, applying existing rules to the development of new technology is a core provision of IHL, namely Article 36 AP I, which establishes the obligation to conduct a legal review of new weapons:

In the study, development, acquisition or adoption of a new weapon, means or method of warfare, a High Contracting Party is under an obligation to determine whether its employment would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party.¹⁰⁵

While the issue of whether Article 36 corresponds to customary IHL still remains open,¹⁰⁶ the fact that, today, AP I counts on 174 signatory parties renders the obligation to conduct a legal review of new weapons almost universal in scope. This obligation presents several strengths. Firstly, it covers different phases of weapons manufacture and procurement (ranging from the ‘study’ to the ‘adoption’ thereof), which may be relevant, for instance, if a particular weapon is developed by private actors (typically companies operating as defence contractors): in this case, the State is under an obligation to ensure that those actors act in compliance with applicable norms. Secondly, the rules against which new weapons are to be assessed encompass those contained in AP I and IHL in general, including the core rules on distinction, proportionality, precautions in attack, but also the principle of humanity.¹⁰⁷ Article 36’s scope is even broader than this, as it also covers other international norms applicable to the State under scrutiny. This is of particular importance *vis-à-vis* CBRN weapons, as CBRN agents and events are regulated by disparate branches of international law (from disarmament and arms control to human rights and environmental law). States are, therefore, under a duty to take into account all these other norms when developing CBRN weapons.

If ‘taken seriously’, Article 36 AP I provides States with a unique device for testing the compatibility of new CBRN capabilities with international law at large. Engaging with comprehensive, multi-disciplinary and integrated legal

¹⁰⁵ AP I, art 36.

¹⁰⁶ N Jevglevska, ‘Weapons Review Obligation under Customary International Law’ (2018) 94 *Int’l L Stud* 186 (concluding negatively).

¹⁰⁷ I Daoust, R Coupland and R Ishoey, ‘New wars, new weapons? The obligation of States to assess the legality of means and methods of warfare’ (2002) 84 *IRRC* 345. As for the principle of humanity, see *Legality of the Threat of Use of Nuclear Weapons* (n 21), particularly paras 86–7 (affirming that the Martens Clause ‘has proved to be an effective means of addressing the rapid evolution of military technology’ and refuting the argument whereby ‘new’ technologies would escape the application of IHL).

reviews of CBRN weapons may thus incentivise respect for other international norms and, indirectly, also favour prevention, preparedness, response and recovery *vis-à-vis* CBRN events in general, not only in the battlefield. For all these reasons, the fact that, as has been lamented for years now, only few States carry out legal reviews pursuant to Article 36 is disheartening.¹⁰⁸ However, it is worth noting that the duty to conduct legal reviews of weapons has been gaining momentum recently, especially in the debates around autonomous weapons systems (AWS).¹⁰⁹ Within the framework of the CCW, several meetings of experts have been convened in recent years to discuss the implications related to the development and deployment of AWS. One of the cornerstones that virtually all States and other involved actors agree upon is that such next-generation weaponry has to be reviewed to ensure compliance with international law, and IHL in particular.¹¹⁰ Article 36 obligations are held to be key to ensuring that technological advances in various fields comply with IHL.¹¹¹

Extending these remarks to our field, revitalising the duty to conduct legal reviews of new weapons may prove beneficial for CBRN security. An important step forward could be for States to implement domestic measures to undertake legal reviews of new weapons and to disseminate results, with a view not only to sharing information on procedures and mechanisms but also – and more importantly – facilitating cooperation among States in the CBRN field.

5 Concluding Remarks

Through the above analysis, the present chapter has managed to demonstrate three main arguments, in ascending order of relevance. First, it makes sense to speak in terms of ‘CBRN weapons’: while the notion does not exist in IHL, the agents’ properties are such that a unitary label is conceptually founded. Second, when turned into weapons, CBRN agents are governed by a wide spectrum of IHL norms, both treaty and customary. The historical trend of

108 ICRC (n 11).

109 For more information, see <<https://www.un.org/disarmament/the-convention-on-certain-conventional-weapons/background-on-laws-in-the-ccw/>>.

110 Group of Governmental Experts of the High Contracting Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, ‘Report of the 2019 session of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems’, 25 September 2019, CCW/GGE.1/2019/3 Annex IV (lit e).

111 W Boothby, ‘Dehumanization: Is There a Legal Problem Under Article 36?’, in W Heintschel von Heinegg, R Frau and T Singer (eds), *Dehumanization of Warfare. Legal Implications of New Weapon Technologies* (Springer 2018).

limiting – in some cases, prohibiting – the weapons that may be used in armed conflict, which characterises IHL, is confirmed by existing rules and principles applicable to CBRN weapons. Third, IHL is part of a larger set of norms dealing with CBRN-related risks. Certainly, IHL provides an effective legal framework for addressing CBRN events occurring in (at least) one specific domain, that is, the battlefield. While one may argue that the scope of this branch of international law is inherently limited – after all, it deals solely with armed conflicts – it has been noted, with respect to all four agents, that touchpoints between IHL and other branches are recurring. The need for a multi-faceted approach is confirmed also by those obligations expressly requiring States to take into consideration other rules and principles of international law, for instance, when manufacturing or procuring new weapons, means or methods of warfare, pursuant to Article 36 AP I. All in all, this chapter's main findings confirm the key intuition lying at the very basis of the entire book: against any logic of strict compartmentalisation, only a comprehensive and integrated legal approach to CBRN events is adequate for coping with the complexities – and the dangers – associated with such matters.

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