

Chapter 31

Military ecocide

Peter Hough¹

Abstract Military ecocide, the destruction of the natural environment in the course of fighting or preparing for war, has a long history and remains a prominent feature of contemporary conflicts. Efforts to prohibit this in International Law were initiated after the US' notorious defoliation campaign in the Vietnam War in the 1960s and have developed since then. Whilst legal ambiguities and the defence of military necessity have limited the application of this body of law the proscription of ecocide has, nevertheless, progressed and looks set to develop further. Normative change driven by scientists, environmentalists and legal experts has raised awareness of and stigmatized such practises to the extent that recourse to the worst excesses of ecocide now appears to have lessened and some recompense for past crimes has been made. Military activities, though, continue to inflict a heavy cost on the environment and the drive for a more explicit legal prohibition of this has grown.

Keywords: ecocide, scorched Earth, Agent Orange, environment

Contents

- 31.1 Introduction
- 31.2 The History of Military Ecocide
 - 31.2.1 *Offensive Ecocide*
 - 31.2.2 *Defensive Ecocide*
 - 31.2.3 *Collateral damage: Indirect military environmental degradation*
- 31.3 The Militarization of the Environment
- 31.4 History of International Law on Military Ecocide
- 31.5 Normative Progress in criminalizing military ecocide
- 31.6 Conclusions

31.1 Introduction

This chapter reviews the progression of international legal efforts to prohibit militarily-induced ecocide; the deliberate or inadvertent destruction of the natural environment in the course of fighting or preparing for war. Ecocide is a term that has also come to be applied to the criminal and industrial destruction of the environment- such as through illegal deforestation or the dumping of toxic waste- but this review will confine itself to military-induced degradation.

There is a long history of military-induced environmental degradation and it is a facet of warfare that has generally worsened over time with the advent of more devastating and poisonous forms of weaponry. Such devastation has often been justified on the grounds of military necessity in ways that could not so readily be done if the casualties were human where, as illustrated in other chapters, a large body of international law offers some restraint. The perennial problem of the natural environment being valued only instrumentally- for its

¹ Associate Professor in International Politics at Middlesex University. Author of *Understanding Global Security* (4th ed. Routledge 2018) and *Environmental Security. An Introduction* (Routledge 2014)
Email: P.Hough@mdx.ac.uk

human utility- rather than intrinsically- in its own right- has been apparent throughout history in the recourse to military strategies such as scorching the earth, altering freshwater supplies or strategic deforestation.

However, many and an increasing number of people do value the environment for its own sake, as is evidenced by the rise of ecocentric domestic policy since the 1960s. In particular it is scientific evidence that has convinced most people of the need for ecocentric restraints on human behaviour. Despite the popular portrayal of environmentalists as mystic, tree-huggers it should not be forgotten that the green movement in the 1960s was kick-started by the emergence of ground-breaking, rational and convincing scientific evidence. In particular, US marine biologist Rachel Carson's magnum opus *Silent Spring* proved that the widespread use of organochlorine pesticides, following their discovery in the 1940s, in the fight against disease-carrying and crop-consuming insects was also polluting streams and killing wildlife.² As a consequence of this, the use of insecticides and herbicides began to be constrained in the US and then elsewhere even though they were serving human interests. One of the first focusses for this burgeoning environmental movement was the ecocentric (as well as anthropocentric) consequences of the US military deployment of organochlorine herbicides in the jungles of the Vietnam War. Whilst, fifty years on, military ecocide continues to feature in military campaigns the legal and normative prohibition of such practises has progressed. This has occurred in roughly the same timescale as the general advance of political ecologism, again largely due to the efforts of scientists and campaigners in highlighting the issue to the public.

31.2 The History of Military Ecocide

The destruction of nature in the course of war can occur as part of an offensive or defensive strategy or, less directly, as collateral damage.

31.2.1 Offensive Ecocide

The 'scorched earth' destruction of the crops or livestock of the enemy is a strategy that has been deployed in wars since ancient times. It formed part of many international conquests, such as by the Romans in the Punic Wars against Carthage, and also in the course of domestic counter-insurgency campaigns, such as in the Normans' 'Harrying of the North' after annexing England in the 11th Century. In the modern era similar methods were still being deployed by US in the Philippines from 1898-1902 to undermine nationalist resistance from jungle-based guerrilla units. Domestic alarm at how this intervention, initially sold to the American public as liberating the Filipinos from the Spanish, had become a typically brutal colonization prompted criticism from prominent domestic quarters. Most notably, the likes of former President Grover Cleveland, business tycoon Andrew Carnegie and literary great Mark Twain expressed outrage at President Roosevelt's war methods as part of the American Anti-Imperialist League, perhaps the first manifestation of an anti-ecocide movement.

With the advent of the synthetic organochlorine pesticides that were the catalyst for *Silent Spring* and environmentalism, offensive ecocide was able to move beyond the razing of food sources to include the tactical destruction of tree cover. The British were the first to undertake a strategy of 'industrialized chemical defoliation' as a military tactic in the early 1950s during the 'Malayan Emergency'. The acidic herbicide formulations 2,4,5-T³, and

² Carson, 1962

³ 2,4,5-Trichlorophenoxyacetic acid

2,4-D⁴ (later combined in *Agent Orange* used by the US in Vietnam) were used to clear lines of communication and food crops in the struggle against communist insurgents. With Imperial Chemical Industries (ICI) providing the technical advice, British and Malayan government troops in 1952 despatched fire-engines spraying mixtures of these herbicides along many key roads. The strategy was not successful and after seven months it proved more effective, both economically and practically, to remove vegetation by hand and the spraying was stopped. In the following year, though, the use of herbicides as an aid to fighting the guerrillas was restarted with the more traditional goal of destroying food crops grown by the communist forces in jungle clearings.⁵ The environmental costs of this British ecocide are unclear. Since this episode pre-dated the political ecology era, the sorts of scientific studies which later highlighted the environmental and health damage resulting from similar spraying operations in Vietnam, never took place.

The application of herbicides was far more widespread in the subsequent Cold War battlefields of Vietnam, with an estimated 80 million litres of 2,4,5-T 2,4-D, picloram, and cacodylate blended in a variety of mixtures- including the notorious *Agent Orange*- and sprayed on jungle foliage from military aircraft between 1962 and 1971 in the most infamous ever systematic military assault on the environment. US scientists have estimated that 10% of Vietnam's inland forests, 36% of her mangrove forests, and 3% of cultivated land were seriously damaged by the programme codenamed 'Operation Ranch Hand'.⁶ This scale of ecological damage indirectly affected the health of millions of Vietnamese by reducing the quality of their nutritional intake and creating internally-displaced persons susceptible to disease. More directly deadly were the cases of acute poisoning by herbicides. In particular dioxin, which arises as a by-product in the manufacture of 2,4,5-T, is one of the most toxic chemicals known and an estimated 170 k.g. of this was sprayed over Vietnam and the neighbouring countries of Laos and Cambodia.⁷ Dioxin is severely toxic in several dimensions. It is teratogenic (causes birth defects), hepatotoxic (liver), mutagenic, carcinogenic, a skin-irritant, and known to increase cholesterol levels in blood. Many studies have linked instances of such symptoms amongst Vietnamese residents and their offspring with the sprayings.⁸ Whilst proving direct causality is difficult for some conditions, the evidence is unambiguous with regards to liver damage due to dioxin exposure. A study led by Do Thuc Trinh found that: 'Chronic hepatitis was more than ten times as prevalent among those subjects who had been directly exposed to military herbicides (more than a decade previously) than among those who had not'.⁹

Despite some initial uncertainties in the scientific data relating to dioxin exposure, the US's defoliation campaign in Vietnam, Cambodia, and Laos was quickly and roundly condemned by the American scientific community and many international statesmen, as well as environmental campaigners. The American Association for the Advancement of Science in 1969 set up a Herbicide Assessment Commission to investigate the effects of Operation Ranch Hand made up of four leading domestic scientists, of whom the most prominent was Arthur Westing. Westing's background was as a botanist and forest ecologist but the fact that he had also served in the US military, seeing action as an artillery officer in the Korean War, equipped him with insights on both sides of the military-environment equation. Westing described the US defoliation campaign in Vietnam as causing; 'widespread, long-lasting, and

⁴ 2,4-Dichlorophenoxyacetic acid

⁵ Connor & Thomas, 1984

⁶ NAS, 1974, 5-6

⁷ Ibid, vii-9

⁸ Franklin, 2003

⁹ Westing, 1984, 166

severe disruptions of perennial croplands, and of farmlands- that is to say of millions of hectares or the natural resource base essential to an agrarian society'.¹⁰ Westing's writings also advocated the need to criminalize and prosecute such acts, most notably in the 1974 article; 'Proscription of Ecocide';

*'... what is urgently required at this time is the establishment of the concept that widespread and serious ecological debilitation- so called ecocide- cannot be condoned.'*¹¹

Westing here was utilizing the term 'ecocide' probably first employed by fellow US scientist Arthur Galston in 1970. Galston was a biologist central to the discovery of the defoliant qualities of 2,4,5-T who later became alarmed at how his work had come to be put into practise and wrote critically about how Operation Ranch Hand was destroying Vietnamese river ecosystems.¹² Continued pressure by the Herbicide Assessment Commission, including a petition signed by 5,000 scientists (of whom 17 were holders of Nobel prizes), led to the termination of the campaign in 1971, fuelled in particular by US public horror at evidence of appalling birth defects occurring in the Vietnamese population.¹³

Criticism of US ecocide, though, did not end with the termination of Operation Ranch Hand. In particular, high-profile international political expression of this view was given when Swedish Prime Minister Olaf Palme, after meeting Westing for a briefing on the subject, used this term indirectly to denounce the Vietnam defoliation programme at the 1972 United Nations Conference on the Human Environment (UNCHE) at Stockholm. Palme did not explicitly cite the US in his address at Stockholm but proceeded to do so overtly in several speeches in the following months.¹⁴ The US administration used the threat of pulling out of UNCHE to avert any direct reference to Operation Ranch Hand in the official principles and paperwork that came out of the conference but Palme's continued criticism prompted Nixon to suspend full diplomatic relations with Stockholm for several months; an extraordinary situation for two Western democracies to find themselves in.

No compensation has ever been forthcoming for any of the Vietnamese, Cambodian or Laotian victims of birth deformities, liver damage or other ailments attributable to Operation Ranch Hand despite appeals from these governments. In fact the only victims to have been compensated for this are soldiers who fought on the side responsible. War veterans from the US, Australia, and New Zealand, who have suffered subsequent skin and liver disorders or birth defects in their offspring, won a long battle for compensation in 1979, when a US Federal Judge ruled that they could sue the companies responsible for the manufacture of Agent Orange. Over 45,000 people have since claimed a share of \$180 million in damages from Dow and six other chemical firms. Dow agreed to this settlement in the face of public pressure and mounting legal costs, but have still never formally admitted that the various illnesses incurred by the veterans were directly related to Agent Orange and other herbicide mixtures sprayed in Vietnam.

Despite the controversy over Operation Ranch Hand the policy nevertheless served to inspire other governments and armed groups engaged in conflicts in woodland or arid terrain susceptible to tactical manipulation. Mimicking the tactics used in Vietnam the Indonesian

¹⁰ Westing, 1989, 337

¹¹ Westing, 1974, 26.

¹² Cook, Heseltine & Galston, 1970

¹³ Hay, 1982,151

¹⁴ Ibid 165

government in the late 1960s conducted what may have been the worst case of deforestation in history in seeking to quell insurgencies in Borneo and West Kalimantan.¹⁵ Similarly, during the 1980s civil war in El Salvador the government bombed agricultural lands and forests in seeking to deny guerrilla forces a base and sustenance. Partly as a consequence of this El Salvador today is almost completely deforested.

In a different form of domestic ecocide Saddam Hussein of Iraq added deliberate desertification to his long list of environmental and human crimes in diverting the courses of the rivers Tigris and Euphrates in order to drain marshland areas that were home to the Shia 'Marsh Arabs', after they had initiated an uprising against his rule in 1991. This act of ecological ethnic cleansing drained around 90% of the region's marshes and also depleted its population from 250,000 to around 40,000.¹⁶ Saddam's 'hydro-terrorism' doubtless served as an inspiration to ISIS who, in 2015, dammed sections of the Euphrates in order to dehydrate their opponents in the Syrian Civil War.

31.2.2 Defensive Ecocide

The 'backs to the wall' destruction of your own resources to prevent an invading enemy making use of them is also a well-established military tactic. Perhaps most famously, Russian forces in 1812 retreated from the invading French army whilst razing their own arable lands in an ultimately successful strategy that paved the way for Napoleon's disastrous 'retreat from Moscow', which led to his downfall. This Russian strategy was learned from British military leader Wellington who two years earlier, in alliance with Portuguese guerrilla forces, had resisted a French invasion in a similar manner in the Peninsular War.

By the 20th Century industrial rather than arable might had become the main determinant of military power but scorching the earth could still have its uses. During World War Two the British took responsibility for rendering uninhabitable the islands of Norway's Svalbard archipelago (Spitsbergen) in order to limit German interest in its coalfields (despite Norwegian opposition). Consequently, the German presence on the Arctic islands was limited to the manning of a few weather stations. In a different and more dramatic form of defensive ecocide the Yellow River was deliberately flooded in 1938 by the Chiang Kai-shek government in China in resisting the Japanese invasion of Manchuria. In doing so the Chinese succeeded in slowing down the invaders, by creating a bigger barrier and destroying potential food supplies, but did so to the cost of hundreds of thousands of their own citizens' lives. More recently defensive ecocide, more spiteful than strategic, featured in the Gulf War when Saddam's forces set fire to hundreds of oil wells whilst retreating from Kuwait in 1991, some of which burned for several months. Oil was also deliberately leaked into the Persian Gulf by the Iraqi troops.

31.2.3 Collateral damage: Indirect military environmental degradation

Environmental degradation due to war can also occur more indirectly as a result of the general destruction of battle. The aforementioned Manchurian war was, in fact, a multi-faceted environmental (and human) horror show. The Japanese used chemical and biological weaponry in a brutal invasion and then, once their defeat in the Second World War became apparent, abandoned remaining munitions across northeastern China to prevent them falling into Allied hands. Shells containing chemicals such as mustard gas and phosgene were dumped in fields, lakes, and rivers prompting a slow-burning disaster which has killed or disabled thousands of Chinese in the decades that have followed. Elsewhere during World

¹⁵ Peluso and Vandergeest, 2011

¹⁶ Weinstein, 2005, 715

War Two ‘total war’ mass bombing campaigns were of such a scale and nature that environmental catastrophes were, of course, inevitable.

In spite of the revival of limited and just war principles since World War Two and the Cold War ‘collateral ecocide’ has still been apparent in the supposedly more strategic strikes of recent conflicts. In 2006, for example, between 20,000 and 30,000 tonnes of oil polluted a large stretch of the Eastern Mediterranean Sea and coastline after Israel bombed the Jiyeh power station during the Lebanon War against Hezbollah.¹⁷ Similarly, during the 1999 Kosovan War NATO included amongst its strategic bombing targets several chemical plants and fossil fuel facilities knowing this would inevitably pollute waterways and the atmosphere. The campaign led to the significant pollution of the Danube and also released many toxic and carcinogenic chemicals into the ground and air. Most notorious was the targeting of the major Serbian petrochemical and fertilizer plants at Pancevo. NATO acknowledged the environmental consequences of these strikes but asserted that military necessity justified some collateral fall-out since the plants were a key source of the Serb regime’s military power. The advent of radioactive and highly persistent chemical ‘depleted uranium’ to coat munitions shells has also served to add a new form of long-term pollution to the spoils of recent wars, such as in Kosovo and Iraq. More generally, greenhouse gasses, chlorofluorocarbons, mercury, sulphur dioxide and nitrous oxide emissions are also now part of the common collateral damage of contemporary bombing campaigns.¹⁸

Battlefield destruction can also render arable land and other natural resources useless to humanity and other life forms. In addition to the effects of pollution and defoliation, millions of craters today mark the agricultural belts of Vietnam and Laos as a consequence of a combination of deliberate and collateral military actions by the US in the 1960s. Many French and Belgian World War One battlefields remain barren today a century on. Resource depletion through over-utilization is another typical consequence of war. The appropriation of food and fuel by invading troops is the most predictable form of this phenomenon but excessive strain can also be put on the home resources of invading forces.

Environmental degradation can also occur more indirectly as a result of sudden influxes of refugees fleeing war. For example, 38 square kilometres of forest in the Kivu Province of Democratic Republic of Congo were lost within three weeks of the arrival of Rwandan refugees fleeing genocide in the mid-1990s.¹⁹ As well as being worsened deliberately, deforestation can also be accelerated as a consequence of countries literally rebuilding after a conflict. Many Iraqi city trees were felled for fuel in the aftermath of the US-led invasion of 2003 and it is also known that Afghan water supplies and vegetation were seriously damaged and depleted following the onset of war in 2001.²⁰ Wild animals are also frequent casualties of war. Gorilla numbers in the Democratic Republic of Congo are known to have fallen as a consequence of that country’s persistent civil conflict, both through direct killings and more indirectly as a result of the destruction of their habitat through deforestation.²¹

Fig. 1 Timeline of some major incidences of environmental damage in modern war

¹⁷ CoE, 2011

¹⁸ Sanders, 2009, 71-2

¹⁹ UNEP, 2002

²⁰ CoE, 2011; Sheehan, 2003

²¹ Kalpers, 2001

1810 Peninsular War: British and Portuguese in defending against French invasion
 1812 'Retreat from Moscow': Russians defending against French invasion
 1812-13 South American War of Independence: Argentine patriots defending against Spanish / Royalists
 1817-18 Sri Lankan Great Rebellion- British colonial suppression of uprising
 1864 'March to the Sea': US Unionists (Sherman) against Confederates in the Civil War.
 1867-69 US (Sherman) extermination of the Buffalo to subjugate native Americans
 1898-1902 US-Philippine War: US colonial suppression of uprising
 1900 2nd Boer War: British against Boers in power struggle over South Africa
 1922 Greco-Turk War: Greeks in Western Anatolia in retreat
 1938 Manchurian War: Chinese flooding in defending against Japanese invasion
 1941 World War Two: Soviets in defending against German invasion
 1941 World War Two: British in Spitsbergen to render useless to German invasion
 1944-5 World War Two: Germans in retreat from Soviets in Northern Norway and Finland
 1945 Manchurian War: Japanese dumping of chemical weapons
 1952 'Malayan Emergency': British and Malayan government suppressing leftist insurgency
 1962-69 Vietnam War: US intervention against leftist insurgency
 1967 Indonesia government suppression of insurgencies in Borneo and West Kalimantan
 1980-90 Salvadoran Civil War: government suppression of leftist insurgency
 1981-2 Guatemalan Civil War: government suppression of leftist insurgency
 1990 Gulf War: Iraq (Saddam) in retreat from Kuwait
 1991 Iraqi government (Saddam) suppression of uprising by 'Marsh Arabs'
 1999 East Timorese secession from Indonesia: pro-government militia in retreat
 1999 Kosovan War: pollution from NATO bombing of Serbia
 1999-2009 Chechen Wars- pollution from Russian bombing
 2003-08 Darfur Crisis: Sudanese government and Janjaweed militia against Darfurians
 2006 Lebanon War: pollution from Israeli bombing
 2006-09 Sri Lankan Civil War: government suppression of Tamil insurgency
 2011 Libyan Civil War: Government (Gadaffi) suppression of rebels in Benghazi.
 2014-15 Syrian Civil War: Insurgents (ISIS) river diversion against government and slashed earth v Kurds.

31.3 The Militarization of the Environment

It is not just actual war which can prompt environmental damage but the whole phenomenon of defence and military preparation. The scale and nature of the Cold War greatly intensified the traditional ecological side-effects associated with this. The rise of nuclear weapons testing, mass military exercises and the global proliferation of military bases came with significant costs, many of which are still being counted. The Soviet testing of nuclear weapons and dumping of the waste from this was particularly extensive in its peripheral regions such as the northern reaches of Siberia. At least 130 tests were carried out in the Soviet Arctic between 1955 and 1970, prompting landslides and depositing radioactive materials in the soil, water, ice and air.²² Environmental damage was also inflicted on parts of the Soviet empire during the Cold War. For example, Soviet military camps occupied nearly 2% of Estonia and left behind significant water and soil pollution in that country on their withdrawal, three years after independence in 1994. No compensation for pollution by oil, cadmium, lead, uranium and general waste was ever paid in a clean-up that the Estonian government claimed cost them \$4billion.²³

US militarism at home and particularly in its overseas outposts has also carried significant environmental costs. Again in the Philippines, realpolitik and imperial neglect saw

²² Glasby & Voytekhovsky, 2010, 20

²³ Auer, 2004, 119-121

the Subic Bay naval base become the scene of a notorious ecological disaster which featured the wilful pollution of allowing human waste to be dumped directly into the sea without sewage treatment. The Philippine government claimed compensation for such pollution but the Americans never payed and abandoned the base in 1991 whilst pointing to the 1947 Military Bases Agreement between the two countries absolving them of any legal responsibility. In domestic politics American military exceptionalism is also apparent with the Pentagon exempted from being reported on by the Environmental Protection Agency and, hence, never having been held accountable for known instances of pollution by solvents, fuels and munitions near military bases well above state limits for other industries.²⁴

In a different facet of ecocide the military securitization of the environment can sometimes take the form of a kind of ‘nationalization of nature’ with wild ‘badlands’ tamed by force. Tropical woodlands have regularly featured in conflicts as both the arenas and symbols of resistance. Much of the resistance to the Japanese invasions in South East Asia during the Second World War was jungle-based and this also came to be the stage for insurgencies against European colonial rule after 1945. Hence, as well as carrying out deforestation for tactical reasons, many governments consciously came to construct their woodland as ‘jungle’ so as to invoke notions of lawlessness, danger and insecurity that required the assertion of sovereign control through enforced land purchases, coerced population movements and the establishment of permanent military bases.²⁵ This was very much the case with the aforementioned governmental deforestations in Indonesia and El Salvador.

In a more general sense it should also always be remembered that there is a significant ecological side-effect to the sheer existence of the military-industrial complex. Sanders, for example, has estimated that the US military consumes a quarter of the world’s jet fuel and is responsible for around 5% of global greenhouse gas emissions.²⁶

31.4 History of International Law on Military Ecocide

Fig. 2 Timeline of International Law and military ecocide

²⁴ Schettler, 1995

²⁵ Peluso and Vandegeest 2011

²⁶ Sanders, 2009, 50,61,68.

C3 rd – C13 th :	Evolution of Just War principles within Christianity and Islam proscribe excessive military damage
1868:	Declaration of St Petersburg by European powers outlawing explosive bullets includes agreed principle that only military targets should be considered legitimate.
1899:	First Hague Convention on Laws of War- article IV (ii) outlaws use of poison gas by great powers (except US)
1907:	Second Hague Convention- article 23(g) outlaws ‘wanton destruction’
1925:	Geneva Protocol to Hague Convention outlaws chemical weapons
1948:	Nuremburg War Trials establish scorched earth tactics without clear military purpose are illegal.
1969:	General Assembly Resolution 2603 states that all military applications of chemicals (including defoliants) is contrary to the 1925 Geneva Protocol.
1976:	Convention on the Prohibition of Military or any Hostile Use of Environmental Modification Techniques (ENMOD)
1977:	Geneva Conventions on War Protocol I Articles 35 and 55 outlaw ‘widespread, long-term and severe’ military damage to the environment
1981:	UN General Assembly Resolution 36/150 condemns Israeli canal plan because of its implications for Jordan in the context of their dispute.
1990:	Cairo Declaration on Human Rights in Islam Resolution Article 3b outlaws military destruction of crops or livestock
1991:	UN Security Council Resolutions 687 and 692 prosecute Iraq government for environmental destruction in invasion of Kuwait.
1992:	UN General Assembly Resolution 47/37 states that military ecocide is contrary to International Law
1992:	UN Conference on Environment & Development- Rio Declaration Principle 24 affirms that the environment should be respected in warfare.
1993:	Chemical Weapons Convention outlaws use and possession of chemical weapons
1995:	Organization of African Union Conference of Ministers of Health Resolution 14(5) outlaws destruction of crops in war.
1999:	International Criminal Court Statute 8(2) b (iv) lists excessive damage to the environment as a war crime

A body of International law proscribing military ecocide has steadily evolved since the 1970s but there is little precedent for enforcing this legislation. Explicit references to the environment were not made in the war laws of the Geneva or Hague Conventions prior to the 1970s, despite their extensive evolution from the 19th Century. The second Hague Convention of 1907, though, does declare as illegal military methods which; ‘destroy or seize the enemy's property, unless such destruction or seizure be imperatively demanded by the necessities of war’. In more general terms, the centuries old tradition of Just War, upon which the Geneva and Hague Conventions are built, can be seen as helping safeguard the environment since the notion of ‘limited war’, which proscribes the escalation of conflicts beyond their specific purposes and acts of pure retribution and spite, logically must apply also to the destruction of nature beyond military necessity. International arms control law can similarly be suggested to proscribe ecocide, in principle at least. The 1925 Geneva Protocol on Chemical Weapons (and its effective contemporary successor the 1993 Chemical Weapons Convention), whilst driven by humanitarian rather than environmental concerns, in outlawing the military use of toxins inherently makes wilful pollution illegitimate.

That the wanton destruction of land (and buildings) is contrary to international law was confirmed at the Nuremberg war trials at the close of the Second World War. German General Lothar Rendulic was prosecuted by the International Military Tribunal for his

command of scorched earth raids in Finnmark, Norway when in retreat from the Russian army. Rendulic was actually acquitted, as the Tribunal accepted that he genuinely believed the destruction to be militarily-justified, but a precedent that such acts could amount to an international crime was, nonetheless, established.²⁷ Another German General, Alfred Jodl, was convicted and hanged for several war crimes amongst which was culpability for ordering scorched earth tactics in Finnmark for which no military justification could be found. The UN War Crimes Commission at Nuremberg also confirmed that German plundering of Polish forestry constituted a war crime under Article 55 of the 1907 Hague Convention (case 7150).²⁸ Military ecocide was more acute in the ‘War in the East’ but national interest and an early manifestation of Cold War realpolitik ultimately trumped humanitarian concerns when it came to prosecuting Japanese war crimes for this. The Tokyo War Crimes Trials did not properly address the Japanese deployment and dumping of chemical and biological weapons in Manchuria, largely because of the US’s desire to keep such knowledge to themselves and out of the hands of the Soviet Union.

Japan’s actions in Manchuria were clearly counter to the Hague Convention and Geneva Protocol but the will to implement these instruments was not apparent, as it also had not been a few years earlier when appeasement saw Mussolini’s chemical assault on Abyssinia essentially overlooked by the League of Nations in 1935. The effective death knell of the Geneva Protocol came when it became apparent that the huge advances in chemical synthesis in the 1940s and ‘50s had rendered it redundant by the time an attempt came to prosecute the US for Operation Ranch Hand on the basis of a 1969 General Assembly request. The US were not a party to the protocol but had indicated a willingness to ratify (and later did so in 1975). Nevertheless in their defence US Secretary of State Rogers stated that the 1925 Geneva Protocol did *not* cover chemical herbicides on the grounds that the chemicals used were not known in 1925 and that their military aim was to kill plants not humans.

Despite not producing a prosecution Operation Ranch Hand did prove the catalyst for the emergence of international law specifically dealing with military ecocide as East-West relations improved with the US withdrawal from Vietnam. In the spirit of detente, the Americans and Soviets actually cooperated in formulating a draft for what would become the 1976 Convention on the Prohibition of Military or any Hostile Use of Environmental Modification Techniques (ENMOD Convention). Moscow, able to capitalize on the controversy that had emanated from Operation Ranch Hand, initiated the idea of an ‘ecocide convention’ and Washington, having terminated the strategy in 1971 and then the whole war four years later, had no strategic need to risk the reputational loss of allowing the Soviets to claim the moral high ground. ENMOD was adopted by Resolution 31/72 of the United Nations General Assembly in 1976 and opened for signature the following year. Parties to the ENMOD Convention undertake not to use environmental manipulation that would have ‘widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party’ (Article I).

Simultaneous to the negotiation of ENMOD a Protocol to the Geneva War Conventions dealing with ecocide was also agreed. Protocol I additional to the Geneva Conventions, agreed in 1977, includes two Articles dealing directly with the dangers that modern warfare poses for the environment.

²⁷ Boas & Schabas, 2003, 293

²⁸ Brady & Re, 2018, 116

Article 35 - Basic rules

3. *It is prohibited to employ methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment.*

Article 55 - Protection of the natural environment

1. *Care shall be taken in warfare to protect the natural environment against widespread, long-term and severe damage. This protection includes a prohibition of the use of methods or means of warfare which are intended or may be expected to cause such damage to the natural environment and thereby to prejudice the health or survival of the population.*

2. *Attacks against the natural environment by way of reprisals are prohibited.*

By 2018 Protocol I had been ratified by some 174 states but notable amongst non-parties were the US, India, Israel, Iran, Pakistan, Turkey and Libya. Far less universal than Protocol I, ENMOD by 2018 had 78 parties (though this does include the United States).

Taken together parties to the twin ecocide instruments are prohibited from attacking, destroying, removing, or rendering useless objects indispensable to the survival of the civilian population, such as foodstuffs, agricultural areas and drinking water supplies. Protocol I is the more ecological of the twin instruments since its aim is to protect the environment from war whilst ENMOD is really humanitarian as it seeks to prohibit the use of the environment as a weapon in war. ENMOD is limited by the stipulation that such manipulation of the environment must be 'widespread, long-lasting or severe' ('WLS') to be deemed illegal, which clearly is open to wide interpretation. Nevertheless, it has the advantage of being worded in such a way that gives it the potential to outlaw war-making methods not yet devised.²⁹ Hence the sort of defence used by the US against prosecution for Operation Ranch Hand under the Geneva Protocol would not stand up in the event of a country being prosecuted under ENMOD (although this could not happen in this particular instance since the Convention does not permit retrospective jurisdiction). Indeed, it was international concern that the US strategy in Vietnam could evolve to include tactics such as deliberate flooding and the manipulation of the weather that did much to inspire ENMOD.

The general multilateral optimism that permeated international relations in the aftermath of the Cold War reinvigorated international efforts to prevent ecocide and this manifested itself in response to the oil pollution that marked the Gulf War. Hence, in 1991, the Security Council held Iraq liable for ecocide in their invasion of Kuwait through the adoption of Resolution 687, confirming that they were:

*liable under international law for any direct loss, damage, including environmental damage and the depletion of natural resources, or injury to foreign Governments, nationals and corporations, as a result of Iraq's unlawful invasion and occupation of Kuwait.*³⁰

On the basis of this the Kuwaiti government and others filed claims against Iraq for damages to natural resources and related public health concerns. The UN Compensation Commission (UNCC), comprising 59 lawyers from 40 states, was subsequently established by Security Council Resolution 692 in May 1991 to adjudicate the amount of damages payable by Iraq.

²⁹ Roberts & Guelff, 2000, 407- 418

³⁰ S/RES/687 (1991) 8 April

Three Commissioners on a panel assessing environmental damages subsequently distributed compensation to numerous individual, corporate and state claimants including the governments of Iran, Jordan, Saudi Arabia and Syria in addition to Kuwait.³¹ Hence the Saddam government became the first and, to date, only international entity to be successfully prosecuted for military ecocide.

As a corollary of this Iraqi prosecution, the UN General Assembly in November 1992 adopted a resolution on ‘The protection of the environment in time of conflict’, which stated that the; ‘destruction of the environment not justified by military necessity and carried out wantonly, is clearly contrary to international law’.³² In the 1996 Nuclear Weapons Case, an advisory opinion of the International Court of Justice on the legality of these weapons, further credence was given to the notion that military ecocide was contrary to customary international law. Written statements to this effect were provided for the court by governments including: Sweden, New Zealand, Samoa, Marshall Islands, Solomon Islands, Zimbabwe, Rwanda, Lesotho, Ukraine and Iran. In further developments, in 1992 and 1993, the UN Secretary General submitted two reports on the protection of the environment which paved the way for a General Assembly resolution mandating the International Committee of the Red Cross (ICRC) to encourage the inclusion of their guidelines on the protection of the environment during conflict in military manuals.³³ Consequently, many countries have adapted ICRC drafted principles into their rules of engagement for armed forces.

A further legal milestone for ecocide came with the adoption of Article 8(2)(b)(iv) in the statutes of the International Criminal Court in 1999, which lists as a war crime:

intentionally launching an attack in the knowledge that such attack will cause ... widespread, long-term and severe damage to the natural environment which would be clearly excessive in relation to the concrete and direct overall military advantage anticipated.

However, whilst this makes individual criminal responsibility for ecocide clearly established in international law, the statute suffers from the same lack of precision as the Geneva Protocol and ENMOD in terms of determining what constitutes ‘excessive damage’.³⁴ Hence, to date, no individual or government has been prosecuted specifically for military ecocide under the Hague Convention, ENMOD or through the ICC.

In illustration of the difficulties inherent in establishing the burden of proof, some cases of military ecocide that have been brought have failed to generate prosecutions. A case was presented to the International Criminal Tribunal for Yugoslavia (ICTY) (a special *ad hoc* UN court set up to try crimes committed in the wars of the Yugoslav secession) by the Serbian government against NATO bombing raids in the Kosovan War but was dismissed by the ICTY committee on the basis that it did not exceed the WLS threshold. Similarly, the Eritrea-Ethiopia Claims Commission, set up in 2000 as part of the Algiers Peace Agreement ending the conflict, rejected a claim from Addis Ababa for compensation from the Eritreans for damages to natural resources on the grounds of insufficient evidence. However in doing so, the Commission did not refute Ethiopia’s right to make such a claim.³⁵

³¹ Payne 2016, 725-6

³² A/RES/47/37

³³ A/RES/49/50

³⁴ Peterson, 2009; Jha 2014, 213-4

³⁵ Plakokefalos, 2017, 263.

In other areas international laws that could potentially limit ecocide military exceptionalism is apparent. The 1993 Prevention of Major Industrial Accidents Convention, for example, does not apply to military installations. Similarly, military vessels are excluded from the large body of maritime safety and pollution laws nurtured by the UN's International Maritime Organization. The Arctic Council, an intergovernmental organization that has produced a range of soft and hard laws on environmental and shipping issues covering the region since the mid-1990s, also has it written into its rules of procedure that military matters are off the table. It is much the same story across the world with 'national security' invariably trumping health and safety or environmental concerns.

Reflecting international relations as a whole, early 1990s international solidarity against Saddam has proved to be something of a false dawn for prosecuting military ecocide and the efforts of campaigners and UN experts have hence sought to improve the implementation of existing legislation and develop new instruments. Through its Environmental Cooperation for Peacebuilding programme, the United Nations Environment Programme (UNEP) has worked with the International Committee of the Red Cross in seeking to strengthen international laws protecting the environment during times of conflict. This work came together and was showcased in 2009 in an International Day for Preventing the Exploitation of the Environment in War and Armed Conflict on the 6th November. The event emphasized the need to clarify and enforce existing laws and made some particular recommendations including the following: (1) Give greater clarity to the 'widespread, long-term and severe' (WLS) threshold; *severe* should be taken to mean environmental impacts over several hundred square kilometres and *long term* should be considered to be a period of several months or over a season. (2) Establish new laws to demilitarize important ecosystems, which should be determined at the outset of conflict. (3) Laws should deal with civil as well as inter-state wars. (4) Environmental crimes should be referable to The Permanent Court of Arbitration and be more directly included in the ICC Statutes.

Alongside these legal developments, a campaign for a more comprehensive and unambiguous UN treaty on ecocide, picking up the mantle from Westing in the early 1970s, has gathered momentum over recent years, led by British lawyer Polly Higgins. This campaign, launched in 2008, seeks to end the ambiguities around military (and industrial) necessity by establishing ecocide as a crime under customary international law (like genocide and torture) and more clearly opening it up to ICC prosecution. Celebrities, politicians and the Morales government of Bolivia are amongst those who have pledged their support for this cause which has set a deadline of 2020 for the codification of a new treaty.³⁶ Higgins submitted this proposal to the UN's International Law Commission in 2010 and they have subsequently produced three reports which have been presented at the UN General Assembly. The third report, presented in 2016, made the case for a single instrument to address military ecocide unambiguously:

...there exists a substantive collection of legal rules that enhances environmental protection in relation to armed conflict. However, if taken as a whole, this collection of laws is a blunt tool, since its various parts sometimes seem to work in parallel streams. A holistic approach to the implementation of this body of law seems to be lacking at times. In addition, there are no existing or developed tools or processes to

³⁶ Higgins, 2010

*encourage States, international organizations and other relevant actors to utilize the entire body of already applicable rules.*³⁷

Higgins simultaneously was instrumental in the setting up of the ‘End Ecocide in Europe’ campaign from 2012 which seeks to get the EU Commission to draft a Directive criminalizing corporate and military damage to the environment. The movement was the first to take advantage of a new EU participatory democracy scheme, the European Citizens Initiative, under which signatures can be gathered to trigger new policies to be considered for proposal by the Commission in Brussels. The petition was discussed in the European Parliament in 2015 and continues to be advocated by Greens and other political groups in Brussels.

31.5 Normative Progress in criminalizing military ecocide

The campaign aim of a UN Treaty on ecocide by 2020 looks like an ambition unlikely to be achieved but the popular support and attention gathered by this movement is maybe as important as establishing a clear legal platform for prosecution. As previous chapters have shown, the precedent for enforcing the conventions on genocide, torture and war crimes against humans is limited but the near universal acknowledgement of these as offences has still made them less likely to occur today than in the ‘total war’ era of the 20th Century. Implementing moral international laws is inherently difficult in a sovereign state system but few would deny that overall progress has been made in advancing both human rights and environmental principles over recent decades. Huge gaps and problems with implementation remain but sovereign states have come to be restrained on the basis of humanitarian and ecological values as they have crystallized in the form of international treaties and the ‘soft law’ rules of looser international regimes. The principle that military ecocide is unacceptable has, in line with this, come to be much better acknowledged. This has been reaffirmed at several high profile intergovernmental fora, including at the UN Conference on the Environment and Development (UNCED) in 1992, where Principle 24 of the Rio Declaration unambiguously states that; ‘warfare is inherently destructive of sustainable development. States shall therefore respect international law providing protection for the environment in times of armed conflict and cooperate in its further development, as necessary.’

Whilst the advent of the 2nd Cold War in the 1980s slowed the progress in advancing the proscription of ecocide made in the détente era, some normative evolution still occurred in relation to the Arab-Israeli dispute. Long before New World Order optimism had come to inform international relations General Assembly Resolution 36/150 in 1981 condemned Israeli plans to construct a canal linking the Mediterranean to the Dead Sea, because of its environmental impact on Jordan (as well as the political ramifications for Palestinian independence), with only the US and Israel voting against. On the basis of this UNEP's Governing Council made several statements condemning Israeli actions that caused environmental damage to their Palestinians and their Arab neighbours and reaffirmed the General Assembly position on the canal in 1983.

Post-Cold War optimism, though, boosted the normative evolution of proscribing military ecocide by advancing the *idea* of environmental protection in war and UNEP have been central to this. The Disasters and Conflicts Programme offers services and advice on: post-crisis environmental assessment, post-crisis environmental recovery, environmental

³⁷ ILC, 2016

cooperation for peacebuilding and disaster risk reduction which have been utilized in Afghanistan, The Congo, Sierra Leone, Nigeria and Ukraine. UNEP also lead ENVSEC, an initiative established in 2003 linking it with the United Nations Development Programme, Organization for Security and Cooperation in Europe and other intergovernmental organizations in researching the environmental impacts of war. In 2006 for example, at the request of the Lebanese government, ENVSEC carried out a scientific assessment of the environmental impact of the Israeli invasion of 2006 and submitted a detailed report just four months after the ceasefire.³⁸

Intergovernmental fora outside of the UN system have also taken up the cause of exposing and stigmatizing military ecocide. The Parliamentary Assembly of the Council of Europe have called for the environment to be more explicitly cited in Geneva Protocol I and argued that the conflicts in Bosnia-Herzegovina and Chechnya should have seen prosecutions mounted on the basis of that legal instrument.³⁹ This body, representing all of Europe bar the dictatorship of Belarus, have also called for the general strengthening of existing international legislation on ecocide and for greater funding for UNEP and ENVSEC in the carrying out of environmental impact assessments on conflict zones.

Whilst the Iraqi compensation to Kuwait represents the one clear legal ecocide case we can see some small steps being taken by other culpable but unprosecuted governments to make amends for historic environmental war crimes. The Japanese government in 1997, having denied knowledge of the chemical weapons used in Manchuria for over half a century, finally entered into talks with the Chinese government over how to remedy the damage. This led to a 1999 memorandum committing Tokyo to a plan to locate and destroy some 700,000 abandoned weapons at a cost of over \$500 million that they continue to work on.⁴⁰

The US have also taken some steps to atone for Operation Ranch Hand, whilst accepting no legal liability. In 1975, on the full termination of the Vietnam War, Executive Order 11850 renounced the military use of herbicides ‘as a matter of national policy’. Nevertheless, thirty year on from this, the US position was still that; ‘there is no basis for any of the claims of plaintiffs under the domestic law of any nation or state or under any form of international law’.⁴¹ However, the persistence of a campaign by Vietnamese victims and the fact that US war veterans suffering from dioxin exposure have received compensation from the chemical manufacturers has made this a difficult position to sustain and maintained pressure on Washington. Hence in 2012, whilst still not accepting liability, the US initiated a clean-up of ecological damage by dioxin in Vietnam. Washington gave \$43 million to two American firms working in conjunction with the Vietnamese Defence Ministry in an operation Hanoi hope to complete by 2020. In 2016 the US also agreed to pay for the clean-up of unexploded ordnance in Laos. Partial atonement was also apparent in 2012 when the US returned to Subic Bay in the Philippines in 2015 in preparation for the re-opening of their naval base. However, in re-establishing military relations with their former colony, the Americans were now cooperating with an independent government that was not willing to accept being literally ‘crapped on’ as a price of their protection. The Subic Bay Metropolitan Authority now provides Philippine oversight of the US naval presence and has helped highlight concerns at the dumping of waste and even hosted maritime pollution conferences.

³⁸ UNEP, 2007

³⁹ CoE, 2011

⁴⁰ BBC, 2004

⁴¹ USDC, 2005, 233

Realpolitik could be said to underpin these cases of atonement since 21st Century US foreign policy still values South East Asian influence and better Japanese relations with Beijing make economic and security sense, but moral pressure has undoubtedly played a part. Global civil society has been influential with groups like the Alliance for Bases Clean Up (ABC) (formerly known as the People's Task Force for Bases Clean Up (PTFBC)) and the Vietnamese Association of Victims of Agent Orange (who have led the legal campaign) presenting the US with a reputational incentive to act. The Manchuria case presents perhaps the clearest illustration of how normative forces can influence governments both by shaming and encouragement. The Chinese came to throw their weight behind the Chemical Weapons Convention by recognizing that abandoning their own small stockpile (a condition of ratification) would be a price worth paying in order to remedy a festering environmental and health sore and also secure a moral victory over their old adversary. At the same time the Japanese, as champions of arms control on the international stage, felt compelled to confront their past demons and make some reparation for the sins of their grandparents.⁴²

It is no coincidence that political ecology rose to prominence at the same time as the backlash against the US intervention in Vietnam and the growth of the powerful green social movement since then has given impetus to the anti-ecocide campaign. Environmental conservation is now part of the political mainstream in most developed democracies. The populism of this perspective is increasingly apparent also in non-democratic settings, with a clear example being the implementation of a range of anti-pollution measures by the Chinese government over recent years in the face of public protest at the growing levels of smog in many cities. We can also see evidence from political evolution in many states that public demands on government are not always self-serving and anthropocentric. Ecocentrism has been apparent in much domestic policy and law on the environment since the US responded to Rachel Carson's critique and restricted the use of DDT in the 1960s, even though the use of the organochlorine as a pesticide had been successful in increasing food yields. More specifically the criminalization of ecocide is making inroads in domestic law. In recent years domestic courts, such as in France and Belize, have passed verdicts against corporations for 'industrial ecocide'.⁴³ Bolivia in 2011 enacted a 'law of mother earth' giving legal protection to their environment and, three years earlier, Ecuador amended their constitution to include this. Guatemala in 2015 then became the first state to establish an 'Environmental Crimes Court' specifically to defend nature.

The maturation of law and politics in this way can also be observed at the global level as the globalization of ideas and ethics advances, aided in particular by global civil society and global epistemic communities of transnational experts usually working within the UN system. The existence of 'global ethics' can be seen in the development of human rights law and in many other dimensions of global law and policy, as seen throughout this volume. The reform of the World Bank, from being an advocate of 'unreconstructed liberalism' into a more socially and environmentally-oriented set of institutions, is a clear example of such normative change. The World Bank now routinely considers the environmental or social cost of any development project, as well as its economic viability, before granting it its seal of approval. This metamorphosis occurred through the development of a different epistemic community working within the system of organizations making up the 'bank', largely in response to civil society criticism. An emergent global discourse has promoted the normative change that has seen principles like a right to health and concrete aims such as the Sustainable Development Goals become established on the international stage not directly

⁴² Frieman, 2004

⁴³ TOTALSA v France 2008; Belize v Westervhaven 2009.

equitable with national interests. Promoted by an epistemic community of scientists, lawyers and expert campaigners, respected as acting outside of parochial state interests by an ever more enlightened global public, environmental rights can be understood as part of this progression. Whilst it is hardly likely to be eradicated, it is difficult to imagine anything other than there coming to be more international awareness of and an increased desire to restrict military ecocide.

31.6 Conclusions

Military necessity will probably always be cited as trumping environmental concerns during times of crisis on the grounds of national interest, but this is not to say that moral restraints cannot advance. As illustrated in previous chapters, whilst democracy and human rights continue to be compromised on the grounds of military necessity International Humanitarian Law (IHL) has nonetheless advanced overall in recent decades. Just War principles continue to be sidestepped in contemporary conflicts but they have, nevertheless, greatly advanced in the years since the end of the Cold War. In addition, globalization makes national reputations more important than ever and exposes illegality and immorality more easily than ever. In this way moral laws and norms tend not to unravel once established. The recent US and Japanese ecocide clean-up operations also show that the passage of time, both in terms of the accumulation of moral pressure in support of victims and in creating 'distance' for the perpetrator, can permit steps to be taken in making amends for historical crimes. Inevitably, governments will continue to carry out acts of ecocide if they feel they can get away with it but they are increasingly unlikely to get away with it, even if only reputationally rather than legally. As with IHL, though, the codification of unambiguous legal restraints on military ecocide would go further in strengthening nations' defences.

However, as is the case in many facets of environmental politics and Public International Law, the high profile military ecocide catastrophes are but the tip of the iceberg. We may be unlikely to witness again anything comparable to Operation Ranch Hand or the burning oilfields of the Persian Gulf but beneath the surface of much international attention lies a huge military-industrial complex eating up the earth's resources and spitting and belching out what it does not need. Establishing ecocide as a war crime is important but only part of the fight to protect nature.

References

- Auer, M. (2004) *Restoring Cursed Earth: Appraising Environmental Policy Reforms in East Europe and Russia*, Rowman & Littlefield, Oxford
- Boas, G. & Schabas, W. (2003) *International Criminal Law. Developments in the Case Law of the ICTY*, Martinus Nijhoff, Leiden
- Bolivia (2011) *Law of Mother Earth*, Law 071.
- Brady, H. & Re, D. (2018) 'Environmental and Cultural Heritage Crimes: the Possibilities Under the Rome Statute', in M. Bose, M. Bohlander, A. Klip & O. Lagodny, *Justice*

- Without Borders: Essays in Honour of Wolfgang Schomburg, Brill Nijhoff : Leiden: 103-136.
- BBC (2004) WW2 Bombs Unearthed in China June 19 <http://news.bbc.co.uk/1/hi/world/asia-pacific/3822007.stm> (accessed 31/01/2016)
- Carson, R. (1962) *Silent Spring*, Penguin, Harmondsworth
- Connor, S. & Thomas, A. (1984) 'How Britain Sprayed Malaya With Dioxin' in *Sahabat Alam Malaysia, Pesticide Dilemma in the Third World. A Case Study of Malaysia*.
- Cook, R.E., Haseltine, W., & Galston, A.W. 1970. 'What have we done to Vietnam?' in: Weisberg, B. (ed.). 1970. *Ecocide in Indochina: the ecology of war*, Canfield Press, San Francisco: 89-94.
- CoE (2011) 'Armed Conflicts and the Environment', Report of the Committee on the Environment, Agriculture and Local and Regional Affairs, Doc 12744 October 17th; Parliamentary Assembly of the Council of Europe, Strasbourg.
- Ecuador (2008) 'Rights for Nature', Constitution, adopted September 28th
- Franklin, H. (2003) 'Agent Orange and Cancer. An Overview for Clinicians', *Environmental Carcinogens* 53(4): 245-255.
- Frieman, W. (2004) *China, Arms Control and Non-Proliferation*, Routledge, London & New York
- Geneva (1977) Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), 8 June 1977.
- Glasby, G. & Voytekhovskiy, Y. (2010) 'Arctic Russia: Minerals and Resources' *Geoscientist* 8.
- Hay, A. (1982) *The Chemical Scythe- Lessons of 2,4,5,T and Dioxin*, Plenum Press, New York
- Higgins, P. (2010) *Eradicating Ecocide: Laws and Governance to Prevent the Destruction of our Planet*, Shephard-Walwyn, London
- ILC (2016) Third report on the protection of the environment in relation to armed conflicts Submitted by Marie G. Jacobsson, Special Rapporteur, United Nations General Assembly June 3rd.
- Jensen, E. (2005): "The International Law of Environmental Warfare: Active and Passive Damage During Armed Conflict." *Vanderbilt Journal of Transnational Law*. Vol.38:145.
- Jha, U. (2014) *Armed Conflict and Environmental Damage*, Vij books, New Delhi
- Kalpers, J. (2001) "Armed Conflict and Biodiversity in Sub-Saharan Africa: Impacts, Mechanisms and Responses", in *Armed Conflict and Biodiversity in Sub-Saharan Africa*. Washington, D.C.: Biodiversity Support Program.
- Laurier-Graham, S. (1993) *The Ecology of War: Environmental Impacts of Weaponry and Warfare*, Walter & Co., New York
- National Academy of Sciences (1974) *The Effects of Herbicide in South Vietnam, Part A Summary and Conclusion*, Washington DC: NAS.
- Netherlands (2006) *Policy Agenda 2006*. Ministry of Foreign Affairs.
- Payne, C. (2016) 'Legal Liability for Environmental Damage. The United Nations Compensation Committee and the 1990-1991 Gulf War' in C. Bruch, C. Muffett and S.

- Nichols Governance, Natural Resources and Post-Conflict Peacebuilding, Routledge, London.
- Peluso, N and Vandergeest, P. (2011) 'Taking the Jungle Out of the Forest' in Peat, R., Robbins, P & Watts, M. *Global Political Ecology*, Routledge, London & New York
- Peterson, I (2009) 'The Natural Environment in Times of Armed Conflict: A Concern for International War Crimes Law?', *Leiden Journal of International Law* 22(2): 325-343.
- Plakokefalos, I. (2017) 'Responsibility for Environmental Damage in Jus Post Bellum. The Problems of Shared Responsibility' in Stahn, C., Iversen, J., & Easterday, J. (2017) *Environmental Protection and Transition from Conflict to Peace*, Oxford University Press, Oxford
- Roberts, A. & Guelff, R. (2000) *Documents on the Laws of War* 3rd ed, Oxford: Oxford University Press.
- Sanders, B. (2009) *The Green Zone: the Environmental Costs of Militarism*, Oakland: AK Press.
- Schettler T. (1995). *Reverberations of Militarism: Toxic Contamination, the Environment, and Health. Medicine and Global Survival*, 2(1).
- Sheehan, N. (2003) "The Aftermath of an Invasion: A field report from Nasiriyah," *Warchild*, 1 May.
- UNEP (2002) *GEO-3: Global Environment Outlook 3*. London: Earthscan.
- UNEP (2007) *Lebanon: Post Conflict Environmental Assessment*, Nairobi: UNEP.
- USDC (2005) "'Agent Orange' Product Liability Litigation', Memorandum Order and Judgement, MDL no. 381 March 10th New York: United States District Court.
- Weinstein, T. (2005) 'Prosecuting Acts that Destroy the Environment: Environmental Crimes or Humanitarian Atrocities?', *Georgetown International Law Review* 17: 607-722.
- Westing, A. (1974) 'Proscription of Ecocide', *Science and Public Affairs* 26: 24-27.
- Westing, A. (1984) *Herbicides in War-the Long Term Ecological and Human Consequences*, Taylor & Francis, London
- Westing, A. (1989) 'Herbicides in Warfare: the Case of Indochina' in P. Bourdeau, J. A. Haines, W. Klein, and C. R. Krishna Murti, eds. *Ecotoxicology and Climate*, John Wiley, Chichester: 337-357.

(GENERAL COMMENTS: Excellent contribution. Very pragmatic and comprehensive. Needs no improvement. Exemplary overview and analysis. Suggestions and prognosis very realistic.)