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<p>Abstract</p> <p>The escalation of armed conflicts in the contemporary world, accompanied by rapid technological advancement and the proliferation of sophisticated weaponry, has significantly intensified the threats facing natural ecosystems. Modern warfare no longer confines its destructive effects to human lives and material property alone; rather, it extends to the systematic degradation of the natural environment through pollution, ecosystem disruption, and long-term ecological damage. The destruction of oil facilities, industrial infrastructure, agricultural land, water resources, and energy installations, as well as the use of chemical, biological, and nuclear weapons, has resulted in environmental harm that transcends national borders and persists long after hostilities have ceased. In response to these dangers, the international community has developed a set of legal frameworks aimed at safeguarding the environment, particularly during armed conflicts. International humanitarian law (IHL), as a branch of public international law, plays a central role in regulating the conduct of hostilities and limiting their harmful effects on civilians, civilian objects, and the natural environment. This study examines the extent to which the principles and rules of international humanitarian law contribute to the protection of environmental systems during both international and non-international armed conflicts. The research adopts an analytical and descriptive legal approach to explore the concept of environmental protection within IHL, the fundamental principles governing warfare, and the international legal mechanisms designed to prevent environmental destruction during conflicts. It further evaluates the adequacy of existing legal texts and highlights the challenges associated with their implementation. The study concludes that, despite notable progress in recognizing environmental protection as a humanitarian concern, existing mechanisms remain insufficient and require further development, stronger enforcement, and greater international cooperation to effectively safeguard the environment during armed conflicts.</p>	
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Introduction

Environmental degradation and ecological violations have become a central concern of the international community, particularly within the field of legal studies, due to their profound and long-lasting consequences for humanity and the planet. Technological development, industrial expansion, and the excessive exploitation of natural resources have significantly contributed to various forms of pollution, undermining the regenerative capacity of ecosystems and threatening environmental sustainability. These challenges are further exacerbated by the global arms race, the outbreak of armed conflicts, and the increasing use of destructive military technologies.

Armed conflicts, wars, and nuclear explosions represent some of the most severe sources of environmental harm. The dispersion of radioactive fallout, the destruction of oil installations and power plants, and the deployment of chemical and biological weapons—commonly referred to as weapons of mass destruction—have intensified environmental pollution and posed serious risks to human security. Importantly, the environmental damage caused by armed conflicts is not confined to peacetime or to the territorial boundaries of the warring parties. Rather, it often spreads across borders, affecting neighboring regions and even the global environment through air, water, and soil contamination.

In recognition of these dangers, the United Nations has affirmed the human right to a clean, healthy, and sustainable environment and has urged the international community to take urgent measures to realize this right. These measures include strengthening international legal obligations, developing environmental protection laws, and enhancing international mechanisms aimed at mitigating environmental harm during armed conflicts. Central to these efforts is international humanitarian law, which seeks to regulate the conduct of hostilities and protect civilians, civilian objects, and, increasingly, the natural environment.

This context raises a fundamental legal question: To what extent does international humanitarian law effectively protect the environment during armed conflicts, and are its existing legal provisions sufficient to address contemporary environmental challenges? To answer this question, the present study is structured around two main themes. The first addresses the general concepts of international humanitarian law and its relationship with environmental protection, while the second examines the mechanisms established to protect the environment from pollution and destruction during armed conflicts.

First Topic: General Concepts of International Humanitarian Law and the Environment

In order to reduce the devastating effects of war, the international community has progressively developed a body of legal rules designed to mitigate the humanitarian consequences of armed conflicts. This body of rules is known as international humanitarian law, which represents a specialized branch of public international law.

First Requirement: The Concept of International Humanitarian Law

International humanitarian law governs relations between states, international organizations, and other entities subject to international law during times of armed conflict. Its primary objective is to protect persons who are not, or are no longer, participating in hostilities and to regulate the means and methods of warfare. By doing so, it seeks to alleviate human suffering and address humanitarian issues arising directly from armed conflicts.

Section One: Definition of International Humanitarian Law

International humanitarian law may be defined as a set of legal rules intended to limit the humanitarian consequences of armed conflicts. It is often referred to as the law of war or the law of armed conflict, as it aims to restrict the methods and means of warfare employed by the parties to a conflict and to ensure the humane treatment of individuals affected by hostilities.

It is also understood as a body of customary and treaty-based rules that seek to improve the conditions of war victims without discrimination, including wounded and sick combatants, prisoners of war, and civilians. These rules are embodied primarily in international treaties, most notably the four Geneva Conventions of 1949, which provide comprehensive protection for victims of war, and the Additional Protocols of 1977. The first Additional Protocol applies to international armed conflicts, while the second governs non-international armed conflicts. Situations of

internal disturbances and tensions that do not reach the threshold of armed conflict fall outside the scope of international humanitarian law and are instead regulated by domestic law and international human rights law.

Section Two: Principles of International Humanitarian Law

In its contemporary formulation, international humanitarian law is founded on a set of fundamental principles designed to mitigate the humanitarian and environmental consequences of both international and non-international armed conflicts. These principles guide the conduct of hostilities and impose legal and ethical constraints on the parties to a conflict. The most prominent of these principles are outlined below.

1. The Principle of Humanity

The principle of humanity constitutes the moral and legal foundation of international humanitarian law. As reflected in the very designation of this branch of law, its primary objective is the protection of human dignity and the alleviation of suffering during armed conflicts. This principle requires the humane treatment of victims of war, respect for their dignity, physical integrity, honor, and property, and the prohibition of unnecessary suffering.

Notably, the principle of humanity finds early expression in Islamic legal and ethical teachings, as evidenced by the Qur'anic injunction: *"Fight in the way of God those who fight you, but do not transgress. Indeed, God does not love the aggressors."* This principle emphasizes restraint, proportionality, and respect for non-combatants.

In positive international law, the principle of humanity obliges belligerents to protect persons who do not take part in hostilities or who are no longer able to participate, including civilians, wounded combatants, prisoners of war, and other protected persons. It also applies in situations not expressly regulated by international conventions. Article 27 of the Fourth Geneva Convention of 1949 affirms this principle by requiring that protected persons be treated humanely at all times, with respect for their honor, family rights, religious beliefs, customs, and traditions.

2. The Principle of Military Necessity

The principle of military necessity permits the use of force only to the extent required to achieve a legitimate military objective. Armed conflict is not justified unless it serves the purpose of weakening the enemy's military capabilities through lawful means. This principle seeks to balance military objectives with humanitarian considerations by limiting violence to what is strictly necessary.

Military necessity does not legitimize unlimited destruction. On the contrary, it requires the selection of methods and means of warfare that minimize human suffering and environmental damage. Whenever possible, capturing enemy combatants is preferred over killing or wounding them. The principle thus reinforces the obligation to use less harmful alternatives and prohibits acts that cause excessive or unnecessary harm beyond what is required to achieve a concrete military advantage.

3. The Principle of Proportionality

The principle of proportionality applies in situations where incidental harm to civilians or civilian objects cannot be entirely avoided. It requires that the anticipated civilian damage resulting from an attack must not be excessive in relation to the concrete and direct military advantage expected.

Before launching an attack, military commanders are legally obliged to assess whether the potential loss of civilian life, injury to civilians, damage to civilian objects, or harm to the environment would outweigh the anticipated military gain. If the expected harm is disproportionate, the attack must be suspended or cancelled. This principle plays a critical role in protecting both civilian populations and environmental assets during hostilities.

4. The Principle of Prohibition of Reprisals

While general international law has historically allowed reprisals under certain conditions as a means of compelling an offending state to comply with legal obligations, international humanitarian law imposes strict limitations on such

practices. Reprisals are prohibited when they target protected persons, civilian populations, civilian objects, prisoners of war, the wounded, the sick, or shipwrecked persons.

Article 33(1) of the Fourth Geneva Convention of 1949 expressly prohibits collective penalties and reprisals against protected persons and their property. This prohibition reflects the humanitarian imperative to shield vulnerable groups and civilian infrastructure from retaliatory violence.

5. The Principle of Prohibition of Indiscriminate Attacks

International humanitarian law strictly prohibits indiscriminate attacks that are not directed at specific military objectives or that employ methods or means of warfare incapable of distinguishing between military targets and civilians. Such attacks often result in severe, widespread, and long-term damage, including environmental destruction.

Additional Protocol I of 1977 prohibits attacks that may be expected to cause excessive incidental harm to civilians or civilian objects, including environmental damage. Examples include the deployment of landmines outside military zones or the use of weapons with uncontrollable or long-lasting effects.

6. The Principle of Permissibility of Military Deception

International humanitarian law permits certain forms of military deception, provided they do not violate other legal prohibitions. These include camouflage, feints, misinformation, and other ruses of war designed to mislead the enemy without causing unnecessary harm.

However, this principle does not allow acts of perfidy, such as feigning civilian status or misuse of protective symbols, which are expressly prohibited under international humanitarian law.

The Second Requirement: The Environment and Its Relationship with International Humanitarian Law

The environment constitutes the fundamental space in which human life unfolds and upon which all living and non-living entities depend. As such, environmental protection occupies a central position in both national and international legal systems. Nevertheless, environmental systems are particularly vulnerable during armed conflicts, where military activities often expose ecosystems to pollution, degradation, and irreversible damage.

International humanitarian law increasingly recognizes the environment as a civilian object deserving of protection, given its essential role in sustaining human life and ecological balance.

Section One: The Concept of the Environment and Environmental Pollution

The environment may be understood as the comprehensive framework within which humans coexist with other living organisms and natural elements. It provides the essential conditions for life, including air, water, food, and shelter, and constitutes the basis for sustainable development.

1. Definition of the Environment

From a linguistic perspective, the concept of the environment is rooted in notions of habitation and settlement, as reflected in religious and cultural texts. Jurists have traditionally defined the environment by reference to its constituent natural elements, such as air, water, plants, animals, and the components resulting from human activity.

In a broader sense, the environment is defined as the physical and biological surroundings in which humans live, encompassing air, water, soil, space, living organisms, and the infrastructures created to meet human needs.

From a legal standpoint, the Algerian legislator has not provided a single, comprehensive definition of the environment. Instead, Law No. 03/10 on the protection of the environment within the framework of sustainable development specifies its constituent elements. Article 4(7) defines the environment as comprising vital natural and non-biological resources, including air, water, land, subsoil, plants, animals, genetic heritage, the interactions among these elements, as well as natural landscapes and landmarks.

2. Elements of the Environment

Most legal systems identify several core environmental elements that are subject to legal protection:

A. The Atmospheric Environment (Air)

Air is one of the most essential components of the environment, indispensable to all living organisms. It consists of a mixture of gases, primarily oxygen and nitrogen, that form the Earth's atmosphere. Any alteration in the composition of these gases can have severe consequences for human health and ecological balance.

B. The Aquatic Environment

Water represents the lifeblood of ecosystems and human civilization. Freshwater accounts for only a small proportion of the Earth's total water resources, while oceans and seas cover approximately 71% of the planet's surface and support diverse marine ecosystems. Pollution of water resources poses serious threats to biodiversity and human survival.

C. The Terrestrial Environment (Soil)

The terrestrial environment, commonly referred to as soil, constitutes the Earth's outer crust and supports most human and biological activities. Although soil is a renewable resource, it is increasingly threatened by population growth, intensive agriculture, industrial activity, and armed conflict. These pressures have led to soil degradation, erosion, and the loss of its natural regenerative capacity.

Section Two: Environmental Pollution

As a result of industrialization, economic expansion, and intensified exploitation of natural resources, numerous environmental problems have emerged. These activities have led to widespread pollution of air, water, and soil, thereby degrading ecosystems and undermining environmental sustainability. Armed conflicts further exacerbate these problems by accelerating environmental destruction and disrupting the natural balance essential for human and ecological survival.

Section Two: Environmental Pollution

1. Definition of Environmental Pollution

The concept of pollution has been subject to multiple definitions across linguistic, religious, legal, and international frameworks. From a linguistic perspective, pollution denotes contamination, corruption, or the mixing of an element with substances foreign to its nature in a manner that alters its original state. Religious texts have also addressed the notion of pollution and corruption, as reflected in the Holy Qur'an: *"Corruption has appeared on land and sea because of what people's hands have earned, so that He may let them taste part of what they have done, that perhaps they may return"* (Surah Al-Rum: 41). This verse highlights the direct link between human actions and environmental degradation.

From a jurisprudential standpoint, several legal scholars define pollution as the introduction of unfamiliar or harmful substances into environmental systems, resulting in adverse effects on ecological balance and living organisms. At the international level, the United Nations Conference on the Human Environment, held in Stockholm in 1972, defined pollution as the direct or indirect introduction by humans of substances or energy into the environment—particularly the marine environment—that results in harmful effects, endangers human health, damages natural resources, and interferes with legitimate uses of the environment.

At the national level, the Algerian legislator has given particular importance to environmental protection. Law No. 03-10 on the protection of the environment within the framework of sustainable development provides a comprehensive legal definition of pollution. Article 4(8) defines pollution as any direct or indirect alteration of the environment resulting from human activity that creates conditions harmful to human health and safety, as well as to plants, animals, air, water, land, and both collective and individual property.

2. Sources of Environmental Pollution

Environmental pollution can be classified according to its sources into two main categories: natural pollution and human-induced pollution.

A. Natural Sources of Pollution

Natural pollution occurs without direct human intervention and results from natural phenomena. Examples include gases and dust emitted during volcanic eruptions, smoke from forest fires, dust storms, heat waves, excessive humidity, floods, earthquakes, and other natural disasters. Although these phenomena can cause significant environmental disruption, ecosystems often possess a degree of resilience that allows for gradual recovery.

B. Human-Induced Pollution

Human-induced pollution arises from deliberate or unintended human activities. This includes pollution generated by industrial production, urban waste, and the gaseous, liquid, and solid emissions discharged by factories. It also encompasses pollution resulting from armed conflicts, particularly through the use of conventional and unconventional weapons. These include weapons of mass destruction, nuclear reactors and radioactive leaks, biological and microbial warfare, nuclear explosions, and weapons involving toxic, radioactive, or explosive substances. Such forms of pollution are often more severe and long-lasting than natural pollution, posing serious risks to human health and environmental sustainability.

Section Three: Effects of Armed Conflicts on the Environment

The environment is inherently fragile and highly susceptible to disruption, making it particularly vulnerable during armed conflicts. Warfare constitutes one of the most serious threats to ecological balance and biological systems, as it exposes ecosystems to extensive pollution, destruction, and long-term degradation. The use of modern combat methods, including biological, chemical, and nuclear weapons, generates harmful radiation and toxic substances whose effects persist for decades and are often irreversible.

A prominent example of such environmental devastation is the nuclear tests conducted by French colonial authorities in the Algerian desert during the Algerian liberation revolution. The radioactive contamination resulting from the Reggane nuclear explosions continues to have destructive effects to this day, despite the passage of several decades. These effects include widespread health problems among local populations, such as respiratory diseases, cancer, and congenital deformities, as well as severe ecological degradation, loss of vegetation cover, and the disruption of agricultural activities.

1. Armed Conflicts: Concept and Classification

According to Article 2 common to the Geneva Conventions of 1949, armed conflicts include all cases of declared war or any other armed confrontation between two or more states, regardless of whether the state of war is recognized by the parties involved. Armed conflicts may occur on land, sea, or air, and may extend to international spaces such as the high seas or airspace above natural or artificial islands.

Armed conflict is also defined as a dispute between two or more subjects of international law that necessitates resolution in accordance with international legal rules governing the settlement of disputes. Such conflicts involve military hostilities between the armed forces of states and must meet the threshold of organized armed violence.

In addition to international armed conflicts, international humanitarian law also applies to non-international armed conflicts. These occur within the territory of a single state between governmental forces and organized armed groups, or between such groups themselves, provided they are under responsible command and exercise control over part of the territory. However, situations of internal disturbances, tensions, and sporadic acts of violence are excluded from this classification, as stipulated in Common Article 3 of the Geneva Conventions of 1949.

2. Environmental Pollutants During Armed Conflicts

The environmental danger of armed conflicts lies primarily in the means and methods of warfare employed by the belligerent parties. These methods often result in severe environmental damage that is difficult, if not impossible, to remedy. In many cases, the consequences of such damage do not become fully apparent until long after hostilities have ended. Environmental pollutants during armed conflicts may be classified as follows:

A. Biological Pollution

Biological weapons are among the most dangerous forms of warfare due to their reliance on viruses, bacteria, and other pathogens. These weapons can cause massive losses by collapsing ecosystems and disrupting natural biological balances. Biological agents, derived from animal or plant sources, may be dispersed in liquid or solid form through aerosols, gases, or explosive devices. Once released, they contaminate air, water, soil, humans, animals, and plants, reproducing within living organisms and causing widespread ecological and health damage.

B. Radioactive Pollution

Radioactive pollution results from the leakage or release of radioactive materials into environmental components, whether through nuclear reactors, nuclear weapons testing, or nuclear explosions. Such contamination spreads rapidly and remains hazardous for extended periods, often spanning generations. Its effects include genetic damage, cancer, and long-term environmental degradation.

C. Chemical Pollution

Chemical pollution arises from the use of chemical substances manufactured for hostile purposes, commonly known as chemical weapons. These substances negatively affect living organisms, contaminate soil and water resources, and disrupt ecological balance. The long-term persistence of certain chemical agents further exacerbates their harmful impact on both human health and the environment.

Topic Two: Mechanisms for Protecting the Environment from Pollution During Armed Conflicts

Environmental protection has occupied a prominent place on the international agenda since the second half of the twentieth century, particularly following the Stockholm Conference on the Human Environment in 1972. This conference marked a turning point in global awareness of environmental risks, including ozone depletion and global warming. However, despite growing concern for environmental protection in peacetime, the protection of the environment during armed conflicts has not received comparable attention, notwithstanding the grave violations committed during such conflicts.

Although initial efforts to address environmental protection in warfare emerged after the First and Second World Wars, meaningful legal attention was only given in 1977 during the Diplomatic Conference convened by the International Committee of the Red Cross. This attention, however, focused primarily on international armed conflicts, while non-international conflicts were largely addressed through the lens of human rights law. Moreover, non-state armed groups are often not fully bound by or compliant with international humanitarian law, further complicating enforcement.

The First Requirement: The Role of International Organizations and Bodies in Protecting the Environment During Armed Conflicts

Environmental violations during armed conflicts constitute a serious infringement of the human right to a healthy environment. In response, the international community has developed legal frameworks for environmental protection that operate through both indirect and direct mechanisms.

Section One: Indirect Protection of the Environment During Armed Conflicts

Indirect protection refers to legal rules that do not explicitly mention environmental protection but nevertheless contribute to limiting environmental harm during warfare. Prior to the 1970s, international concern was primarily directed toward the protection of civilians and private property, rather than the environment itself. This approach is

evident in several international instruments that indirectly mitigate environmental damage during armed conflicts, including the following:

1. The St. Petersburg Declaration of 1868

The St. Petersburg Declaration represents the earliest international instrument addressing limitations on the means and methods of warfare. Adopted during the meeting of an international military commission between November 29 and December 11, 1868, it established key principles, most notably the restriction on the use of weapons that cause unnecessary suffering. This principle, later reaffirmed in Article 35(1) of Additional Protocol I to the Geneva Conventions of 1977, aims to prohibit the use of weapons that exceed the legitimate objectives of war and cause undue harm to humans and the environment.

2. The Fourth Hague Convention of 1907

The Fourth Hague Convention on the Laws and Customs of War on Land contains several provisions that limit the freedom of belligerents in choosing means of warfare. Articles 22 and 23 prohibit the use of poison, poisoned weapons, and methods that cause unnecessary injury or suffering. Although not explicitly environmental in nature, these provisions indirectly contribute to environmental protection by restricting particularly harmful weapons and practices.

3. The Geneva Protocol of 1925

The Protocol for the Prohibition of the Use of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, adopted in Geneva on June 17, 1925, prohibits the use of chemical and biological weapons. This protocol represents a significant step toward limiting environmental and human harm resulting from such weapons.

4. The Geneva Conventions of 1949

The four Geneva Conventions of 1949 do not contain explicit provisions dedicated to environmental protection. However, indirect protection can be inferred from several of their articles. Notably, Article 53 of the Fourth Geneva Convention prohibits the destruction of private and public property by an occupying power, except where such destruction is rendered absolutely necessary by military operations. This provision indirectly safeguards environmental resources and infrastructure from unjustified destruction.

Section Two: Direct Protection of the Environment During Armed Conflicts

With the rise of global environmental awareness in the early 1970s, international law gradually moved from merely *implicit* (indirect) protection of the environment to forms of *explicit* (direct) protection, particularly in the context of armed conflict. This shift was reflected in the adoption of treaties, declarations, and international criminal norms that specifically address environmental harm or restrict weapons and warfare practices that cause severe ecological damage. The most significant instruments include the following:

1. 1971/1972 Seabed Arms Control Treaty (Seabed Treaty)

The Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and in the Subsoil Thereof—adopted in the early 1970s and entering into force in 1972—was designed primarily to slow the arms race and protect the marine environment from the catastrophic consequences of deploying weapons of mass destruction beneath the sea. The treaty obliges each State Party not to place nuclear weapons or other weapons of mass destruction, as well as related launching installations, testing facilities, or storage infrastructure, on the seabed or ocean floor beyond the outer limit of the seabed zone as defined by the treaty. Although motivated by disarmament concerns, its legal effect also serves direct environmental protection by preventing a particularly dangerous form of ecological contamination.

2. ENMOD Convention (1976) on Environmental Modification Techniques

The Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD) was adopted on 10 December 1976 under the auspices of the United Nations in a context shaped by concerns raised during the Vietnam War. ENMOD prohibits States Parties from using environmental modification techniques—such as deliberate manipulation of natural processes—when such techniques have **widespread, long-lasting, or severe effects** as a means of destruction, damage, or injury to another State Party. The convention also prohibits assisting, encouraging, or inducing any state, group of states, or international organization to engage in such prohibited activities. ENMOD is significant because it directly addresses the environment not merely as collateral damage, but as a potential *weapon* or *target* of hostile action.

3. The 1992 Rio Declaration and Principle 24

The United Nations Conference on Environment and Development (Rio Conference, 1992) reaffirmed the global linkage between environmental protection, human security, and sustainable development. Principle 24 states that war is inherently destructive of sustainable development, and therefore states must respect international law providing protection for the environment in times of armed conflict. Although the Rio Declaration is primarily a soft-law instrument, it reflects the development of international legal consciousness and reinforces the normative expectation that environmental considerations must form part of conflict-related obligations.

4. Additional Protocol I (1977): Explicit Environmental Protection in International Armed Conflicts

Additional Protocol I to the Geneva Conventions of 1949 constitutes one of the strongest legal bases for direct environmental protection during **international armed conflicts**. Unlike the 1949 Geneva Conventions—which largely provided indirect protection—Protocol I includes explicit rules that treat the natural environment as an object of legal protection.

- **Article 35(3)** prohibits methods and means of warfare intended, or expected, to cause **widespread, long-term and severe** damage to the natural environment.
- **Article 55** further establishes that care must be taken during hostilities to protect the natural environment against such damage, emphasizing that this protection includes prohibiting attacks and warfare methods that harm the environment in ways that prejudice the health or survival of the population. Article 55 also prohibits attacks against the natural environment by way of reprisals.

These provisions are crucial because they recognize that environmental destruction is not only an ecological issue but a humanitarian one linked to public health, survival, and post-war recovery.

Protection in Non-International Armed Conflicts: Protocol II (1977)

While Protocol II does not contain provisions identical to Articles 35 and 55, it provides environmental protection through rules safeguarding objects essential for civilian survival.

- **Article 14** prohibits attacks on objects indispensable to survival—such as foodstuffs, agricultural areas, crops, livestock, drinking water installations, and irrigation works—thereby indirectly but effectively contributing to environmental protection during internal armed conflicts.
- **Article 15** prohibits attacks on works and installations containing dangerous forces (e.g., dams, nuclear electrical generating stations) because of the catastrophic consequences that would harm civilians and the environment.

5. Chemical Weapons Convention (1993/1997)

The Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction represents a major milestone in disarmament and environmental protection. It prohibits the use, production, transfer, and stockpiling of chemical weapons and mandates their destruction under international verification. It also established the **Organisation for the Prohibition of Chemical Weapons (OPCW)**, which oversees inspections, compliance, investigation procedures, and cooperation mechanisms, including protective

assistance for States exposed to chemical attacks. Beyond humanitarian protections, the convention has clear environmental relevance due to the highly toxic and persistent nature of chemical agents.

6. Rome Statute (1998): Environmental Damage as a War Crime

The Rome Statute of the International Criminal Court (ICC) strengthens direct environmental protection by linking serious environmental harm to individual criminal responsibility. The statute includes within war crimes certain acts involving the launching of attacks with knowledge that they will cause incidental harm that is excessive relative to the concrete and direct overall military advantage anticipated. The statute explicitly refers to **widespread, long-term and severe damage to the natural environment**, thereby allowing environmental destruction to be treated not only as a policy failure or state violation, but as an internationally punishable basis for criminal accountability.

Requirement Two: Environmental Assets Subject to Protection During Armed Conflicts and the Effectiveness of International Protection

Initially, international legal protection in armed conflict focused primarily on persons and property. However, as environmental awareness grew—especially after the Stockholm Conference of 1972—the need to protect environmental systems during war became increasingly urgent. This evolution led international humanitarian law and related instruments to recognize that certain objects and structures possess special value due to their essential role in sustaining human life and ecological balance.

Section One: Environmental Assets Covered by Legal Protection

These are objects and environments protected under international humanitarian law, and serious violations may constitute war crimes or internationally wrongful acts.

1. Civilian Objects

Civilian objects include all objects that are not military objectives. They enjoy general protection under IHL, meaning parties must take precautions to avoid or minimize harm to them. Civilian objects encompass hospitals, dwellings, public utilities, agricultural infrastructure, and the natural environment itself. Hospitals may not be attacked unless they are used for acts harmful to the enemy and only after a warning that provides a reasonable time limit. Protected civilian objects also include:

- objects indispensable to civilian survival,
- the natural environment,
- installations containing dangerous forces,
- reminders of protected zones such as demilitarized or safe zones. Serious attacks against these objects may amount to war crimes.

2. Cultural and Historical Property

Cultural property is regarded as part of the common heritage of humanity due to its scientific, spiritual, religious, and historical significance. International protection is reinforced through multiple instruments, including the 1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict, and through the Rome Statute, which includes attacks on buildings dedicated to religion, education, charity, and historical monuments as war crimes. UN organs and peacekeeping missions have also supported UNESCO in protecting cultural sites and enabling access to threatened areas during conflict.

3. Objects Indispensable for Civilian Survival

Protocol I (Article 54) prohibits attacks on objects indispensable to civilian survival. This includes food, agriculture, crops, livestock, and drinking water installations. These protections have a strong environmental dimension: the destruction or contamination of such resources leads to ecosystem disruption, famine, forced displacement, and long-term human insecurity. International humanitarian law therefore requires not only abstention from attacking these objects but also facilitating humanitarian relief and ensuring safe access to essential supplies.

4. Installations Containing Dangerous Forces

Works such as dams, dikes, and nuclear power plants receive special protection—even if they could be considered military objectives—because attacks on them may release dangerous forces causing catastrophic civilian harm and widespread environmental destruction. Such attacks can render areas uninhabitable for long periods due to contamination, flooding, or radiation, thereby undermining post-conflict recovery and sustainable development.

Section Two: Effectiveness of International Humanitarian Law in Environmental Protection During Armed Conflicts

Despite the existence of humanitarian principles and treaty provisions addressing environmental harm, contemporary practice reveals that existing rules remain insufficient in light of the rapid development of military technology and the complexity of modern warfare.

1. Effectiveness in International Armed Conflicts

The legal protection offered by international conventions is often **limited and modest** compared to the scale of environmental destruction caused by armed conflicts. Several weaknesses can be identified:

- **High threshold for prohibition:** Articles 35(3) and 55 of Additional Protocol I require that damage be **widespread, long-term, and severe**. Meeting all three conditions simultaneously creates a very high evidentiary threshold, making responsibility difficult to establish.
- **Lack of precise criteria:** The terms “widespread,” “long-term,” and “severe” are not uniformly defined in a way that provides clear and consistent criteria across cases. This allows parties to interpret these standards in a self-serving manner.
- **Discretion and enforcement gaps:** There is often no independent international body automatically tasked with assessing environmental harm during conflict or determining whether the threshold is met, leaving assessment largely to belligerents and political institutions.
- **Collateral environmental harm remains under-regulated:** While deliberate environmental damage is prohibited, indirect or incidental environmental harm occurring during attacks on military objectives is often treated as permissible if considered “non-excessive” under proportionality analysis. This creates a legal space where significant environmental destruction may occur without clear liability, particularly when military advantage is asserted.

Consequently, international humanitarian law may be seen as offering a framework of protection that is important in principle but frequently weak in practice, especially when the proportionality balancing test is applied without robust environmental measurement tools or independent oversight.

Ethical Considerations

This research is based exclusively on doctrinal legal analysis, international conventions, academic literature, and publicly available legal texts. It does not involve human participants, personal data, field surveys, or experimental methods. Therefore, ethical approval was not required. The authors have adhered to academic integrity standards, ensuring accurate citation, originality, and respect for intellectual property.

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