Forum: Environmental Committee (EC)

Issue: Managing war debris for sustainable environmental restoration

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INTRODUCTION

"In war, whichever side may call itself the victor, there are no winners, but all are losers"[1] - Neville Chamberlain. Indeed, war has no victors; all suffer. Including the environment.

When conflicts end, attention is directed towards addressing political and economical issues that have arisen, often overlooking the environmental aftermath that's left behind. Vast amounts of waste, such as unexploded ordnance, destroyed vehicles and military equipment, and damaged infrastructure. Such debris poses a major threat to both the environment and human health. Limited natural resources, pollution and human displacement are just a few examples.

Historically, even Ancient Romans used to clear the battlefields after the battle to prevent disease or hazards. However, their efforts were limited to waste removal. This raises a critical question: Is there a way to transform war debris into something beneficial? Is it possible to support the environment by repurposing or managing these materials more effectively, rather than allowing them to cause further damage? And if it is, how will security be ensured and resources be salvaged? All these questions will be addressed throughout the course of this study guide.

Managing war debris for sustainable environmental restoration should be addressed to the challenge of "Re-defining Human Rights in an ever changing world". The rights to a clean, safe, and habitable environment must no longer be seen as secondary to political and economic recovery. As the global landscape shifts due to persistent warfare, traditional definitions of human rights must change to reflect this new reality. Restoring the environment, through the proper reuse and management of war waste, is not just an environmental necessity but a moral obligation. It represents a vision of the future: one in which the healing landscape becomes inseparable from healing communities, and where the right to environmental security is claimed alongside peace and dignity.

[1] Speech by Neville Chamberlain at Kettering, 3 July 1938

DEFINITION OF KEY-TERMS

Circular Economy

"The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended."[2]

Environmental Impact Assessment (EIA)

"An Environmental Impact Assessment (EIA) is commonly described as an assessment of the impact of planned activities on the environment, including impacts on biodiversity, vegetation and ecology, water, and air. An EIA can be seen as a process of identifying, predicting, and evaluating the likely environmental, socioeconomic, cultural and other impacts of a proposed project or development to define mitigation actions—not only to reduce negative impacts but also provide positive contributions to the natural environment and well-being."[3]

Environmental restoration

"Environmental restoration involves recovering damaged or degraded ecosystems to restore their original function and health. This includes efforts to rehabilitate forests, wetlands, lakes, and urban areas impacted by human activities or natural disasters."[4]

Sustainable development

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[5]

Unexploded Ordnance (UXO)

Unexploded ordnance is any munition, weapon delivery system, or ordnance item that contains explosives, propellants, or chemical agents that has been primed, fused, armed, or otherwise prepared for action, and that has been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material, and remains unexploded either by malfunction, design, or for any other cause.[6]

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[2] European Parliament. *Circular Economy: Definition, Importance and Benefits* (Factsheet). European Parliament, Dec. 2015, publications.europa.eu/resource/cellar/ Accessed 1 July 2025.

[3] International Institute for Sustainable Development. (n.d.). EIA: What? Why? When? In EIA Online Learning Platform. https://www.iisd.org/learning/eia/eia-essentials/what-why-when/ Accessed on 25 June 2024

[4] "What Is Environmental Restoration?" *Coleman Environmental Engineering*, Coleman Environmental Engineering, LLC, n.d., colemanenv.com/what-is-environmental-restoration/. Accessed 30 June 2025.

[5] Federal Office for Spatial Development. "1987: Brundtland Report." *ARE*, Swiss Confederation, updated 20 June 2025, www.are.admin.ch/are/en/home/medien-und-publikationen/publikationen/nachhaltige-entwicklung/brundtland-report.html . Accessed 9 July 2025

[6] Defense Technical Information Center. *Unexploded Ordnance (UXO)*. DTIC, 1 Mar. 1999. PDF file, https://apps.dtic.mil/sti/pdfs/ADA389383.pdf. Accessed 30 June 2025.

War debris

War debris, also known by the name “war waste” are unexploded ordnance, burned vehicles and military equipment, spent disposable NLAW systems, batteries, and building ruins that lingers in cities, towns, forests, fields, beaches, water, and on our land after hostilities.[7]

Waste Valorization

Waste valorization is the process of waste products or residues from an economic process being valorized (given economic value) by reuse or recycling to create economically useful materials.[8]

BACKGROUND INFORMATION

Historical Background

Managing war debris has been a challenge for humanity, from its earliest organized conflicts. In ancient times, waste management was about sanitation and survival, as poor sanitation could lead to outbreaks of disease that were sometimes deadlier than combat itself. Waste management was also a logistical challenge, since armies generated large quantities of waste, such as human waste, food remains and general refuse. One of the earliest examples of waste management in ancient times comes from the Roman Empire (27 BCE – 5th century CE). Roman camps had designated latrines, drainage systems, and routines for waste removal to keep living areas clean and reduce the risk of diseases. Armies would establish specific zones for waste within camps, often to prevent contamination. These practices were signs of well disciplined and organized armies and often contributed to overall success.

As time passed, these early innovations endured in various forms. However, the Industrial Revolution brought a sudden shift. Weaponry grew stronger and much more harmful for the environment. With the introduction of firearms (9th - 10th century) and the invention of bombs (11th century), management of war debris became harder and significantly more complex. By the time the American Civil War (1861–1865) erupted, the environmental damage caused by warfare reached unprecedented levels.

World War I further escalated the issue. Chemical weapons and toxic gases caused immediate environmental damage. Around 125 million tons of toxic gases were deployed, including mustard gas, phosgene, and organoarsenic compounds[9]. Lacking knowledge and preparation, global powers were not ready to deal with the long-term consequences of such warfare. The aftermath of WWI laid the groundwork for more thoughtful responses in the years that followed. WWII transformed waste management by turning garbage into a vital resource amid material shortages. During the devastating conflict, governments implemented nationwide

[7] Hubareva, Viktoriia. “War Waste: What Is It and How to Deal with It?” *Rubryka*, July 2022, rubryka.com/en/article/waste-from-war/. Accessed 30 June 2025.
[8] “Sustainability; Mathematics of the Circular Economics.” *IGI Global Dictionary*, IGI Global, n.d., www.igi-global.com/dictionary/mathematics-of-the-circular-economics/110209 . Accessed 30 June 2025. [9] Freemantle, Michael. “The Great War Clean−Up.” *Chemistry World*, 11 Nov. 2018, www.chemistryworld.com/features/the-great-war-clean-up/3009456.article . Accessed 30 June 2025

scrap drives, collecting millions of tons of metal and other materials for military production. Recycling and resource conservation became patriotic duties, with communities and schools actively participating.

The environmental toll of conflict didn't stop with the World Wars. In Bosnia-Herzegovina, after the Yugoslav wars (1991-2001), the military waste led to a complex relationship between communities and contaminated landscapes. Mostar were split into two major ethnic groups: Bosnian Muslims and Croats. This division also affected the two companies that overseed waste collection and disposal in various towns. Soil and water studies revealed a decline in water quality at Vihovići as a result of this complicated scenario and the pollution issues.

In Gaza, one of the major post-conflict issues is the management of resulting demolition waste including its removal, sorting, recycling, and material recovery. In May 2021, over 370,000 tons of demolition waste composed of rubbles and debris was generated during 11 days of armed conflict.[10] Addressing this debris became a significant challenge but also opened doors for recovery. Recycling of post-conflict demolition waste management projects, brought economic and social benefits through the reuse and recycle of resources and creation of job opportunities.

Today, similar challenges continue, but so do the lessons of the past. An exceptional example is Ukraine's green recovery program. The conflict in Ukraine has generated millions of tons of debris, thus UNIDO, in partnership with the Ukrainian government and international actors like the EU, is leading efforts to implement a circular economy approach to debris management. The approach emphasizes environmental sustainability, safety protocols, and local empowerment.

When tracing looking back through history, one sees a rare pattern: people learning from past mistakes. Across centuries and continents, the ways we deal with the waste of war continue to evolve, shaped by innovation, necessity, and a growing understanding of our environmental responsibility.

Types of War debris

Structural Debris

In times of conflict, structures that took years to build and cost millions of dollars, are taken down in an instant. A key feature of modern day conflicts is the bombing of highly populated areas. Not only does it kill civilians, but it also destroys vital infrastructure. This includes residential, commercial and institutional structures such as schools, hospitals and municipal buildings, as well as civil structures such as bridges, tunnels, ports and historical buildings. More than just physical damage, the destruction of key facilities, such as warehouses or ports, is the disruption in logistics systems and essential networks, such as water and electricity. Lastly, attacks on culturally significant buildings, such as churches and monuments, represents loss of identity and heritage.

[10] AbuHamed, Hatem, et al. "Managing Post−Conflict Demolition Wastes in Gaza Strip: A Case Study on May 2021 Conflict." *Journal of Material Cycles and Waste Management*, vol. 25, 2023, pp. 684–693, doi:10.1007/s10163-022-01570-y. SpringerLink, link.springer.com/article/10.1007/s10163-022-01570-y. Accessed 30 June 2025

Military Equipment Debris

Military operations produce a wide range of debris, from outdated equipment and munitions to electronic waste, such as computers and servers, and construction materials. This debris often includes vehicles like tanks, trucks, drones, and aircraft, as well as weapons systems such as artillery, guns, and missile launchers. In post-conflict settings, such debris not only poses risks to civilians and aid workers but also hampers environmental recovery and infrastructure rebuilding.

Hazardous Debris

After war, the rubble left behind still poses a danger. Dust from destroyed buildings can contain harmful materials like asbestos and toxic chemicals, which can lead to respiratory problems and increase the risk of cancer. Fuels and chemicals left behind can contaminate soil and water, causing long-term damage. These risks are especially hard on communities already affected by displacement and destruction, putting extra pressure on health systems and recovery efforts. Additionally, these pollutants can disrupt ecosystems, harm biodiversity, and compromise natural resources that communities rely on for survival.

Electronic and Electrical Debris

Electronic and electrical waste (E-waste) from military operations, especially from electronic warfare vehicles, presents serious environmental challenges. These vehicles emit pollutants that degrade air quality and contribute to greenhouse gas emissions, worsening climate change. Additionally, if their electronic components are not properly managed or disposed of, they risk contaminating soil and water with harmful substances like heavy metals and toxic chemicals. This contamination can have lasting effects on local ecosystems and pose health risks to nearby communities.

Environmental Impact of War debris

Impact on natural resources

Natural resources are often both a cause and casualty of aremd conflicts. Conflicts frequently drive intensified extraction of valuable resources like minerals, timber, and water, sometimes through illegal means, which in turn fuels further violence and environmental damage. On top of that, climate related pressures worsen competition over these resources, raising the likelihood of violence, especially in vulnerable areas. Lastly, weak governance of natural resources during and after conflicts makes sustainable management difficult, resulting in lasting harm to both the environment and local economies.

Emissions and pollution

Military activities contribute significantly to pollution and greenhouse gas emissions. Military vehicles, aircraft, and operations release significant amounts of carbon dioxide and other gases that contribute to climate change. The use of chemical weapons, nuclear tests, and depleted uranium munitions has led to serious and long-lasting damage to both ecosystems and

human health. Additionally, conflicts release pollutants into the atmosphere and oceans, disrupting weather patterns, damaging the ozone layer, and harming marine life.

Deforestation

Illegal logging and mining operations, often taking place in protected areas, have led to significant deforestation and a sharp decline in biodiversity. These activities not only destroy critical habitats for endangered species but also undermine the forests' ability to absorb carbon, accelerating climate change. In countries like the Democratic Republic of Congo and Iraq, deforestation has been closely tied to ongoing conflict and the illegal exploitation of natural resources. Armed groups frequently use profits from timber and minerals to fund their operations, further fueling instability. The environmental damage caused by these practices is long-lasting, weakening ecosystems and putting already vulnerable communities at greater risk.

Human displacement

In addition to the direct environmental damage caused by wars, conflicts often result in the forced displacement of millions of people, usually to areas where resources are already limited. This mass displacement creates a range of environmental challenges, as displaced communities depend heavily on local ecosystems for essentials like food, water, and shelter. The sudden arrival of large populations can place serious strain on natural resources, leading to overuse and further environmental degradation in already fragile regions.

Strategies for Sustainable War Debris Management

Sustainable Housing

In the aftermath of conflict, providing temporary shelter is crucial, but true recovery begins with rebuilding sustainable communities. Emergency shelters must be simple to construct, easy to maintain, and adaptable to evolving needs on the ground. Leveraging locally sourced, eco-friendly materials can accelerate deployment and limit environmental damage. Still, there’s a more impactful path forward. Sustainable reconstruction is about creating lasting, energy efficient homes and infrastructure that support long-term resilience. By embracing circular economy principles communities can reduce dependency on finite resources while building a more stable future.

Effective use Natural Resources

Reconstruction should prioritize the use of local materials to avoid further environmental strain. Taking a full life cycle approach to construction helps ensure that resources are reused wherever feasible, while cutting waste and reducing demand for raw extraction. War debris, can be repurposed into building materials, turning destruction into a source of renewal. Rethinking energy is also key. Passive and active design strategies, paired with renewable energy systems, can significantly lower emissions and energy costs. Beyond sustainability, these systems enhance energy security in post-conflict regions. Lastly, water management is also of great importance, as conflict often disrupts water sources. Sustainable rebuilding must protect natural reserves, support recycling, and incorporate efficient management to ensure long-term access to clean water.

Sustainable Materials

Sustainable materials play a pivotal role in eco-conscious construction. HempLime is a lightweight, low-carbon material made from hemp fibers and lime, which offers excellent insulation and durability. It's an eco-friendly alternative to concrete that supports carbon sequestration during its growth cycle. Seaweed and algae are fast-growing marine resources, which can be harvested sustainably and used in everything from insulation to bioplastics. They're renewable, biodegradable, and well-suited for coastal communities. Lastly, cork, is harvested without cutting down trees, making it a renewable, recyclable, and highly adaptable material. It insulates well and supports circular design in construction projects.

Proper disposal

Clearing and managing war debris is a crucial step in ecological recovery. This process should include three basic steps. First, debris should be sorted at the source to separate reusable materials from hazardous waste. Second, efforts should focus on reducing the volume of waste through recycling and repurposing. Finally, salvaged materials can be reintegrated into new civilian structures, supporting a more sustainable rebuild. Beyond clearing rubble, this approach helps communities recover with dignity while protecting ecosystems from long-term harm.

Challenges in addressing the problem

Security Risks

In many former conflict zones, unexploded ordnance, landmines, and unstable munitions remain hidden in debris fields. These create serious threats to cleanup crews and local populations. Some areas have been left untouched, raising questions about whether this is for environmental protection or due to unresolved security issues. Balancing ecological preservation with safety needs is a delicate matter.

Hazardous Materials

Military installations often have hazardous substances such as fuel, solvents, heavy metals, and chemical residues. After conflicts, these materials may be abandoned or damaged, leaking toxins into the soil, air and water. Handling this waste needs special knowledge, protective equipment, and proper facilities, which are often lacking in post conflict areas.

Limited Resources and Capacity

Fragile economies emerging from war usually face serious financial and institutional challenges. With urgent needs like food, shelter, and basic healthcare taking priority, environmental cleanup and debris management often get limited funding and attention. This lack of capacity slows progress and can worsen the environmental and health impacts of war debris.

Social and Cultural Sensitivities

Debris removal can bring emotional and cultural challenges. In many cases, debris fields may include human remains, which require careful handling in line with local customs and religious practices. Ignoring these cultural aspects can distress affected communities and complicate reconciliation efforts.

Case Studies

Vietnam

During the Vietnam War, the U.S. military conducted widespread chemical warfare, most notoriously through the use of Agent Orange, which was a powerful herbicide containing the highly toxic compound dioxin. It intended to strip forests and crops used by enemy forces, and in the end managed to devastate more than 3 million hectares of land, causing long term ecological damage that continues to affect the region today.

The human toll has been even more severe. Millions of Vietnamese civilians and soldiers were exposed to Agent Orange, leading to a dramatic increase in birth defects, cancers, and chronic illnesses. According to a PBS article, children born decades after the war are still suffering from deformities and disabilities linked to dioxin exposure[11]. Contaminated "hotspots" remain around former U.S. airbases, where soil and sediment hold dangerously high levels of dioxin even today.

Efforts to clean up these toxic sites have been slow and costly. Joint initiatives between the U.S. and Vietnamese governments, such as a project at Da Nang Airport, show some progress, but vast areas remain untreated, and many victims have yet to receive proper compensation or care.

Bosnia and Herzegovina

Years after the war ended, Bosnia and Herzegovina continues to bear the scars of conflict. Many of them are buried in the ground, leaching into water systems, or left to decay in abandoned industrial zones. The post-war landscape is defined not only by physical destruction but also by environmental degradation that threatens both ecosystems and human health.

Large areas of Bosnia remain contaminated by unexploded ordnance (UXO), which pose a daily risk to civilians, farmers, and environmental workers. In addition to this direct danger, the war left behind a complex mix of hazardous materials, including polychlorinated biphenyls (PCBs), heavy metals, fuel residues, and damaged electronic equipment. This waste is especially dangerous in karstic regions, where the porous ground allows toxins to quickly infiltrate underground water reserves, contaminating drinking water and damaging fragile ecosystems.

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[11] "50 Years Later, a Daunting Cleanup of the Vietnam War's Toxic Legacy Continues." *PBS NewsHour*, PBS, n.d., www.pbs.org/newshour/science/fifty-years-later-a-daunting-cleanup-of-the-vietnam-wars-toxic-legacy-continues .
Accessed 30 June 2025.

Additionally, the conflict severely damaged Bosnia's infrastructure, including its power grids, waste treatment systems, and transportation networks. Post war reconstruction has been slow and underfunded, with environmental concerns often treated as secondary. The country's limited institutional capacity has made it difficult to safely manage and dispose of war-related waste, which increases long term risks for local communities.

Furthermore, Bosnia has also been subject to "waste colonialism." This refers to the practice of international actors, particularly foreign militaries and contractors, leaving behind pollution and hazardous materials without accountability. In many cases, Bosnia has been treated as a disposable space, with little regard for the long term environmental or public health consequences of foreign intervention. The same logic that fueled wartime destruction continues to shape post war recovery, deepening Bosnia's dependency and environmental vulnerability.

MAJOR COUNTRIES AND ORGANIZATIONS INVOLVED

United States of America

The U.S. military has long recognized the environmental impact of its operations. One particularly harmful practice has been the use of burn pits, where waste is burned openly, causing serious health and environmental issues. To tackle this issue, the military is now looking into cleaner alternatives like waste-to-energy (WTE) technology, which converts waste into usable energy instead of just burning it. Installing WTE systems at military bases aims to improve waste management and meet energy demands, while possibly reducing the military's carbon footprint. A 2023 report from the Defense Technical Information Center[12] shows that developing and testing these systems is part of a broader effort to adopt more sustainable military practices, balancing mission needs with environmental responsibility. While WTE technologies are promising, they still face challenges like cost and infrastructure needs, but they offer a meaningful step toward smarter, more eco-friendly waste management on military installations.

Germany

Germany's approach to managing war related waste during World War II is a complex example influenced by the demands of total war and limited resources. Under the Nazi regime, recycling became mandatory through the forced labor of concentration camp prisoners, who were compelled to collect and process scrap metals, textiles, and other materials essential for the war effort. While this system did recover important resources, it was closely linked to severe human rights abuses. The use of forced labor for recycling during wartime highlights that environmental management in conflict zones must consider its social and ethical impacts. The lessons from this dark period stress the need to ensure that today's efforts to handle war waste respect human dignity and do not allow injustices to continue under the pretext of necessity or efficiency.

[12] "Waste & Energy on U.S. Military Bases." *Think Global Health*, Council on Foreign Relations, n.d., www.thinkglobalhealth.org/article/waste-energy-us-military-bases . Accessed 30 June 2025.

Ukraine

The ongoing conflict in Ukraine has left behind a hazardous legacy with significant risks for both people and the environment. Unexploded ordnance (UXO) and various types of toxic industrial and military waste have harmed infrastructure and natural habitats. This contamination threatens water supplies, farmland, and biodiversity. It also makes humanitarian relief and rebuilding efforts more difficult. Ukrainian authorities, supported by international partners, are actively working on assessment and cleanup initiatives. Their main goals include safely clearing UXO, managing toxic waste, and rebuilding infrastructure to prevent future environmental damage. This work is crucial for public safety and for restoring stability and trust in communities severely affected by conflict. The situation highlights the important connection between environmental recovery and human security in post conflict areas.

European Union (EU)

The European Union plays an important role in promoting sustainable recovery in areas affected by conflict, particularly in Ukraine. In addition to providing emergency aid, the EU focuses on long-term strategies that incorporate circular economy principles and resource efficiency in reconstruction. This includes improving waste management systems, encouraging recycling, and supporting sustainable urban development. The EU's approach acknowledges that post-conflict rebuilding presents an opportunity to build back better by embedding sustainability into the foundation of new communities. This also involves protecting ecosystems, restoring damaged land, and creating green jobs that support social and economic resilience. Through funding, policy support, and public outreach, the EU aims to lessen the environmental impact of war while empowering local people to take part in recovery efforts.

North Atlantic Treaty Organization (NATO)

NATO's role in managing war waste mainly focuses on preventing and controlling dangers related to chemical, biological, radiological, and nuclear (CBRN) materials. The alliance has established clear policies and technical standards to ensure member countries handle these hazardous substances safely. This protects both military personnel and the environment. This system allows for quick and effective responses to CBRN threats in conflict zones, lowering the risk of environmental contamination and health emergencies. NATO also invests in training and skill-building across member states to stay prepared. By encouraging international cooperation on these complex issues, NATO reinforces the important link between environmental security and military operations. It understands that ecological damage often directly affects human safety and regional stability.

TIMELINE OF EVENTS

DATE	DESCRIPTION OF EVENT
08 May 1945	End of World War II.[13]
06 August 1945	Hiroshima Bombing [14]
14 December 1995	Dayton Agreement Signed[15]
24 March 1999	NATO Bombing of Yugoslavia[16]
20 March 2003	U.S. Invasion of Iraq[17]
March 2011	Start of Syrian Civil War[18]
January 2016	UNDP Launches Syria Debris Recycling Project[19]
24 February 2022	Russia Military Action in Ukraine[20]
21-22 June 2023	Ukraine Recovery Conference - "Green Recovery"[21]

RELEVANT UN RESOLUTIONS, TREATIES AND EVENTS

[13] Lowe, Keith. "How & When Did WW2 Officially End?" *History Extra*, 1 Sept. 2020, historyextra.com/period/second-world-war/how-when-ww2-end-ve-day-vj-day-fighting-atomic-bombs-japan-world-europe/ . Accessed 1 July 2025.
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[16] HISTORY.com Editors. "NATO Bombs Yugoslavia." *HISTORY.com*, A&E Television Networks, published 21 July 2010, last updated 2 March 2025, www.history.com/this-day-in-history/March-24/nato-bombs-yugoslavia . Accessed 1
July 2025.
[17] "Explosive Remnants of War Plague Post-Conflict Landscapes." *BBC News*, 29 Mar. 2023, www.bbc.com/news/world-64980565 . Accessed 1 July 2025.
[18] "Syria's War Explained From the Beginning." *Al Jazeera*, 14 Apr. 2018, www.aljazeera.com/news/2018/4/14/syrias-war-explained-from-the-beginning . Accessed 1 July 2025.
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[20] "Timeline: The Events Leading up to Russia's Invasion of Ukraine." *Reuters*, 1 Mar. 2022,www.reuters.com/article/world/timeline-the-events-leading-up-to-russias-invasion-of-ukraine-idUSKBN2KX2AM . Accessed 1 July 2025.
[21] "Ukraine Recovery Conference 2023." *GOV.UK*, UK Government, 22 June 2023, www.gov.uk/government/topical-events/ukraine-recovery-conference-2023 . Accessed 1 July 2025.

UNGA Resolution A/RES/47/37 (1992)

Adopted in 1992, UNGA Resolution 47/37, titled “Protection of the Environment in Times of Armed Conflict,” was one of the first international acknowledgments that war related environmental damage has lasting consequences for both ecosystems and human wellbeing. Although non-binding, the resolution calls on all states to respect their international environmental obligations during armed conflicts and is a call for the working out of legal mechanisms for protecting the environment during war. It acknowledges that environmental damage may long outlive the conflict and have repercussions for future generations, public health and post conflict reconstruction. This resolution opened the discussion for legal and moral obligations of warring parties in relation to the protection of the environment.

UNEP Post-Conflict Environmental Assessments (PCEAs)

The United Nations Environment Programme (UNEP) has led the way in assessing and mitigating the environmental impact of armed conflict through its Post-Conflict Environmental Assessments (PCEAs). These field based assessments are carried out in regions emerging from war or disaster, providing evidence on the impact that war has had on human health, livelihoods, biodiversity, water systems, soil and air quality. More than simply recognizing the wound, PCEAs help direct national recovery planning and inform international aid. By integrating environmental concerns into peacebuilding and reconstruction planning, UNEP emphasizes that sustainable recovery depends not only on rebuilding institutions but also on restoring the environment that communities rely on. In this way, PCEAs link ecological integrity with human resilience.

PREVIOUS ATTEMPTS TO SOLVE THE ISSUE

Syria Debris Recycling Project

After the war in Syria, efforts were made to recycle debris from destroyed buildings to help rebuild critical infrastructure and create job opportunities for affected communities. Humanitarian groups supported projects aimed at salvaging construction materials to aid both city recovery and livelihoods. However, these initiatives faced major challenges. Ongoing hostilities and weak coordination limited the scale and speed of operations. In many regions, debris removal remained stalled because of the constant threat of violence and the lack of safe working conditions. Despite these setbacks, the project showed how recycling debris could be a useful tool, helping both rebuild and boost the economy at the same time.

Iraq Post-2003 Reconstruction

After the 2003 invasion, Iraq made reconstruction efforts aimed at removing hazardous debris and rebuilding infrastructure. Clearing rubble in urban areas was essential in enabling the return of displaced populations and removing hazards like toxic waste and unexploded ordnance. However, these efforts were often undermined by limited funds, logistical problems, political turmoil, and ongoing security risks. The lack of coordinated planning and sustainable frameworks also meant that many reconstruction projects remained incomplete or were delayed

for years. Iraq's experience shows how important it is to start debris removal early, with enough funding and security measures in place, to support recovery after conflict.

POSSIBLE SOLUTIONS

Recycling and Reuse

Recycling materials from destroyed infrastructure is one of the most immediate and tangible steps toward post war recovery. Crushed concrete and masonry can be reused in the reconstruction of roads, embankments, and even building foundations. This reduces the demand for newly quarried stone or cement. Additionally, metals like steel, aluminum, and copper, often recovered from damaged vehicles and structures, can be processed and used again in construction or manufacturing, supporting both environmental recovery and economic revitalization. This approach promotes a circular economy and minimizes the environmental burden of war debris.

However, a major concern is contamination risk, particularly from explosives and asbestos. If materials aren't carefully sorted, screened, and treated, they could pose health risks and environmental problems in the future. To make recycling debris both safe and scalable, it is essential that governments invest in mobile screening units and safe handling protocols.

Conduct Environmental Impact Assessments (EIAs)

Environmental Impact Assessments (EIAs) should be conducted to evaluate the extent and nature of contamination, before every large scale reconstruction or material reuse. These assessments are critical to determining whether debris can be safely recycled, needs remediation, or should be securely disposed of. EIAs also inform land use planning, water protection measures and ecosystem restoration efforts, making them a significant measure of sustainable recovery.

However, the availability of reliable data, technical capacity and safe access to affected areas often poses significant challenges especially in ongoing or unstable conflict zones. Establishing partnerships with international environmental agencies and using satellite or drone based data collection could help with these limitations.

Waste-to-Energy (WTE)

In regions overwhelmed by post conflict waste and lacking energy infrastructure, waste to energy technologies offer waste reduction and power generation. Converting organic debris such as wood, vegetation, or paper into biochar or biogas can improve energy access while reducing carbon emissions. For example, biochar can serve as a soil enhancer and a long term carbon sink, aiding in both environmental and agricultural recovery.

However, biomass availability may be inconsistent. Also the presence of toxic or hazardous materials could pose a thread to the safety of those conducting combustion or thermal conversion processes. Additionally, WTE systems require investment and trained personnel resources that most post conflict settings lack. In order to limit these challenges, careful site selection, contamination controls and decentralized small scale units are essential.

Green Reconstruction

Post war rebuilding is a rare opportunity to redesign cities with resilience and sustainability at their core. Eco urban planning incorporates features like green infrastructure, resilient buildings, passive design strategies and renewable energy systems. Using sustainable materials, such as hempcrete, seaweed composites or recycled steel, can reduce environmental impact while fostering innovation in the construction sector. Designing energy efficient architecture, supported by solar, wind, or geothermal systems, can reduce long term costs and enhance self sufficiency in vulnerable communities. Integrated water management systems, including rainwater harvesting, greywater recycling and aquifer recharge, can safeguard freshwater resources in fragile environments.

However this solution faces the challenges of cost and capacity. Sustainable building practices are more expensive than regular buildings and require expertise that are not available in post conflict zones. Overcoming this requires international collaboration, technical training and financial support mechanisms from development banks, donor countries and humanitarian organizations.

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