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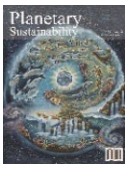


WAR AND SUSTAINABILITY: THE TWO-WAY RELATIONSHIP BETWEEN CONFLICT AND UNSUSTAINABLE DEVELOPMENT

MAZIAR MORADI-LAKEH[1,2]* AND REZA MAJDZADEH[3]

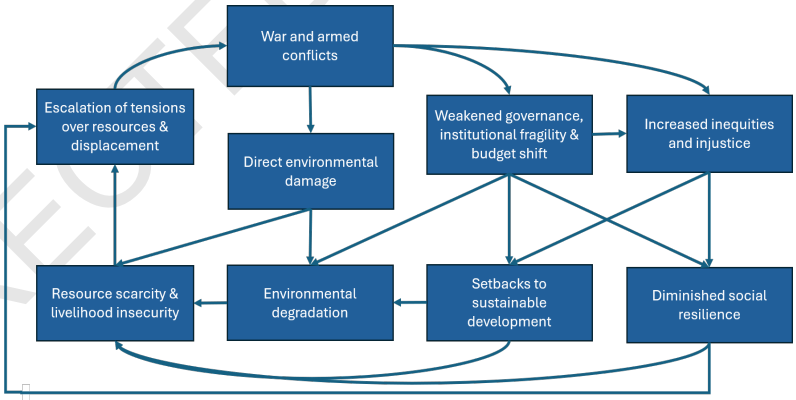
[1]*Institute of Tropical Aquaculture and Fisheries, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia*
[2]*Preventive Medicine and Public Health Research Center, Iran University of Medical Sciences, Tehran, Iran*
[3]*School of Health and Social Care, University of Essex, Colchester, United Kingdom*

**Corresponding author: m.moradi@umt.edu.my*

HIGHLIGHTS

- Wars and armed conflicts undermine sustainability through interconnected environmental, social, economic, and institutional pathways.
- Sustainability-related stressors can act as risk multipliers that contribute to tensions, displacement, and conflict.
- A global surveillance system and sustainability-related taxation of military industries could support accountability, prevention, and recovery.

GRAPHICAL ABSTRACT



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ABSTRACT

Wars and armed conflicts are inherently destructive, and their impacts extend far beyond military resources and intended targets. Generally speaking, the damage caused by wars and conflict extend even beyond civilian populations and facilities, this spillover often referred to as collateral damage, there are numerous additional victims of wars and conflicts, which includes animals, plants, natural resources, biodiversity, and climate systems and ecosystems. Wars and conflicts, which may represent both drivers and consequences of shortcomings in Sustainable development goals (SDG), specifically SDG16, which has to do with (Peace, Justice and Strong Institutions Wars and other conflicts also negatively affect the progress across of almost all other Sustainable Development Goals (SDGs), including

poverty reduction, health and well-being, food security, economic development, education, equity as well as goals related to natural resources and the environment. Consequently, wars and other conflicts constitute major barriers to achieving sustainable development. The consequences of wars and armed conflicts on global sustainability, natural resources, biodiversity, and climate systems are widespread, long-lasting, and potentially intergenerational. Although these impacts have received increasing attention in international documents and protocols, they continue to be inadequately addressed by military powers that often fail to safeguard even civilian populations. The most effective mitigation strategy for the sustainability impacts of wars and armed conflicts is prevention; however, such efforts frequently fail. Regarding the environmental consequences of wars and armed conflicts, we argue that the current limited initiatives for documenting these impacts should be expanded into an independent global surveillance system to systematically identify, monitor, analyse, and inform policies and interventions. We also call for sustainability-related taxation of military industries to partially and pre-emptively compensate for their destructive contributions to planetary sustainability.

Introduction

Wars and armed conflicts are inherently destructive. In addition to humans and constructed resources, which are often the primary targets of such attacks, other animals, plants, and ecosystems are also heavily affected during wars and armed conflicts. Their impacts can be long-lasting and can continue well beyond a ceasefire period.

Sustainability should not be regarded solely as a purely environmental concept; it is an important dimension of peace, resilience, governance, and human security. Sustainable development and persistent armed conflict are fundamentally incompatible because sustainability depends on long-term ecological integrity, social stability, institutional continuity, and intergenerational responsibility (Cairns, 2003; Ani, 2016). Armed conflicts not only harm contemporary populations, but they may also compromise the environmental, social, and institutional foundations required for future generations and threaten intergenerational well-being (Cairns, 2003; Arenas *et al.*, 2025). Therefore, armed conflicts and in a broader sense, militarism, should not be viewed only through a security lens, but also as a sustainability destabiliser. Sustainability discourse frequently emphasises climate, biodiversity, and economic development, but the role of militarism and armed conflict often receives disproportionately little attention (Vuong *et al.*, 2024; Arenas *et al.*, 2025). This destabilisation is also a matter of justice which is an important aspect of sustainable development. The harms of armed conflict are not distributed evenly across populations, territories, or

generations; they often fall most heavily on those with limited political voice, economic security, mobility, and adaptive capacity. War-related destruction can deepen inequality, erode institutional trust, and reduce the resources available for recovery. These processes may create conditions in which scarcity, displacement, grievances, and political instability become more likely. We therefore approach the relationship between war and unsustainability as a self-reinforcing cycle, in which inequality is not only an outcome of crisis but also one mechanism through which crisis is reproduced.

The environmental impacts of armed conflict are multidimensional and interconnected, affecting ecosystems, biodiversity, natural resources, pollution patterns, climate systems, and human livelihoods simultaneously (Bhardwaj & Parveen, 2024; Wang *et al.*, 2024). In fact, large-scale armed conflicts may reverse years or decades of progress toward sustainable development; they may intensify structural weaknesses in global sustainability systems including fragile supply chains and unequal resource distribution (Pereira *et al.*, 2022). Armed conflicts may negatively affect progress across nearly all Sustainable Development Goals (SDGs) (Wang *et al.*, 2024). In this paper, we review some of the consequences of wars and conflicts on sustainability and sustainable development, and the impact of unsustainability on the emergence or intensification of conflicts and discuss potential approaches for safeguarding sustainability. We argue that war and armed conflicts act as drivers of environmental degradation, institutional fragility, and social inequity, while unsustainable development itself may contribute to tensions, displacement, competition over resources, and conflict emergence. We further discuss the implications of this framework for surveillance, accountability, and policy responses.

How War and Conflict Undermine Sustainability

Environmental Consequences of War and Conflict

There are several historical examples in which invading forces have used environmental and ecosystem destruction intentionally to disarm the other party or put them under pressure through famine or hunger or displace them. Such intentional destruction, or ecocide, is generally considered an unlawful and criminal act, although it continues to be used in the modern era (Falk, 1973; Wirtu & Abdela, 2025). However, destruction of the environment and natural resources is often introduced merely as collateral damage in wars and armed conflicts. Unfortunately, the term “collateral damage” has become so widely and commonly used for civilian populations, as well as medical, educational, cultural, and essential life-supporting facilities, that its use for damage to damage to ecosystems, the natural environment, and biodiversity, and adaptive capacity is often overshadowed or overlooked. Armed conflicts may damage both terrestrial and aquatic ecosystems through bombing, fires, deforestation, land degradation, contamination, and destruction of coastal and marine habitats. They can accelerate biodiversity loss through habitat destruction, wildlife exploitation, weakened conservation systems, and the unregulated over-extraction of natural resources to fund the

conflict (Bhardwaj & Parveen, 2024; Vuong *et al.*, 2024).

Pollution and contamination of natural resources are common consequences of wars; environmental contamination associated with war may persist long after active conflict ends (Antoine, 1992; Vuong *et al.*, 2024). Soil and groundwater contamination, oil spills, chemical and radioactive contamination, air pollution with dust, debris, and military waste have been reported in many wars. Effective management of hazardous materials, military waste, fuel systems, and contamination risks may reduce long-term environmental and public health consequences (Falk, 1973; Reichberg & Syse, 2000), but they are usually assigned the lowest priority for the military commanders.

The military sector is estimated to produce around 5.5% of global greenhouse gas emissions; however, this estimate may not be fully accurate because of the secretive nature of military activities and the classified or limited availability of data required for proper measurement (Larbi *et al.*, 2025).In addition to contributing substantially in greenhouse gas emissions during military conflicts, due to fuel-intensive operations and related processes such as rapid construction (Vuong *et al.*, 2024). Military activities also divert substantial financial resources away from social and sustainability programmes and climate actions toward destructive and resource-intensive activities (Cairns, 2003; Pereira *et al.*, 2022).

Armed conflicts often weaken environmental governance systems by disrupting regulators and enforcement mechanisms. Institutional capacity of governing systems decreases through instability and erosion of public trust (Ani, 2016; Bhardwaj & Parveen, 2024). Conservation programs and biodiversity protection efforts become more difficult during armed conflicts (Vuong *et al.*, 2024).

International humanitarian law recognises limits intended to restrict widespread, long-term, or severe environmental destruction. However, they remain insufficient in the absence of strong accountability and enforcement mechanisms (Antoine, 1992).

Wars and Conflicts: Barriers to Achieve Sustainable Development Goals (SDGs)

Effects of wars and conflicts are not limited to the environment; they also affect almost all dimensions of sustainable development and slow progress towards achieving these goals. Wars and armed conflicts affect almost all aspects of SDGs, directly or indirectly. While SDG16 has been specifically defined to cover “Peace, Justice and Strong Institutions”, this goal is in fact a foundational precondition or enabler for achieving the broader SDG agenda. Armed conflicts have systematic cascading effects on several SDGs (Pereira *et al.*, 2022; Wang *et al.*, 2024; Arenas *et al.*, 2025). Achievement of SDGs in settings characterised by prolonged insecurity and institutional fragility is very difficult (Figure 1) (Ani, 2016).

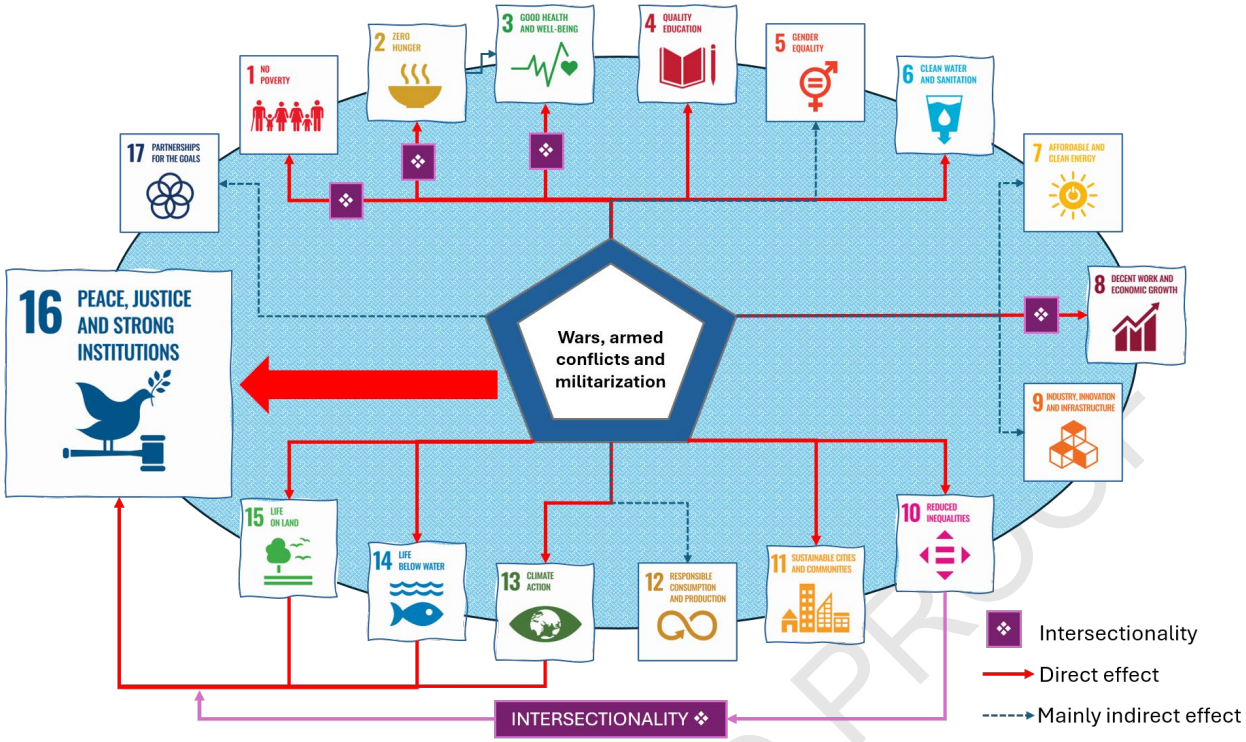

Figure 1: Impact of wars, armed conflicts, and militarisation on sustainable development goals (SDGs)

Wars and other forms of armed conflicts have huge effects on health and well-being of populations (SDG 3). Global Burden of Disease (GBD) study estimates demonstrated how war affects the health of a population (Massahikhaleghi *et al.*, 2018; Moradi Lakeh *et al.*, n.d.). Part of the pressure on population health arises from the direct effects of wars, including fatal and non-fatal injuries. However, the health consequences of war extend far beyond these immediate effects and affect Non-communicable Diseases (NCDs), mental health, and infectious diseases. Damage to and destruction of health and medical facilities, overcrowded healthcare centres and hospitals, shortages of healthcare professionals due to war conditions, and the internal or external displacement of populations to areas far from healthcare services all contribute to delays and disruptions in regular healthcare delivery (Abukmail *et al.*, 2025; Katchhi & Ming, 2025; Parmar & Rathod, 2026; Pinchuk *et al.*, 2026). In prolonged wars and insecure conditions, essential preventive services such as vaccination programmes are often disrupted, increasing the risk of infectious disease outbreaks. Such outbreaks may spread beyond the affected country or conflict area and become a broader regional or global public health threat (Sabahelzain *et al.*, 2025).

These SDG-related effects should not be read as separate domains of damage. Health systems, food security, education, social equity, and institutional capacity interact closely during and after conflict. Damage in one domain can intensify vulnerability in another: Disrupted education weakens future human capital; food insecurity worsens health and poverty; institutional collapse limits fair access to recovery; and widening inequality reduces collective resilience. The sustainability burden of war is therefore cumulative and

relational, not merely sectoral. It should be understood as interacting and mutually reinforcing disruptions that accumulate across social, environmental, economic, and institutional systems. Below are some examples of how armed conflicts and wars affect different aspects of sustainable development. However, the impacts of war are not limited to these SDGs, and the underlying mechanisms and pathways are broader and more complex than those presented here.

Armed conflict may severely disrupt agricultural and other food production systems (Bhardwaj & Parveen, 2024). Armed conflicts can also significantly disrupt global and regional food systems through interruptions in supply chains, fertiliser shortages, and rising food prices. Such disruptions may intensify the risk of global hunger and threaten food security, particularly in vulnerable countries and among disadvantaged populations around the world (Pereira *et al.*, 2022; Hinz *et al.*, 2026; Sangwa *et al.*, 2026). In August 2025, the Integrated Food Security Phase Classification (IPC) declared an IPC Phase 5 (Catastrophic Famine) in the Gaza Strip after several months of conflict and limitations to access to food (GAZA STRIP, n.d.). Irrespective of whether such events and pathways are intentionally engineered or simply unintended consequences of war, they delay countries' progress toward achieving sustainable development and zero hunger (SDG 2).

Armed conflicts undermine education and human capital development through disruption of education systems and reduced research capacity (Ani, 2016; Milton, 2021). Schools and universities as civilian infrastructure must be protected under the international humanitarian law and intentional attacks on such facilities can be a war crime under the Rome Statute of the International Criminal Court (ICC) (Rome Statute of the International Criminal Court | International Criminal Court, n.d.). Attacking countries usually present the consequent damages as collateral damage, but in fact in many cases the academic or educational facilities are indeed the real targets; in the recent decade, scholasticide, the systematic destruction of educational facilities in times of war or armed conflict has increasingly become the new norm (Hajir & Qato, 2025). At the same time, conflict-related migration and brain drain further weaken educational systems and undermine long-term capacity for sustainable development (SDG 4) (Milton, 2021).

The relationship between war and social inequities is complex. Inequities and the related grievances they generate can be among the underlying causes that ignite conflicts, and in some cases, conflicts may ultimately lead to improvements in equity; however, such an improvement is not the outcome in most situations (Wayne Nafziger & Auvinen, 2002; Cederman *et al.*, 2011). Some civilian populations such as women, children, older adults, and refugees, are often at greater risk of the consequences of war than other civilians. These categories should not be treated as isolated or fixed groups. An intersectional justice lens is needed to examine how gender, age, disability, poverty, displacement, ethnicity, geography, and political exclusion may overlap to shape exposure to harm, capacity to adapt, and access to recovery (Vedadhir *et al.*, 2023). For instance, the risks faced by an older displaced woman, a child with a disability, or a poor rural household may differ substantially from those captured by any

single category of vulnerability. Recognising these intersections is essential for identifying whose losses are most likely to remain undercounted, politically invisible, or excluded from conventional recovery assessments.

Consequently, armed conflicts frequently exacerbate disparities and social inequities. Economic instability associated with armed conflict may contribute to inflation, unemployment, disrupted markets, and weakened public services; these issues disproportionately affect the most vulnerable and economically at-risk countries and may further widen existing disparities (Wang *et al.*, 2024). Their impact can, in fact, be intergenerational, as armed conflict may intensify educational inequalities against displaced and marginalised populations, with consequences that may extend to future generations (Milton, 2021). Inequality can therefore operate as a feedback mechanism rather than merely a residual effect of conflict. Groups that experience greater exposure to violence, displacement, food insecurity, interrupted care, and educational loss often have fewer means to recover. Unequal recovery can weaken social cohesion, deepen mistrust toward institutions, and sharpen perceptions of injustice. Over time, these conditions may increase grievances and leave societies more vulnerable to renewed instability (Wayne Nafziger & Auvinen, 2002; Cederman *et al.*, 2011) From a sustainability perspective, inequality should therefore be viewed both as a consequence of war and as a mechanism that may prolong recovery, weaken social resilience, and increase susceptibility to future instability through perceived oppression and political radicalisation.

Military expenditures and conflict-related costs may also divert resources away from investments needed for sustainable development. Therefore, the sustainability consequences of war often extend far beyond the active conflict period (Arenas *et al.*, 2025). Failure to address environmental considerations during armed conflict may increase long-term recovery costs and ecological restoration requirements (Mosher, 2008).

How Unsustainability Can Contribute to Conflict

Scarcity and limited access to natural resources are among the sources of geopolitical tensions and wars. This pathway should be understood as conditional rather than automatic. Scarcity does not, by itself, produce conflict; the pathways are rarely linear although possible for populations that are already under pressure for vital resources such as water or food, or experiencing background tensions for other reasons. Resource scarcity may increase conflict risk through its interaction with governance quality, economic inequalities, population displacement, and perceptions of injustice. Consequently, sustainability-related stressors should be mainly viewed as risk multipliers rather than deterministic causes of conflict (Ross, 2004; Lujala, 2009; Bernauer & Böhmelt, 2020). Environmental stress becomes politically dangerous when it interacts with inequality, institutional weakness, exclusion, or unresolved grievances.

Theoretically, any act that increases unsustainability, places affected parties at increased risk of escalating tensions and conflict. This specifically occurs when the policies and interventions of one party

directly affect shared resources and impose limitations on the other party involved. In reality, some natural resources are more likely to contribute to the emergence of tensions and conflicts, particularly crude oil and natural gas from common fields (Ross, 2004; Lujala, 2009). More than 60% of the global land area affected by at least one month of extreme drought in 2024, which was almost 300% above the 1951–1960 average; it threatens sanitation, water security, food production, disrupt power generation, and fluvial transport (Romanello *et al.*, 2025). This creates enormous challenges and tensions around the world and has the potential to ignite conflicts over freshwater (Bernauer & Böhmelt, 2020). Although international collaborations, dialogue, bilateral and multilateral treaties, and other forms of agreement resolve some of the challenges, this is not always the case.

Unsustainability, severe climatic conditions, and environmental degradation can contribute to population displacement and migration from affected areas, depending on the extent of the issue and the capacity for mitigation or adaptation. These migration flows may intensify during emergencies such as natural disasters. However, even in the absence of acute events, populations living in environmentally degraded and resource-scarce settings may increasingly seek relocation opportunities, particularly in regions experiencing persistent economic and social underdevelopment (Reuveny, 2007). Host countries vary in their capacity and willingness to accommodate migrants, although emergency situations may temporarily increase acceptance and humanitarian support. Nevertheless, prolonged or large-scale migration patterns may contribute to political and social tensions within and between countries, particularly when combined with economic pressures, weak governance, or social inequalities. Displacement should similarly be viewed not merely as a humanitarian outcome of conflict or environmental degradation, but as a process that transfers sustainability pressures across locations and generations, creating new environmental, social, and institutional challenges in receiving communities.

Therefore, it functions as a transmission pathway between ecological stress, conflict, and social instability (Reuveny, 2007). It can move the consequences of war or environmental degradation beyond the original site of destruction, increasing pressure on housing, employment, health services, education systems, and local ecosystems in receiving areas. Whether these pressures develop into social tension depends largely on governance capacity, inclusion, public communication, and the fairness of support provided to both displaced and host communities. In some settings, migrants and refugees have also been exposed to discrimination, hostility, and violence in host communities (Reuveny, 2007). In regions where residents are already exposed to the daily challenges of climate change and socio-economic disparities,

armed conflict and the consequent displacement of populations impose severe consequences on population health and increase environmental pressures in the regions and or host countries (Ani, 2016; Bhardwaj & Parveen, 2024).

Together, worsening of institutional fragility, inequalities, population displacement, environmental degradation and resource scarcity illustrate how sustainability challenges and conflict can become embedded within self-reinforcing cycles that extend beyond the original geographic area or time period of a crisis (Figure 2).

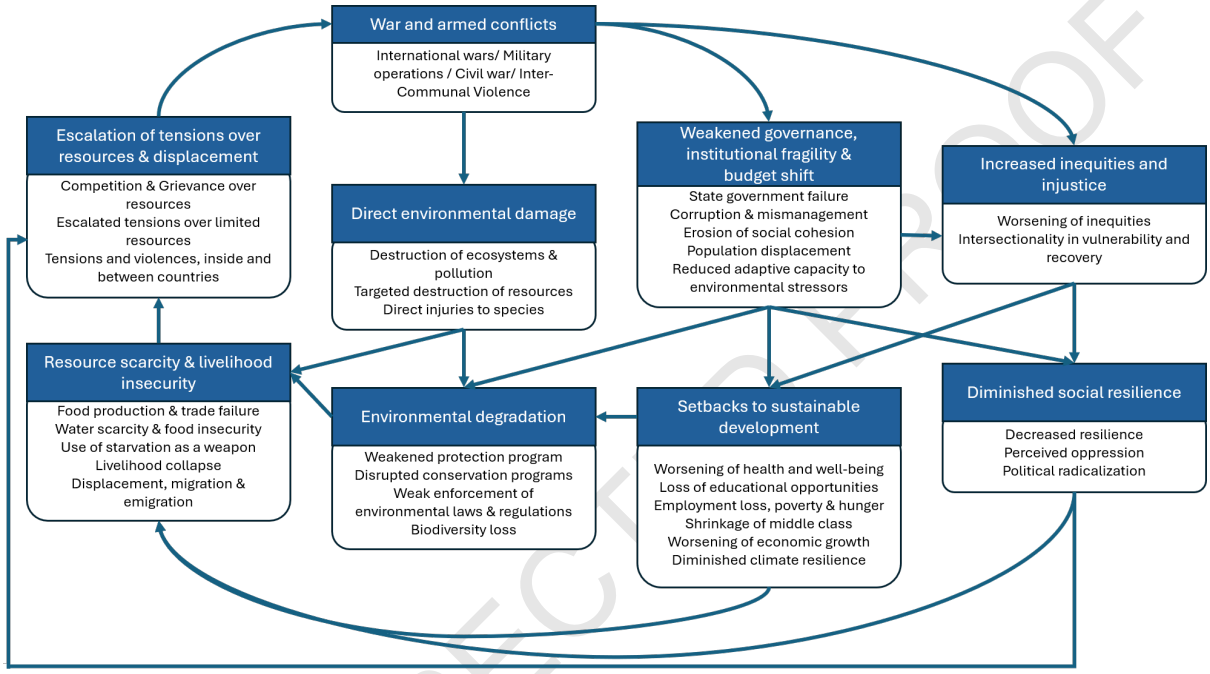

Figure 2: Two-way and self-reinforcing relationship between wars or armed conflicts and impaired cumulative sustainability and resource scarcity

Moving Forward

During wars and armed conflicts, the parties involved, and sometimes the affected human populations, are at least partially aware of the underlying reasons and may have some agency in advancing or stopping the conflict. The humanitarian consequences of such events are extensive, often devastating, long-lasting and multidimensional; however, human populations are not the only victims. Wildlife, ecosystems, and natural resources are also bystander victims, without any agency in the conflict process. On the other hand, the destruction and degradation of such systems can create a vicious cycle that worsens the lives of human populations in both the short and long term, with effects that may even extend across generations. Damage to sustainability is not limited to the environment; it also affects multiple dimensions of sustainable development and slows progress toward achieving the goals. The United Nations and other international organisations have shown increasing attention to the protection of the environment and sustainability during wars and armed conflicts, although several limitations remain, including restricted

applicability in situations of internal conflict (UN Environment Programme, 2009; Gieseken & Murphy, 2023). However, in many cases, the rules, regulations, and enforcement mechanisms that compel countries and parties to comply remain unclear or insufficient. Similar to, and in some cases exceeding, violations of international humanitarian law, these laws are often ignored by the parties involved with limited consequences or accountability.

The most effective and most efficient strategy for mitigating the sustainability consequences of war and armed conflict is their prevention through diplomacy, dialogue, and peaceful conflict resolution. This approach has been aptly characterised as a "peace pill" because of its potential to reduce the profound human, environmental, and developmental harms associated with war (Karamouzian *et al.*, 2026). Unfortunately, in many cases, the parties involved still choose to ignore opportunities for dialogue and instead resort to armed confrontation. Those who show little concern for human lives are often equally indifferent to the destruction of sustainable environments. The United Nations and other international organisations often lack sufficient authority, and in some cases sufficient willingness, to prevent such events. Changes in international law and enforcement mechanisms may help address these challenges, although the effectiveness of such laws and regulations requires further evaluation.

An independent surveillance system to monitor, analyse, report, and advocate on the consequences of wars and conflicts for sustainability appears essential, and we call for the establishment of such a system. There are several platforms and mechanisms that have been introduced for this purpose, for instance, WISEN, or the Wartime Incidents to Environment Database has initiated a system to assess near real-time and long-term environmental risks and damage resulting from direct attacks on environmentally hazardous sites during armed conflicts; however, its coverage remains limited to specific regions/countries and is restricted to specific aspects of environmental impacts of wars, such as industrial or environmentally hazardous facilities and their toxic and pollution effects (Introducing WISEN, 2026).

In addition, such initiatives would benefit from greater transparency regarding their independence from the interests of particular countries or political and military alliances. Beyond generating critical evidence for planning and mitigation, such a mechanism could also contribute to accountability and responsibility. We also call for sustainability-related taxation of military industries to compensate for their contribution to carbon emissions, environmental degradation, and the destruction of sustainability. To serve that purpose, monitoring should be explicitly justice-oriented and intersectional. It should document not only aggregate environmental or developmental losses, but also the unequal distribution of harm across social groups, territories, ecosystems, and generations. This requires attention to how gender, age, disability, displacement status, poverty, ethnicity, geography, and political marginalisation may overlap to produce distinct forms of exposure, vulnerability, and exclusion from recovery. Such evidence would be essential for prioritising recovery, supporting affected communities, informing reparative measures, and making visible forms of damage that are otherwise

treated as collateral or politically invisible (Vedadhir *et al.*, 2023).

The monitoring and accountability frameworks should therefore capture not only direct environmental damage, but also the cumulative and interconnected sustainability impacts of conflict, including displacement, inequality, institutional disruption, and long-term barriers to recovery and sustainable development. We also call for sustainability-related taxation of military industries through a binding international regulation, not only as compensation for their contribution to carbon emissions, environmental degradation, and the destruction of sustainability, but also as a mechanism for focusing on peace to mitigate humanitarian and environmental impacts of wars and armed conflicts, financing ecological restoration, community recovery, and long-term support for populations that bear disproportionate burdens of conflict-related harm. Implementation of such a taxation mechanism would face several challenges, including the need for international coordination, limited transparency of military expenditures, resistance from military industries, and questions over governance of collected funds. Further work is needed to assess the feasibility, effectiveness, and potential unintended consequences of such approaches.

This paper has several limitations. The relationships between sustainability, environmental degradation, and armed conflict are complex, context-dependent, and often difficult to disentangle from broader political, economic, historical, and geopolitical factors. Many of the pathways discussed are supported by observational evidence and conceptual frameworks rather than direct causal inference. Furthermore, the sustainability impacts of armed conflict vary substantially across settings and conflict types. Accordingly, the purpose of this paper is to highlight major pathways and implications rather than provide a comprehensive causal model.

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Data Availability Statement

The data supporting the findings of this study are publicly available from the sources cited in the manuscript.

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Conflict of Interest Statement

The authors declare no conflict of interest.

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