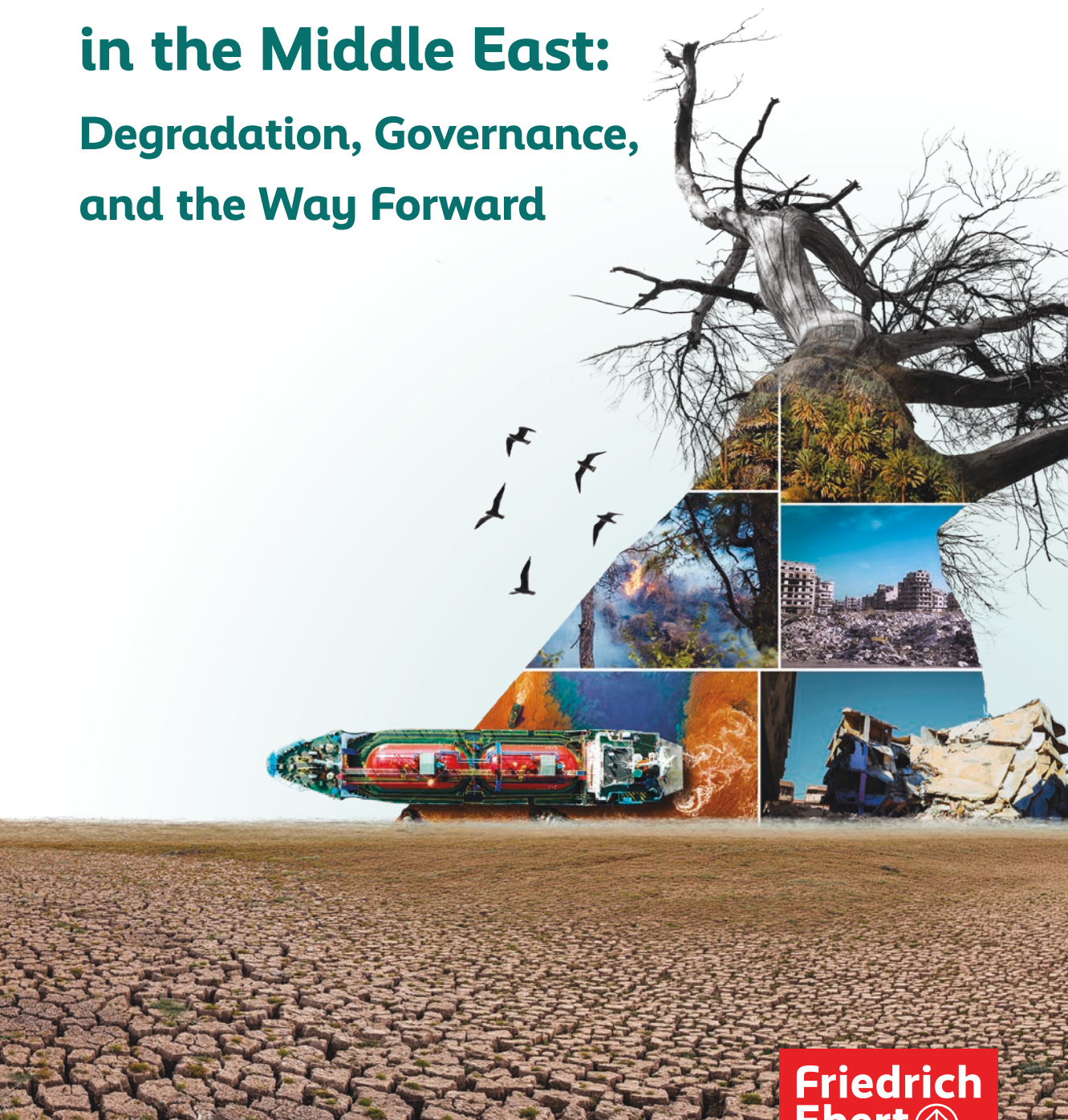


War and the Environment in the Middle East:

Degradation, Governance, and the Way Forward



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David Jalilvand & Tobias Zumbräge

July 2026

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Executive Summary

In the Middle East, armed conflict is increasingly undermining not only human security and infrastructure but also the environmental systems on which livelihoods and long-term stability depend. This reflects a broader global trend in which rising organised violence and ecological degradation interact in mutually reinforcing ways. In conflict settings, the environment is not merely a passive backdrop but a system shaped by human action and integral to wellbeing. Warfare damages critical infrastructure, depletes natural resources, erodes biodiversity, and instrumentalises nature for political objectives, while governance constraints often relegate environmental protection to a secondary concern. Crucially, the consequences reach beyond ecological damage, exacerbating social vulnerability and complicating recovery.

This report analyses these dynamics through interdisciplinary perspectives and empirical case studies. It recognises the heterogeneity of conflicts – ranging from inter-state wars and civil conflicts with foreign intervention to occupation and fragmented governance – and highlights corresponding variations in environmental harm and institutional challenges. Case studies from the Middle East, alongside the reference context of Ukraine, illustrate a spectrum of impacts, including infrastructure destruction, contamination, long-term resource depletion, and socio-economic disruption. At the same time, the analysis acknowledges the limits of available data and the ethical challenges inherent in conducting research in conflict environments.

Beyond diagnosis, the report develops policy-oriented recommendations to mitigate environmental harm, strengthen governance, and integrate ecological considerations into recovery and peacebuilding.

Introduction

David Jalilvand & Tobias Zumbrägel

The recent resurgence of violent conflict is not merely a matter of perception or political rhetoric. Empirical conflict data demonstrate a clear upward trend in organised violence worldwide over the past decade. According to the Uppsala Conflict Data Program (UCDP), both the number of state-based armed conflicts and the intensity of violence have increased significantly since the mid-2010s, with the Middle East remaining one of the most affected regions.¹ This escalation coincides with, and increasingly intersects, profound ecological stress, rendering the environmental dimensions of war an urgent but still insufficiently integrated field of analysis.

The environment is commonly framed as a passive backdrop to conflict or as a reservoir of capital, labour, and resources feeding production and consumption. Yet in many contemporary wars, nature is not only instrumentalised as a strategic asset (through energy systems, water infrastructure, extractive industries, or control over strategic resources) but also becomes a direct victim of violence. Armed conflict systematically degrades ecosystems and depletes natural resources that constitute the material basis for human survival. As soils are contaminated, water systems are destroyed, forests are burned, and biodiversity is eroded, the ecological foundations of livelihoods, food security, and public health are progressively undermined.

Armed conflicts inflict environmental harm through multiple, often overlapping pathways. These include the deliberate or collateral destruction of industrial, energy, and transport infrastructure; the release of toxic substances from damaged chemical plants, refineries, and military installations; the burning of oil and gas facilities; the accumulation of rubble and hazardous waste; and the collapse of water, sanitation, and waste management systems. Beyond immediate damage, warfare accelerates deforestation, illegal resource extraction, and biodiversity loss, while post-conflict reconstruction often generates additional emissions and ecological pressures due to carbon-intensive, unsustainable rebuilding practices.²

In the Middle East, the entanglement of war and environmental destruction has been evident for decades.³ The burning of Kuwaiti oil wells during the 1991 Gulf War produced one of the most severe cases of conflict-related environmental damage in modern history. The 2003 invasion of Iraq resulted in widespread destruction of power stations, industrial facilities, chemical plants, and sewage infrastructure, with long-term consequences for air and water quality. Since 2011, the war in Syria has further illustrated how protracted conflict devastates ecosystems: oil fields and refineries were set ablaze or sabotaged, water infrastructure was deliberately targeted and weaponised, agricultural land degraded, and entire cities such as Aleppo reduced to rubble mixed with toxic residues.

1 Uppsala University 2026; S. Davies et al. 2025

2 Le Billon 2001; Scheffran et al. 2012; Sowers, Weinthal, and Zawahri 2017; Swain and Öjendal 2020; Ide 2025

3 Raleigh and Urdal 2007; Kim and Garcia 2023

Current wars in the region continue and intensify this pattern. Recent hostilities have once again demonstrated how military operations translate into environmental harm through wildfires, damage to wastewater and energy facilities, contamination from munitions remnants, and the destruction of ports and industrial zones. While the attribution and quantification of environmental damage in ongoing conflicts remain methodologically challenging,⁴ emerging assessments indicate that ecological impacts are substantial and likely to have long-term consequences for already fragile socio-ecological systems.

Crucially, the environmental impacts of war do not remain confined to ecological domains. In a region characterised by water scarcity, climatic stress, rapid urbanisation, and political fragmentation, environmental degradation exacerbates vulnerabilities, deepens socio-economic inequalities, and undermines post-conflict recovery.

Environmental damage thus becomes a security issue in its own right, with direct implications for human security, migration, public health, and political stability.⁵ Recognising these linkages is particularly relevant for German and European foreign and security policy, where environmental risks are increasingly acknowledged as threat multipliers but remain insufficiently integrated into conflict analysis, policy design, and deliberations about reconstruction.

Contextualisation and Relevance

Objectives and Approach

The study project examines the environmental consequences of ongoing warfare in the Middle East and formulates policy options relevant for German and European decision-makers, while contributing to the broader international debate on the war-environment nexus. It brings together regional and international experts to assess not only the immediate ecological damage caused by armed conflict but also its long-term structural implications.

At the same time, the study explicitly contextualises the heterogeneity of the region and the phenomena under investigation. Conflicts differ markedly in nature: they range from inter-state confrontation (such as between Iran and Israel), to (past) civil wars with foreign interventions (as in Syria, Sudan, Yemen, Iraq, and Lebanon), to conflict under occupation (as in Palestine). These different conflict constellations intersect with varying degrees of statehood and governance capacity – from comparatively consolidated state structures, as in Iran, to severely constrained or fragmented governance contexts, as in Palestine. The analysis also takes into account disparities in access to information, the politicisation of data, and the shrinking or uneven space for civil society activism, all of which shape both environmental harm and the possibilities for addressing it.

The insights generated provide a comprehensive window into the many dimensions of the war-environment nexus. They address the destruction of infrastructure crucial for human security, including water, energy, and sanitation systems;

4 See chapter “Methodological Approaches”

5 Behnassi 2021; Daoudy, Sowers, and Weinthal 2022

the degradation of natural resources; the loss of livelihoods tied to land and ecosystems; and the erosion of biodiversity. They also examine the instrumentalisation of nature and resources for political and military purposes, as well as the increasing deprioritisation (or even absence) of environmental protection and conservation in unstable and conflict-affected settings.

In doing so, the project seeks to go beyond the level of diagnosis. The contributing authors not only provide differentiated snapshots and in-depth analyses of the current situation in their respective contexts, but also develop policy recommendations and forward-looking strategies. Their chapters outline pathways to mitigate environmental harm, strengthen governance under fragile and conflict-affected conditions, and restore the environment as a fundamental life-support system and a cornerstone of sustainable peace and societal resilience.

The development of the study follows a collaborative and iterative process. Authors participated in group calls and an authors' workshop to discuss conceptual alignment, shared insights, and ensured coherence across chapters. The project is thus a genuine peer effort. Contributors bring established expertise from their respective fields and regions. The study does not generate primary empirical data; rather, it consolidates, interprets, and contextualises existing knowledge. In this sense, it offers a structured window into a wide array of environmental, political, and socio-economic dynamics; a mosaic of perspectives that together provide a comprehensive picture.

Most Recent Developments

Upon finalisation of this report, a new wave of conflict erupted in the Middle East, further reinforcing the central premise of this study. The joint Israeli-US attack on Iran and the subsequent Iranian response marked a significant regional escalation, extending the geographical scope of hostilities to large parts of the region and underscoring the extent to which contemporary conflict in the region generates environmental harm. These developments provide further evidence that environmental damage is not a peripheral or incidental dimension of warfare, but one of its increasingly salient and regionally consequential effects.

Preliminary observations of the latest escalation point to several ways through which military confrontation has generated environmental damage. Deliberate attacks on energy infrastructure, including fuel depots, oil terminals, petrochemical facilities, and maritime energy assets such as tankers, create a heightened risk of fires, toxic emissions, soil and groundwater contamination, and marine pollution.⁶ In the Gulf in particular, damage to oil-related infrastructure carries implications that extend beyond the immediate site of attack, given the ecological sensitivity of coastal and maritime environments and the centrality of these systems to regional economies and energy supply chains. At the same time, reported strikes affecting desalination facilities in both Bahrain and Iran illustrate the particular vulnerability of water infrastructure in conditions of armed conflict and raise broader concerns regarding the weaponisation of water in a region already characterised by structural water stress.

In Lebanon, the reported use of white phosphorus highlights a further dimension of conflict-related environmental harm, namely the contamination and long-term degradation of soils, with potential consequences for agriculture, public health, and local livelihoods.

Given the practical need to conclude the project within a limited timeframe, these most recent developments could not be examined in this study. However, the most recent examples reflect the continued and evolving relevance of the issues addressed throughout this volume. Even more, these developments reinforce the need to examine the nexus between armed conflict and environmental degradation as a core dimension of contemporary conflict in the Middle East, with impacts that frequently extend beyond national boundaries into shared and ostensibly neutral ecosystems, including transboundary waters and marine environments.⁷ They also strengthen the argument that environmental considerations should not be treated as secondary in efforts aimed at accountability, reconstruction, and recovery. Where damage to ecosystems, water systems, energy infrastructure, and contaminated land is insufficiently addressed, recovery processes risk entrenching socio-ecological vulnerability rather than reducing it.

Structure of the Study

The study's design is guided by this overarching objective: it begins with a methodological chapter that discusses the specific challenges of conducting research in conflict-affected contexts, including data limitations, security constraints, the politicisation of information, and ethical considerations. The analysis then turns to Ukraine as a reference case. Ukraine represents a particularly salient example of large-scale environmental damage and alleged environmental crimes occurring alongside devastating and inhumane military violence. The Ukrainian case offers both lessons for documenting environmental harm during active conflict and insights into emerging accountability and debates on reconstruction. As such, it serves as a relevant reference for the Middle East, offering transferable lessons on documenting environmental damage, pursuing accountability, and integrating environmental considerations into reconstruction and recovery processes.

This broader analytical foundation provides the appropriate framework for subsequently zooming in on countries in the Middle East that have experienced significant armed confrontations over the past two years. The country chapters focus on Palestine, Syria, Lebanon, Yemen, Iraq, Iran and Sudan. While Sudan, as a geographically African state, may appear peripheral to a study centred on the Middle East, it is included on account of its deep political, ecological, and security entanglements with the region: through its Nile basin interdependencies, Gulf states involvement in its civil war, and shared patterns of resource-driven conflict that mirror broader Middle Eastern dynamics.⁸ Accordingly, each case presented here highlights distinct patterns of environmental harm, governance challenges, and potential pathways for integrating environmental considerations into humanitarian, reconstruction, and peacebuilding strategies.

7 Conflict and Environment Observatory (CEOBS) 2026

8 Lynch 2025.

Through this layered and comparative design, the study offers a structured yet pluralistic mosaic of perspectives, combining contextual depth with cross-regional insight.

The findings of this study underscore that neglecting environmental dimensions contributes to the persistence of vulnerability, fragility, and instability. Degraded ecosystems, polluted resources, and disrupted livelihoods can entrench grievances and undermine recovery efforts. By contrast, systematically integrating environmental governance into conflict prevention, response, and recovery processes offers a pathway toward more resilient, inclusive, and sustainable outcomes. The primary obstacle is not a lack of knowledge or analytical frameworks, but rather the political will and institutional capacity required to translate insight into effective and sustained action.

Conceptual Framing and Terminology

The project does not impose a rigid analytical template on contributors. Authors were free to select methodological approaches and thematic emphases that best reflect their expertise and the realities of their case studies. This flexibility is intentional, given the diversity of conflict contexts and environmental challenges.

At the same time, the study is guided by a shared set of key terms and reference concepts that provide coherence across chapters. Accordingly, this volume conceptualises armed conflict in accordance with the Uppsala Conflict Data Program (UCDP) as a contested incompatibility between at least two organised, armed actors that results in 25 or more battle-related deaths.⁹ While this threshold provides a widely used and transparent benchmark, the volume also acknowledges that environmentally induced forms of coercion, repression, or livelihood destruction may shape conflict dynamics without immediately registering as battle-related fatalities.¹⁰ Unless otherwise specified, the terms armed conflict, war, and conflict are used interchangeably. The environment is understood as the human-shaped natural world that is fundamental to human wellbeing.¹¹ The environment is understood as the human-influenced dimension of the natural world that shapes and sustains human wellbeing and socio-economic security. This framing reflects a strong environmental security perspective, as discussed and employed by other authors in the field.¹²

Environmental peacebuilding serves as the central analytical framework throughout this volume. As an umbrella concept, it may (but does not necessarily) include a variety of related and emerging approaches that explore non-violent and sustainable responses to environmental degradation, such as environmental peacemaking, environmental peace perspectives, disaster diplomacy, peace ecology, ecological diplomacy, and sustainable recovery. Environmental peacebuilding is adopted for two principal reasons: it is one of the earliest and most widely established concepts in the field, and it provides sufficient conceptual flexibility to accommodate the diverse,

9 O. Davies 2015; Uppsala University 2026

10 see further: Nixon 2011

11 Sowers, Weinthal, and Zawahri 2017

12 Ibid.; also, see chapter “Methodological Approaches”

issue-specific perspectives developed across the empirical contributions. In this context, the volume draws on a widely used definition that understands environmental peacebuilding as “all forms of cooperation on environmental issues between distinct social groups that aim at and/or achieve less violent and more peaceful relations between these groups”.¹³

Accordingly, environmental peacebuilding encompasses a broad range of interventions, from technical and managerial measures to mediation processes and longer-term restorative approaches that seek to address the structural drivers of conflict.¹⁴ More generally, it captures multiple pathways through which environmental governance is embedded in conflict prevention, mitigation, resolution, and recovery, spanning all phases of the conflict cycle rather than being limited to post-conflict reconstruction.

Experiences and empirical evidence from Ukraine¹⁵ demonstrate that environmental sustainability in conflict-affected societies cannot be achieved through mitigation and adaptation alone, but requires sustainable recovery as a core governance principle. Against this backdrop, we further define sustainable recovery as the process in conflict-affected, post-conflict, and fragile settings to restore livelihoods, institutions, and social relations through environmentally sound, inclusive, and cooperative forms of governance, with the aim of strengthening resilience, addressing structural conflict drivers, and reducing the risk of renewed or escalated violence over the long term, drawing from UNDP’s understanding of recovery and sustaining peace.¹⁶

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13 Ide 2018: 3

14 Dresse et al. 2019; Ide et al. 2021; also, see chapter “Methodological Approaches”

15 See chapter “Sustainable Recovery from Conflict: Lessons from Ukraine”

16 United Nations Development Programme (UNDP) 2016; UNDP 2023

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Methodological Approaches

Tobias Ide

The Complex Relationship between Conflict and the Environment

Environmental stress and armed conflict are key challenges of the 21st century. Nowhere is this more evident than in the Middle East, as exemplified by the contributions to this compilation. In recent years, devastating wars have ravaged Gaza, Lebanon, Iraq, Syria, and Yemen. To this, one can add the armed disputes between Israel and Iran, Lebanon, and Syria, as well as political instability and terrorist attacks in various countries.¹⁷ At the same time, the Middle East is heavily exposed to and highly vulnerable to climate change.¹⁸ Under high-global-warming scenarios, parts of the region could become uninhabitable during the summer months without large-scale access to air conditioning. Climate change will also aggravate already severe environmental risks, such as droughts in Syria and Yemen, wildfires in Lebanon, and erosion along all major coastlines of the region.¹⁹

There is mounting evidence that conflict and the environment are not separate challenges but interact with and shape one another, thus constituting significant challenges for policymakers in the region. Already in 2019, a Nature study concluded that “climate variability, hazards and trends have affected organized armed conflict within countries” while “other conflict drivers are much more influential for conflict risk across experiences to date”.²⁰ Follow-up studies have backed up these conclusions.²¹ They show that in politically unstable and environmentally vulnerable contexts, climate change can result in competition over scarce resources (such as food, land, and water), weaken established institutions, fuel grievances, and help armed groups to gain new members. Some experts have also argued for an (indirect and politically mediated) link between an intense drought and the onset of the Syrian civil war, even though such claims remain contested.²²

Vice versa, armed conflicts can have tremendous environmental impacts. In the Middle East, for instance, fighting destroyed crucial environmental infrastructure²³, resulting in authorities’ inability to monitor the environmental situation and implement adequate policies²⁴, and in local communities adopting short-term coping strategies (such as abandoning land or overharvesting forests), with long-term detrimental impacts on the environment.²⁵

17 Davies et al. 2025
18 ND-GAIN 2025
19 Lahn and Shapland 2022
20 Mach et al. 2019: 194
21 e.g., Ide 2023; Koubi 2019; Michelini 2025
22 Dinc and Eklund 2024
23 Sowers and Weinthal 2021
24 Matthew et al. 2009
25 Dinc and Eklund 2024

Militaries are also major emitters of greenhouse gases and other pollutants.²⁶ According to a recent study by Krampe et al., “[e]ven after an armed conflict ends, countries need about 20 to 30 years to recover in terms of environmental performance.”²⁷

In a worst-case scenario, this could result in a vicious cycle in which armed conflict increases environmental stress and vulnerability, while environmental changes in turn increase future conflict risks.²⁸ In Gaza, for instance, where access to water has already resulted in political tensions in the past and climate change is a major threat to water security, Israeli bombings reduced water storage capacity by 84% and desalination capacity by 69%.²⁹ In this context, understanding the environmental impacts of armed conflicts is crucial to (i) limit environmental damage during fighting, (ii) plan for the reconstruction of environmental infrastructure and the rehabilitation of ecosystem services after the conflict, and (iii) thereby create the conditions for sustainable and climate-resilient peace.

Yet, understanding the environmental impacts of armed conflict is difficult. Conflict zones are hard to access because they are insecure, and/or travel restrictions are often in place. Warring parties frequently hide or manipulate information to avoid the disclosure of military information, portray their opponents as irresponsible, or cover up their own destructive actions. Local researchers working on the topic can face backlash from authoritarian regimes or armed groups. Consequently, any assessment of the environmental impact of war needs to rely on suitable, high-quality methods. Likewise, it is crucial to reflect on the potentials and pitfalls of the respective methods, both in general and in the context of armed conflicts.

In line with the introduction, I define armed conflicts as incompatibilities between organised, armed actors that result in at least 25 battle-related deaths.³⁰ If not stated otherwise, I use the terms armed conflict, war, and conflict synonymously. Likewise, when considering the environment, I refer to the part of the natural world shaped by human activities and central to human well-being.³¹

Assessing Conflict-Related Environmental Damage

While efforts to document the environmental impacts of armed conflict go back at least to the Vietnam War, the topic has seen a surge in research in recent years.³² This increase in interest can be attributed to greater political efforts to build peace and recover from conflicts in sustainable ways, to various methodological advantages (see below), and to a general increase in interest in the environmental dimensions of peace and conflict.

Studies on the environmental impacts of conflicts focus on different countries or regions, forms of conflicts, actors involved, and types of environmental damage.

26 Vogler and Teicher 2025
27 Krampe et al. 2025: 1
28 Buhaug and von Uexkull 2021
29 UNEP 2025
30 Davies et al. 2025
31 Sowers et al. 2017
32 Krampe et al. 2025

Yet, based on their basic methodology, I suggest distinguishing between three different approaches.

The first approach focuses on measuring destruction. Studies using this approach aim to quantify the destruction of the environment or of environmental infrastructure, mostly focusing on the upstream aspects of environmental damage. Most research using such a methodology either draws on event data or satellite images.

When utilising event data, analysts sift through numerous media reports and other publications to compile evidence of environmental destruction during wars. Sowers et al., for example, compile a dataset of attacks on energy, sanitation, waste, and water systems during the civil wars in Libya, Syria, and Yemen between 2010 and 2017. They diagnose a sharp increase in environmental infrastructure destruction from 2014 onwards, creating significant challenges for any future reconstruction process.³³ Likewise, King draws on various primary and secondary sources to identify 44 instances of “water weaponization” during the armed conflicts in Iraq and Syria in the period 2012-15.³⁴ Examples include withholding water from certain areas or flooding others to displace populations and slow enemy troops. Future studies using event data could draw more strongly on civilian reporting and citizen science approaches, even though this is not without challenges (see below).

Alternatively, analyses draw on satellite data and remote sensing to assess environmental destruction during conflicts. The downside of this approach is that event data usually contains more detailed information, for instance, on which conflict party caused the environmental destruction and why. But compared to event data, satellite data are usually more comprehensive (because they are available for an entire area), more reliable, and easier to collect without support from local authorities. Event data are at higher risk of reporting gaps (e.g., if media cannot access the conflict zone) or reporting biases (e.g., if conflict parties or civilians report events in line with their interests). Event data also struggle to account for structural environmental damage during conflicts, which occurs because environmental management systems break down rather than because of a single destructive event. This is why destruction-focused analyses utilising satellite data are currently the most common type of study in the research field.

Yin et al., for example, assess environmental damage in Gaza since the onset of the 2023 war based on high-resolution satellite data and machine learning. They conclude that fighting between Israel and Hamas destroyed 64-70% of all tree crop fields, with serious consequences for food security.³⁵ Likewise, Fadhil et al. draw on Landsat satellite data and employ machine learning algorithms to assess land-use changes during and after the Islamic State conflict in Iraq’s Tikrit district.³⁶ According to their analysis, cropland declined during the conflict (posing food security challenges) and expanded afterwards (reflecting more stable political conditions), while forest cover hardly changed.

33 Sowers et al. 2017

34 King 2016

35 Yin et al. 2025

36 Fadhil et al. 2025

The second approach focuses on measuring impacts. It is less concerned with the extent of environmental (infrastructure) destruction upstream and more with the impacts of such destruction downstream. This can involve various methods, such as measuring air, soil, and water pollution via chemical analyses. Studies also frequently use methods from biology (e.g., biodiversity analyses) or medicine (e.g., detecting harmful substances in human blood).

An example of the latter is a recent study by Baraquoni et al., who utilise Inductively Coupled Plasma Mass Spectrometry (ICP/MS) to analyse baby and toddler hair samples in Gaza. They find higher concentrations of heavy metals (like arsenic and barium) in the hair samples in the aftermath of major military encounters and various rounds of Israeli bombings in the 2010s.³⁷ Focusing on more traditional environmental indicators, Altahaan and Dobslaw analyse air quality in Mosul after its occupation by ISIS (2014-2017) and compare it to pre-war data. They detect heightened levels of particulate matter and nitrous oxide, among others. The authors attribute this to the direct impacts of war (e.g., burning oil fields, emissions from weapons) and post-war coping strategies of affected groups (e.g., deforestation, use of power generators).³⁸

Finally, the third approach to measuring the environmental impacts of war can be termed measuring exposure. With the partial exception of event data analysis, this approach is most firmly rooted in the social sciences, as it examines how individuals and groups make sense of the environmental impacts of war. This is based on insights from sociology and geography that there can be significant differences between how devices (e.g., satellites) and experts, on the one hand, and local communities, on the other hand, perceive and act upon environmental change (Yeh, 2016). Interviews, focus groups, and surveys are common methods used by this approach. Unlike event data collection, researchers utilising the “measuring exposure” approach usually collect primary data in the field (or by talking to people living in the conflict zone). This approach places greater emphasis on civilian expertise, though combatants, decision-makers, and experts can also be interviewed.

Dinc and Türk, for instance, study the cutting of olive trees by conflict parties in the Palestinian West Bank and the Kurdish areas of northern Syria. Through interviews, participatory observation, and document analysis, they show that tree cutting

affects not only ecology, economics, and livelihoods. Rather, the loss of olive trees also has severe psychological and cultural impacts on the affected communities, for instance, because the trees serve as focal points of intergenerational learning, positive emotions, and seasonal celebrations.³⁹ Focusing on Gaza between 2023 and 2025, Hassoun traces the social impacts of conflict-related water contamination and soil erosion based on a triangulation of secondary data. He illustrates how environmental stress not just undermines health and livelihoods but also erodes social cohesion by increasing resource competition and decreasing opportunities for positive interactions.⁴⁰

37 Baraquoni et al. 2025

38 Altahaan and Dobslaw 2025

39 Dinc and Türk 2025

40 Hassoun 2025

Each of these three approaches has clear advantages and disadvantages. Ideally, insights from all three should be combined to gain a comprehensive picture of the environmental impacts of war and to derive suitable policy recommendations.

When it comes to identifying the extent of adverse environmental impacts, the “measuring destruction” approach is most suitable. In particular, satellite imagery and remote sensing can provide quick, comprehensive, and reliable assessments of changes in water bodies and land characteristics. This allows decision-makers to assess requirements for post-conflict reconstruction and identify areas with particular needs for humanitarian assistance. While this approach is also methodologically very advanced, it can fail to consider input and expertise from the affected regions.

To identify the causes and responsibilities of environmental destruction, event data that measure destruction and insights from “measuring exposure” approaches are especially useful. They often provide rich contextual information about who targeted environmental infrastructure or failed to manage a certain ecosystem, and why. Studies of the strategic reasons for the weaponisation of water by ISIS⁴¹ and the destruction of olive trees by Israeli settlers⁴² are cases in point. Given that monitoring, lobbying, and sanctioning by the international community can play a key role in preventing such environmental attacks (or environmental negligence), identifying the involved actors and their motives is highly relevant.

Finally, to gain a comprehensive understanding of the consequences of conflict-related environmental damage, it makes most sense to combine “measuring impacts” and “measuring exposure” approaches. The former can highlight issues such as air pollution or contamination of the human body that are invisible to the naked eye, yet can substantially impact health and livelihoods. The latter identifies causal linkages and cultural meanings attributed to the environmental impacts of war, thereby shedding light on community preferences. Both aspects are crucial when providing emergency aid and planning post-conflict reconstruction. Combining them also builds bridges between substantial local knowledge and technical-scientific methods.

Environmental Peacebuilding and Environmental Destruction

Environmental peacebuilding “comprises the multiple approaches and pathways by which the management of environmental issues is integrated in and can support conflict prevention, mitigation, resolution and recovery.”⁴³ It refers to a set of practices that aim to build trust and positive relationships through environmental cooperation, integrate environmental concerns into peacebuilding processes, and address conflict risks associated with the mismanagement of natural resources. For instance, ever since the collapse of the Oslo Peace process in the late 1990s, communities in Israel, Jordan, and Palestine have sought to build positive relations by addressing shared environmental challenges.⁴⁴ Such cooperation can reduce the risk of conflict and improve symbolic relations between the parties to the conflict.

41 King 2016

42 Dinc and Türk 2025

43 Ide et al. 2021

44 Kedem et al. 2024

However, it mostly catalyses existing reconciliation processes or builds trust at a micro-level, while it is unsuitable to break deadlocks between powerful political opponents.⁴⁵

Empirical evidence indicates that environmental peacebuilding limits environmental destruction during armed conflicts and builds environmental resilience in war-torn communities. In the West Bank, for instance, engaged Israelis and Palestinians together with the NGO EcoPeace managed to prevent the destruction of agricultural land in Battir and groundwater pollution in Wadi Fuqin.⁴⁶ When political instability and armed violence multiplied in Yemen, local communities worked together to manage water-related disputes and prevent groundwater overextraction.⁴⁷

So far, however, environmental peacebuilding research has mostly focused on more peaceful relations (dependent variable) resulting from environmental cooperation or management (independent variable). As a consequence, we have limited systematic knowledge on how environmental cooperation in conflict settings shapes war-related environmental destruction. Future research should reveal additional details on whether (and in what contexts) environmental peacebuilding is effective in preventing or reducing environmental destruction during armed conflicts. The presence of local environmental cooperation in conflict settings can be determined via interviews, for instance, because such dynamics are often under-reported by the media, particularly in fragile contexts.⁴⁸

Insights from environmental peacebuilding research also play a pivotal role in dealing with the environmental impacts of war during the post-war reconstruction phase. In many post-conflict countries, the agricultural sector is vital for the economy, making access to land and water key in providing livelihoods, including for former combatants.⁴⁹ Access to environment-related goods, such as clean air or safe drinking water, also enhances state legitimacy and positive peace.⁵⁰

Hence, the rehabilitation of environmental spaces and services, and the reconstruction of environmental infrastructure, need to be integral parts of the post-conflict peacebuilding process.⁵¹

Drawing insights from environmental peacebuilding scholarship, such environmental reconstruction needs to be:

1. Ambitious and well-funded, given the scale of environmental destruction during armed conflicts (see above);

45 Johnson et al. 2021; Krampe et al. 2021

46 Ide and Tubi 2020

47 Lichtenthaler 2014

48 Funder et al. 2010

49 Blattman and Annan 2016

50 Krampe et al. 2021

51 See also Matthew et al. 2009

- 2. inclusive by providing a strong voice for affected communities and respecting local knowledge, perceptions, and priorities (which is in line with the “measuring exposure” approach);⁵²
- 3. transformative by addressing power and wealth inequalities and injustices that inhibit long-term peace;⁵³
- 4. based on a strong understanding of sustainability that resists environmental extractivism for quick economic recovery;⁵⁴
- 5. climate-resilient by taking into account projected future changes in climatic conditions; and
- 6. data-driven and hence based on a comprehensive assessment of the environmental impacts of conflict, obtained through appropriate methods (see above).

Conclusion and Recommendations

Understanding the environmental impacts of armed conflict is important for limiting environmental destruction during fighting, facilitating reconstruction, and building sustainable peace. Gaining such an understanding can be quite challenging, given the topic’s various (and intertwined) aspects and the limited access to reliable information.

This chapter reflected upon three broad methodological approaches to assess the environmental impacts of armed conflict: measuring destruction, measuring impacts, and measuring exposure. Each approach has particular strengths in assessing the extent, causes, and consequences of war-related environmental destruction, thereby providing specific benefits for analysts and policymakers. Environmental peacebuilding can be an effective way to limit environmental destruction during armed conflicts and to mainstream environmental concerns in their aftermath. As such, it would benefit from (and should be integrated into) comprehensive assessments of the conflict-environment nexus.

In light of these insights, I formulate five broad policy recommendations:

- 1. Support the continuous assessment of war-related environmental damage during conflicts to deal with their humanitarian consequences and to deter or sanction perpetrators.
- 2. Support the comprehensive assessment of war-related environmental damage after the end of a conflict to integrate environmental concerns into post-conflict reconstruction efforts.
- 3. Encourage multi-method approaches that triangulate information and provide policy-relevant knowledge on the environmental impacts of armed conflict. Make sure that local knowledge and expertise are not marginalised in this context.

52 Ide et al. 2021
53 Grajales et al. 2025
54 Zelli and Krause 2025

4. Enhance the capacities of cooperating local communities to prevent war-related environmental damage, for instance by providing them with funding, data, and training. This involves support for fragile contexts that are often avoided by environmental finance mechanisms (yet in desperate need of them).⁵⁵

5. Design environmental peacebuilding projects in an evidence-based, ambitious, inclusive, sustainable, and climate-resilient way.

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Sustainable Recovery from Conflict: Lessons from Ukraine

Doug Weir, Anna Ackermann

Introduction

The environment has historically had a low profile in conflict narratives, despite its importance for civilian protection, peacemaking, peacebuilding, and economic recovery.⁵⁶ Russia's full-scale war against Ukraine has been an exception, and together with several other factors, this has contributed to the emergence of calls for Ukraine's recovery to be "green" or at least environmentally sustainable. This would require that it is responsive to the triple planetary crisis⁵⁷ and capable of transitioning the country to a more sustainable future. This aspiration runs counter to the experience of most countries, where the transition from war to peace is associated with environmental neglect or with the continuation or intensification of environmentally harmful activities, such as deforestation.⁵⁸

While efforts to encourage post-war sustainable development have been undertaken for many years by actors such as the UN Development Programme (UNDP) – whose own definition of sustainable recovery can be found in the introduction to this report – these efforts can at times be piecemeal, project-based, and top-down. What is happening in Ukraine feels more organic and comprehensive, and has involved a wider range of stakeholders, with civil society playing a leading role in its design. Ukrainian civil society organisations have defined sustainable recovery as: "...the process of restoring infrastructure, housing, the economy and ecosystems in an inclusive way that ensures long-term environmental safety, efficient use of natural resources and environmental restoration, while taking into account climate change and minimising negative impacts on ecosystems."⁵⁹ This definition emphasises a pragmatic and sector-specific focus, foregrounding material reconstruction and environmental safeguards. It reflects both the immediacy of wartime needs and an environmentally responsible recovery agenda, rather than the more institutional and conflict-governance framing used by international organisations.

In this era of international connectivity and increasing environmental awareness, Ukraine's experience has not gone unnoticed by civil society in other conflict-affected areas, including in the Middle East. They are rightly questioning whether their recoveries could be sustainable, particularly because many are highly exposed to the climate crisis, which is exacerbating the environmental degradation

56 UN Environment 2016

57 The "Triple Planetary Crisis" is a term and framework adopted by the United Nations to describe the three intersecting global environmental crises of pollution, climate crisis and biodiversity loss.

58 Grima and Singh 2019

59 Build Ukraine Back Better 2025

caused by years of protracted conflict. For many, accountability for conflict-linked environmental and climate harm is also a priority, and this too is an area where the war in Ukraine is increasing expectations.

This chapter examines the emerging concept of sustainable recovery, identifies its enabling conditions, and explores how the two phases of Russia's war against Ukraine have contributed to momentum towards it. The outcome of Ukraine's process remains highly uncertain, and the chapter will also examine the barriers to sustainable recovery, along with lessons for other national contexts in the Middle East and beyond. In doing so, it aims to identify the factors that external actors can support to encourage similar processes elsewhere.

Environmental Damage and Accountability

Between 2014 and 2021, and while Ukraine prioritised political stabilisation, security, and EU integration, the environmental consequences of Russia's occupation of Crimea and parts of its eastern Donbas region accumulated largely in the background. Militarisation devastated unique protected areas in Crimea,⁶⁰ while in Donbas, coal mine flooding, landscape fires, and damage to hazardous industrial sites transformed the region into a hotspot of environmental risks.⁶¹ The Ukrainian authorities had limited access and capacity, and environmental monitoring across occupied areas was fragmented and heavily dependent on external actors. With Ukrainian civil society mainly focused on EU-aligned reforms rather than conflict-related environmental impacts, most analysis was left to the Organization for Security and Cooperation in Europe (OSCE), the UN Office for the Coordination of Humanitarian Affairs (UN OCHA), and international NGOs.⁶² Nevertheless, the government began to recognise the strategic value of environmental storytelling, pursuing initiatives such as a landmark 2016 UN Environment Assembly (UNEA) resolution,⁶³ and using the platform of a UN legal process to enhance the protection of the environment in relation to armed conflicts to draw attention to the threats in its eastern region⁶⁴ – diplomatic and advocacy foundations that would expand significantly after 2022.

On 24 February 2022, Russia launched a full-scale invasion of Ukraine, dramatically escalating the war. In its initial phase, Russian forces sought to take Kyiv and decapitate the leadership, targeted military sites and logistics hubs, and occupied hydropower plants and civilian nuclear facilities. This was followed by a period of strategic transition that saw towns, cities, and the industrial and energy infrastructure they contain heavily shelled along slowly shifting front lines. As movement slowed, zones of intense front-line destruction developed even as persistent missile and drone attacks targeted population centres across Ukraine. While Ukrainian counteroffensives succeeded in liberating some areas captured at the outset of the war, by January 2026, and after months of grinding advances, Russia held just under 20% of Ukrainian territory.

60 Vasyliuk 2023

61 Denisov and Averin 2017; Rüffer 2022

62 Weir and Denisov 2017

63 Weir 2016

64 Ministry of Foreign Affairs of Ukraine 2018

International attention and interest in the war's environmental dimensions have been unprecedented in their scope and duration. From the outset of the full-scale invasion, Ukraine's government sought to actively integrate the environment into its strategic communications as part of the information war, the capacity for which had been expanded since 2014.⁶⁵ Western media outlets covered the invasion in great detail, naturally landing on the environment as an additional source of stories, with journalists becoming sensitised to the topic. The government and domestic and international civil society were available with content and comment thanks to the affordances of social media – particularly Telegram⁶⁶ – and remote sensing. Both allowed the war's environmental consequences to be tracked in near real time.

Environmental harm was not restricted to Ukraine's front lines, towns and cities, nor to its nature reserves and protected areas. Civil society and academics increasingly documented transboundary threats and so-called telecoupled consequences. Examples included the pollution risks posed by the Russian "Shadow Fleet" of ageing oil tankers, a consequence of sanctions placed on Russian oil sales, and the global expansion of agricultural land driven by increased commodity prices after agricultural exports from Ukraine were blocked.⁶⁷

High-profile incidents such as the destruction of the Kakhovka Dam and the occupation of the Chornobyl and Zaporizhzhia nuclear plants encouraged ongoing attention on the environment, and the government was increasingly able to feed this interest with data and policy measures. National legislation encouraging all ministries to calculate the financial cost of wartime damage prompted the environment ministry to expedite the development of damage-calculation methodologies for different environmental components. While the scientific basis for these was questioned,⁶⁸ they nevertheless allowed the government to communicate a dollar or hryvnia price on environmental damage. The State Environmental Inspectorate, which had previously been tasked with monitoring permits and emissions, was repurposed to gather data on wartime damage.

Ukrainian environmental NGOs expanded their capacity and reprioritised their activities to respond to the consequences of the war. Examples of this include SaveDnipro's work on distributed air quality monitoring, which is expanding to support the nationwide deployment of radiation sensors, and the Ukrainian Nature Conservation Group's shift in focus to the war's impacts on biodiversity. Environment People Law expanded its work on criminal accountability and governance; Society and Environment began systematic analysis of green recovery policies and approaches, while Ecoaction and Ecoclub explored opportunities in reconstruction and the green transition. Many Ukrainian environmental NGOs benefited from international donor funding, which supported the expanded capacities and the development and retention of institutional expertise. Importantly, civil society's focus was not restricted to the direct impacts of the war but also extended to the need to enhance environmental governance,

65 Kutidze 2023

66 The availability of Telegram images declined over time as new laws were introduced to minimise the sharing of information on the damage from Russian strikes.

67 Chai et al. 2024

68 Weir and Denisov 2024

a prerequisite for ensuring closer alignment with the EU. Progress towards this continued despite the war.

International organisations also benefited from substantial donor funding for environmental activities, some of which flowed to NGOs outside Ukraine. However, the international community’s initial environmental response was chaotic, with the sheer volume of data and the level of environmental attention itself posing a challenge at times. Unlike the humanitarian system, there is no standard model to coordinate the environmental response to conflicts. A group comprising Ukrainian and international NGOs and international organisations emerged organically, which was later coordinated by the UN Environment Programme (UNEP)-OCHA Joint Environment Unit. By late 2023, analysis by the UN Economic Commission for Europe (UNECE), UNEP, the Organisation for Economic Co-operation and Development (OECD), and Ukraine’s Ministry of the Environment identified 129 organisations and institutions working on environmental damage assessments in Ukraine, 38% of which were Ukrainian.⁶⁹ Engagement by international organisations was not always straightforward. For example, UNEP was slow to engage due to political sensitivities over Russia’s role in the war. The OSCE enjoyed some comparative advantage because of its extensive work in Ukraine pre-2022, but also struggled with politics due to its Russian and Ukrainian membership. Political constraints like this are common barriers for international organisations responding to the environmental dimensions of conflicts.

During its first two years, the war’s environmental narrative primarily focused on financial accountability for the damage being wrought. Precedent in such cases is limited. The fact that one of the conflict parties is a permanent member of the UN Security Council limited the ability to follow the path of the UN Compensation Commission, which was established by a Security Council resolution after the 1991 Gulf War.⁷⁰ Nevertheless, in May 2023, the Council of Europe agreed to establish the Register of Damage Caused by the Aggression of the Russian Federation against Ukraine, which opened for claims in April 2024.⁷¹ It will begin accepting environmental claims in 2026, but these can only be submitted by the Ukrainian state. The Ukrainian state also pursued criminal accountability cases against Russian military personnel under its domestic ecocide law.⁷² Ukraine and Russia are two of a handful of countries that have ecocide in their national statutes. The war’s accountability discourse has energised calls for an international crime of ecocide to be added to the Rome Statute, and coincided with work by the International Criminal Court to integrate the environment into its existing crimes better.⁷³ Accountability also formed a key component of the 2024 Environmental Compact for Ukraine,⁷⁴ a presidential initiative that brought together high-level figures, including climate activist Greta Thunberg, to propose priorities for recovery. Another high-level initiative, Ukraine’s Peace Formula Philosophy, saw President Zelenskyy embed the environment and recovery as a component of “ecological security”.⁷⁵

69 Grygaski 2023

70 Payne 2017

71 RD4U 2026

72 Rogers, Mackintosh, and Popov 2024

73 Millar 2025

74 High-Level Working Group on the Environmental Consequences of the War 2024

75 President Zelenskyy Peace Formula 2022

Unusually, Ukraine and its allies leveraged multilateral environmental spaces to draw attention to the consequences of the war, building on limited initiatives pre-2022. Some proved more successful than others. At 2022's UN Framework Convention on Climate Change meeting in Sharm el Sheikh (COP27), Ukraine's pavilion featured examples of environmental damage,⁷⁶ while a report using a novel methodology allowed the country to articulate the climate cost of the war.⁷⁷ International media and public interest in the carbon costs of war has grown since then, overtaking attention on many other harms; at COP30, Ukraine announced that it would seek climate damages from Russia.⁷⁸ At the sixth UNEA in 2024, Ukraine tabled a resolution intended to establish common guidelines for documenting wartime environmental damage.⁷⁹ However, a 2022 resolution adopted by states party to the Ramsar Convention on Wetlands condemning Russia ultimately led to its withdrawal from the convention in 2025,⁸⁰ potentially placing Russia's Ramsar wetlands at greater risk. This experience suggests that such initiatives must be navigated sensitively to avoid unintended environmental consequences.

Sustainable Recovery in Practice

The idea of “building back better” or “greener” during armed conflicts and in their aftermath is not new. For decades, actors such as UNEP, UNDP, and the World Bank have contributed towards post-war sustainable development through development projects or by helping restore environmental governance. And yet, just a few months into the full-scale invasion, there were already expectations that Ukraine represented an opportunity to do this more holistically, and that the visibility of the war's environmental dimensions would be a key factor in encouraging this.⁸¹ But visibility is not the only factor at play, and this section explores other enabling conditions for sustainable recovery, as well as the barriers that can constrain it.

For our purposes, sustainable recovery is not just a technical definition⁸² or a narrow reactive policy measure; it also encompasses the wider societal movement to achieve it. For example, while the conflicts in Gaza, Syria, and Yemen have seen rapid transitions to solar energy, this has been driven by the need for energy resilience during conflict, rather than by green principles. What sets Ukraine apart is the degree of stakeholder buy-in to the concept and to the process, as well as the breadth of their ambition. This breadth is exemplified by the scope of the Build Ukraine Back Better (BUBB) coalition's Roadmap for the Sustainable Recovery of Ukraine.⁸³

The BUBB platform comprises Ukrainian and international NGOs and academia. As such, it is far less top-down than typical recovery interventions,

76 Ukrainian Climate Office 2026

77 Initiative for GHG Accounting in War 2023

78 Ukrainian Climate Office 2025

79 Weir 2024

80 Baudichau and Wang 2025

81 Weir 2022

82 “...the process of restoring infrastructure, housing, the economy and ecosystems in an inclusive way that ensures long-term environmental safety, efficient use of natural resources and environmental restoration, while taking into account climate change and minimising negative impacts on ecosystems.”

83 Build Ukraine Back Better 2025

whether led by international organisations or the state. Nevertheless, international donors have played an important role in ensuring that the BUBB coalition and its members have had the capacity to influence the recovery discourse, set expectations, and monitor progress. The process has been aided by the fact that international organisations and the Ukrainian state are broadly in alignment with their objectives, at least in terms of public messaging. Other important stakeholders include local communities and authorities, particularly those that have suffered wartime damage, and the private sector, which will play an important role in recovery. Scale matters, and research by CEOBS in late 2025 identified 754 Ukrainian and international stakeholders potentially involved in Ukraine’s sustainable recovery, a number that likely undercounts private sector actors.⁸⁴

Beyond this stakeholder base, many other factors are collectively creating the enabling conditions for sustainable recovery. While Ukraine “...has a number of strategic advantages: access to critical resources, a common border with the EU and a free trade agreement with the EU, scientific and educational potential, and basic energy infrastructure,”⁸⁵ other linked and mutually dependent factors are relevant too, as set out in Table 1 below.

Factors that have influenced the development of sustainable recovery discourse in Ukraine

Table 1

Enabling condition	Description
Societal environmental awareness	The extent to which Ukrainian and international society values the environment and its protection, and is sensitised to environmental threats.
Conflict scale and intensity	Location, scale and conduct of hostilities are key determinants of the degree of environmental damage.
Conflict characteristics	The simplicity or complexity of the war’s narrative and the extent to which sides are perceived as “good” and “bad”.
Environmental data	Quantity, quality, diversity and accessibility of data on environmental harm.
Environmental narratives	The ability of wartime environmental narratives to resonate with Ukrainian and international stakeholders including the media, public and policymakers.
Domestic legal context	The existence or development of domestic laws that address wartime environmental damage.
Domestic political context	The extent to which domestic political discourse engages with and promotes wartime environmental and climate narratives.
International legal context	The extent to which harm narratives can encourage or be informed by developments in international law.
International political support	The degree of support for the affected state from donor countries, including through processes such as EU alignment and security interests.
Civil society capacity	The ability of domestic and international civil society to influence recovery processes through research and advocacy.
Local communities’ capacity	The ability of local communities to integrate green principles into recovery planning and to be able to deliver sustainable projects on the ground.

84

In press, research by CEOBS for the OSCE project “Assessment of environmental impacts of the war against Ukraine and options for remediation”.

85

Build Ukraine Back Better 2025

Nevertheless, systemic challenges remain. Economic and political pressures, as well as urgent pragmatism amid the ongoing conflict, continue to undermine messaging and actions around the environment and sustainability. Dissonance has been commonplace in government messaging, with sustainable recovery themes remaining: “...largely on the margins of the authorities’ attention”, while “environmental policy is seen as an additional burden and obligation and is not properly integrated into recovery processes.”⁸⁶ For example, in mid-2025, UNDP, the Ministry of Environment, and civil society came together to announce a consultation on a draft law on green recovery.⁸⁷ Weeks later, the process was abandoned thanks to a merger of the ministries of the economy, agriculture, and environment, and a ministerial reshuffle. Most of the barriers identified below are commonplace for countries affected by armed conflict or insecurity, and while many are beyond the influence of non-state actors, some could be addressed through targeted donor support aligned with selected enabling factors in the table above.

Table 2

Barriers affecting sustainable recovery in Ukraine

Barrier	Description
Economic prioritisation	Whereby projects and activities are prioritised for their economic rather than environmental or sustainability returns.
Institutional restructuring	The restructuring of government ministries and institutions, and persistent reshuffling of ministerial staff undermine expertise, focus and continuity.
Legislative weakening	Environmental legislation is weakened in response to the conflict, e.g. requirements to conduct environmental impact assessments before reconstruction or redevelopment.
Outcome uncertainty	Where the outcome of a conflict remains uncertain, planning remains short-term and reactionary, and resources are not released.
Recovery risks	The process of implementing short-term recovery responses generates new environmental risks.
Data availability	Inadequate monitoring and data management systems impede long-term planning.
Access to environmental information	Martial law restricts public access to environmental information, including datasets critical to sustainable recovery planning.
Selective focus	Sustainable recovery discourse and funding favours issues perceived as more urgent such as infrastructure reconstruction to the detriment of others (such as biodiversity protection).
Capacity constraints	Capacity constraints across national and local government, and civil society, slow or prevent sustainable recovery initiatives.
Donor fatigue, cuts and prioritisation	Severe and prolonged armed conflicts see donor engagement dropping off over time; where fewer resources are available, what remains is redirected towards immediate humanitarian needs.
Narrative scepticism and fatigue	Public and policy-maker opinion is sceptical of sustainability, while persistent reporting of environmental harms and threats leads to normalisation and fatigue.

86 Build Ukraine Back Better 2025
87 Samus 2025

Conclusion

The strategic advantages identified by the BUBB platform make Ukraine an outlier when set against the recent and ongoing armed conflicts in the Middle East and wider region. Many of these are protracted, cyclical, and complex, with environmental degradation exacerbated by weak governance. None enjoys the donor attention of Ukraine, nor the motivation of aligning with a neighbouring trade and security bloc.

When we consider the enabling conditions for Ukraine's sustainable recovery discourse, several complementary factors stand out as areas that could be supported by external parties: Environmental data, environmental narratives, civil society capacity, and the domestic political context. Supporting domestic civil society organisations to collect environmental data – whether directly or in partnership with external actors – and helping them to develop and tell environmental stories, can influence the domestic political context. Indeed, being able to understand and articulate the environmental dimensions of the conflict is foundational to identifying steps to address them. In turn, these stories can influence the international legal and political contexts, where debates and processes around themes such as accountability will continue to evolve. They can also influence those international donors whose support is vital to sustaining civil society capacity and expertise in the medium term. Importantly, because of the overwhelming focus on humanitarian needs – and the persistent yet puzzling inability of many donors to recognise the profound relationship between people and the environment – support for environmental civil society is rarely a given, unless a compelling case is made for it.

Ukraine's context is unique and is likely to remain an outlier for sustainable recovery. It would therefore be entirely wrong to expect any Middle Eastern country to be able to initiate and sustain a civil society-led sustainable recovery discourse in the absence of the structural advantages and enabling conditions we have seen in Ukraine.

However, this does not mean that the concept has no value for other settings. Context-specific versions of sustainable recovery thinking are not only possible but also urgently needed. They will look very different from one place to another, and be tailored to the capacities, priorities, and needs of different societies and ecosystems. However, they should offer an opportunity to leverage periods of transition to help direct development towards a path that builds resilience to environmental change, rather than contributing to further degradation and exacerbating vulnerabilities. This would be greatly aided by the development of an international community of practice on sustainable recovery, which could capture lessons learned and act as a knowledge hub, supporting others on this pathway.

In a parallel with Ukraine, the intense environmental destruction wrought by recent conflicts in the Middle East has also contributed momentum towards the recognition of an international crime of ecocide. Unlike Ukraine and Russia, no Middle Eastern states currently have domestic ecocide laws, and their recognition as an international crime remains unlikely in the near term.

This is already risking a disconnect between public expectations and the law, as the concept has received more attention. In the nearer-term, the International Criminal Court's new environmental guidance for pursuing war crimes might hold out more opportunity for criminal liability.⁸⁸ But this is just one facet of accountability for gross violations of international law, which may also include other forms of remedy and reparation.⁸⁹

It is highly likely that accountability for wartime environmental damage will become an increasingly important pillar of diplomatic, legal, and recovery strategies. For Ukraine, the pursuit of financial damages has been as important as the pursuit of criminal liability. The precedents already in use connect Ukraine to the Middle East, with regional examples such as the United Nations Register of Damage Caused by the Construction of the Wall in the Occupied Palestinian Territory and the post-1991 Gulf War UN Compensation Commission, which have already informed the Council of Europe's Register of Damage for Ukraine.

The unprecedented global attention to the environmental impact of the war in Ukraine has strengthened political will, generated new methodologies for damage assessment, informed communication approaches, and expanded civil society expertise. Yet accountability efforts remain highly sensitive to geopolitical constraints and domestic political priorities, and it remains that some states are allowed to act with apparent impunity. Nevertheless, history has shown that environmental accountability builds on precedent and, whether this is around the pillage of natural resources in the Democratic Republic of the Congo,⁹⁰ the footprint of a separation barrier, or the devastation of a full-scale invasion, those interested in justice should ensure that civil society and other stakeholders have the capacity and resources to contribute towards its further development meaningfully.

Recommendations

1. Integrate and embed the environment into conflict narratives from their earliest stages.

Ukraine's proactive use of data collection, remote sensing, and public communication helped keep environmental harm visible despite competing wartime priorities. Early, systematic documentation of damage and risks strengthens strategic planning, supports accountability efforts, and prevents the marginalisation of environmental concerns during prolonged crises. Civil society, donors, international organisations, and governments all have a role to play in this, which in turn is a key enabling condition for sustainable recovery.

2. Environmentally sustainable and climate-friendly recovery should be approached by all stakeholders as a long-term, phased process rather than an immediate transformation. Ukraine's experience shows:

88 Millar 2025

89 UN General Assembly 2005

90 Ventura 2023

At the international level, there is a need for a community of knowledge and practice that enables the exchange of methodologies, lessons learned, and tools for recovery under conditions of insecurity.

At the national level, strengthen, update, and modernise construction, energy, and environmental standards as early on as possible, even if full enforcement is delayed, to ensure that reconstruction does not lock in outdated, environmentally harmful, or carbon-intensive practices once recovery accelerates.

3. International donors should embed environmental and climate criteria as core requirements for recovery and reconstruction funding, rather than as optional add-ons.

In the short term, donor priorities could address sectors where humanitarian needs and environmental benefits overlap, such as energy security and resilience, water supply, pollution control, and waste management.

Ukraine's case demonstrates that, while immediate humanitarian imperatives dominate early responses, longer-term environmental risks and opportunities must be addressed in parallel to avoid creating future structural vulnerabilities or costly remediation burdens.

4. Donors and governments should prioritise capacity-building, flexible core funding, and direct support to local organisations and communities, enabling them to combine immediate assistance with environmental monitoring, risk reduction, and recovery planning. Civil society organisations and local communities play a critical role in sustaining environmental action during and post-conflict, particularly where state capacity is constrained.

Ukraine's experience highlights the value of bridging environmental mandates with other work, encouraging NGOs from different spheres to integrate environmental considerations into emergency response, community support, policy work, and recovery activities.

Local governments should be supported in parallel to strengthen institutional capacity through training, staffing, and partnerships to integrate green principles into recovery planning and be able to deliver sustainable infrastructure projects.

5. Longer-term, accountability mechanisms are essential for addressing environmental destruction and climate damage caused by armed conflicts. Ukraine's pursuit of national and international accountability – through the establishment of the damage register, changes to national legislation, and climate-related claims – illustrates the importance of setting accountability goals early, even when enforcement appears politically constrained. Other conflict-affected states, supported by the international community, should work to strengthen legal frameworks and multilateral mechanisms addressing environmental war crimes and ecocide, contributing to evolving norms around responsibility for ecological harm.

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War, Environmental Collapse, and the Institutional Challenges of Recovery and Peacebuilding in Palestine

Ahmed Hilles

Introduction

Armed conflict in the occupied Palestinian territory represents an extreme case of conflict-induced environmental degradation in a densely populated and politically constrained setting. Since October 2023, military operations have not only caused large-scale humanitarian harm but also accelerated the collapse of environmental life-support systems in Gaza and intensified long-standing structural degradation in the West Bank.⁹¹

Environmental damage in this context is not a secondary consequence of warfare. The systematic destruction of infrastructure, the disruption of water and sanitation systems, and the contamination of air, soil, and groundwater have directly undermined public health, food security, and urban resilience. Pre-existing vulnerabilities – including prolonged blockade, restricted access to natural resources, and fragmented governance – sharply amplified these effects, transforming chronic environmental fragility into systemic failure.⁹²

This chapter examines the environmental dimensions of the post-2023 war in Gaza and the West Bank, tracing how infrastructure destruction and environmental contamination interact with human security outcomes. It argues that environmental rehabilitation must be treated as a core pillar of stabilisation and recovery, with direct implications for European and German policy engagement in the region.

Environmental Impacts of the War (Post-2023) in Gaza and the West Bank

Even before October 2023, the environmental governance and infrastructure in Gaza and the West Bank were influenced by a complex interplay of interconnected constraints, rather than by isolated sectoral deficiencies. The presence of political divisions, restricted access, and persistent economic challenges has undermined critical systems – such as energy, water and wastewater management, waste management, and environmental regulations – resulting in a precarious scenario where issues in one sector rapidly influence others.

91 UNEP 2024; Rintoul-Hynes 2025; Weir, McQuillan, and Francis 2019

92 WHO 2024; Weir, McQuillan, and Francis 2019; Yavuz and Unal 2025

The conflict that started in 2023 has brought these underlying vulnerabilities to the forefront, leading to a series of interrelated system failures that exacerbate one another. The inadequacies in energy supply and the imposition of access restrictions served as catalysts for the sequential disintegration of water and wastewater services, health-care systems, food supply chains, and municipal operations. Subsequently, secondary environmental amplification ensued, characterised by significant air pollution, contamination of soil and aquifers, and degradation of coastal areas. This perspective on interconnected systems informs the subsequent analysis, structuring the impacts according to the interrelated pathways among infrastructure, the environment, and health.

Situation in Gaza

Health Status

The health crisis that unfolded in Gaza following the 2023-2025 war is inseparable from the destruction of environmental and basic service infrastructure. Damage to water, sanitation, energy, and waste systems directly undermined infection control, disease prevention, and emergency healthcare provision, precipitating a systemic collapse of the health sector.⁹³

Severe damage to hospitals and clinics, combined with energy shortages and fuel scarcity, reduced operational capacity at a time of mass casualty needs. At the same time, unsafe water, sewage overflows, overcrowding, and waste accumulation drove sharp increases in epidemic-prone diseases, including acute diarrheal illnesses and hepatitis A, disproportionately affecting children under five.⁹⁴

In this context, health outcomes cannot be understood solely as a result of direct violence. They reflect the interaction between environmental degradation, infrastructure failure, and prolonged exposure to hazardous living conditions.⁹⁵

Water Sector Management

The destruction of Gaza's water and sanitation infrastructure represents one of the most severe instances of conflict-induced water system collapse in a densely populated urban setting. Extensive damage to wells, desalination plants, pumping stations, and distribution networks, combined with prolonged energy shortages and access restrictions, reduced water production to a fraction of pre-October 2023 capacity.⁹⁶

The shutdown of the three Mekorot supply pipelines on October 9, 2023, removed a major source of drinking water and further accelerated system collapse.⁹⁷ By mid-2025, the majority of households had access to far less than minimum humanitarian water standards, forcing reliance on unsafe, saline, or contaminated sources and significantly increasing public health risks.⁹⁸ Beyond immediate humanitarian impacts, prolonged disruption of water and wastewater services has caused lasting contamination of the Coastal Aquifer, posing long-term risks to recovery, public health, and environmental sustainability.⁹⁹

93 OCHA 2025e; UNICEF 2024; UNICEF 2025b; World Bank 2025

94 OCHA 2025d; WHO 2025a; UNEP 2025

95 OCHA 2025d; UNICEF 2024; UNICEF 2025

96 OCHA 2024a; UNICEF 2025a; Jafarnia et al. 2024

97 Jafarnia et al. 2024

98 Abuawad et al. 2025; UNICEF 2025c; UNICEF 2025b; UNICEF 2025a

99 Abuawad et al. 2025

Energy Resources

Gaza's energy system collapsed almost entirely during the 2023-2025 war, eliminating the foundation for water, sanitation, health, and waste services. Damage to the Gaza Power Plant, electricity networks, and fuel infrastructure, combined with severe import restrictions, reduced electricity supply across much of the Strip to negligible levels.¹⁰⁰

Energy deprivation rapidly cascaded into environmental system failure. Water pumping and wastewater treatment ceased, sewage overflows increased, and healthcare and food systems became dependent on unreliable generators with limited fuel supply.¹⁰¹ While decentralised solar systems had previously enhanced resilience, damage and lack of maintenance sharply reduced their effectiveness.¹⁰² The collapse of energy supply thus emerged as a central driver of environmental degradation and population-wide health risks.

Public Buildings and Private/Domestic Facilities Destruction

Widespread destruction of housing and public buildings generated an unprecedented volume of rubble and hazardous debris, transforming Gaza's urban environment. By mid-2025, more than 370,000 housing units were damaged or destroyed, producing over 50 million tonnes of debris.¹⁰³

The accumulation of rubble exacerbated air pollution, soil contamination, and physical hazards, while severely complicating displacement and recovery. Without rapid and environmentally sound debris management, urban destruction risks locking in long-term public health and environmental damage.¹⁰⁴

Agriculture and Biodiversity

Large-scale damage to farmland, greenhouses, and irrigation infrastructure, combined with access restrictions, severely reduced agricultural production and accelerated land degradation.¹⁰⁵ Soil contamination from debris, sewage infiltration, heavy metals, and unexploded ordnance further undermined fertility, while groundwater salinisation constrained crop viability.¹⁰⁶

Biodiversity losses in orchards, olive groves, and natural buffers weakened ecosystem services, intensifying erosion and desertification. These impacts translated directly into livelihood losses and rising food insecurity.¹⁰⁷

Food Security

The collapse of food security in Gaza reflects the interaction between environmental destruction, infrastructure failure, and restricted access. Damage to farmland, water systems, energy supply, and markets undermined local food production, while rising prices and income collapse rendered food increasingly unaffordable.¹⁰⁸

100 OCHA 2023; Bonasia 2025; Isaa and Alwazeer 2025; HRW 2023

101 WHO et al. 2025; OCHA 2025b; Bonasia 2025

102 WHO 2025b; OCHA 2025a

103 World Bank, EU, and UN 2025; UNEP 2024

104 UNEP 2024; World Bank, EU, and UN 2025; IOM 2025

105 IOM 2025; World Bank, EU, and UN 2025; UNEP 2024; UNOSAT 2025

106 UNEP 2024

107 FAO 2025

108 IPC 2024; IPC 2025; OCHA 2025b

Environmental degradation functioned as a multiplier of hunger, translating infrastructure collapse into widespread malnutrition, increased mortality, and long-term human capital loss, particularly among children.¹⁰⁹

Mediterranean Sea and Shoreline Area

The destruction of wastewater treatment infrastructure resulted in the daily discharge of large volumes of untreated sewage into the Mediterranean Sea, severely degrading coastal water quality and marine ecosystems. Combined with damage to fishing assets and access restrictions, this undermined fisheries, coastal livelihoods, and food supply.¹¹⁰

Prolonged pollution increased public health risks and reduced the adaptive capacity of Gaza’s coastline to climate-related stressors, including sea-level rise and storm surges.¹¹¹

Ambient Air Pollution

Air pollution intensified sharply due to explosions, fires, dust from massive debris accumulation, open burning of waste, and widespread reliance on improvised fuels following the collapse of the energy system.¹¹²

Prolonged exposure to fine particulate matter and toxic emissions increased respiratory and cardiovascular health risks, particularly in overcrowded shelters with limited ventilation. These conditions illustrate how environmental harm persists long after active hostilities, embedding health risks into everyday survival strategies.¹¹³

Solid Waste Management

Solid waste management collapsed following the 2023-2025 war as infrastructure damage, access restrictions, and fuel shortages overwhelmed municipal capacity. Uncontrolled dumping, open burning, and leachate infiltration exacerbated soil, groundwater, and air pollution.¹¹⁴

The accumulation of mixed municipal waste, hazardous materials, and war debris created persistent environmental and public health risks, underscoring the need for systematic waste and debris management as a prerequisite for recovery.¹¹⁵

Humanitarian Interventions and Strategic Projects

The scale of destruction caused by the 2023 war has defined humanitarian and early recovery priorities in Gaza, where the collapse of infrastructure and basic services has been unprecedented. The Gaza Rapid Damage and Needs Assessment (RDNA) estimates total physical damage at approximately USD 18.5-20 billion, with housing, WASH, energy, transport, and health accounting for the majority of losses.¹¹⁶

109 IPC 2024; IPC 2025; Al Jazeera 2025

110 FAO 2024b

111 Arab Water Council and WFP 2022; UNEP 2024; WHO 2025b; UNEP 2025

112 OCHA 2025b; UNEP 2024

113 WHO 2021; WHO 2025b

114 UNEP 2024; UNDP 2024

115 UNEP 2024; UNDP 2024

116 World Bank, EU, and UN 2025

Immediate humanitarian interventions have therefore focused on emergency shelter, debris clearance, the restoration of minimum water and sanitation services, limited electricity supply for critical facilities, and the stabilisation of health and food systems.¹¹⁷ Environmental considerations are central to these efforts. UNEP warns that delays in debris removal and hazardous waste management substantially increase long-term remediation costs and prolong public health risks, underscoring the need to integrate environmental safeguards into early recovery planning.¹¹⁸

At the same time, humanitarian response remains severely underfunded. Funding levels for 2024-2025 fell below 45% of assessed requirements, resulting in persistent gaps in WASH, food security, health, and environmental services despite annual needs exceeding USD 3.5 billion.¹¹⁹

Beyond immediate relief, long-term recovery requires a transition toward integrated reconstruction strategies that prioritise climate-resilient infrastructure, renewable energy, water reuse, and decentralised waste management. Implementation, however, remains constrained by restricted access, fragmented governance, limited fiscal space, and high transaction costs linked to the broader political context.¹²⁰

Situation in the West Bank

Environmental conditions in the West Bank reflect a structurally entrenched crisis driven by prolonged occupation, intensified restrictions since 2023, and severe limitations on Palestinian governance. Unlike Gaza's abrupt post-war collapse, environmental degradation has evolved cumulatively through land fragmentation, unequal resource allocation, and escalating violence, producing lasting impacts on ecosystems, livelihoods, and institutional resilience.¹²¹

Israel retains exclusive planning and zoning authority over Area C, which comprises approximately 62% of the West Bank, while Palestinians are permitted to develop on less than 1% of this territory. Between 2012 and 2022, more than 99% of Palestinian building permit applications in Area C were denied, fostering unregulated construction and heightened demolition risks.¹²² By 2024, Israeli settlements covered around 10% of the West Bank within municipal boundaries, while an additional 20% was designated as military firing zones, severely constraining agriculture, grazing, and environmental protection and accelerating land degradation, soil erosion, and pressure on infrastructure in Areas A and B.¹²³

Water governance remains highly asymmetric. Israel controls an estimated 85-90% of shared water resources, while Palestinian abstraction and infrastructure development depend on permit regimes characterised by frequent delays and denials.

117 Ibid.

118 UNEP 2024

119 OCHA 2025b

120 World Bank, EU, and UN 2025; UNEP 2024

121 PCBS 2025; Farha 2023

122 OCHA 2025c; PCBS 2024

123 Farha 2023; PCBS 2025

Average Palestinian water consumption ranges from 70 to 90 litres per capita per day and falls below 50 litres in many Area C communities, compared with 240-300 litres per capita per day among Israeli settlers.¹²⁴ Constraints on well rehabilitation and wastewater reuse have contributed to declining groundwater quality and increased reliance on costly tanker water, which can absorb up to 20% of household income in marginalised communities.¹²⁵

Solid waste management is similarly constrained by fragmented jurisdiction and restricted land access. More than sixty Palestinian communities in Area C lack regular waste collection services, resulting in open dumping and burning. UNEP and OCHA report elevated soil and groundwater contamination near informal dumping sites, particularly where access to sanitary landfills is obstructed or delayed, shifting environmental burdens onto vulnerable rural populations.¹²⁶

Since 2023, settler violence has become an increasingly significant driver of environmental harm. OCHA recorded over 1,200 settler-related incidents in 2023-2024, including arson, tree uprooting, destruction of irrigation systems, and contamination of water sources. These attacks disproportionately affect farming and herding communities, contributing to displacement, land abandonment, accelerated land degradation, and biodiversity loss.¹²⁷

Overall, environmental degradation in the West Bank is inseparable from its political context. Persistent land-use restrictions, water inequities, movement constraints, weakened institutions, and escalating violence have produced a chronic condition of environmental vulnerability that undermines sustainable development and resilience. Absent structural changes enabling Palestinian access to land, water, and regulatory authority, degradation is likely to persist and intensify regardless of humanitarian or development interventions.

International Processes Relating to the Reconstruction of the Gaza Strip

International coordination on Gaza’s recovery has increasingly converged around a sequenced relief-early recovery-reconstruction approach anchored in joint needs assessments and governance frameworks. The UN-EU-World Bank Interim Rapid Damage and Needs Assessment estimates total recovery and reconstruction needs at approximately USD 53.2 billion over ten years, with around USD 20 billion required in the first three years to restore basic functionality across housing, WASH, energy, health, transport, and productive sectors.¹²⁸

The IRDNA provides a shared technical and managerial baseline for donors, supporting sectoral sequencing and reducing fragmented, project-based interventions. At the same time, it does not constitute a reconstruction authority and cannot by itself address the political, security, and access constraints that continue to shape recovery prospects.

124 UNEP 2020
125 Sawafta and Sharaf 2025
126 UNEP 2020
127 FAO 2024a
128 World Bank 2025; World Bank, EU, and UN 2025

UN Security Council Resolution 2720 (2023) established a UN coordination mechanism to facilitate humanitarian assistance and oversight, offering a limited institutional entry point for early recovery without resolving longer-term governance challenges.

The European Union has signalled readiness to support stabilisation, early recovery, and reconstruction in Gaza, conditional on access, security arrangements, and the reactivation of functioning Palestinian institutions. The European Commission's proposed multiannual financial package of up to EUR 1.6 billion for 2025-2027 combines budget support linked to Palestinian Authority reforms, resilience and recovery funding, and European Investment Bank instruments to support private-sector liquidity.¹²⁹ This blended approach integrates grants and project finance but remains contingent on political and operational conditions.

Despite these frameworks, international funding remains far below assessed needs. OCHA's 2025 Flash Appeal requests approximately USD 4.0 billion to meet urgent humanitarian requirements in Gaza and vulnerable communities in the West Bank, underscoring the persistent gap between technical assessments and operational delivery.¹³⁰ Updated UN estimates further suggest that total reconstruction needs could approach USD 70 billion once environmental remediation, debris management, ecosystem restoration, and the rehabilitation of health and WASH systems are fully accounted for.¹³¹

Three structural constraints continue to impede reconstruction. First, access restrictions and import controls severely limit the entry of construction materials, fuel, equipment, and spare parts, directly shaping the pace and feasibility of recovery.¹³² Second, governance and legitimacy challenges persist, as large-scale donor financing remains tied to the presence of an accountable administrative authority with transparent procurement and fiscal oversight.¹³³ Third, the politicisation of humanitarian and recovery mechanisms constrains impartial access and complicates the transition from emergency relief to early recovery.¹³⁴

From an environmental perspective, these constraints expose deep institutional capacity gaps. Nearly two decades of blockade, political fragmentation, and repeated destruction have eroded environmental governance, monitoring, and regulatory enforcement. Experience from other conflict-affected settings indicates that environmental recovery requires predictable access, clear standards, and robust oversight. In Gaza, this underscores the need for reconstruction arrangements that embed environmental remediation and governance at the core of recovery frameworks, rather than treating them as secondary or technical add-ons.

129 OCHA 2024b; General Secretariat of the Council 2025

130 OCHA 2024b

131 UNDP et al. 2025

132 World Bank 2025; World Bank, EU, and UN 2025

133 General Secretariat of the Council 2025

134 OCHA 2024b

Conclusions

The 2023-2025 war in the occupied Palestinian territory has generated one of the most severe and complex environmental crises ever documented in a densely populated and politically constrained urban setting. In Gaza, pre-existing environmental vulnerabilities were transformed into a systemic collapse of environmental life-support systems. The destruction of infrastructure and the widespread contamination of air, water, soil, and coastal ecosystems crippled essential services, including water and sanitation, energy supply, waste management, and public health.

Even before October 2023, Gaza's environmental foundations were critically weakened by prolonged blockade and repeated military escalations. Chronic electricity shortages, acute water scarcity, overstretched waste and wastewater systems, and limited institutional capacity left the Strip highly vulnerable. The scale and intensity of destruction since 2023 have rapidly overwhelmed local coping mechanisms, turning environmental degradation into a central driver of disease risk, displacement, livelihood collapse, and the escalation of recovery costs and complexity. Massive debris generation, damage to water and wastewater infrastructure, uncontrolled waste disposal and burning, and restricted access to environmental assets further heightened exposure to hazardous pollutants and communicable diseases, while explosive remnants and toxic materials embedded in rubble created long-term risks.

An integrated recovery approach is therefore indispensable. Environmental rehabilitation must be treated as a foundational pillar of stabilisation, public health protection, livelihood recovery, and safe return. Priority actions include restoring water and sanitation services, ensuring reliable energy for essential facilities, establishing secure systems for debris and waste management, rehabilitating agricultural and coastal environments, and rebuilding environmental governance and monitoring capacities. A high-level, field-based environmental fact-finding mechanism is critical for documenting damage, guiding remediation priorities, and supporting evidence-based recovery planning and accountability.

The findings of this study demonstrate that Gaza's recovery is not primarily a technical reconstruction challenge but one of governance and institutional resilience. Environmental collapse occurs where regulatory authority, resources, and enforcement capacity are severely constrained. Sustainable reconstruction, therefore, requires strengthening environmental governance alongside physical rebuilding, including transparent regulatory frameworks, coordinated environmental data systems, and climate-resilient planning instruments.

Environmental restoration also holds peacebuilding potential. By reducing resource-related tensions, enabling the safe reintegration of displaced populations, and fostering social trust, inclusive and accountable recovery processes can contribute to longer-term stability. Evidence from other conflict-affected settings underscores that recovery efforts are more effective when decision-making is inclusive, oversight is credible, and accountability mechanisms are clear. In Gaza, this points to the need for a reconstruction framework that is technically grounded, politically neutral, and backed by international guarantees.

At the same time, the scale of destruction far exceeds Gaza's institutional and financial capacity. Updated UN assessments estimate that reconstruction and environmental remediation will require around USD 70 billion, encompassing not only physical rebuilding but also the cleanup of hazardous waste, contaminated soil and groundwater, and degraded coastal and agricultural systems. Recovery cannot follow conventional post-conflict models. It requires a sequenced, internationally supported framework that ensures access to materials and fuel, embeds strong environmental safeguards, prioritises climate-resilient water, energy, and sanitation systems, and relies on transparent financial governance led by Palestinian institutions with international oversight.

Integrating environmental rehabilitation into the core of reconstruction planning is therefore not optional. Without a coherent and adequately funded recovery architecture, the environmental degradation, public health risks, and systemic service failures documented in this study will persist, undermining prospects for safe return, economic recovery, and long-term resilience.

These findings have direct relevance for Germany and the European Union as major donors and leaders in climate and environmental governance. European involvement can significantly influence Gaza's recovery by incorporating climate-resilient infrastructure, environmental protections, and responsible, multi-lateral rebuilding processes into funding and execution plans.

Obstacles

Key obstacles to addressing environmental and environmental-health impacts stem from a combination of security, capacity, and governance constraints. Persistent insecurity and access restrictions impede damage assessments, repairs, and routine operations, while the destruction of assets, shortages of fuel and spare parts, and loss of skilled personnel have led to the collapse of local service capacity. Mass displacement and overcrowding in sites with inadequate WASH conditions further accelerate pollution and disease transmission.

These pressures are compounded by blockade-related restrictions on the entry of equipment, chemicals, and construction materials essential for environmental services, alongside fragmented governance, weak coordination mechanisms, and chronic underfunding relative to needs. Finally, limited access to specialised tools and expertise for managing hazardous waste, rubble, and explosive remnants poses a critical barrier to safe environmental remediation and recovery.

Technical interventions alone cannot address these obstacles. They are structurally embedded in the international governance and access regime shaping humanitarian and reconstruction assistance to Gaza. As mentioned before, limits on access, import rules, divided control, and biased aid systems consistently weaken the impact of international assistance, making outside support a temporary fix rather than a means to achieve lasting environmental recovery.

Recommendations

1. Enable Depoliticised Access and Reconstruction Governance (EU/German Role: Guarantees, Diplomacy, and Coordination)

European and German policy-makers should leverage diplomatic, multilateral, and financial instruments to secure sustained, depoliticised humanitarian and technical access to Gaza, including predictable entry of fuel, spare parts, treatment chemicals, equipment, and construction inputs essential for WASH, energy, waste, and health services. The EU, in coordination with the UN, should support establishing an independent, technically competent reconstruction coordination mechanism that ensures neutrality, transparency, and uninterrupted operational access, insulating recovery efforts from political fragmentation and fluctuating security conditions.

2. Anchor Reconstruction in Environmental Rehabilitation and Climate-Resilient Infrastructure (EU Green Deal & Climate Finance)

Environmental rehabilitation must be embedded as a core pillar of reconstruction financing and planning. Germany and the EU should prioritise funding for debris and hazardous waste management, soil and groundwater remediation, coastal rehabilitation, and the restoration of water and wastewater systems, all under robust environmental safeguards. Investments should align with European climate and environmental standards by promoting decentralised, solar-powered water and energy systems, climate-resilient WASH infrastructure, and environmentally sound rebuilding practices. This would position European climate policy instruments (e.g., the Green Deal, climate finance windows, the EIB) as drivers of an environmentally sustainable recovery.

3. Establish Independent Environmental Monitoring and Accountability Mechanisms (EU support to evidence-based governance)

The EU and Germany should support the creation of an independent, field-based environmental fact-finding and monitoring mechanism with strong technical capacity to document damage, certify debris clearance safety, identify contamination hotspots, and verify environmental compliance of reconstruction projects. This mechanism should maintain open-access environmental data platforms to support transparent decision-making, accountability, and evidence-based sequencing of recovery priorities. Such a structure aligns with European commitments to multilateral environmental governance and international humanitarian and environmental law.

4. Invest in Palestinian Institutional Capacity for Environmental Governance and Service Delivery (State-Building through Environment)

European assistance should move beyond asset replacement toward rebuilding environmental governance capacity. Targeted support is needed for Palestinian institutions and municipalities to restore regulatory authority, environmental monitoring, coordination of service delivery, and climate-resilient planning tools across the water, waste, energy, and public health systems. Long-term EU/German technical assistance, institutional twinning arrangements, and capacity-building programs can help ensure that reconstruction strengthens governance resilience rather than reproducing pre-war institutional fragility.

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Scorched Earth: Environmental Impact of the Conflict in Yemen

Hisham Al-Omeisy

Introduction

Yemen has faced mounting structural, economic, social, and security challenges even before the current conflict, and the war that started in 2015 has only exacerbated its many woes. The exceedingly complex political and military situation has been worsened by an overwhelming humanitarian crisis that has been growing in scale since the onset of the war. The conflict, which has gradually escalated from a political impasse into full-scale hostilities over the past few years, has become ostensibly intractable. The roots of the conflict lay in the government's failure to curb corruption and in its overall mismanagement of the state, in which real democratic mechanisms were absent, political inclusion and representation were limited, and resource sharing was disproportionate. The violence that delineates and pits political factions against each other has heightened group identity and perceptions of irreconcilability, ultimately polarising narratives and contributing to the conflict's resistance to resolution. Over time, divergent agendas, regional interests, and barriers erected by past grievances have further exacerbated the conflict. Moreover, war has weakened the central state's control, debilitated institutions, obscured the conflict's real roots, and had a splintering effect, increasing the number of fighting factions.

Although the humanitarian consequences and immediate needs – marked by famine, disease, and displacement – have received significant attention, the environmental impacts of the conflict remain underexplored. The intersection of violent conflict and environmental degradation is complex and multifaceted, encompassing direct destruction of infrastructure and natural resources, pollution from military operations, disruption of environmental governance, and indirect effects resulting from societal and economic collapse. Understanding and highlighting these impacts is critical not only for environmental preservation but also for humanitarian relief and post-conflict reconstruction.

Conflict as a Catalyst for Environmental Degradation

Armed conflict generally acts as a catalyst for environmental degradation through the intensification of destructive activities, the collapse of governance, and the disruption of environmental monitoring. In Yemen, the conflict also overlaps with existing vulnerabilities, such as water scarcity and climate change, creating a vicious cycle in which environmental degradation causes instability and vice versa. This has resulted in a range of problems, including resource depletion, pollution, and environmental destruction, which threaten the country's habitability.

One of the most pressing environmental consequences of the conflict is the disruption of water resources. Yemen is a particularly dry country due to its arid environment, high population density, and inefficient use of water resources. In addition, bombings and blockades have damaged wells, pipelines, and desalination plants, forcing communities to over-extract groundwater for survival.

Water Resources and Qat Cultivation

Yemen is considered the world's most water-scarce country. Apart from the pressing issue of accessibility to water due to the conflict, the war has also destroyed vital water infrastructure through airstrikes and shelling. There were about 105 incidents documented, which destroyed 10% of the water infrastructure (for example, the desalination plant in the city of Hudaydah) and negatively impacted 38% of the water infrastructure as well.¹³⁵ This has had negative effects on the country's accessibility to water. Before the war, the country received 131 cubic meters of water per capita, relying heavily on rainwater to sustain its groundwater and surface water sources. However, the country now receives only 74 cubic meters of water per capita. This is below the absolute scarcity threshold of 500 cubic meters. Over-extraction of groundwater through unregulated well-digging has accelerated depletion. At the same time, untreated wastewater (an estimated 31.2 million cubic meters per year in Taiz alone) pollutes agricultural produce with heavy metals such as zinc, arsenic, and barium, exceeding permissible standards. It is estimated that the problem has affected more than 16 million people, causing susceptible groups (women and girls mostly) to walk long distances to fetch water and leading to serious health outbreaks, characterized by more than two million cases of cholera and 13,750 deaths as of 2019, in addition to dramatic increases in dengue fever, malaria, Hepatitis A, and Typhoid. In Aden itself, the availability of water has decreased from 22 to 8 hours per day due to unregulated well digging (over 70 in Taiz alone), the majority of which have stopped yielding water.¹³⁶ Climate change has worsened this through erratic rainfall, rising sea levels, salinising coastal aquifers, and floods that damage remaining infrastructure and displace landmines, further contaminating sources.

Moreover, warring parties in the conflict have exploited and weaponised water resources, raising localised conflicts with thousands of deaths every year due to resource-driven war.¹³⁷ Groundwater has been depleted at an increasing rate, with extraction exceeding recharge by one-third, and aquifers are expected to run dry by 2040 or earlier. The weakened governance and lack of oversight resulting from the conflict have led to an exponential increase in random, unregulated well drilling. Moreover, with 70% of Yemeni communities residing in rural areas, they have to walk for up to two hours to access water, while cities such as Sana'a receive water delivery only once or twice per week.¹³⁸ The damage to drainage and sewage infrastructure has led to a 55% increase in solid and liquid waste in surface and groundwater. Moreover, the displacement of more than four million persons has increased water demand in host communities, where costs have skyrocketed by an alarming 400%.¹³⁹

135 Mohammed 2023

136 Ibid.

137 Barry et al. 2024

138 Lackner and Al-Eryani 2024

139 Omar 2025

One important factor is the growth of Qat, a semi-narcotic plant that significantly contributes to environmental degradation by consuming 30-40% of the country's groundwater and 36% of its renewable water. Irrigation demands have led to aquifer depletion at rates of up to six meters per year in areas such as Sana'a.¹⁴⁰ Moreover, farmers growing Qat commercially have also heavily used pesticides, which have contaminated soil and water, contributing to biodiversity loss and increased health risks, such as cancer, from residues.¹⁴¹ Climate change has worsened this cycle: rising temperatures and droughts pushed farmers toward drought-resistant qat, which yields more when irrigated, creating a vicious feedback loop.

Unfortunately, the cultivation and chewing of Qat are deeply ingrained in Yemeni culture. Although it provides short-term economic benefits, its long-term impacts have contributed to water scarcity, food insecurity, health issues, and hindered sustainable development. Despite mounting evidence of negative impacts, its cultivation has continued to expand and now covers about 15% of the country's arable land across 18 of 21 governorates, with production concentrated in areas such as Sana'a, Amran, Hajjah, Ibb, Dhamar, Taiz, and Al-Bayda.¹⁴² In addition, Qat has displaced food crops, coffee, and grains, exacerbating environmental, economic, and social challenges amid Yemen's ongoing conflict and climate vulnerabilities.

Deforestation

Deforestation in Yemen has not been a recent trend but rather a continuation of structural challenges, including aridity, sparse forests, and demands for land use and fuelwood. But protracted conflict changes the extent, pace, and regions of tree cover loss completely through two basic demands: (i) rising wood fuel demands due to unaffordable or unavailable commercial fuels, and (ii) impairing national and community efforts to constrain wood extraction, particularly in protected zones. The rising unavailability or high costs of cooking gas, kerosene, or electricity led to an increased use of alternative fuels such as wood and charcoal. Yemen's reliance on traditional fuelwood has always been high. According to FAO reporting on West Asia, wood fuel and charcoal constitute a substantial source of energy for households in Yemen, and wood fuel use, in particular, tends to rise when commercial fuel supplies are limited.¹⁴³

Moreover, with income loss and unemployment, charcoal production and wood sales become emergency cash-generating activities. These coping behaviours have shifted extraction from subsistence collection to market-oriented harvesting. This, coupled with military operations, internal displacement, and urban stress, has increased local demand for fuelwood, and, with environmental agencies losing staff, budgets, and mobility, protected areas become harder to manage, while informal extraction has expanded. Global Forest Watch (GFW) estimates that Yemen had approximately 91,000 ha of natural forest in 2020,

140 McCracken 2012

141 Rouis 2014

142 Kasinof 2023

143 FAO 2008

representing about 0.20% of the national land area – an indicator of how limited the resource base is and why marginal increases in extraction have outsized ecological effects.¹⁴⁴ In a country like Yemen, with low forest cover to begin with, the consequences of accelerated cutting have been disproportionately severe: reduced soil stability, increased erosion and flood risk, lowered groundwater recharge, and biodiversity loss.¹⁴⁵

UNEP provides a specific example from Socotra, where the high cost and low availability of cooking gas have contributed to a spike in deforestation and desertification, with conflict-related isolation worsening pressures.¹⁴⁶ Even before 2015, certain high-value ecosystems were under pressure from agricultural expansion, overharvesting of firewood, and overgrazing. Conflict increases these pressures by weakening management and enforcement capacity. The Conflict and Environment Observatory (CEOBS) documents how Yemen’s protected areas – such as Jabel Bura’a – contain rare forest fragments and face heightened risk, with fuelwood reliance rising as a coping strategy under wartime economic conditions.¹⁴⁷ However, data remains scarce as conflict reduces monitoring, forest inventories, and enforcement records.

Land Degradation and Landmines

The conflict has accelerated land degradation in the country through both direct methods, such as landscape destruction, and more indirect mechanisms, including the collapse of institutions, displacement, and survival strategies that are pressuring the land. Overgrazing, unsustainable agricultural practices, and the abandonment of land management have also contributed to the degradation process and accelerated soil erosion. However, this particular land degradation did not start during the conflict but rather resulted from water shortages, aridity, erosion risk in mountainous areas, and land change stress. It has also significantly increased the rate and spatial extent of degradation by destroying farm and water infrastructure, limiting land management, and forcing households to adopt extractive coping practices. A UNDP-commissioned 2024 study explicitly links the ongoing war to land degradation via “damage to land and infrastructure” and the prevention of restorative measures, underlining the conflict-development-environment nexus.¹⁴⁸

The intense bombardment and ground combat accompanying the military operations since the onset of the armed conflict have damaged soils, terraces, irrigation systems, and rangelands. The mines, UXOs, and remnants of cluster munitions restrict access to farmland and grazing areas, preventing cultivation and rehabilitation. Internal displacement has reduced labour availability for terrace maintenance, a central land-conservation technology in steep highland environments to retain runoff water and reduce erosion on slopes, as well as other soil conservation techniques. A report by the UNDP states that degraded terraces contribute to highly destructive flooding, with reduced water absorption leading to the loss of farmland.¹⁴⁹ This implies a direct mechanism linking the conflict-driven neglect to the outcomes of erosion. Furthermore, erosion pressures are compounded by changing rainfall patterns and flood shocks that damage agricultural infrastructure and strip topsoil

144 Global Forest Watch 2024

145 Lackner 2024

146 UNEP 2022

147 Weir 2021

148 UNDP 2024

149 Ibid.

– an effect reported in humanitarian and resilience programming accounts.¹⁵⁰

Landmines pose a serious threat to the environment by contaminating soil with chemicals and heavy metals. In addition, they use explosives where residues take a long time to biodegrade and leach into groundwater and crops. The effect has been witnessed in arable lands such as Taiz, Mocha, and Shabwah, where farmers have abandoned their fields, resulting in the destruction of vegetation, soil erosion, salinisation, and loss of biodiversity. This has also led farmers in places like Al Remah, where farms and livestock have been destroyed by landmines, to overexploit cleared areas, resulting in declining soil fertility.¹⁵¹ Beyond land denial, mines and explosive ordnance have driven environmental harm through soil disturbance during emplacement or detonations and through contamination risks associated with energetic compounds. International mine-action guidance has specifically highlighted how they contribute to erosion and soil degradation.¹⁵²

Oil Spills and Marine Pollution

The conflict has significantly increased the risk and incidence of oil pollution, particularly along the Red Sea coast. The fighting has damaged oil and port infrastructure and created acute spill risks that have threatened marine ecosystems, coastal livelihoods, and public health through both infrastructure neglect and direct maritime incidents. The Houthis' attacks on ships in the Red and Arab Seas have further increased those risks.

The Case Study of FSO Safer

A central environmental threat linked to the conflict has been the deterioration of the FSO Safer, a floating storage and offloading unit moored off Yemen's Red Sea coast since 2015. Following the early stages of the war, the vessel fell into disuse, and its structural condition has deteriorated due to the absence of maintenance, significantly increasing the risk of leakage or catastrophic oil discharge. The tanker carried an estimated 1.14 million barrels of crude oil – equivalent to four times the volume spilled in the 1989 Exxon Valdez disaster – posing a possible large-scale marine pollution event if containment fails. Should a spill have occurred from the Safer, modelled scenarios indicated rapid spread along the western Yemeni coastline and into adjacent Red Sea waters, with severe implications for sensitive marine habitats such as coral reefs, mangroves, and seagrass beds. These ecosystems are essential for biodiversity, fish nursery habitats, and ecological productivity, meaning oil pollution could degrade ecological function over years or decades. Luckily, a crisis was averted through a coordinated international effort led by the UN, where a ship-to-ship transfer of the oil was facilitated.

The Safer crisis had captured headlines and triggered a coordinated international response, but other maritime incidents and direct attacks on commercial vessels in the Red Sea have received less attention. For example, the sinking of the MV Rubymar after being struck by the Houthis released heavy fuel oil into the Red Sea, illustrating how conflict-linked naval engagements compound risks of pollution beyond infrastructure neglect. Additional ships like the MV Tutor, MV Eternity C, and MV Magic Seas were also sunk in similar attacks, compounding the risks.¹⁵³ The sinkings have caused significant immediate and potential long-term damage to the Red Sea's fragile ecosystem, which includes coral reefs, mangroves, and diverse marine life.

150

Ibid.

151

Buchanan 2025

152

Frost 2021

153

Oral 2025

Waste Management

The conflict has severely impacted Yemen’s already weak waste management infrastructure, causing a near breakdown in collection, disposal, and treatment services. Projects and planned efforts before the conflict, like the National Strategy for the Management of Solid Waste in 2009 aimed at enhancing the collection infrastructure, developing the network of controlled landfills and managing the issue of waste picking in the informal sector, were abandoned because of the advent of the Arab Spring in 2011, followed by the war, with donor support switching to funding humanitarian crises.¹⁵⁴ This has caused massive, uncontrolled dumping and burning, and the rise of dumpsites in the informal sector, further deteriorating environmental conditions and leading to public health emergencies. As a result, the number of dumpsites has doubled from 213 in 2014 to 473 in 2024, with the garbage-covered area expanding from 6.3 km² to 15.6 km².¹⁵⁵

There are military activities that have also specifically affected the waste facilities. For instance, in 2015, airstrikes by forces led by Saudi Arabia damaged

major facilities like a waste processing building of Sana’a’s largest landfill, making Yemen’s only hazardous healthcare waste treatment facility unusable because of a series of power failures.¹⁵⁶ There was also looting, theft, or damage

to vehicles used for waste collection by parties involved in the conflict, resulting in 45% of these vehicles being inaccessible, damaged, or missing by mid-2015.¹⁵⁷ Debris from housing that was destroyed or torn down in the course of the conflict was also massive in scale, about 1 million tons in 2015 in urban centres like Aden, Hajjah, Sa’ada, Taiz, Abyan, and Sana’a, some of which was contaminated with dangerous materials such as unexploded ordnance, asbestos, or home chemicals.¹⁵⁸

Socioeconomic changes and disruptions brought by the war have also weakened the waste management sector. The local authorities lacked the funds to pay for staff and fuel to maintain the vehicles, drastically reducing the waste collection rate. It has also resulted in health emergencies associated with unattended waste, which becomes a breeding ground for disease and outbreaks such as cholera from contaminated water sources. Socioeconomic impacts include declining rural agriculture due to land and water pollution, which also increases resource conflicts, and declining trust in government, as well as public demonstrations in urban centres due to poor service delivery. The threats posed by population growth and climate change could also worsen the situation and fuel instability.¹⁵⁹

154 Weir 2019
155 PAX 2025
156 Frenton 2021
157 Clausen 2025
158 Schulten 2024
159 Garcia et al. 2024

Collapse of Environmental Governance and Monitoring

The conflict has contributed to the collapse of environmental governance and monitoring. Granted, certain gaps and vulnerabilities have existed due to weak institutions, a lack of technical capacity, and insufficient funding, but the many woes have been exacerbated by the conflict, leading to fragmented control, impeded environmental policies, and the absence of monitoring.¹⁶⁰ Additionally, the conflict has contributed to the collapse of important environmental organisations through military offensives and the diversion of resources. Inadequate control has also contributed to the failure to enforce environmental laws, leading to activities such as drilling illegal wells and disposing of industrial waste. In addition, the conflict has contributed to the weakening of interventions by international organisations that are responsible for environmental stewardship.

Monitoring efforts in war-torn areas have also deteriorated due to economic collapse, displacement, institutional dysfunction, and disunity. Fuel constraints and power shortages made it nearly impossible to collect data, including satellite and survey data. Monitoring climate change, essential for observing temperature increases (+1°F over the last 50 years) and irregular rainfall patterns, has virtually stopped, further exacerbating unresolved issues, including floods and droughts.¹⁶¹ Governance challenges also stimulated dysfunctional activities, including water misuse, which drained groundwater resources. This also started a vicious cycle, as environmental deterioration contributed to subnational conflict, further weakening government control. With the conflict recently witnessing renewed bouts of escalation, there still appears to be no major peace agreement to reintegrate governance, further entrenching the crisis.

Conclusion

The extent of environmental implications brought on or exacerbated by the conflict, from the intensity of the damage inflicted on the environment as a direct consequence of military interventions to resource depletion, infrastructure damage, and the breakdown of the environment of governance itself, represents the cumulative fragility of ecosystems caught up in survival crises in which sustainability falls secondary to the need to survive the moment. Addressing this requires a comprehensive, cycle-focused approach to evaluation and remediation, a robust system of environmental governance, and the full synthesis of environmental objectives and humanitarian as well as reconstruction efforts. The following is a non-exhaustive list of recommendations:

- Make water infrastructure protection and rehabilitation a priority: invest in the rehabilitation of damaged wells, pipelines, and desalination plants to limit the over-extraction of groundwater, while ensuring fair water resource management to avoid conflict over water resources. Moreover, make sustainable groundwater resource management a reality by supporting community-based monitoring of groundwater levels, banning deep-well construction by powerful landowners, and incorporating climate-resilient approaches such as rainwater harvesting to mitigate droughts and social inequality.

160 Porter 2023

161 Douglas 2016

- Launch demining and soil remediation initiatives: remove landmines and explosive residues to eliminate soil pollutants, followed by remediation activities like reforestation and soil erosion control to mitigate desertification and improve agricultural productivity.
- Embrace sustainable use of land resources: implement crop rotation, control overgrazing, and avoid excessive fertiliser use through education and incentives, especially in marginal areas impacted by population displacement, to improve soil nutrient quality and avoid further erosion.
- Mitigate fuel shortages to limit deforestation: offer accessible clean fuel sources other than firewood and charcoal, and preserve mountain terraces to avoid floods, landslides, and species extinction. Further, initiate measures for sustainable logging and land tenure changes to avoid seizures that contribute to vegetation degradation, and support carbon sequestration projects to address local and global climate change.
- Remediate pollution from conflict debris and improve waste management: remove oil spills from bombed refineries and ports, control dangerous waste disposal, and avoid unregulated waste burning to reduce the spread of toxins and greenhouse gas emissions. Furthermore, establish governance structures for the proper disposal of plastics and other materials, and merge demining activities with flood management to prevent the diffusion of contaminants.
- Break the conflict-environment cycle: integrate environmental analysis into peace talks, prioritising resource-sharing agreements to mitigate inter-communal conflicts driven by resource constraints and environmental disasters.
- Make climate-resilient communities: improve governance structures in ethnically divided communities through climate-resilient strategies such as drought-tolerant crops and warning systems to halt the escalation of environmental stressors into conflict.
- Integrate green strategies in transitional justice: this should include land restoration, water equity, and demining initiatives in the post-conflict recovery process to ensure sustainable rebuilding and avoid areas of Yemen from becoming uninhabitable.
- Boost international aid for environmental interventions: this should provide funding for integrated programmes that address the nexus of the war and climate, with a focus on holistic strategies that combine humanitarian assistance with ecological restoration to help make Yemen habitable and peaceful.

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Sudan’s Conflict, Collapse of Critical Infrastructure: Environmental Impacts and Responses

Abdalfthah H.M Ali

Introduction

Sudan’s war (approaching its third year) hasn’t just destroyed lives and hometowns; it has dismantled the systems that make civilian life viable.¹⁶² Since the outbreak of the conflict between the Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF) in April 2023, the conflict has extended across urban and rural regions; its consequences on humans remain catastrophic, with tens of millions needing urgent humanitarian aid.¹⁶³ The escalation produces a dual collapse: critical infrastructure failure and pollution, as well as the hollowing-out of state administrative capability to monitor, maintain, and recover.¹⁶⁴ This has triggered cascading system failures across civilian life: electricity outages disable water pumps and treatment plants; damaged pipes and sewers contaminate drinking water; fuel shortages paralyse agriculture and humanitarian logistics; and municipal infrastructure degrades into debris and hazardous waste.¹⁶⁵

Likewise, Sudan is experiencing an environmental tragedy that is being produced through brutality and institutional breakdown, amid pre-existing climate stress and low adaptive capacity. According to ND-GAIN’s vulnerability ranking, Sudan sits among the world’s most vulnerable states, echoing high exposure and limited capacity to manage climate and environmental shocks.¹⁶⁶ Furthermore, the war has radically accelerated the effects and driven communities to tipping points where recovery is no longer simply a matter of rebuilding what was lost. All of these come with an uncomfortable reality: the war has been under-prioritised internationally, including by the global media and diplomatic bandwidth. That invisibility matters, as wars that fade from sustained international attention face less monitoring, fewer constraints on fighters, and more permissive space for external interference, whether through arms flows, financing, political cover, or opportunistic resource extraction.

This chapter argues that environmental degradation in Sudan’s war is not just a byproduct of violence but also a mechanism of coercion enabled by institutional breakdown. It traces how damage to critical infrastructure and governance collapse translates into ecosystem loss, livelihood erosion, displacement, and heightened climate risk.

162 Hamed 2025
163 Middle East Monitor 2026
164 Human Rights Watch 2024b; Singh 2025
165 United Nations Office of the High Commissioner for Human Rights 2024
166 Hamed 2024a

The analysis is guided by three questions: (i) How is the environment being damaged – directly and indirectly – through conflict and the targeting or neglect of life-support systems? (ii) How does the hollowing-out of institutions transform environmental harm into chronic vulnerability and forced mobility? (iii) What policy options are feasible under fragmentation to prevent lock-in, reduce harm now, and enable recovery over time?

War and the Degradation of Environment and Resources

The war has systematically converted Sudan’s pre-existing structural vulnerabilities into a deliberate mechanism for degradation, where the control of water and power infrastructure serves as a primary lever for territorial dominance and civilian coercion (RSF has repeatedly seized or disabled key water sources and used access control to coerce civilians).¹⁶⁷ In practice, the weaponisation of infrastructure replaces overt threats with a structural imposition of scarcity. The deficiency of water serves as a primary tool of coercion and forced displacement.¹⁶⁸ This tactical deprivation forces civilian compliance more effectively than explicit military force does, leveraging the managed collapse of essential services to secure territorial control and obedience.¹⁶⁹

This dynamic has arguably produced two predictable outcomes. First, it has accelerated the likelihood of waterborne disease outbreaks. Cholera was the clearest indicator, rising in direct connection with the collapse of water, health, and sanitation systems. For instance, UN agencies reported more than 83,000 cholera cases and over 2,000 deaths nationwide since mid-2024, with thousands of cases in Khartoum state alone by May 2025, as the outbreak spread across multiple states amid insecurity and degraded hygiene conditions.¹⁷⁰ Second, the drivers of displacement are frequently mischaracterised as a purely reflexive response to kinetic violence. Nonetheless, displacement and migration serve as a survival strategy necessitated by the systemic erosion of the fundamental requirements for human dignity and biological survival.¹⁷¹ The convergence of acute water insecurity – evidenced by contamination, prohibitive energy costs for pumping, and scarcity – with the simultaneous disintegration of public health infrastructure renders displacement an inescapable imperative.

Meanwhile, energy infrastructure has become both a casualty of the war and a pillar of its political economy. Fighting over fuel depots, refineries, pipelines, and power stations does more than cut electricity: it shuts hospitals, cripples water treatment, forces dependence on diesel generators, and pushes households toward charcoal and firewood, accelerating deforestation.¹⁷² Khartoum’s Sunut Forest illustrates this trajectory. It has been protected since 1939 and long treated as the capital’s ecological lung and a site for forestry education; it has been heavily logged during the conflict for charcoal and fuelwood.¹⁷³

167 Yale School of Public Health 2025; Eltahir and Abdelaziz 2025; Middle East Monitor 2025

168 Geneva Academy 2025b; also, see chapter “War, Ecology, and Degradation: Environmental Impacts of the Syrian Conflict”

169 Geneva Academy 2025a

170 UN News 2025

171 Human Rights Watch 2024a

172 Hamed and Ali 2025

173 Hamed 2024a; Mashawir Agencies 2025

This is not an isolated case but part of a wider feedback loop: mass displacement raises demand for survival resources, turning ecological assets into wartime commodities. In Blue Nile, acute gas shortages reportedly have driven the felling of around 4,000 trees per day for household fuel and brick production, undermining riverbank stability and riverine biodiversity.¹⁷⁴ The pattern points to functional paralysis in environmental governance: enforcement becomes impossible when institutions are degraded, and viable energy alternatives are absent.

Industrial damage has triggered a widespread contamination of Sudan's air, soil, and water, stemming from the destruction of industrial and energy infrastructure, the dispersal of munitions, and the functional collapse of hazardous waste management. In Khartoum, where industrial sites are deeply embedded in residential areas, these chemical hazards have rapidly become acute civilian exposure risks.¹⁷⁵ This environmental crisis is further exacerbated by the breakdown of pre-war waste systems, leaving untreated sewage and hazardous debris as primary drivers of long-term ecological degradation and disease transmission.¹⁷⁶ In January 2025, for instance, a fire at the Al-Jaili refinery highlighted how industrial damage can become a public health and environmental issue. Reports documented the scale of the smoke plume, underscoring both the pollution burden and the disruption to fuel supply.¹⁷⁷ Combat may move on, but pollutants remain. They settle into soils, seep into water, and accumulate in bodies, quietly shaping disease burdens and livelihoods long after headlines fade. Timelines in post-conflict settings often stretch into decades: the long tail is not the rubble you can see, but the contamination you cannot.

Furthermore, dam infrastructure sits at the intersection of environmental security and political power as well, since it supports irrigation, hydropower, fisheries, and flood management. Under conditions of war-induced disruption or deferred maintenance, a dam transforms from a functional engineering structure into a potential mass-casualty risk and a trigger for wide-area livelihood loss.¹⁷⁸ Beyond catastrophic failure, operational paralysis – manifesting as mechanical dysfunction, personnel absence, and damaged monitoring systems – actively compounds the destructiveness of extreme rainfall and flooding. Notably, the Arbaat dam disaster near Port Sudan on the Red Sea in August 2024 demonstrates how climate shocks and wartime fragility collide as heavy rains contributed to dam failure, killing dozens, affecting tens of thousands, and devastating villages and water supplies.¹⁷⁹ The lesson here is not simply that climate change caused a flood, but that conflict and institutional breakdown reduce the margin of safety. Maintenance is delayed, inspections stop, early-warning systems fail, and emergency response is slower and more politicised. As a result, climate extremes become more lethal since the systems designed to buffer them are no longer functional.

174 Al Jazeera English 2025

175 Conflict and Environment Observatory 2025

176 Saad 2024

177 Gambrell 2025; National Aeronautics and Space Administration 2025

178 Abdallah 2025

179 Hamed 2024b

Additionally, artisanal mining illustrates another layer of conflict.¹⁸⁰ As gold becomes a central wartime currency and governance is fragmented, unregulated extraction expands rapidly. The use of mercury and cyanide creates environmental and health hazards with decadal persistence, a risk amplified by the proximity of tailings to rivers and floodplains.¹⁸¹

The institutional dimension is critical: while pre-war environmental regulations existed in principle, enforcement was contingent upon state capacity – a resource now severely degraded. In the wake of state collapse, pollution is no longer an anomaly but an inherent feature of survival economies.

This compounding effect is one of the clearest pathways by which Sudan could cross ecological and infrastructural tipping points. A flood is not just an immediate disaster; it can wash contaminants into water systems, ruin topsoil, destroy stored seed and tools, push pastoralists into new grazing areas, and accelerate local competition over what remains. The repetition of these dynamics under conditions of conflict diminishes the likelihood of recovery, rendering displacement increasingly permanent.

The environment becomes both the last safety net and the first thing to be depleted. Yet, for a displaced household lacking the liquidity to afford essential food and medicine, timber harvesting may be the only accessible means of sustenance; similarly, for a youth stripped of formal employment, artisanal mining may be a rational livelihood pathway. These actions are not reflective of moral failure but rather the logical manifestations of institutional collapse. The overarching tragedy lies in the synergistic effect of these individual strategies, which, when scaled across millions, threatens to push fragile ecosystems beyond their ecological tipping points, particularly in regions already burdened by historical degradation and climatic volatility.

The Contours of Irreversibility

Discussions of the damage-to-permanence pathway often evoke a single vivid moment: a dam collapse, a refinery explosion, or a toxic spill, which has already been seen in the Sudan setting; however, there are irreversible thresholds more likely to appear as slow cumulative transitions – where the system still functions, but not well enough to sustain recovery. The first threshold is persistent contamination of water and soils, especially from heavy metals, fuel residues, and mining chemicals. Once contaminants penetrate groundwater in arid or semi-arid systems with low recharge, natural attenuation can take many years, and remediation is technically complex and expensive. Returning to contaminated land without rigorous monitoring and remediation transforms localised environmental damage into a permanent structural crisis. This trajectory ensures the entrenchment of intergenerational health burdens, a sustained collapse in agricultural productivity, and the solidification of chronic poverty. In practice, this can lock in displacement because a home area is no longer safe to farm or draw water from, even after violence declines.

180 Saed and Pearce 2025

181 Ahmed, Purwanto, and Sunoko 2019

The second threshold is the loss of vegetative cover and soil structure in zones already on the edge of desertification. The erosion of topsoil and the subsequent collapse of organic matter make recovery a multi-decade endeavour; simple reforestation is insufficient without sustained soil rehabilitation, integrated water management, and active protection of land from overgrazing. In regions like Darfur and Kordofan, the conflict-driven paralysis of local governance has halted the enforcement of grazing corridors, pushing landscapes toward low-productivity states that are notoriously difficult to reverse. For pastoral and farming systems dependent on seasonal mobility, this environmental attrition is a primary security threat. The collapse of environmental buffers effectively hardens competition over remaining resources, ensuring that local conflicts remain easily ignited even in the presence of a national ceasefire.

Consequently, irreversibility in the Sudanese context is as much administrative as it is ecological. The continued erosion of core technical capacity (specifically engineers, hydrologists, and public health officers) represents a primary structural barrier to Sudanese recovery. This institutional hollow-out ensures that any successor state will inherit public responsibilities it is fundamentally unequipped to fulfil.

The Impact of Environmental Degradation on Conflict Duration and Resolution

Environmental collapse does not just follow war; it can feed war. To do so, the findings of the Sudan case suggest at least four pathways by which it could be argued that environmental degradation prolongs conflict or destabilises peace. First, environmental harm expands the war economy. The collapse of the formal economy (revenues) has forced armed actors and their networks to rely more heavily on extractive rents, gold, land capture, fuel smuggling, and timber. The more the conflict economy depends on extraction, the stronger the incentives to maintain insecurity and territorial fragmentation.

Second, environmental degradation reshapes local conflict dynamics. Displacement into new areas intensifies competition over land, water points, and grazing routes. Traditional mechanisms that managed these disputes (local mediation, customary access rules) are weakened by militarisation and demographic shock. This structural instability sustains localised violence, ensuring its persistence even amid national-level de-escalation.

Third, environmental damage creates what might be called negotiation and peace spoilers. Thus, controlling critical infrastructure yields leverage that directly disincentivises political compromise. However, this calculation downgrades environmental assets as bargaining chips, entrenching a zero-sum logic that systematically undermines the environment.

All these dynamics help explain why environmental recovery must be integrated into peace efforts early, not added later. It could be argued that environmental factors have received too little attention amid the overwhelming humanitarian crisis, even though they are intertwined with conflict dynamics and prospects for recovery.

It should be clear to mediators and donors that the lack of environmental discussion in peacebuilding design, monitoring, and early recovery planning means the peace process is more likely to rest on unstable ground.

Institutional Capacity and the Recovery: Assessing Sudan's Realistic Scope for Action and Structural Constraints

Institutional capacity is the binding constraint in Sudan's environmental crisis. The war has accelerated the hollowing out of institutions responsible for the environment, water, energy, health, and municipal services. Staff have fled or gone unpaid, laboratories and equipment have been looted, data systems have collapsed, and chains of command are fragmented. The practical result is that environmental harm is increasingly unmeasured, unmanaged, and therefore more likely to become permanent.

Yet capacity has not vanished; it has shifted. In many areas, core governance functions are being carried by non-state or semi-formal actors – emergency response rooms, professional networks, diaspora support channels, and local committees that keep clinics open, organise water trucking, or coordinate basic waste removal in relatively safer pockets. This matters for policy: strategies that engage only central institutions will miss where implementation capacity currently sits.

A realistic assessment is therefore layered. At the national level, formal capacity for environmental regulation and monitoring is severely constrained and likely to remain so for years. This limits pollution control, mining oversight, hazardous waste management, and large-scale water quality monitoring. Rebuilding national systems will require security, professional retention, and credible governance; inputs that cannot be assumed in the near term.

At the state and municipal levels, capacity varies widely and is often dependent on local security conditions and political control. Where utilities can operate, they face chronic constraints: fuel scarcity, spare parts shortages, damaged networks, and limited revenue collection. In many areas, even basic chlorination becomes difficult whilst supply lines break.

At the community level, however, institutional memory and social organisation remain usable. Traditional resource management arrangements (especially around grazing access and seasonal mobility) are weakened but not erased. While trust has been damaged, the war has also forced cooperation around survival. Environmental peacebuilding is therefore not an abstract add-on; it is a practical entry point, using resource governance and service restoration to reduce tensions, enable returns, and rebuild a minimum social contract. Its effectiveness depends on local legitimacy, conflict sensitivity, and inclusion – not on assuming a functioning centre. This layered picture dictates sequencing. The question is not what Sudan should do in an ideal recovery plan, but what can be stabilised under fragmentation – and what must wait for a political settlement and institutional reconstruction.

Restoring essential life-support functions in major urban centres is achievable even before a formal ceasefire, provided minimum access and funding conditions are met. The urgent priorities include some of the following: rapid repair of water stations and pumping systems; stabilising electrical substations that keep hospitals, water networks, and cold chains functioning; resuming municipal waste collection in key corridors; and reactivating basic monitoring where possible (water quality spot checks, incident reporting, sentinel surveillance in health facilities). This is the phase in which visible improvements reduce the risk of outbreaks and blunt coercion by deprivation.

This period should also treat debris and hazardous waste as a first-order risk, not a later reconstruction detail. Unmanaged rubble, medical waste, fuel residues, and unexploded ordnance become long-term sources of contamination and impede housing recovery if not addressed early. In policy terms, rapid debris mapping, controlled clearance, and safe temporary storage are no-regret interventions: they protect health now and lower the cost of future rebuilding.

Meanwhile, over the next few years, recovery depends on institutional rebuilding and economic stabilisation: restoring agricultural inputs, repairing irrigation management, improving grid resilience, and re-establishing environmental governance at subnational levels. This is also where climate adaptation must be mainstreamed. A reconstruction strategy that merely restores pre-war fragility – rebuilding the same exposed systems – will lock Sudan into repeated cycles of flooding, drought, and displacement.

In practice, this phase requires rebuilding administrative capability to plan, budget, procure, and enforce payroll and retention for technical cadres; the reactivation of laboratories; credible reporting chains; and basic regulatory functions for extractives and waste. Without these, donor-funded projects will remain islands that do not scale.

The most complex and expensive recovery tasks sit on the far horizon: groundwater remediation in contaminated zones; large-scale soil rehabilitation and reforestation; and rebuilding scientific and regulatory institutions capable of managing pollution and extractives responsibly. Where mercury and other heavy metals have spread widely, recovery can take decades. Environmental recovery is therefore not a post-war project; it becomes generational unless early action reduces the burden now.

In other words, institutional strengthening (especially subnational service delivery, environmental monitoring, and conflict-sensitive resource governance) is not secondary to humanitarian relief. It is the most decisive lever for preventing reversible damage from becoming irreversible. The practical implication is a two-track approach: protect life-support systems now through local/municipal and humanitarian channels, while designing recovery finance around rebuilding regulatory and service institutions.

Conclusion and Policy Recommendations: Preventing Lock-in and Irreversible Damage

In Sudan, the war has made a hard truth clearer: environmental degradation is not just collateral damage. It is increasingly a tool of coercion, because disabling water, power, fuel, and sanitation systems reshapes civilian survival choices, forces displacement, and deepens local competition over scarce resources. At the same time, institutional hollowing-out – staff flight, looted equipment, collapsed data systems, fragmented authority – removes the administrative capability needed to monitor harm, contain contamination, and restore services. That combination is where tipping points live: damage that would be reversible under functioning institutions becomes effectively irreversible under fragmentation.

This also means the window to prevent the worst lock-in effects is closing. The policy implication is urgent but practical: the most cost-effective form of sustainable recovery is harm prevention now – limiting contamination, protecting key water systems, maintaining minimal monitoring, and supporting the local and semi-formal institutions that still function. Three priorities stand out, each actionable under political uncertainty and without waiting for a comprehensive settlement.

First, environmental safeguards need to be embedded in relief delivery, as humanitarian operations now shape Sudan's resource use, public health risk, and local tensions. This requires practical tools and clear responsibility: environmental focal points within response teams; routine screening to flag environmental and health risks; and operational guidance for debris handling, safe disposal of medical and hazardous waste, and water-trucking protocols that minimise secondary contamination. Scaling solar-powered pumping and purification can expand water access while reducing dependence on diesel supply chains and on charcoal-based coping. Relief programming should also include basic field tools and risk screening, so assistance does not unintentionally accelerate degradation through unmanaged waste or unsustainable fuelwood demand. This is environmental peacebuilding in functional terms: keeping life-support systems running reduces disease, displacement pressure, and local resource conflict.

The second priority is to build an evidence-and-accountability architecture for environmental harm, because what is not documented is rarely repaired and rarely deterred. This is where Germany and the EU have a clear comparative advantage. Support is needed for satellite-based monitoring and open-source analysis to track damage to critical environmental infrastructure (water and sanitation plants, energy sites, pipelines, and depots), vegetation loss, mining expansion, and pollution hotspots. Pair this with support to Sudanese professional networks and civil society actors who document harm and understand local exposure patterns. The same evidence base serves three functions at once: it informs humanitarian risk decisions (where contamination and disease risk are rising), it guides recovery prioritisation (where exposure is highest and damage most severe), and it supports accountability for attacks on civilian life-support systems under international humanitarian law. The point is not to litigate the war in real time; it is to ensure that future negotiations, recovery planning, and funding decisions rest on verifiable baselines rather than competing narratives.

Because documentation can endanger local actors, this architecture also needs basic safeguarding: secure reporting channels, careful geolocation redaction for sensitive sites, and “do no harm” publication rules.

The third priority is to integrate environmental peacebuilding¹⁸² into governance by linking reconstruction funding to institutional rebuilding and conflict-sensitive resource management, and by emphasising ecological issues to reduce violence and promote peaceful relations. Environmental peacebuilding works only once it builds governance arrangements that can survive fragmentation. The core move is to link recovery finance and technical support to institutional rebuilding and conflict-sensitive resource governance. That means designing recovery to reduce relapse risks: transparent management of extractive revenues, enforceable safeguards on environmental damage, restoration of local natural resource dispute-resolution mechanisms, and rebuilding water and land governance that is inclusive and credible. It also means embedding climate resilience into infrastructure choices – especially around floods, droughts, and urban sanitation – so Sudan does not rebuild into the next shock. Germany and the EU can support this through targeted technical assistance, capacity-building, and financing tied to minimum governance benchmarks, including strengthened controls on mercury and cyanide supply chains linked to informal and conflict-associated extraction.

That said, environmental peacebuilding still offers workable entry points under political uncertainty. Sudan has relied on community-level dispute resolution around grazing routes, water access, and seasonal mobility; these mechanisms could be strengthened and adapted to today’s pressures, with explicit inclusion of women, youth, and marginalised groups. Thus, community-based natural resource management – watershed protection, participatory land-use planning, forest stewardship, and sustainable livelihoods – can help rebuild social cohesion while restoring ecological buffers. This is also where institutional rebuilding becomes concrete: protecting cadres, systems, and routines that keep water, sanitation, and environmental management functioning, so reversible damage does not become permanent. Regional cooperation also matters; coordination on transboundary issues and shared ecosystems can reduce interstate tensions and build confidence.

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182 See Introduction and chapter “Methodological Approaches”

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War, Ecology, and Degradation: Environmental Impacts of the Syrian Conflict

Sarine Karajerjian

Introduction

Syria and the Levant more broadly are climatically sensitive regions where prolonged heat waves and recurrent droughts interact with political economy and conflict dynamics. Although these environmental risks have long shaped Syria's development and ecosystems, they have taken on new significance as climate change exacerbates water scarcity and as war and displacement disrupt the social and ecological systems that once mediated exposure to environmental harm.

Since the conflict that began in 2011, Syria has experienced one of the largest displacement crises globally, with over seven million people internally displaced and more than six million living as refugees.¹⁸³ The outbreak of war amplified both economic and ecological pressure: it disrupted agriculture and markets, degraded forests, and damaged water and energy infrastructure.

Too often, policymakers persist in framing environmental issues as a “luxury concern”, one to be deferred until more immediate political and economic challenges are resolved. Yet Syria's environmental situation cannot be postponed until the country's other crises are addressed. The impending ecological breakdown is inseparable from Syria's broader social, economic, and political crises.¹⁸⁴

Against this backdrop, this paper argues that environmental degradation in Syria is structural, conflict-transformed, and politically productive. First, Syria's development has long been shaped by harsh climatic conditions and uneven hydrology: large parts of the country fall in semi-arid and desert zones, and national water availability is heavily dependent on the Euphrates River. Second, war has not simply “damaged” the environment; it has transformed ecological systems into terrains through which violence, survival, and inequality are mediated, through toxic contamination, rubble, fuel-driven deforestation, disrupted irrigation, and the collapse of environmental institutions. This is why some policy and research communities describe environmental destruction in conflict as a “silent casualty”.¹⁸⁵ Third, Syria's so-called “post-war” condition remains analytically unstable under persistent insecurity, external intervention, and fragmented authority.

183 UNHCR 2025

184 Shuker 2025

185 UNEP 2016

In such a setting, governing water, land, waste, forests, and infrastructure becomes inseparable from governing society, a central arena where state capacity, legitimacy, and human security are negotiated.

The war has also produced significant indirect environmental impacts. Large-scale population displacement has altered land-use patterns, intensified pressure on ecosystems in receiving areas, and disrupted traditional resource management practices.

This paper situates the environmental impacts of the Syrian war within this longer trajectory of structural vulnerability and governance failure. Rather than treating environmental degradation as a secondary outcome of violence, it analyses how war interacts with pre-existing ecological fragility to produce enduring patterns of insecurity.

Environmental Degradation: Before Assad’s Fall and During the Civil War

The environment severely impedes socioeconomic growth in Syria. More than half of the country is classified as semi-arid or desert, with some areas receiving less than 50 mm of annual rainfall and large areas receiving less than 200 mm.¹⁸⁶ While sandstorms, which are typical from February to May, seriously harm agriculture, summer temperatures can surpass 40°C. Water supplies are scarce; over 80% of Syria’s water comes from the Euphrates (Al Furat), the nation’s longest and most significant river.¹⁸⁷ With an average discharge of 583 m³/s, the river flows across 610 km of Syrian land.¹⁸⁸ Many desert valleys experience sporadic flow, and other rivers, such as the Orontes (Nahr al-Asi), Barada, Sinn, Al-Awaj, and Queiq, typically have average discharges of less than 6 m³/s.

Syria has built several hydrotechnical infrastructure projects to meet water needs for hydropower, agriculture, and flow control. The most important is the 1973-opened Tabqa Dam on the Euphrates, which is located upstream of Ar Raqqa. Al Assad Reservoir (Buhayrat al Assad), which spans 665 km² and holds 14 billion cubic meters of water, was constructed by this dam.

Groundwater has historically provided local populations in places without surface water. Currently, 726,000 ha (55.8%) of the 1.3 million ha under irrigation depend on groundwater. Ain al-Zarqa (5110 l/s), Ain al-Fegy (4801 l/s), Baniyas (1027 l/s), Al Nasriyeh (700 l/s), and Barada (526 l/s) are some of the major springs.¹⁸⁹

The vegetation of Syria is mostly desert and semi-arid, with sporadic trees, shrubs, and grasses. Just over 3% of the land is covered with forests, which are primarily found in the wetter western areas. Precipitation and soil types are closely linked: aridisols, which cover 47.5% of the nation and are highly susceptible to erosion, predominate in regions with less than 200 mm of annual precipitation.¹⁹⁰

186 Popa and Cocos 2012
187 Ibid.
188 Ibid.
189 Ibid.
190 Ibid.

Overgrazing and extensive grain production are two examples of human activities that have increased soil erosion; according to FAO (2003), 17.3% of Syria's land is affected by soil degradation.

Syria's agricultural output, food security, and economic growth are strongly affected by environmental limitations, including an arid climate, scarce water resources, fragile soils, and widespread degradation. Additionally, they increase susceptibility to shocks such as population displacement, climate variability, and violence. These stresses are made worse by fighting in Aleppo and other conflict-affected areas, where population displacement, irrigation disruptions, and destroyed infrastructure exacerbate already-existing environmental fragility.

The military's operations are largely responsible for the detrimental environmental consequences. Toxic materials, including heavy metals, have been produced due to the combatants' extensive use of weaponry and ammunition, as well as American and allied air raids. Certain explosives are poisonous to living things and may cause cancer. These materials have contaminated the air, water (including groundwater), and soils, in addition to smoke and oil leaks in the rebel-controlled extraction and processing areas, dust from collapsed buildings (which may contain asbestos and other toxic substances), destruction of industrial areas, and theft of chemical plants. When explosions and chemical contamination significantly alter soil cover, fertility is diminished or permanently eliminated, leaving the area desolate.

The United Nations cited PAX, a non-governmental organization, as saying that it would take 25 years for nature to recover if the war ended today. Until then, the soil and water will already be contaminated, and the accumulated harmful compounds will have a substantial impact on human health, including that of future generations (more children will be born with disabilities or get cancer). About 40% of the bombs dropped in Syria did not detonate upon impact, according to PAX's data.¹⁹¹

Indirect repercussions of the conflict include population shifts, the suspension or restriction of environmental institutions' operations, and governmental initiatives to regulate biological diversification, desertification, and climate change. However, Syria is particularly vulnerable to desertification due to its vast arid and semi-arid regions, water scarcity, and exposure to extreme climatic variability, making the implementation of such plans all the more necessary. The ecology of the areas where they settled is also significantly affected by the large number of people who left conflict zones in search of a safer existence.

Water Scarcity as a Central Element of the Environmental Impact of the Syrian Civil War

Syria's socioeconomic and political vulnerabilities have been significantly shaped by water scarcity. Water resources, which are essential for domestic use, industry, and agriculture, are unevenly distributed across the country due to the nation's diverse geological and climatic characteristics. Syria's primary freshwater supply has historically come from the Euphrates River, which supports wheat cultivation,

191 Popa and Cocos 2015

a staple crop important to the country’s economy and food security. Despite this, per-capita water resources have long lagged behind globally recognized benchmarks, particularly in rural areas where groundwater is crucial, and precipitation is scarce.¹⁹² Additionally, water was used in military operations by ISIS. The November 2015 airstrike on the Al Khafseh water treatment plant, which produced 18 million litres per day, cut off piped water to approximately 200,000-300,000 people. “By capturing strategic dams and upstream portions of the Euphrates-Tigris basin, ISIS gained control over nearby regions dependent on those streams for drinking water, irrigation, and electricity supply. For example, in early May 2014, ISIS diverted water from Lake Assad, the reservoir of the ISIS-controlled Tabqa Dam, to Iraq and Aleppo, reducing the level of the Euphrates River.”¹⁹³

The southwestern and northeastern parts of Syria were severely affected by the worst multi-year drought in centuries, which lasted from 1998 to 2012. Massive crop failures and livestock losses resulted from these protracted dry spells; estimates suggest that up to 85% of livestock were lost in some places.¹⁹⁴ Pre-existing environmental stresses, such as inadequate rainfall, excessive groundwater exploitation, and desertification in arid regions, were exacerbated by the droughts. Water supply became inadequate for agriculture and livelihoods due to a combination of human-induced and natural stressors, particularly affecting vulnerable rural populations.

Syria’s water crisis worsened due to long-term governance and policy choices. Beginning in the 1960s, the government made agricultural self-sufficiency a top priority by constructing dams, expanding irrigation systems, and providing subsidies to farmers. Although these measures initially increased agricultural productivity, they also led to groundwater overuse, resource depletion, and environmental degradation. The conversion of formerly rain-fed plains into extensively irrigated agricultural areas was expedited by government-managed drilling and irrigation programmes, placing an unsustainable burden on water resources.

By the late 2000s, the system was particularly vulnerable due to a combination of policy failures, water mismanagement, and climate stress. Syria was the only nation in the Fertile Crescent to face a severe humanitarian crisis that led to political upheaval and ultimately civil war, even though nearby regions also faced drought. This implies that while environmental stress alone does not always result in conflict, it can trigger widespread political instability when coupled with inadequate governance, social injustice, and economic fragility.¹⁹⁵

Post-war transition, foreign intervention, and environmental governance

The notion of a “post-war” transition in Syria remains analytically fragile. Rather than a clear rupture from violence, the current period is better understood as a reconfiguration of authority under conditions of persistent insecurity and violence.

192 López Bremme and Regilme 2025

193 PAX 2021

194 López Bremme and Regilme 2025

195 López Bremme and Regilme 2025

Drawing on fieldwork in Syria's coastal regions, Aghiad Ghanem challenges narratives of a violence-free political transition by conceptualizing the present moment as a state of violence in which peace and conflict coexist.¹⁹⁶ The March 2025 massacres of predominantly Alawite civilians, he argues, do not represent an aberration but an intensification of longer-standing patterns of insecurity marked by expropriation, arbitrary arrests, enforced disappearances, and socio-economic marginalisation. This continuity is crucial for understanding why environmental degradation persists beyond formal regime change: governance remains coercive, fragmented, and unevenly territorialized.

Foreign intervention further complicates this landscape. As analysed by the Arab Center for Research and Policy Studies, these arrangements risk institutionalising territorial fragmentation through demilitarised and security-controlled zones, thereby constraining state authority and undermining national cohesion. From an environmental perspective, such fragmentation directly affects water governance, land access, agricultural recovery, and the maintenance of shared infrastructures, reinforcing uneven exposure to scarcity.¹⁹⁷

Within this constrained political space, environmental recovery initiatives take on a distinctly symbolic and political character. Reforestation campaigns launched across Syria illustrate this dynamic. Between 2010 and 2024, the country lost nearly 20% of its forest cover due to wildfires, illegal logging, and drought, particularly in coastal and southern regions. While post-conflict planting initiatives have mobilised state institutions, local authorities, and civil society, experts emphasise that these efforts function more as symbolic entry points into green reconstruction than as immediate ecological restoration. Without addressing structural drivers, fuel scarcity, weak enforcement, land tenure ambiguity, and conflict economies, reforestation risks remaining performative rather than transformative.

Public perceptions of transition further underscore the centrality of environmental governance to human security. A large-scale survey conducted after the collapse of the Assad regime reveals that while a majority of Syrians express cautious optimism about political change, anxiety and insecurity remain widespread. These concerns are closely tied to uneven access to water, food, energy, and livelihoods. As highlighted in the Arab Opinion Index: Syria 2025, human security in Syria is not primarily defined by formal political arrangements, but by exposure to scarcity and the unequal governance of resources.¹⁹⁸ Environmental degradation thus becomes a key mediator between political transition and everyday insecurity.

Sanctions regimes continue to shape this terrain. Despite partial easing, restrictions associated with frameworks such as the Caesar Act have constrained infrastructure repair, investment in public goods, and the state's capacity to manage water, energy, and environmental services. As Ibrahim¹⁹⁹ argues, US sanctions (most prominently the Caesar Act) effectively impede reconstruction

196 Ghanem 2025

197 Ibid.

198 Ibid.

199 Ibrahim 2025

by deterring foreign firms and governments from participating in rebuilding efforts, since any meaningful engagement risks triggering far-reaching secondary sanctions, including exclusion from the US financial system.

Current environmental indicators underscore the urgency of this challenge. Syria is experiencing its most severe water shortage since 1954, with the FAO warning that up to 75% of crops failed in 2025. Declining Euphrates flows, damaged irrigation systems, fuel shortages, and heat extremes have reduced wheat production by nearly half compared to pre-war levels. In this context, any “green recovery” agenda must operate within a politicised landscape in which rebuilding WASH systems simultaneously serves as an ecological adaptation strategy and a poverty-reduction mechanism. As argued in PAX’s *Thirst for Peace*, environmental governance is not ancillary to peacebuilding; it is one of its core arenas.²⁰⁰

Role of Civil Society as a Scenario for Peace

In a context marked by donor-driven territorial fragmentation, decentralised governance, deep political divisions, and a weak central state, environmental action in Syria is likely to be driven primarily by local authorities, communities, and Syrian civil society actors. Rather than a nationally coordinated strategy, environmental governance would evolve through region-specific, bottom-up initiatives shaped by local needs, political realities, and resource constraints.

In opposition-held northwest Syria, for example, the White Helmets have expanded their mandate beyond emergency rescue to include solid waste management, responding to escalating pollution and public health risks in displacement-affected areas.²⁰¹ This evolution illustrates how humanitarian actors increasingly assume quasi-municipal functions in the absence of effective state institutions, linking environmental management to disease prevention and human security.²⁰²

Similarly, in northeast Syria, the Autonomous Administration has institutionalised environmental governance by establishing Ecological Councils and campaigns such as “Make Rojava Green Again.” These initiatives promote reforestation, sustainable agriculture, and ecological education, reflecting a grassroots environmental ethic embedded in the Kurdish political movement’s principles of autonomy, communal governance, and sustainability.²⁰³

Under this model, civil society organizations, local councils, and activist networks effectively substitute for state institutions, tailoring environmental responses to each region’s socio-ecological conditions. Prolonged conflict has often intensified communities’ emotional and material attachment to land, giving rise to forms of environmental activism rooted in an “urge to protect the land” as both a livelihood base and a symbol of survival. However, the viability of such localised environmental governance depends heavily on international support,

200 Schellens et al. 2024

201 Zwijnenburg 2025

202 Ibid.

203 Yildirim 2024

particularly for investments in renewable energy, water management, waste systems, and environmental restoration.²⁰⁴

Finally, the Syrian diaspora plays a critical connective role in this scenario. Through advocacy networks, fundraising initiatives, and transnational campaigns, diaspora actors function as bridges between local environmental struggles and global climate justice arenas, helping to keep Syria's climate-conflict nexus visible within international policy debates.²⁰⁵

Conclusion

This paper reflected that environmental degradation in Syria cannot be understood as a secondary by-product of war or as a technical sector awaiting post-conflict reconstruction. Rather, it is a structural, conflict-transformed, and politically productive dimension of Syria's crisis, one that both precedes the war and has been radically reshaped by it. Long-standing ecological fragility, aridity, vulnerable soils, and dependence on the Euphrates interacted with development choices that prioritised short-term productivity over sustainability, embedding environmental stress into Syria's political economy well before 2011. The war did not simply damage these systems; it converted land, water, forests, and infrastructure into active terrains of violence, survival, and inequality.

Syria's so-called post-war transition remains unstable. Persistent violence, foreign intervention, sanctions, and fragmented authority constrain the possibility of coherent environmental governance. Water issues emerge as a critical nexus linking climate change, agrarian political economy, sanctions regimes, and legitimacy struggles. Given these pressing priorities, environmental concerns are treated as secondary. This is reflected in the institutional architecture of the new regime: notably, no dedicated Ministry of Environment has been created. Instead, responsibility for environmental matters appears to have been implicitly assigned to the newly established Ministry of Emergency and Disaster Management and to the Ministry of Agriculture and Agrarian Reform. This arrangement suggests an underlying assumption that engagement with the environment will be framed primarily around disaster management, response, and post-crisis recovery, rather than through long-term environmental governance.²⁰⁶

In this constrained landscape, civil society, local authorities, and community-based actors have emerged as central drivers of environmental action, which requires engaging with local communities and civil society actors in Syria to ensure greater inclusivity. From waste management in the northwest to ecological councils and reforestation campaigns in the northeast, localised initiatives demonstrate both communities' adaptation and improvisation in finding solutions and the decentralisation of governance under protracted conflict. These efforts link environmental protection to dignity, survival, and belonging, while also exposing deep dependencies on international funding.

204 Turkmani 2023

205 Robert Bosch Stiftung n.d.

206 Shuker 2025

Any sustainable transition in Syria will depend not on technocratic fixes alone, but on addressing the political conditions under which environmental degradation is produced and managed. Recognising the environment as a central analytic lens is not only essential for understanding Syria's past and present crisis, but also for imagining more just and viable futures in the Levant under conditions of climate change, conflict, and uncertainty.

Policy Recommendations

1. Separate environmental assistance from military and security agendas: donor-funded environmental and infrastructure interventions should be institutionally and operationally independent from military stabilisation and security frameworks.
2. Lift sanctions to enable reconstruction and investment: Existing sanctions regimes should be reviewed and adjusted to enable reconstruction processes and attract international investment.
3. Invest in environmental data, documentation, and accountability mechanisms: greater support is needed for data collection through local communities and monitoring agencies that play a role in accountability measures.
4. Engage with local communities, civil society actors in Syria, and the Syrian diaspora as strategic environmental actors: donors and international institutions should recognise the Syrian diaspora not merely as fundraisers or advocates, but as strategic actors in environmental governance. Diaspora networks can facilitate the transfer of technical knowledge, cross-border coordination, and access to global climate and environmental justice platforms, while maintaining accountability to local communities.
5. Move beyond climate-conflict discourses and shift toward political ecology approaches: policies addressing climate risks in Syria must avoid simplified "climate-caused conflict" narratives. Instead, interventions should be grounded in political ecology and rights-based approaches that address how climate stress interacts with governance failures, sanctions, agrarian political economy, and social inequalities.

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Ecological Coercion and Living Nonetheless: War Time in Lebanon

Sammy Kayed

Introduction

Since the 1940s, every generation in Lebanon has encountered war.²⁰⁷ Living through your first is almost like a cruel coming-of-age. The experienced pass lessons to the less experienced on avoidance of danger, desensitization, resistance, resilience, and mistrust.²⁰⁸ My mother taught me how to distinguish the sound of an Israeli plane from that of a commercial one, and when we played outside as kids, we were told to hide under trees when we heard it. We turned it into a game, which allowed us to continue playing. Trees became shelter and comforted us when the sky sounded like it was splitting. Later, I came to see that this is just one of many ways ecology does social work, holding together safety and the possibility for staying put. It's part of the reason why keystones like olive, citrus, carob, pine, and oak – along with the atmospheric, hydrologic, and biologic relationships that make them more than trees – are explicitly being targeted.²⁰⁹ Inflicting deliberate ecological harm, in what researchers call the “Biosphere of War,” “terra devastata,” or ecocide, has become an increasingly visible feature of colonial projects, often treated as an integral tool for erasure, displacement, and control of communities that have long evolved in intimate relation with land and ecological processes.²¹⁰ Nonetheless, even amid grief and disruption, communities continue to return, adapt, and persist despite attempts to turn their lived landscapes into “deadly landscapes” carrying layered socio-ecological harms.²¹¹

These realities shape the terrain on which conflict-environment research, environmental peacebuilding, and sustainable recovery efforts operate. Yet supporting actors – here referring to actors involved in research, practice, funding, and policy intermediation in sustainable recovery aside from the Lebanese state – often find the drives and ontologies of ecologically enmeshed people persisting at the frontlines of conflict and ecological breakdown difficult to interpret and translate into methodology, programming, and policy. When this disconnect happens, it can contribute to the misallocation of human and financial resources and to their limited translation into structural and sustainable recovery, even when the intentions of supporting actors are well-meaning.²¹²

207 Traboulsi 2012
208 Haugbolle 2010
209 Khayyat 2022; Touhouliotis 2018
210 Abu-Roufail and Abdel-Khaleq 2026; Lindgren 2018
211 Khayyat 2022; Touhouliotis 2018
212 Barnett and Finnemore 1999; Carraro 2019; Ide et al. 2021

Taking Lebanon as a case study and using a longitudinal literature analysis, this article first examines when and how ecological harm is weaponised to undermine communities whose everyday livability is tied to local ecosystems already strained by planetary destabilisation. It offers a glimpse into the frontline ontologies of persistence and future-making and outlines how supporting actors often underappreciate the ways in which life is organised here. It concludes with practical policy recommendations for more generative cooperation between frontline communities and supporting actors genuinely interested in sustainable recovery.

Socio-Ecological Harm as Warfare

Across Lebanon’s asymmetric and proxy-based wars since the mid-twentieth century, overwhelmingly involving the Israeli coupled air-water-soil processes – and the infrastructures and capacities that would normally protect them – have repeatedly been targeted, producing widespread socio-ecological harm.²¹³ The harm from these attacks moves through a recovery terrain shaped by the Lebanese state’s deliberate abandonment of select issues and geographic areas, its reliance on public-private partnerships in others, and deeply unequal access to basic services, often obtained through private purchase, patronage, or the capacity to improvise.²¹⁴ This does not shift responsibility away from Israeli aggression; it adds complexity to the ways in which intentionally inflicted damage to life-supporting systems is prolonged, unevenly addressed, and absorbed most heavily by those least able to buffer it. Over time, these layers accumulate into what can be treated analytically as entangled socio-ecological harm, in which violence operates through landscapes that sustain life, and the persistence of harm depends on access, governance, and visibility as much as on biophysical processes.²¹⁵

Fire and Vegetation Loss

Conflict-linked fires (from incendiaries, shelling, or secondary ignitions) damage forests and agricultural mosaics in ways that couple atmospheric exposure, soil processes, hydrology, and livelihoods.²¹⁶ Harms from vegetation loss unfold as a cascade. Incendiaries and canopy burning cause toxic smoke inhalation; the loss of leaf litter and roots reduces slope stability and infiltration; and post-fire runoff mobilises sediment into valleys and springs, affecting irrigation and potable water supplies well beyond the immediate burn footprint.²¹⁷ These shifts accelerate erosion and alter soil chemistry, structure, and microbiome, rendering soils incapable of supporting certain native and agricultural life.²¹⁸ While the loss of trees, crops, soil, and water sharply constrains agricultural livelihoods – with agriculture accounting for up to 80% of the south’s GDP – it also erodes local identity, reduces communities’ ability to forage and harvest fuelwood for heating, and diminishes the psychological benefits associated with time in nature.²¹⁹

213 Traboulsi 2012; UNEP 2007; World Bank 2025
214 Abu-Roufail and Abdel-Khaleq 2026; Kayed 2025
215 Certini et al. 2013; Conca and Wallace 2009; Weir 2015
216 UNDP 2025; World Bank 2023
217 Certini, Scalenghe, and Woods 2013; World Bank 2023
218 Certini et al. 2013; UNDP 2025
219 Abu-Roufail and Abdel-Khaleq 2026; Al-Shaar and Bonin 2021; Yehya et al. 2025

Table 1: Hectares (ha) of orchard, forest, and scrubland area burned or destroyed in South Lebanon between October 2023 and November 2024 as a result of the ongoing conflict, as reported by FAO.²²⁰

Table 1			
Orchard tree category	Ha burned or destroyed	Forest tree category	Ha burned or destroyed
Olive groves	814	Stone pine (Pinus	89
Citrus orchards	637	Other pine species	70
Banana Plantations	461	Broadleaf forests	4,787
Other fruit tree orchards	192	Total forests	4,949
Vineyards	48	Total scrubland	1,984
Total orchards	2,154		

Indicators of ecological weaponisation are strongest where hostilities have predictable effects in livelihood landscapes. Investigations document the occupation’s deliberate destruction of tree-bearing farmland in southern Lebanon using heavy machinery – bulldozers and armoured bulldozers – in situations where rights groups argue there was no imperative military necessity.²²¹ Olive groves are explicitly targeted in South Lebanon. The area produces around 38% of the country’s olives.²²² Between late 2023 and 2024, Israeli attacks burned more than 65,000 trees and caused over 236 million US dollars in losses, damaging a livelihood that is both economically vital and culturally rooted across generations.²²³ Israeli aerial spraying of chemicals (most recently in February 2026) has defoliated 400-500 ha of plant life along the Lebanese border, destroying vegetation that supports grazing, beekeeping, foraging, and other ordinary land-based practices through which communities remain.²²⁴ Monitoring in the post-October 2023 conflict documents the use of white phosphorus (WP) in southern Lebanon, including in or near civilian areas, with a known incendiary propensity that predictably ignites vegetation and structures.²²⁵ Where bulldozing, defoliant spraying, and WP repeatedly harm productive landscapes and restrict cultivation, grazing, and civilian return, the pattern suggests the intentional exertion of pressure on everyday life-support systems – even when publicly framed as a tactical measure.²²⁶

Bombardment, Rubble, and Unexploded Ordnance

High-explosive bombardment produces rubble fields and cratering, while unexploded ordnance (UXO) produces long-term hazard landscapes that constrain land use, recovery, and ecological management.²²⁷ Rubble generates dust and particulate hazards and can introduce contaminants into soils and water bodies via leaching and mobilisation during rain.²²⁸ Cratering and soil disturbance alter infiltration and runoff pathways,

220 FAO 2025
221 Amnesty International 2025
222 Abu-Roufail and Abdel-Khaleq 2026
223 Ibid.
224 National News Agency 2026; Khayyat 2022
225 Human Rights Watch 2024
226 Ibid.; Lindgren 2018; UNDP 2025; World Bank 2025
227 CREEMO 2024; Human Rights Watch 2008
228 Certini et al. 2013; UNEP 2007

making water sources for homes and agriculture less reliable.²²⁹ UXO extends harm over time by restricting access to fields, forests, and infrastructure corridors, delaying cultivation, grazing, debris clearance, and repair.²³⁰ These constraints feed back into land-use change. For example, farmland may be abandoned or underused, and access for forest management and firefighting can be curtailed.²³¹ Lebanon’s post-2006 experience provides a documented baseline for how UXO becomes a durable ecological condition rather than a discrete hazard, affecting health, labour, and rural economies.²³² The post-October 2023 conflict has added new layers of rubble and renewed UXO constraints, likely to shape civilian exposure pathways for decades.²³³

One of the clearest indicators of land weaponisation arises where weapon choices and operational patterns indicate a strategic interest in denying access to land or in rendering landscapes dangerous for civilian use in the long term. Documentation of Israel’s cluster munition use in 2006 provides evidence of widespread dispersal in southern Lebanon and the predictable persistence of unexploded submunitions, which continued to kill and injure civilians after hostilities.²³⁴ As Zurayk 2025 notes in reference to the 2006 hostilities, “[b]y 2019, despite extensive demining efforts, 1,176 hectares of agricultural land, 2,404 hectares of pastures, and 650 hectares of forests remained contaminated (with UXO). The deliberate timing of cluster strikes – 90 percent of which occurred in the final 72 hours of the war – emphasizes the intent to impose enduring harm.”²³⁵ Satellite imagery shows village-scale destruction in more than 15 municipalities, making property demarcations often indistinguishable, while reports indicate that Israeli attacks also burned or destroyed prefabricated homes intended to support civilian return in at least eleven villages.²³⁶ Where destruction patterns intersect with persistent constraints on return, farming, and repair, the evidentiary base supports an argument that rubble and UXO function as landscape-level tools of pressure that entangle ecology and governance, keeping harm active through delayed clearance, inhibited repair, and constrained return.²³⁷

Pollution and Karst Water Vulnerability

War introduces toxic residues (metals, energetic compounds, hydrocarbons, and combustion by-products) that can move across air-soil-water interfaces.²³⁸ Here, Rob Nixon’s “slow violence” operates through fast pathways.²³⁹ In karst terrains, conflict-linked toxics deposited on soils or contained in rubble can rapidly infiltrate via fractures and conduits, with limited natural filtration, into drinking and agricultural water sources and coastal zones.²⁴⁰

229 Certini et al. 2013
230 Human Rights Watch 2008; LMAC 2025
231 Darwish et al. 2009; Yehya et al. 2025
232 Human Rights Watch 2008; LMAC 2025
233 CREEMO 2024; UNDP 2025
234 Human Rights Watch 2008
235 Zurayk 2025
236 Abu-Roufail and Abdel-Khaleq 2026
237 Conca and Wallace 2009; CREEMO 2024
238 Certini et al. 2013; Doummar et al. 2018
239 Touhouliotis 2018
240 Certini et al. 2013; Doummar et al. 2018

Evidence is strongest when linked to targeting of infrastructure with predictable health and environmental consequences and to credible documentation of munitions with known toxic properties. UNEP’s post-conflict assessment following 2006 established that conflict produced measurable environmental contamination and created remediation needs beyond immediate destruction.²⁴¹ Israeli strikes on the Jiyeh power plant in 2006 – triggering a coastal oil spill – were assessed by rights-based and UN inquiry reporting as unlawful and disproportionate and as potentially meeting a war-crime threshold under International Humanitarian Law.²⁴² The spill’s socio-ecological afterlives included widespread marine contamination along with widespread damage to fisheries and coastal livelihoods.²⁴³ Recent use of WP entails well-characterized, foreseeable health and environmental risks, as documented in assessments of phosphorus residues and exposure pathways.²⁴⁴ Authorities reported that soil tests from areas subjected to Israeli aerial spraying of chemicals over an estimated 400-500 ha in southern Lebanon detected glyphosate at 20-30 times the acceptable limit.²⁴⁵ While glyphosate is a defoliant, it’s also classified by the International Agency for Research on Cancer as linked to cancer.²⁴⁶ Glyphosate can persist in soils and vegetation, move beyond the sprayed area into nearby crops, water pathways, and human bodies through drift, contact, dust, and ingestion.²⁴⁷ Separately, three wastewater treatment plants and three wastewater pumping stations were destroyed or partially damaged by Israeli strikes, raising the risk of untreated sewage discharge, downstream contamination, and water-borne disease.²⁴⁸ Pollution from munitions, WP, chemical defoliants, and sewage is particularly concerning, given the area’s karst terrain, where pollutants can move rapidly through fractured aquifers with limited natural filtration.²⁴⁹ Where toxic residues and pollution coincide with damaged land, water, and sanitation systems – especially in ecologically and hydrologically sensitive areas – the pattern supports the claim that environmental pressure is being used to produce population-scale harm by undermining the reliability of livelihood, food, and water systems, even when publicly framed as collateral effects.²⁵⁰

Infrastructure, Access, and Earthmoving

Infrastructure is an ecological interface that mediates water availability, forest cover, soil moisture, waste flows, and market access. Damage to and control over infrastructure (water, wastewater, energy, roads to fields, terraces) reorganises land use and livelihood viability.²⁵¹ Damage to water and irrigation networks constrains cultivation, shifts crop choices, and can accelerate land abandonment.²⁵² Damage to energy infrastructure can place additional strain on local forests as a source of fuel wood.²⁵³

241 UNEP 2007
 242 Amnesty International 2006; UNEP 2007
 243 Amnesty International 2006; UNEP 2007
 244 Human Rights Watch 2024
 245 National News Agency 2026
 246 ATSDR 2020; National News Agency 2026
 247 ATSDR 2020
 248 UNDP 2025; World Bank 2025
 249 Doummar et al. 2018
 250 Conca and Wallace 2009; Doummar et al. 2014; Lindgren 2018; UNDP 2025
 251 Darwish et al. 2009; UNDP 2025; Yehya et al. 2025
 252 Darwish et al. 2009; UNDP 2025
 253 Kayed 2025

Where earthmoving or clearance operations disturb terraces and field boundaries, the consequences include altered natural water availability, erosion risk, and the practical unworkability of agricultural parcels.²⁵⁴

Indicators of weaponising socio-ecological harm are strongest where operational doctrine normalises extensive destruction of civilian infrastructure and where monitoring shows systematic impacts on life-support services. Scholarship on the “Dahiya doctrine” documents strategic arguments for disproportionate infrastructural destruction in Lebanon as a mode of pressure, providing a doctrinal basis for linking infrastructure attacks to coercive intent.²⁵⁵ In the most recent conflict, damage to public water systems appears systematic rather than isolated “targets.”²⁵⁶ Recent Israeli attacks damaged at least 34 water infrastructure facilities – disrupting water supply for more than 400,000 people.²⁵⁷ Between August and October 2025, at least four Israeli strikes hit reconstruction-related sites in southern Lebanon, destroying over 360 bulldozers, excavators, and other heavy machinery, which rights groups argue were not lawful military objectives.²⁵⁸ Where infrastructure damage combines with access constraints, attacks on reconstruction and rubble-clearing equipment, and prolonged non-repair, especially in agriculturally central zones, the evidence supports interpreting this as weaponisation through the life-support system.²⁵⁹

Attacks on Environmental Visibility and Response Capacity

Attacks on journalists – and diminished on-the-ground press reporting due to fear of being targeted – narrow the informational basis for documenting the short and long-term civilian and ecological harms from conflict. Attacks on public authorities weaken emergency response and governance capacity (for example, firefighting, debris management, and UXO clearance) and longer-term remediation.²⁶⁰

Investigation into strikes on journalists in Lebanon provides a primary indicator that visibility itself can be targeted, with predictable downstream effects on what becomes reportable and contestable.²⁶¹ At least four well-documented cases clearly identified journalists and journalist compounds being targeted by Israeli strikes, leading to at least 15 casualties since October 2023.²⁶² Municipal authorities have been targeted as well, including the killing of the mayor of Nabatieh, Ahmad Kahil, and at least 16 municipal employees during a strike on the municipal headquarters while they were reportedly meeting to coordinate civic services and aid delivery; an incident assessed as lacking evidence of a military objective.²⁶³ In contexts of systematic socio-ecological harm, attacks on visibility and response capacity can compound damage by reducing outsiders’ ability to know and act and institutions’ ability to carry out formal recovery.²⁶⁴

254 Al-Shaar and Bonin 2021; Certini et al. 2013; Yehya et al. 2025

255 Khalidi 2014

256 UNDP 2025

257 Ibid.; World Bank 2025

258 Human Rights Watch 2025b

259 Conca and Wallace 2009; UNDP 2025

260 Amnesty International 2024; Committee to Protect Journalists 2025; Conca and Wallace 2009; LMAC 2025

261 Committee to Protect Journalists 2025

262 Ibid.

263 Amnesty International 2024

264 Conca and Wallace 2009; Murdie and Davis 2012; Weir 2015

Planetary Destabilisation as a Force Multiplier

Planetary destabilisation (including climate change and biodiversity loss) can be understood as a background condition that makes conflict-driven socio-ecological harm more damaging. As planetary destabilisation intensifies, the natural processes that support food, water, and livelihoods become more volatile, and baseline liveability declines.²⁶⁵ Where both (a) communities are tightly enmeshed with local ecological functions and (b) politically marginalized settings provide thinner buffers (infrastructure, insurance, institutional support), damage to forests, soils, or water systems can propagate faster into livelihood disruption and stalled recovery.²⁶⁶

Disproportionate vulnerability is not, by itself, evidence that particular actors intend to exacerbate – or deliberately neglect to address – planetary destabilisation; it does, however, help specify how destabilisation can incidentally increase the effectiveness of colonial projects that target life-support systems.

This interaction can be read through two bodies of work. Settler colonialism highlights how control over land is maintained over time – through forced displacement and by reshaping who can access land and resources – while climate coloniality shows how climate impacts and climate governance can reproduce unequal authority, knowledge, and material control, constraining Indigenous futurities and normalising unequal exposure.²⁶⁷ Taken together, they suggest that when conflict already damages ecological systems, a declining baseline of planetary stability can create uneven leverage: it raises the everyday costs of staying, repairing, and recovering for land-reliant communities more than for actors with stronger institutional and economic buffers. As earth-system volatility rises, it increases the number of shocks communities have to deal with and reduces the time window they have to recover from each.²⁶⁸ Under these conditions, war-related damage to land, water, and infrastructure is more likely to drive whole communities from chronic strain into livelihood non-viability and displacement pressure.

Frontline Ontologies and Prefigurative Politics

Ethnographic work on South Lebanon's border villages describes war not only as episodic violence but as a lived terrain that reshapes seasonal time, multi-species relations, and the logistics of staying put or returning.²⁶⁹ Khayyat's rendering of *ihsass waqi'i* as a "real, practiced, present, placed feeling," alongside frontline refusals such as "[b]etter than money or projects; give me the ability to be on the land and the freedom to do what I want with my traditions," and the concept of *Snod* as "leaning... that enables the mutual persistence of all" are analytically useful: they step away from victimisation and foreground a practical relation to land and place – commitment expressed through the everyday work of tending, adapting, and recalibrating life at the margins.²⁷⁰

265 Steffen et al. 2015
266 Adger 2006; Lindgren 2018; Steffen et al. 2015
267 Islam et al. 2024; Sultana 2022; Wolfe 2006
268 Steffen et al. 2015; Sultana 2022
269 Faxon 2025; Khayyat 2022
270 Kayed, 2025; Khayyat 2022; Khayyat, 2025a

These accounts point to the emergence of a practical ontology in which land and ecology become a lived continuum that entangles safety, memory, livelihoods, and recovery even in unstable, hazardous, and contested conditions.

Within this context, “prefigurative politics” refers to how people sustain desired forms of life within present constraints.²⁷¹ In Lebanon’s frontlines, it appears as many everyday cooperative and largely informal actions: seed-saving; modified grazing routes; micro-adaptations in planting and harvesting; experimentation with soil restoration (for example, worm composting and microbial rehabilitation); periodic trips back to villages to clear rubble and vegetation and recondition fields for the next season; and the social organisation needed to live with uncertainty.²⁷² These practices are not immune to exhaustion, frustration, helplessness, ambivalence, or disenchantment; they often coexist with them.²⁷³ Yet they can still function as a form of future-making: a practical insistence that life remains worth organising, even when the present conditions are shaped by repeated shock and violence.²⁷⁴

Epistemic Dissociation

In frontline settings, institutional categories and logics (for example, post-conflict framings, beneficiary-based targeting, victimisation narratives, and the tendency to isolate issue areas from each other) often misalign with lived land-and-livelihood realities, turning documentation and support interventions into struggles over what counts as harm and what counts as recovery.²⁷⁵

Supporting actors often assume an implicit theory of change in which documentation supports accountability, accountability supports remedies and deterrence, and these together reduce recurrence while enabling recovery.²⁷⁶ However, documentation and advocacy do not reliably translate into enforceable constraints when strategic interests, institutional mandates, and compliance incentives are misaligned.²⁷⁷ Naming-and-shaming and transnational advocacy – through solidarity protests, divestment, and boycotts – can raise the salience of socio-ecological harm and impose reputational or financial costs.²⁷⁸ But more structural outcomes usually hinge on high-leverage actors, especially Western states, choosing to convert evidence into binding and enduring costs through executive and regulatory levers (arms-export controls, sanctions, trade restrictions, regulatory compliance and enforcement).²⁷⁹ International justice scholarship similarly emphasises the limits of legal and intergovernmental mechanisms to deliver prevention and recovery at scale under adverse political conditions.²⁸⁰

271 Schlosberg and Craven 2019

272 Hourany 2025; Kaye 2025; Khayyat 2022; Schlosberg and Craven 2019

273 Kaye 2025

274 Schlosberg and Craven 2019; Touhouliotis 2018

275 Dresse et al. 2019; Faxon 2025

276 Conca and Wallace 2009; Ide et al. 2021; Murdie and Davis 2012

277 Carraro 2019

278 Murdie and Davis 2012

279 Carraro 2019

280 Ibid.; Machado de Oliveira 2025

These limits do not negate documentation; they sharpen a practical question: when normative accountability pathways underperform amid blatant and well-evidenced war crimes and violations of international humanitarian law, what kinds of knowledge and intervention logics remain centred, and with what effects?

Epistemic dissociation is used here to name a patterned detachment between (a) the ways supporting actors frame and operationalise harm, recovery, and evidence (through categories, indicators, program logics) and (b) how those realities are lived and navigated by frontline communities. Detachment often appears as abstraction and compartmentalisation that convert relational realities into administratively actionable units (for example, “WASH” versus “agriculture,” beneficiary categories, output metrics).²⁸¹ This is not a claim about ill intent or lack of empathy; it describes how institutional knowledge practices can generate incidental yet predictable disconnects. Institutional mandates and professional incentives (for example, efficiently generating deliverables, evaluations, and publications) among well-meaning supporting actors can stabilise into routines even while frontline communities experience limited recovery, if at all.

Three modes of dissociation are especially relevant. Framing dissociation narrows socio-ecological harm to discrete sectors or incidents, pushing dynamics such as long-term access, seasonal livelihood rhythms, land attachments, and chronic hazard out of view.²⁸² Measurement dissociation occurs when indicators of impact or recovery replace what communities treat as constitutive – for example, securely restored access, continuity of livelihood practice, and local authority over what recovery entails.²⁸³ It also occurs when local knowledge is included in programming after being drained of its lived meaning and forced into predetermined institutional boxes, leaving underlying logics untouched.²⁸⁴

Here, reports on project success in sustainable recovery can coexist with no structural improvements in liveability – namely, restored basic services with deeply unequal access, rebuilt facilities with no operating budget, replanting and reforestation without secure land tenure or irrigation, and community engagement without any shift in who decides priorities, timelines, or acceptable trade-offs.²⁸⁵

Conclusion

This article synthesises evidence showing how conflict linked to colonial projects in Lebanon targets socio-ecological systems – producing harms that cannot be treated as isolated environmental issues or legitimate military objectives, nor dismissed as collateral damage. The resulting harms propagate through vegetation loss, rubble and UXO, toxic residues, damaged infrastructure and access, and attacks on visibility and response capacity. They intensify as earth-system destabilisation lowers baseline liveability, heightens volatility, and compresses recovery time, especially where buffering capacity is thin.

281 Dotson 2011

282 Dresse et al. 2019; Ide et al. 2021; Machado de Oliveira 2025

283 Dotson 2011; Machado de Oliveira 2025; Shore and Wright 2015

284 Dotson 2011; Machado de Oliveira 2025; Shore and Wright 2015

285 Barnett and Finnemore 1999; Machado de Oliveira 2025; Shore and Wright 2015

The article foregrounds frontline ontologies of persistence and traces prefigurative practices that sustain everyday life under constraint. It highlights how misalignment between the institutional logics and incentives of supporting actors and the lived realities of frontline communities produces material and evaluative consequences: programmes can still report success while generating limited – if any – deterrence, reduced recurrence, or structural improvements in livability.

Policy Recommendations

Co-define harm and sustainable recovery markers with frontline communities. Rather than relying on standardised and imported indicators, ground recovery frameworks in jointly defined markers that reflect coupled realities (for example, reliability of springs and wells across seasons; facility construction aligned with dependable and more shock-proof operational models and budgets; viability of replanted crops and trees in relation to caretaking, irrigation, and ecosystem change; pasture regeneration alongside secure access to grazing lands; and continuity of informal and cooperative labour arrangements under selective state absence and presence). Treat ontological differences between supporting actors and those being supported as a very practical problem in programme design that requires time to be reconciled: what gets treated as “real” or worth measuring, who decides that, and to what end.

Prioritise structural change and incentivise learning over success claims: When structural improvements in liveability become the programme goal, build reporting rules and institutional fortitude that do not let completed activities stand in for structural change, even though it’s slow, difficult, and politically charged. Incentivise the adoption of mechanisms that treat information on non-achievement as useful for improving structural outcomes in future programming, not only as something to be managed for institutional risk, reputation, and internal compliance.

Reconfigure program design around longer time horizons and adaptability: Incentivise multi-year arrangements for partnership, outcome tracking, and learning that can accommodate the longer afterlives of conflict and ecological time. Build programme adaptation clauses that widen what can be adapted and even encourage adaptation, given that the conditions for liveability at the frontlines usually evolve rapidly.

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Erosion of Livelihood in Iraq: Dynamics of Collective Violence Linked to Environmental Decline, Water Scarcity, and Resource Conflict

Safaa Khalaf

Introduction

In June 2025, a shepherd killed two brothers and then committed suicide following a dispute over grazing in Siba Khan Village in Sulaymaniyah. The incident sheds light on an escalating pattern of environment-related violence and resource conflict across Iraq. Droughts, agricultural collapses, desertification, water scarcity, and salinisation, combined with state water rationing, are putting severe strain on rural economies, leading to social fragmentation, displacement, violence, and a self-reinforcing cycle of resource competition. Although Iraq's large-scale military confrontations have mostly ended, conflicts over water, land, pollution, and resource governance continue and have intensified in some areas.

Affected communities increasingly resort to self-arming and violent organisation when they consider it an effective survival strategy amid livelihood loss and inequitable governance. Violence against the state, local rivals, or oneself has increasingly become a forced coping mechanism. Iraq's field-based evidence closely aligns with the climate-security nexus, demonstrating that environmental decline undermines livelihoods and stability, increases conflict and risk multipliers, and reshapes social and economic relations.

Environmental scarcity concepts, including supply-induced, demand-induced, and structural scarcity,²⁸⁶ together with the political ecology framework, which links conflict to both scarcity and the geopolitics of resource control, governance, politicisation, and militarisation,²⁸⁷ are essential for understanding the Iraqi context. Accordingly, environmental stress does not directly cause violence. Still, it significantly raises the risk when combined with weak institutions, corruption, declining livelihoods, and scarcity overlaps with a rent-based political economy that fuels clientelism. In such contexts, marginalised groups are more likely to take up arms and resort to violence to protect their livelihoods and resources, especially where there are power imbalances and the spread of weapons beyond state authority.

286 Homer-Dixon 1994; Homer-Dixon 1999

287 Le Billon 2001; Le Billon 2012

Dynamics Reinforcing Collective Violence

This paper proposes the concept of “Environmental Impact Intensity”²⁸⁸ as an integrative analytical local framework that captures the structural interactions among multiple, overlapping factors that jointly shape environmental decline and its social-security consequences over five key drivers:

(1) Multidimensional climate change impacts; (2) Water scarcity and policies of hydrological resource depletion; (3) Poverty and broader social vulnerability; (4) Unchecked expansion of the oil industry and gas flaring; and (5) Weak water and environmental governance.

This perspective demonstrates the cumulative effect of intersecting pressures that reshape conditions of fragility and violence, producing new and more severe forms of collective violence that differ fundamentally from the sectarian and ethnic conflicts and dynamics that dominated Iraq post-2003, and creating widespread, more complex risks. In recent years, environmental stresses have no longer been a marginal factor in Iraq’s conflicts; they have become a nationwide driver that cuts across identities, threatening social cohesion, stability, and fragile livelihoods in the north and south, reflecting what Iraq’s National Development Plan (2018-22) identified as a “vicious cycle between environmental degradation and armed conflict.”²⁸⁹

Due to a long-term dramatic trajectory since 2003 – marked by prolonged periods of war, chronic security deterioration, and the failure of the state governance model under the current regime – Iraq’s ability to manage resources, national wealth, and basic services has declined, and environmental degradation has emerged as the most powerful driver of fragility.

This has escalated local conflicts, especially in rural, marginalised, and oil-producing areas. Internal displacement, immigration, and poverty stemming from drought, desertification, and livelihood losses have become increasingly interconnected, increasing Iraq’s overall fragility.²⁹⁰ The concept also represents a broader pattern of fragility, marked by chronic institutional failure, inefficient bureaucracy, and intense competition for power driven by quota-based sectarian divisions. Poor security governance leads to state-repressive responses. Security measures are frequently deployed to suppress public demands instead of supporting early, development-focused mitigation or limiting the influence of armed factions and tribal groups that harm local environments.

As water scarcity has intensified, Iraqi policies have increasingly shifted towards “disaster management” rather than “risk management”,²⁹¹ primarily to shield urban voters, who constitute the largest electoral bloc (70.3% of the population).²⁹² This reflects the clientelist structure through which the regime consolidates power.²⁹³

288 Khalaf 2022

289 Ministry of Planning, Republic of Iraq 2018

290 Intergovernmental Panel on Climate Change (IPCC) 2022; Rudaw Network 2022

291 United Nations Educational, Scientific and Cultural Organization (UNESCO) 2014

292 Ministry of Planning, Republic of Iraq 2025

293 Ali and Khalaf 2018

The shrinking rural population (29.7%) points to the rapid erosion of non-oil productive sectors, particularly agriculture and its supply chains. Rural communities are being subjected to the sustained destruction of their economic and historic cultural landscapes, losing livelihoods as land is increasingly taken over by oil expansion.²⁹⁴ In this context, resource-rationalization measures have been implemented to avoid acute water shortages in the absence of an effective national water reform strategy. This trajectory reflects a growing reliance on security to counter local water dispossession.²⁹⁵ In parallel, the state continues to fail politically and institutionally to confront upstream violations of Iraq’s water rights by Iran and Turkey.

Against this backdrop, Iraqi environmental conflicts can be expected to intensify, leading to more complex collective violence over water, land, and livelihoods. This may trigger cycles of resistance and confrontation, resulting in long-term instability. Affected communities may turn to violence, both to cope with poor conditions and to resist state security-led responses. Collective violence risk stems from changes in the response patterns of affected communities. Locals are within an armed society and are acquiring a growing capacity to mobilise experience and violence to protect dwindling resources and long-standing settlement patterns historically tied to water availability.

In contrast, the state is leaning heavily on security measures and tends to reproduce a top-down, security-centric approach that controls communities rather than engaging them as partners in adaptation policies. As a result, there is a collision between two competing forces: adaptive community violence and state-led violence, generating destructive dynamics that undermine prospects for adaptation and constrain stability. Moreover, environmental risk management is framed as a security dilemma rather than a viable development-oriented process. These challenges highlight the need for early, responsible policies to reduce tensions, protect social cohesion, and ensure fair resource distribution for long-term stability.

Human Cost: Environmental Displacement and Migration

Environmental displacement indicates the forced relocation of people due to environmental degradation, natural disasters, or climate change. In the Iraqi context, environmental displacement intersects with weak governance, rural economic fragility, declining agricultural support, and resource-related conflict, transforming it from a humanitarian concern into an instability multiplier by reshaping dispute dynamics and disrupting fragile peace processes.²⁹⁶

Agricultural and rural communities constitute the primary “environmental displacement” matrix in Iraq, as they are the most affected by poverty, fragility, and unemployment. Eight million individuals live in poor households, and internally displaced persons receive government welfare.²⁹⁷ Drought is expected to reduce demand for low-skilled labour in Iraq by 11.5% in the medium term,²⁹⁸ further weakening livelihoods.

294 Khalaf 2021
295 Al-Mirbad 2023
296 O'Driscoll and Fazil 2022
297 Iraqi News Agency 2024
298 Mahmalat and Ahmad 2023

Over the past two decades, limited job opportunities and low private-sector wages have pushed many low-skilled youth into the “economics of violence”,²⁹⁹ which requires neither skills nor formal education. School dropout and educational exclusion are widespread in Iraq. In 2025, the Ministry of Education recorded 238,462 new dropouts nationwide,³⁰⁰ with 8,000 cases in Dhi Qar alone driven by displacement, tribal conflict, water scarcity, and economic pressure.³⁰¹ According to the 2019 National Survey of Adolescents and Youth, 53.6% of Iraqis aged 10-14 had dropped out,³⁰² a condition clearly reflected in the recruitment and use of children by armed actors, including by PMF, ISIS, and PKK.

Further illustrations can be drawn from Iraqi adults, including those within Iraq as well as in Syria and Yemen. ISIS, for example, recruited local farmers in the upper Iraqi basins. In addition, currently, thousands of young Iraqis are participating in the war in Ukraine. These patterns demonstrate that environmental degradation-induced vulnerability can contribute to local or transnational violence. Domestically, environmentally displaced people in Iraq’s central and southern regions show higher rates of recruitment into official security forces or armed groups than other population segments.³⁰³

Since summer 2018, IOM Iraq has been monitoring climate-induced displacement. The results for the seven years (2018-25), compiled by the author from cumulative data from the Climate-Related Displacement Tracking Matrix (IOM/DTM), indicate that 35,458 families (212,748 individuals; 6 individuals per family) from 12 mid- and southern governorates were displaced to 497 sites.³⁰⁴ The UN in Iraq reported that 7.5% of households displaced by environmental factors eventually migrated abroad.³⁰⁵ In return, the Ministry of Migration and Displacement reported that 17,367 families (104,202 individuals) were displaced from seven mid and southern governorates between 2021 and 2025.³⁰⁶ Due to the lack of official data, NGO monitoring indicates a consistent annual increase in the number of young Iraqis leaving. Over the past decade, more than 794,000 Iraqis have sought asylum in the EU. In 2025, 31,420 individuals who left fell within the 18-35 age group.³⁰⁷

Iraq’s agricultural provinces have become major hotspots of environmental displacement, creating a complex security crisis that increases the risk of youth involvement in crime or terrorism. This clearly demonstrates how the water crisis has evolved from an environmental challenge into a direct driver of demographic reconfiguration.

299 The “Economics of Violence” refers to activities associated with organised violence, where armed groups emerge as economic actors, providing alternative employment opportunities beyond the formal economy. Reliance on a rentier economy with structural fragility produces parallel violence markets, managed as a way of life that does not require skills or formal education. Le Billon 2001; Ruiz Estrada et al. 2024; Watts 2004

300 Alghad Press 2025

301 Al Mayadeen Iraq 2025

302 United Nations Population Fund (UNFPA) and United Nations Children’s Fund (UNICEF) 2019

303 According to the 2021 IOM social survey based on a random representative of the majority inhabitants of Basra, to monitor waves of “environmental displacement” from the rural areas of Maysan and Dhi Qar, 15% of “settled” displaced families and 9% of newly arrived have members in formal security-military institutions or armed groups. International Organization for Migration (IOM) 2021

304 IOM 2025b

305 Isaczai 2026

306 Rudaw Network 2025a

307 European Union Agency for Asylum (EUAA) 2024

Displaced households often relocate to areas lacking employment and basic services, leading them to engage in informal economies or rely on aid, which can increase social friction and competition within host communities. Moreover, these dynamics intensify acute conflicts over land ownership and water quotas, and accelerate the erosion of natural habitats and agricultural land as these areas are converted into residential zones for displaced populations. At the same time, political money and militia power further damage local environments by exploiting state fragility, reshaping patterns of land and resource seizure for substantial commercial gain.³⁰⁸

Agriculture, livestock farming, and fishing remain the three most important sources of income for the majority of those displaced, at risk of displacement, or struggling to survive in arid areas. Yet these activities are rapidly collapsing. Marshland communities, in particular, are experiencing severe degradation of their historic ecosystems. The drying up of the marshes has led to acute shortages of animal fodder and drinking water, as well as significant livestock losses, affecting 67% of livestock breeders in Maysan, 65% in Dhi Qar, and 27% in Basra.³⁰⁹ Initiatives to retain marshland households have so far failed to produce meaningful results.³¹⁰

Environment-Related Collective Violence

Environmental stress-related violence is common in rural and large armed tribal communities. Causal links can be established between the acute water shortages, agricultural decline, and rising tribal conflicts. The governorates of Babil, Wasit, Najaf, Karbala, Diwaniyah, Muthanna, Dhi Qar, Maysan, and Basra – together representing 39% of Iraq's population – are witnessing a multi-pattern security escalation, with armed conflicts carrying significant potential for further expansion. This escalation is driven by disputes over water and land allocation, as well as tribal competition to secure irrigation for holdings tied to local property structures and clan-based influence networks. These dynamics point to a system of kinship- and commerce-based dominance over land and water management. Resource-related conflicts are often labelled as “tribal disputes,” yet this framing oversimplifies and obscures the underlying climate-peace-security risks. In reality, conflicting groups frequently maintain affiliations beyond tribal structures, including links to political parties. Tribal leaders often hold political or administrative positions and sustain close relationships with various armed groups.

Dozens of incidents are recorded daily, either within single administrative units or across governorates. These include actions such as blocking water flows from neighbouring areas or obstructing key roads connecting the southern region to the rest of the country. Such behaviour reflects the absence of effective institutional dispute-resolution mechanisms and reliable water governance frameworks. Affected communities often express their collective grievances through confrontation with the state and, at times, violent protest, using these as forms of negotiating pressure to redistribute resources and enforce local arrangements of “water justice”. As competition intensifies and security bargaining expands, the risk of escalation reflects a “water war”.

308 United Nations Assistance Mission for Iraq (UNAMI) 2024

309 International Trade Centre (ITC) 2021

310 Both programs by the Iraqi government as well as from international donors, including the WFP, Canada, and Germany.

In Iraq, patterns of violence, protest, and security have become structurally inter-linked with the water-agriculture-environment nexus. Together, they represent the causal chain of instability: water scarcity and salinity trigger immediate livelihood losses, which lead to social and tribal clashes over land and water, followed by security responses, coercive measures, suppression of protests, and ultimately internal displacement. The result is a political and social environment highly conducive to deeper fragility and escalating violence, in which weapons become means of redistributing damage through two overlapping dynamics: conflicts over land and water that escalate into armed confrontation.

Since 2016, Dhi Qar Governorate has experienced repeated security incidents, including tribal disputes over water and armed clashes involving heavy weapons. One such incident resulted in 13 casualties, including the death of a security official. These events prompted government interventions, curfews, and the designation of certain areas as closed military zones. Local community stability is projected to deteriorate further. In rural Nasiriyah, crime rates increased by 40%³¹¹, while in Al-Rifa'i district, some farmers have turned to illegal activities, including drug trafficking.³¹²

Maysan's rural areas are collapsing, as cultivated land has been reduced to less than one-third of its level, and 26,000 dunams rely solely on groundwater. Water rationing barred 50,000 farmers, leading to two consecutive years of unemployment (2024-25).³¹³ At the same time, the continued degradation of historic and World Heritage marshlands due to oil activities³¹⁴ threatens indigenous cultures and undermines traditional livelihoods.³¹⁵ Consequently, Maysan has become one of Iraq's primary hotspots for environment-related violence, with 186 armed tribal conflicts recorded in 2025 alone.³¹⁶ This violence is driven by severe losses³¹⁷ and has triggered large-scale displacement affecting entire villages and tribal communities.³¹⁸ Nearly 20% of Iraq's environmentally displaced population originates from Maysan.³¹⁹ In parallel, drug trafficking networks have emerged as alternatives to the legitimate economic networks previously based on agriculture, livestock, and fishing.

Tribal tensions have increasingly drawn both federal and local governments into water-related conflicts. In April 2014, water-related tribal clashes across these governorates³²⁰ prompted the federal government to launch its first large-scale military operation. Tribes accused state forces of confiscating land and restricting farming, pushing them toward displacement or violent self-defence. In March 2018, the Muthanna governor, alongside official military forces, stormed Diwaniyah to halt tribal encroachments on water allocations.

311 Al-Mada 2018
312 Berghof Foundation 2023
313 Al-Mirbad 2025a
314 Khalaf 2026
315 Khalaf et al. 2025
316 Al-Mirbad 2025b
317 Al-Mirbad 2025d
318 Al-Mirbad 2025c
319 IOM 2025a
320 Al-Hurra 2014

Collectively, these developments indicate the breakdown of the intermediary local authorities’ roles, while state responses have prioritised coercive enforcement³²¹ over the design of sustainable water and development policies.

Basra represents a particularly sensitive case where environmental degradation, a rentier economy, and coercive state policies intersect amid complex water, oil, and security issues. Chronic deterioration in water quality and oil pollution led to the 2018 environmental uprising, which restructured the relationship with central authorities³²² and included the burning of the Iranian consulate as a protest against regional water policies. Politically, the uprising disrupted the long-standing Daw’a Party monopoly over power and paved the way for the October 2019 protests, demonstrating the capacity of environmental protest to drive structural shifts in political power relations.³²³

Most farmers in Basrah do not own the land they cultivate, as “oil zones” cover more than 80% of the governorate’s land. Agricultural contracts are cancelled, and locals are displaced to facilitate the expansion of international oil companies (IOC) projects through mechanisms such as Law No. 84 of 1985, eviction orders, and water cuts. This has pushed affected populations either to relocate or to confront the state and companies directly. IOCs have seized approximately one million dunams of farmland.³²⁴ Simultaneously, the oil industry exacerbates water scarcity by consuming large volumes of freshwater – up to three water barrels per oil barrel – while communities face severe drought conditions. Escalating protests in northern Basrah over salinity³²⁵ and land confiscation³²⁶ have been met with repressive security measures, raising human rights warnings.³²⁷ Federal eviction measures (Resolution No. 149 of 2011) have further significantly harmed farmers and stable local communities,³²⁸ even as Basra urgently requires environmental rehabilitation, including the planting of 40 million trees to improve air quality and mitigate oil pollution. Against this backdrop, environmental conflict in Basrah has evolved into a struggle for survival.

Agricultural Decline and Local Resistance to State Policies

In water-abundant years, Iraq typically allocates around 63% of its water resources to agriculture. However, under conditions of water scarcity, this allocation yields limited productive returns. Current yields average 350 kg per dunum – nearly eight times lower than the global average – and are likely to decline to 75 kg by the end of the century.³²⁹ Arable land has also decreased significantly, from 13.4 million dunams in 2014 to less than 4.5 million dunams today. This contraction of cultivated land reflects two serious challenges:

321 Al-Araby Al-Jadeed 2021
322 Khalaf and al-Jaffal 2021
323 Khalaf 2023
324 Interview conducted by the author with Hadi Hussein, Director of Agriculture in Basra.
325 Al-Mirbad 2025e
326 Al-Mirbad 2025f
327 Al-Mirbad 2025h
328 In June 2018, the Basra Integrity Department officially criticized the South Oil Company’s clearing of agricultural land for oil operations, arguing that such actions harm the local environment and that Basra urgently needs increased tree planting to mitigate rising temperatures and environmental degradation. Radio Nawa 2018
329 Republic of Iraq 2024

First, the erosion of rural livelihoods and the poverty of local communities are forcing affected populations to compensate for substantial losses through alternative coping strategies, some of which may undermine local stability and exacerbate security risks.

Second, the state is making a serious structural mistake by eliminating agriculture from the national production landscape to preserve scarce water supplies for urban consumption and the oil industry. This indicates that drought and water scarcity are no longer treated as natural conditions, but are increasingly the outcome of deliberate policy choices.

Agriculture employed 20-30% of Iraq's labour force and 4% of its GDP between 1990 and 2014. However, its output has recently declined to 2%. As a result, the sector has become the primary hotspot for violence and militarisation, as hundreds of thousands of tribal men lose stable livelihoods each year.

Water scarcity, recurrent drought, the reduction or cancellation of agricultural seasons, bans on the cultivation of strategic crops such as wheat and rice, restrictions on land access, and reduced water supplies have left small farmers and livestock breeders increasingly marginalised and largely unsupported. In response, affected communities have confronted state authorities to defend their livelihoods, employing tactics such as violent protests, blocking major transport routes, and occupying government offices.

Over the past two decades, communities in Iraq's upper agricultural basin have endured prolonged conflict and widespread destruction during the ISIS war. In the post-conflict phase, armed factions have taken control of several areas, displacing residents and confiscating or burning crops.³³⁰ In the northern Baghdad belt, 60% of farmland remains uncultivated due to water cut-offs and militia control. Farmers have reported receiving threats and were given the choice between "leaving or facing merciless militias".³³¹

Alongside coercive measures on agricultural communities, the state has imposed conditional compliance measures requiring the adoption of efficient farming methods, modern irrigation, and water-saving technologies, warning that support would be withheld in cases of non-compliance. Yet adoption remains low, at just 3.7% nationwide, with fewer than 300,000 dunams under modern irrigation.³³² FAO-Iraq finds that water scarcity and complex loan requirements limit farmers' access to modern equipment, constraining investment.³³³ At the same time, the high costs of climate-financed technologies and limited non-state support render such tools largely inaccessible for small-scale producers. Farmers dependent on formal loans have become increasingly vulnerable, pushing some into extreme distress, including suicide,³³⁴ particularly after the state-owned Agricultural Bank halted interest-free lending.³³⁵

330 Amwaj Media 2024

331 Erem News 2025

332 Iraq 24 TV 2025

333 Food and Agriculture Organization of the United Nations (FAO) 2021

334 Al-Arab UK 2022; Al-Mirbad 2025a; Iraq 24 TV 2023; Iraq Al-Hur News 2021

335 GOAL and Big Heart Foundation 2016

Serious corruption allegations against the Iraqi Agricultural Bank³³⁶ have led to the arrest of multiple officials on charges of fictitious loans, embezzlement,³³⁷ nepotism, and political interference.

Farmers increasingly believe that state policies are deliberately dismantling the rural economy and engineering the “death of the farmer”³³⁸ through cumulative measures, including the failure to provide fertilisers, water cutoffs, the suspension of well-drilling, higher agricultural lease fees, rising electricity tariffs, and the repeated cancellation of farming seasons. Cultivated land is projected to decline by up to 50% in 2026 compared to current levels, while ongoing crop bans have effectively eliminated output in key production zones between 2022 and 2025.³³⁹ Oppositional dynamics have expanded beyond isolated protests, giving rise to cross-local alliances among farmers from multiple governorates,³⁴⁰ as seen in the Ghammas protests.³⁴¹ Farmers from Karbala, Najaf, Diwaniyah, and Muthanna drove their tractors to Ghammas, Iraq’s rice-producing hub, raising tribal flags to signal escalation and collective anger. The scene was similar to recent European farmers’ protests against the EU-Mercosur free trade agreement, in which agricultural groups openly opposed policies perceived to threaten their livelihoods.³⁴²

Conclusion

Environmental degradation in Iraq is no longer an isolated sectoral crisis. It has evolved into a structural condition that generates violence and instability, marked by the interplay of several key factors. These shape the concept of “Environmental Impact Intensity”, representing the interconnected dynamics that transform livelihoods, redefine state-society relations, and escalate collective conflict.

Analysis demonstrates that Iraqi public policies have largely responded through security measures and “disaster management”, rather than adopting proactive approaches to environmental risk management. This has shifted the burden of adaptation onto rural and vulnerable communities, amid the dismantling of the agricultural economy, intensifying water scarcity, and increased economic exclusion, thereby driving affected communities to adopt high-risk survival strategies, including displacement, violent protests, and participation in the “economy of violence”.

Hence, agricultural collapse evolves from a sector-specific crisis into a broader socio-security emergency, in which environmental scarcity and flawed public policies deepen fragility and sustain the “violence economy” controlled by armed groups.³⁴³ As a result, rural communities are increasingly driven to resort to high-risk actions such as protest, violence, and security breakdowns as survival strategies in the absence of credible development alternatives.

336 Dijlah TV 2021; Mawazin 2018
337 Ultra Voice of Iraq 2025
338 Al-Mirbad 2025g
339 Rudaw Network 2026
340 CNN Business Arabic 2025
341 Rudaw Network 2025b
342 Anadolu Agency 2026
343 Béné et al. 2024

This contraction not only expands rural unemployment but also dismantles local economies, increasing the likelihood of mass displacement and security escalation driven by livelihood loss. Farmers are expected to absorb the costs of environmental stress and technological transition, while the necessary tools and support remain largely unavailable.³⁴⁴

In this context, disputes over water and land extend beyond localised conflicts. Structural imbalance transforms natural resources into political-security tools, making the environment a battleground for the state, armed groups, and local communities. Growing conflicts across the country reveal that violence related to the environment is being produced within a vicious cycle.

Consequently, continuing this path places Iraq at the heart of international climate security risks and threatens the country with long-term political and social instability. Breaking this trajectory requires a comprehensive shift in the state's approach, from a logic of control and coercion to one based on environmental justice, resource redistribution, and building trust with affected communities, as these are conditions for stability.

Recommendations

1. Strengthening institutional coordination, environmental governance, and turning to risk management and environmental peacebuilding.
2. Linking sustainable recovery to livelihoods and environmental adaptation by localising agriculture as a socio-developmental sector.
3. Enabling local environmental responses and aligning climate finance with social justice.
4. Promoting environmental mediation and multi-stakeholder dialogue, as well as limiting security-led interventions in water and resource sharing.
5. Enhancing accountability, justice, environmental oversight, and enacting legislation, as well as the legal framework.

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Stress Test for a Stressed System: The Environmental Dimension of Iran's Twelve-Day War

Introduction

When war reached Iran in June 2025, the country's environmental sector was already operating in crisis mode. Environmental stress had for years, if not decades, shaped everyday life in tangible ways. Time and again, severe air pollution brought public life in cities to a halt, while chronic water shortages forced authorities to suspend supplies in multiple localities. These pressures were not solely the product of natural constraints. They were compounded by persistent governance failures, including weak and fragmented institutions that limited the state's capacity to plan, coordinate, and respond effectively to mounting environmental risks. Moreover, environmental governance had also become highly securitized, increasingly entangled with the commercial interests of regime-linked institutions.

The war with Israel last summer, therefore, did not create Iran's environmental crisis, but it exposed and somewhat intensified it. Entering the conflict amid multiple environmental challenges and weak governance structures, Iran emerged from the war with broader paralysis in political decision-making: most visible in the security realm but arguably extending into other policy domains, including the environment.

The conflict thus functioned as a stress test for a system already under strain, revealing how environmental governance, long securitized and politically constrained, is now further sidelined by a political class vying for power, while preoccupied with short-term regime stability.

This results in a deepening environmental and socio-economic vulnerability with limited prospects for mitigation in the foreseeable future. Beyond its immediate consequences, the persistent inability to address environmental challenges feeds into a broader legitimacy crisis for the Islamic Republic, which, across multiple policy domains, is struggling to deliver credible solutions to the country's mounting problems.

Shortly after the completion of this chapter in February, a broader Israel/US-Iran war erupted, with initial observations suggesting a significant expansion in the targeting of environmentally sensitive infrastructure. Israeli strikes on Iranian oil facilities caused oil to rain on the capital Tehran, while further critical sites were deliberately hit, including gas facilities and industrial installations.³⁴⁵ Iran, in turn, also struck environmentally sensitive infrastructure in Israel and the Gulf states, targeting energy facilities, oil tankers at sea and mining maritime waters. In both Iran and Bahrain, desalination plants came under attack as well.

Taken together, these strikes illustrate how natural resources and essential infrastructure are increasingly instrumentalized as strategic assets in armed conflict – their destruction serving both military and political objectives while inflicting long-term environmental and humanitarian damage.

At the time of writing, it remains unclear when and how the war will end, and how Iran (and the region) will emerge in terms of both governance and environmental damage. A comprehensive assessment of the impact of this latest conflict, therefore lies beyond the scope of this chapter. Nevertheless: In view of perceived more acute needs to fix damage from war amid socio-economic crisis as well as, if the regime survives, power competition for future outlook of the country, the main argument that environmental governance is pushed further to the margins by war will likely hold.

Background: A Crisis Before the War

On the eve of the 2025 war with Israel, Iran's environmental sector was already in a state of full-fledged crisis. Environmental stress had become a defining feature of governance and daily life alike. Across a wide range of issues, Iran's environmental sector faced profound challenges that remained inadequately addressed at the policy level, including deteriorating air quality, chronic water scarcity, soil degradation, advancing desertification, the loss of wetlands, and the growing impacts of climate change, particularly rising temperatures.³⁴⁶ These challenges were not abstract. They manifested directly in daily life, as severe air pollution repeatedly forced the closure of schools and public offices in major cities, while chronic water scarcity led to frequent disruptions in supply, straining households, agriculture, and local economies across the country.³⁴⁷

Iran's environmental crisis has been closely tied to the Islamic Republic's governance model. Responsibility for environmental management is shared across multiple institutions, often with overlapping mandates and poorly defined lines of authority.³⁴⁸ This fragmentation generated persistent coordination failures and policy incoherence. Competition between institutions, limited information-sharing, and weak mechanisms for inter-agency alignment undermined not only the implementation, but even the formulation of comprehensive strategies. Nominally existing policy objectives are not backed up by coherent and binding policies and legislation, let alone effective implementation.³⁴⁹ This has created a profound gap between ambition and reality and, ultimately, left environmental governance fragmented and ill-equipped to address the country's growing challenges in this sector.³⁵⁰

³⁴⁶ See, e.g., the 2004 Waste Management Act, the 2017 Clean Air Act or the 2019 Soil Protection Act. Iran's current Five-Year Development Plan, adopted in 2023, also formulates several environmental objectives, including with respect to climate policy and a green economy. Yet the document contains no dedicated section on the environment capable of consolidating these commitments into a coherent framework.

³⁴⁷ See e.g., Associated Press 2024.

³⁴⁸ The water sector illustrates this fragmentation: strategic direction is set by the Supreme Council of Water, operational control and allocation sit with the Ministry of Energy, pollution control lies with the Department of Environment, while agricultural water demand and watershed management fall under the Ministry of Agriculture Jihad. In practice, these bodies often compete for authority, budgets, and political influence, rather than coordinating effectively, leading to inconsistent governance decisions. Parliamentary oversight exists nominally, but is fragmented across committees and largely reactive, impairing its ability to resolve institutional conflicts or enforce coherent accountability.

³⁴⁹ E.g., the 2017 Clean Air Act, the 2017 Wetlands Protection Law, or the 2004 Waste Management Act. For a contextualization, see Climate Action Tracker 2023.

³⁵⁰ In this context, see Yousefi, Knieper, and Pahl-Wostl 2024; Madani 2014.

Policy-wise, these governance shortcomings were reinforced by structural priorities that consistently sidelined environmental considerations. Rapid population growth and sustained pressure to deliver economic expansion pushed environmental protection to the margins of policymaking, with development objectives routinely pursued at the expense of sustainability. Infrastructure projects, industrial expansion, and resource extraction were prioritized as tools of economic management, while their environmental consequences were treated as secondary or deferred concerns.³⁵¹

Environmental governance in Iran was further undermined by persistent implementation gaps. Environmental regulations and policy commitments often existed on paper but were unevenly enforced, as responsible agencies lacked the capacity to monitor compliance and sustain follow-through across regions. In the agricultural sector, for instance, concerns over local economic activity, rural employment, and food security frequently led authorities to ignore the overextraction of water resources and the proliferation of illegal wells.³⁵²

Environmental degradation in Iran was also shaped by the activities of regime-affiliated institutions. The Islamic Revolutionary Guard Corps (IRGC), most notably, and powerful (nominally) religious foundations, combined economic activity with political influence, while effectively operating beyond meaningful government oversight. Their autonomy from regulatory scrutiny insulated their practices from accountability, allowing them to circumvent environmental standards with minimal consequence.³⁵³ All this further weakened environmental governance and constrained the prospects for meaningful policy interventions. Large-scale projects in water diversion, land use, and energy production were often pursued with limited regard for long-term environmental consequences, reinforcing patterns of overexploitation and ecological stress.

International sanctions have further compounded these challenges. By restricting access to technology, services, expertise, and international environmental assistance, they have constrained Iran's capacity to address environmental degradation. At the same time, the economic pressures generated by sanctions have pushed environmental considerations even further to the margins of policy formulation and practice.³⁵⁴

Moreover, long before the outbreak of war, environmental policy in Iran had become deeply embedded within a security-oriented framework. Environmental challenges were increasingly treated as matters of (proclaimed) national security rather than environmental governance, a shift that narrowed the scope for reform and insulated decision-making from public scrutiny. Influential stakeholders with vested economic interests not only benefited from this arrangement but also actively shaped it, steering policy in ways that preserved existing patterns of resource use and authority. At the same time, environmental activists and independent experts were marginalized or, in numerous cases, subjected to repression or imprisonment, further constraining the political space for meaningful environmental policymaking.³⁵⁵

351 Madani, AghaKouchak, and Mirchi 2016.

352 See e.g. Nabavi 2018.

353 See Kowsar 2021.

354 Madani 2021

355 See Nature Editorial 2022; Human Rights Watch 2019.

This securitization carried tangible consequences for accountability, expertise, and transparency. Information on environmental conditions was tightly controlled, limiting opportunities for credible assessment, informed public debate, and holding those in office accountable. The systematic restriction of data and expert input undermined evidence-based policymaking and weakened societal engagement with environmental issues. In the period following the 2015 nuclear deal and prior to the U.S. withdrawal in 2018, these constraints also curtailed meaningful cooperation with international partners, foreclosing opportunities to draw on external expertise that might have strengthened environmental governance.

In a broader sense, environmental mismanagement had become a recurring source of public dissatisfaction in Iran, in no small part because of its direct impact on everyday life. Disruptions linked to water shortages and air pollution, in particular, were experienced not as isolated incidents but as persistent failures in the state's ability to provide basic services. Over time, environmental problems became part of a broader pattern of dissatisfaction with the state's capacity to address the country's fundamental challenges, ultimately leading to an erosion of confidence in the Islamic Republic as such.

All in all, therefore, well before the outbreak of war, these deficits had already narrowed the space for meaningful environmental intervention in Iran, leaving the system ill-equipped to absorb additional shocks.

Impact of the War: Two Reinforcing Effects

Direct Environmental Harm

The war resulted in localized but tangible environmental damage, even as the full extent of its impact remains difficult to determine. Comprehensive assessment has been constrained by restricted access, limited official disclosure, and the absence of systematic and free on-the-ground reporting. As a result, much of the available analysis relies on satellite imagery and open-source information, which allows for the identification of discrete incidents but not for a complete accounting of cumulative or long-term effects.³⁵⁶ These constraints have shaped early evaluations of environmental harm, underscoring both the provisional nature of existing findings and the likelihood that some impacts remain undocumented.

Preliminary assessments nonetheless point to a series of pollution incidents linked primarily to strikes on energy and military infrastructure. Satellite imagery indicates fires and emissions at facilities such as the Tehran refinery, the Shahrān fuel and gas depot, and installations connected to the South Pars natural gas complex. Damage to fossil fuel infrastructure is associated with the release of airborne pollutants, with implications for local air quality and surrounding ecosystems. In addition, the destruction of military and logistical sites generated debris and potentially toxic remnants of war such as fuels, lubricants, and firefighting chemicals, further compounding environmental stress in affected areas. While these effects did not amount to nationwide environmental collapse, they added acute, localized burdens to an already strained system.³⁵⁷

356 See chapter "Methodological Approaches"
357 Conflict and Environment Observatory 2025.

Particularly sensitive were attacks on nuclear-related and heavily militarized sites, which carried more diffuse but potentially severe environmental risks. Although no confirmed large-scale radioactive contamination has been reported, the possibility of hazardous material release highlighted the vulnerability of such installations during armed conflict.

Taken together, these direct impacts did not create new structural weaknesses in Iran's environmental sector, but they reinforced existing vulnerabilities, at least at the local level.

Exacerbation of pre-existing vulnerabilities

The war did not introduce fundamentally new environmental stressors, but it aggravated vulnerabilities that were already deeply entrenched. Air pollution, a chronic problem in major cities, worsened as military activity, strikes on energy infrastructure, and emergency fuel use added to existing emission burdens. The concentration of energy facilities and military infrastructure in or near densely populated urban areas further amplified risks, exposing large segments of the population to localized pollution and environmental hazards.

These dynamics underscore how pre-war patterns of infrastructure placement and environmental mismanagement translated directly into heightened exposure once conflict erupted, compounding everyday risks.

More consequential still was the war's impact on political decision-making. Since the conflict with Israel in June 2025, Iran's political leadership has appeared increasingly paralyzed. This immobilization has been most visible in the security realm, where core pillars of the Islamic Republic's deterrence doctrine have come under strain.³⁵⁸ For the first time, the limits of this deterrence calculus became openly apparent, shaking confidence at the highest levels of the system. In a moment that would have demanded strategic clarity, authority appeared diffuse and hesitant, compounded by the perception that Supreme Leader Ali Khamenei was politically, and reportedly physically, less able to impose direction.

This paralysis extended beyond security policy into other domains, including environmental governance. Intensified factional competition within the political elite, increasingly shaped by succession dynamics, further narrowed the space for decisive action. Rather than enabling coordination, these struggles reinforced fragmentation across already weak institutions.

All of this resulted not only in reduced willingness but also in diminished capacity to address environmental challenges systematically.³⁵⁹ Environmental governance slipped even further down the list of political priorities, even as underlying vulnerabilities deepened. In this sense, the war acted less as a discrete environmental shock than as an accelerator of political immobilism, widening the gap between mounting environmental risks and the state's ability to respond.

358 In particular, Iran's regional network of allied militias, missile and drone capabilities, and latent nuclear leverage.

359 The latest wave of country-wide protests in late December 2025/January 2026, which fundamentally questioned the regime's legitimacy, sent shockwaves through the system and made bold reforms even less likely, as the leadership is likely to avoid destabilising an already fragile status quo.

Outlook: Environmental degradation as a multiplier of stress

The war with Israel did not generate Iran's environmental crisis, but it has exposed its depth and sharpened its effects. Coming on top of long-standing structural degradation and weak governance, the conflict has further narrowed the already limited space for meaningful environmental reform.

Political leaders remain acutely sensitive to socio-economic unrest and face severe fiscal constraints, reducing both the willingness and the capacity to absorb the short-term costs associated with substantive environmental measures. In this context, reforms aimed at addressing water mismanagement, pollution, or resource overexploitation are widely viewed as politically risky and therefore – most likely – continue to be deferred.

This deferral carries accumulating costs. Across the country, environmental degradation is set to exert simultaneous pressure across public health, socio-economic stability, and the fiscal position of the state. As air pollution, water scarcity, and ecosystem decline persist, environmental stress increasingly interacts with existing socio-economic pressures, reinforcing grievances rather than remaining a contained policy problem.

Beyond its immediate effects, the war has thus contributed to locking in these dynamics by accelerating political paralysis and diverting attention and resources toward short-term security concerns. Environmental degradation, already deeply embedded in Iran's governance challenges, functions in this context as a multiplier of stress: deepening economic and social strain for the population while further eroding the political system's capacity and legitimacy in the post-war period.

Recommendations

Europe's relationship with Iran is overshadowed by the protracted standoff over the nuclear programme, regional policies and the authorities' frequent and brutal crackdown on the country's own population. Moreover, in the environmental domain, past European offers of support were ultimately rejected by the unwillingness of Iranian authorities to meaningfully engage with European interlocutors. All in all, at the inter-state level, relations remain tense and, for the time being, offer little room for meaningful cooperation. Two areas nevertheless stand out in which Europe could make a tangible difference.

Promoting access to information

Access to reliable environmental information in Iran is severely limited. Independent monitoring is constrained, data is tightly controlled by the state, and the systematic restriction of expert input has weakened both evidence-based policy-making and informed public debate. Under current political circumstances, where space for international collaboration on the ground is extremely limited, a range of remote tools can contribute to generating independent data on environmental conditions. Satellite-based monitoring and remote sensing, including platforms for air quality tracking and water body and land degradation assessment, offer one of the few viable avenues for systematic, externally verifiable observation.

Open-source air quality platforms, which aggregate and disseminate pollution data independently of state reporting, offer a further layer of transparency, particularly relevant given Iran's chronic urban air quality crisis. Taken together, these tools can partially compensate for the absence of reliable official data. Europe should support initiatives that systematically gather and disseminate such information, investing in the technical capacity to process and interpret it, and that promote structured dialogue, including among diaspora networks and internationally based Iranian researchers, on policy and governance solutions to Iran's most acute environmental challenges.

Supporting Iran's environmental civil society

Iran's environmental civil society has shown remarkable resilience in the face of sustained repression. Europe should make visible the efforts of those working under these conditions, including by drawing attention to the situation of imprisoned environmental activists – whose prosecution reflects the broader securitization of environmental governance documented in this chapter. Beyond advocacy, Europe should enable Iranian civil society actors to engage with global peers, for example by funding participation in international conferences and collaborative research projects. More broadly, European research funding should support work that develops concrete policy and governance solutions for Iran's environmental challenges, building analytical foundations that can inform reform and reconstruction efforts when political conditions allow.

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Conclusions & Recommendations

The analysis presented in this report demonstrates that environmental degradation is not an incidental byproduct of armed conflict but a structurally embedded dimension of contemporary warfare. Across diverse conflict settings in the Middle East, ecological systems are systematically damaged through the destruction of infrastructure, the contamination of natural resources, and the erosion of biodiversity. These impacts extend far beyond the immediate temporal and spatial boundaries of violence. They reshape socio-economic conditions, undermine human security, and constrain the prospects for recovery and long-term stability.

What emerges clearly is that environmental harm operates as both a consequence and a driver of fragility, confirming the consensus in the literature. Damaged water systems, degraded agricultural land, and polluted urban environments contribute to declining public health, reduced livelihood opportunities, and increased dependence on external assistance. In contexts already characterized by climatic stress, demographic pressure, and governance fragmentation, such impacts create reinforcing feedback loops that deepen vulnerability and heighten the risk of renewed conflict. The environment thus constitutes not only a victim of war but also a critical factor in shaping post-conflict trajectories.

At the same time, the report highlights the unevenness of both impacts and responses. Variations in conflict type and intensity, governance capacity, and access to resources produce highly differentiated environmental outcomes. In some contexts, state institutions retain limited capacity to respond to environmental damage, while in others, governance is fragmented or absent altogether. Data limitations, politicization of environmental information, and restricted access for researchers and practitioners further complicate both assessment and intervention. These constraints underscore the importance of context-sensitive approaches that avoid one-size-fits-all solutions.

A central insight of this report is that technical remediation alone is insufficient. While infrastructure repair, decontamination, and ecosystem restoration are essential, they must be embedded in broader governance frameworks that address underlying political, institutional, and socio-economic dynamics. Environmental recovery is inherently linked to questions of legitimacy, inclusion, and accountability. Where governance remains exclusionary or contested, environmental interventions risk reinforcing existing inequalities or becoming instrumentalized for political purposes.

Conversely, the findings point to the potential of environmental governance as an entry point for cooperation and stabilization. It is not inevitable that shared environmental challenges, such as water scarcity, land degradation, and pollution, per se lead to an intensification of conflict. To the contrary, if addressed in a comprehensive governance framework, it can create incentives for collaboration across conflict lines, particularly when linked to tangible benefits for affected populations.

In this sense, environmental peacebuilding offers not only a normative framework but also a set of practical tools for integrating ecological considerations into conflict prevention, mitigation, and recovery.

Building on these conclusions, the following recommendations translate the analytical insights of this report into actionable priorities for policymakers, international organizations, and practitioners. Central to these is the need to strengthen institutional coordination and environmental governance, as the evidence shows that neglecting environmental dimensions perpetuates vulnerability and instability, while integrating them into conflict prevention, response, and recovery can foster more resilient, inclusive, and sustainable outcomes. The following recommendations are intended to provide guidance and food for thought on how this integration can be implemented in practice.

- **Improve Environmental Data, Expertise, and Awareness:** Reliable data and robust analytical capacity are essential for understanding and addressing the environmental impacts of conflict. However, as highlighted throughout this report, data availability is often limited by security constraints, political sensitivities, and methodological challenges. Efforts should therefore focus on strengthening environmental monitoring systems, including the use of remote sensing technologies, open-source intelligence, and community-based data collection. At the same time, investments in training and capacity-building are needed to enhance local expertise in environmental assessment, risk analysis, and sustainable planning. Raising awareness among policymakers, practitioners, and the broader public is equally important. Environmental considerations should be systematically integrated into conflict analysis, foreign policy, and development planning. This includes recognizing environmental degradation as a threat multiplier and incorporating it into early warning systems and risk assessments.
- **Link Sustainable Recovery to Livelihoods and Climate Adaptation:** Environmental recovery must be closely tied to the restoration of livelihoods and the strengthening of climate resilience. In many conflict-affected areas, communities depend directly on natural resources for agriculture, fishing, and informal economic activities. The degradation of these resources not only undermines economic recovery but also exacerbates social inequalities and displacement pressures. Policies should therefore prioritize nature-based solutions, sustainable land management, and climate-adaptive infrastructure as part of recovery strategies. Investments in renewable energy, water-efficient technologies, and resilient agricultural practices can generate co-benefits for both environmental sustainability and economic stabilization. Importantly, such interventions should be designed to create local employment opportunities and support inclusive growth, thereby addressing some of the structural drivers of conflict.
- **Support Local and Community-Based Environmental Responses:** Local communities are often the first to experience and respond to environmental degradation, yet they are frequently marginalized in formal decision-making processes. Strengthening community-based approaches is essential for ensuring that interventions are contextually appropriate, socially inclusive, and sustainable over the long term. This involves supporting local knowledge systems,

grassroots initiatives, and civil society organizations that play a critical role in environmental monitoring, resource management, and conflict mediation. Empowering local actors also enhances ownership and legitimacy, which are key factors for the success of recovery efforts. Particular attention should be paid to the inclusion of women, youth, and marginalized groups, whose perspectives are often underrepresented despite their central role in managing natural resources and sustaining livelihoods.

- **Promote Environmental Mediation and Multi-Stakeholder Dialogue:**

Environmental issues can serve as both sources of conflict and platforms for cooperation. Promoting dialogue around shared environmental challenges offers opportunities to build trust, reduce tensions, and foster collaborative solutions. Environmental mediation initiatives should be integrated into broader peace-building efforts, with a focus on transboundary resources such as water basins, grazing land, and energy infrastructure. Multi-stakeholder platforms that bring together governments, local communities, private sector actors, and international organizations can facilitate knowledge exchange and joint problem-solving. While such processes are inherently complex and politically sensitive, they can contribute to incremental confidence-building and lay the groundwork for more comprehensive peace agreements.

- **Promote Accountability and Legal Frameworks:** Addressing environmental damage in conflict settings requires stronger mechanisms for accountability at both national and international levels. The absence of clear legal frameworks and enforcement mechanisms often allows environmental harm to go unpunished, undermining both justice and deterrence. Efforts should be directed toward strengthening the documentation of environmental damage, supporting independent investigations, and advancing legal instruments that address environmental crimes in conflict. This includes engaging with ongoing debates on the recognition of ecocide and the expansion of international humanitarian law to better reflect environmental considerations. At the same time, accountability should not be limited to punitive measures. It also encompasses the responsibility to repair and restore damaged ecosystems and to compensate affected communities. Linking accountability to recovery processes can help ensure that environmental restoration is not sidelined but becomes an integral component of post-conflict reconstruction.

These five recommendations, while not exhaustive, point to the need for a more comprehensive and integrated understanding within the international community of how conflict and environmental degradation are interconnected. Environmental considerations must move from the periphery to the core of policy design, particularly in times of war. In the Middle East and elsewhere, armed conflicts, regardless of their intensity or duration, are ultimately finite. The more enduring question, however, is whether the ecological foundations necessary for recovery, peacebuilding, and long-term stability remain intact. Without a functioning environment, reconstruction risks becoming both materially constrained and socially unsustainable.

Biographies

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War and the Environment in the Middle East: Degradation, Governance, and the Way Forward

In the Middle East, armed conflict is increasingly undermining not only human security and infrastructure but also the environmental systems on which livelihoods and long-term stability depend. This reflects a broader global trend in which rising organised violence and ecological degradation interact in mutually reinforcing ways. In conflict settings, the environment is not merely a passive backdrop but a system shaped by human action and integral to wellbeing. Warfare damages critical infrastructure, depletes natural resources, erodes biodiversity, and instrumentalises nature for political objectives, while governance constraints often relegate environmental protection to a secondary concern. Crucially, the consequences reach beyond ecological damage, exacerbating social vulnerability and complicating recovery.

Further information on this topic can be found here:

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