



¹ Queen Mary Business School,
University of London, London, UK

b.neimark@qmul.ac.uk

Cite this as: *BMJ* 2026;395:e101023

<http://doi.org/10.1136/bmj-2026-101023>

Measuring the impact of conflict on the climate

Benjamin Neimark *reader*¹

Greenhouse gases resulting from armed conflicts are a serious problem. Recent wars in Ukraine, Gaza, and Iran have highlighted the immense potential costs of armed conflict to the climate and overall ecological health of people and Earth. The first 14 days of the Iran war alone produced more than the total climate pollution of Iceland in 2024—roughly five million tonnes of carbon dioxide.¹ Five years of war in Ukraine has released almost 311 million tonnes of carbon dioxide—the equivalent of annual emissions in France.² In Gaza, carbon emissions during the first 15 months of the conflict were more than 30 million tonnes—equivalent to the amount of carbon absorbed by 33 million acres of forests in a year.³

Although these estimates provide a window into the climate damage of war, still no international climate agreement requirements exist for governments to report these emissions. Citing national security concerns, the US Congress lobbied and won an exemption on the reporting of military greenhouse gases to the 1997 Kyoto protocol,⁴ and since the Paris agreement in 2015, all military reporting is now voluntary.⁵ In fact, assessing any environmental impacts from war today, in particular climate damaging emissions, remains a “black-box,” ignored and overshadowed by the humanitarian and economic damage of war.

Accurate, comprehensive, and transparent reporting of anthropogenic greenhouse gases is vital if we are to limit global temperature increases to below 1.5°C. Militaries are not transparent when it comes to reporting greenhouse gas emissions during armed conflict, and therefore it is up to individual researchers to conduct their own assessments.⁶

Methodological tools to measure conflict related emissions are becoming more accessible.⁷ These instruments are meant to support the international scientific research and policy community in accounting for the environmental toll of armed conflicts. What is still needed, however, is for governments to mandate emission reporting for militaries during peacetime and war.

While militaries are known to be large emitters of greenhouse gases, their “carbon footprint” substantially increases during conflict. Some obvious direct sources during conflict include carbon intensive jet fuel for fighter and cargo planes and diesel for tanks and naval ships. These “tailpipe,” or Scope 1, emissions, result from the burning of such fossil fuels.

However, a massive amount of less apparent indirect or embodied military emissions, known as Scope 2, come from generating electricity on forward operating bases, and Scope 3 emissions, which include the extensive military supply chains of industrial manufacturing of ammunitions and weapons and

logistics of deploying troops and feeding and housing armies.⁸

To obtain a more comprehensive picture of the complex “long tail” of emissions resulting from war, researchers have proposed the Scope 3+ category, which specifically focuses on conflict related emissions.⁹ This new category highlights less studied greenhouse gas emissions from indirect supply chains during active combat before conflict, through the building of bunkers and tunnels in preparation for war, and also reconstruction after conflict.³

In our publication on the Gaza war, we identified embodied emissions found in the less studied defensive structures before and after conflict, such as Israel’s smart or iron wall, and Hamas’ extensive tunnel networks³—most of these emissions emanating from the highly carbon intensive roasting of cement for concrete¹⁰—and rubble removal, and reconstruction of roads, houses, schools, and hospitals.¹¹

Each war is different. Geography, topography, ecological sensitivity of the environment, and types of weapons used all play a major factor in dictating both the environmental footprint and the climate footprint. Owing to the lack of transparent data, researchers must begin with what is already known about a conflict, such as the types of fuel consumed by fighter jets and number of sorties flown and then move backwards through the supply chain to estimate how much carbon has been emitted during the conflict.

Researchers must also be cognisant of changes in economic conditions that might affect emissions during conflict and build robust methodologies that account for these shifts. For instance, during war there are times when a country’s economic output decreases resulting in a temporary reduction in countrywide greenhouse gas emissions. Such was the case during the first year of the war in Ukraine when some industries had to shut down. Nonetheless, studies showed that regional emissions increased when steel production shifted abroad and when refugees were displaced across Europe.¹² A further examination found an uptick in jet fuel related emissions owing to the diversion of commercial flights to avoid Ukrainian airspace.²

The environmental and health effects of greenhouse gas emissions and other toxic residues of war can be acute, as recently witnessed in the toxic sludge of rubble and other contaminants in Gaza or take the form of thick smoke and soot (“black rain”) when ignited fuel from major oil storage depots and refineries mixes with rain clouds, as happened across the Gulf region during the recent Iran war.¹³

A bright spot, however, exists. In 2025, the International Court of Justice issued a landmark

advisory opinion on the obligations of countries to tackle climate change,¹⁴ confirming governments' legal responsibility to protect the climate system and detailing tangible steps that must be taken to respond to climate change. The court's important legal findings showed that states are now required to prevent harm to the climate system to the best of their ability and to cooperate with each other to achieve these goals.

However, military emissions were not directly addressed in the advisory opinion. A supplementary declaration, annexed to the main advisory opinion, by Justice Sarah Cleveland noted, "Thus, the obligations of States under the climate change treaties and customary international law to assess, report on and mitigate harms to the climate system include responsibility to address the impacts resulting from armed conflict and other military activities."¹⁵ This was one of the few, if not the only, times the international court raised the issue of conflict related emissions.

Since the advisory opinion, several legal cases have been brought against major climate change polluters in domestic and international courts.¹⁶ Yet, up to this point no legal action has been taken against militaries for climate related emissions.

In all of this, data are essential. Comprehensive and transparent data on conflict related emissions provide a clearer picture of the environmental costs of war—not just economic costs, but the costs to humans and the climate system they depend on. Data can be used as evidence in a courtroom to hold militaries, governments, and individuals accountable.

Diverse groups of scientists, civil society organisations, and legal professionals are emerging to advocate for better data and with the potential to drive improvements, holding militaries accountable or supporting other targets.

We also need data for mitigation. As a scientific community, we cannot consider targets to cut emissions without adequate baseline data, and with such huge gaps in reporting emissions, a massive gap in military related emissions remains.¹⁷ My hope is that policymakers will be forced to act through either the courts or the ballot box to mandate meaningful reporting of military emissions and targeted cuts.¹⁸ Understanding the scale of conflict emissions is an essential first step in addressing the military's oversized contribution to the climate crisis.

AI use: None.

Provenance and peer review: Commissioned; not externally peer reviewed.

- 1 Otu-Larbi F, Bigger P, Neimark B. Two weeks of war in Iran unleashed more carbon pollution than Iceland does in a year. 2026. <https://climatecommunityinstitute.substack.com/p/iran-war-pollution> (27 Jun 2026).
- 2 De Klerk L, Shlapak M, Zibtsev S, et al. Climate damage caused by Russia's war in Ukraine 24 February 2022 - 23 February 2026. Initiative on GHG Accounting of War/Ecoaction. 2026. https://en.ecoaction.org.ua/wp-content/uploads/2026/02/Climate-Damage-Caused-by-War-48-months_ENs.pdf (10 Jul 2026).
- 3 Neimark B, Otu-Larbi F, Larbi RT, et al. Israel-Gaza conflict carbon emissions exceeded 30 million tons. *One Earth* 2026;9:. doi: 10.1016/j.oneear.2026.101648
- 4 Crawford NC. Mission impossible? Quantifying military emissions. *Bulletin of Atomic Scientists*. 2026. <https://thebulletin.org/2026/08/mission-impossible-quantifying-military-emissions/> (23 Sep 2026).
- 5 Crawford NC. *The pentagon climate change and war: Charting the rise and fall of US military emissions*. MIT: Press; 2022.
- 6 Rajaeifar MA, Belcher O, Parkinson S, et al. Decarbonize the military - mandate emissions reporting. *Nature* 2022;611:-32. PMID: 36323814. doi: 10.1038/d41586-022-03444-7
- 7 De Klerk L, Shlapak M, Onopchuk I. Guidance on the assessment of conflict-related GHG emissions. *EcoAction*. 2024. <https://en.ecoaction.org.ua/conflict-related-emissions-guidance.html> (30 Jun 2025).

- 8 Belcher O, Bigger P, Neimark B, et al. Hidden carbon costs of the "everywhere war": Logistics geopolitical ecology and the carbon boot-print of the US military. *Trans Inst Br Geogr* 2019;45:-80. doi: 10.1111/tran.12319
- 9 Cottrell L. A framework for military greenhouse gas emissions reporting. *Conflict and Environment Observatory*. 2022. <https://ceobs.org/report-a-framework-for-military-greenhouse-gas-emissions-reporting/> (12 Jun 2026).
- 10 Larbi R, Neimark B, Ashworth K, et al. Parting the fog of war: Assessing military greenhouse gas emissions from below. *Extr Ind Soc* 2025;23:. doi: 10.1016/j.exis.2025.101654
- 11 Abdelnour S, Roy N. Processing debris from destroyed and damaged buildings in Gaza: carbon emissions time frames and implications for rebuilding. *Environ Res: Infrastruct Sustain* 2025;5:. doi: 10.1088/2634-4505/adeadc
- 12 De Klerk L, Shmurak A, Gassan-Zade O, et al. Initiative on GHG Accounting of War. 2022. <https://climatefocus.com/wp-content/uploads/2022/11/ClimateDamageinUkraine.pdf> (23 Sep 2026).
- 13 Moreland L, Walsh J, Darbyshire E, Weir D. The emerging environmental consequences of the Israel-Iran war. *CEOBS*. <https://ceobs.org/the-emerging-environmental-consequences-of-the-israel-iran-war/> (1 Jun 26).
- 14 International Court of Justice. Obligations of States in Respect of Climate Change. 2025. <https://www.icj-cij.org/case/187> (27 Aug 26).
- 15 International Court of Justice. Declaration of Justice Cleveland 2025. <https://icj-web.ileman.un-icc.cloud/sites/default/files/case-related/187/187-20250723-adv-01-10-en.pdf> (27 Aug 26).
- 16 Sabin Centre for Climate Change Law. The Climate Litigation Database. 2026. <https://www.climatecasechart.com/> (27 Aug 2026).
- 17 Military Emissions Gap. Military Emissions Gap: View Your Governments Military Emissions Data. 2026. <https://militaryemissions.org/> (20 Jun 2026).
- 18 Neimark B, ed. *Confronting Military Greenhouse Gas Emissions*. Interactive Policy Brief. London, UK. 2024. <https://www.qmul.ac.uk/sbm/media/sbm/documents/Confronting-military-greenhouse-gas-emissions> (20 Jun 2026).