

## OPINION

# On the relationship of armed conflicts with climate change

Asmeret Asefaw Berhe \*

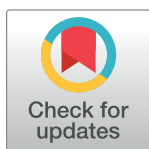
Department of Life and Environmental Sciences, University of California, Merced, Merced, California, United States of America

\* [aaberhe@ucmerced.edu](mailto:aaberhe@ucmerced.edu)

The war in Ukraine has now motivated a lot of interest on how wars are related to ongoing concerns with climate change [1]. This is following a couple of decades of discussions on the relationship of armed or violent conflicts with climate and climate change [2–18]. The current attention on how climate change can increase the damage caused by armed conflicts is ultimately motivated by theories that suggest that resource availability and access are the root causes of most violent conflicts [19, 20] because climate change is expected to have serious implications for resource access and availability for the fast-growing global human population [6].

However, the increasing attention on the topic has so far failed to properly acknowledge the acute shortage of primary, empirical data in this area of research. A lot of the current interest in this topic is spurred by the availability of mostly country-scale data on climate and conflicts that don't take into account spatial variability of resource availability, demographics (including ethnicity, income levels, etc.), and climate at national and regional scales [10]. Theisen and coworkers [8], for example, conducted a review of the available literature that provides empirical analyses on how climate or environmental change is related to intrastate conflicts. They reported that major gaps in research still exist, and that our current understanding of how climate change may be contributing to armed conflicts is, at best, incomplete. Similarly, Solow [6] argued that scientists from different fields should come together to address major knowledge gaps in this area of study. Both works rightfully highlight that the reasons why conflicts are waged are complex [6, 8]. Conflicts in different ecosystems also lead to a complex set of humanitarian and environmental impacts [21, 22].

With the growing interest in the topic, it is important to acknowledge that any attempt to make sweeping conclusions on this complex issue that has huge socio-economic and political sources and implications [23] is rightfully going to be met with warnings for caution [7, 23–26]. The same studies that highlight that climate change will lead to increased stresses on the already limited natural resource base globally, and can compromise human security and governance also state that, currently, the availability of empirical data to demonstrate the strength of the direct or indirect relationship between environmental change and violent conflicts remains limited [8]. So far, there has been very limited primary, scientific analysis of the impacts of conflicts on the health of ecosystems and the ability of natural ecosystems to continue to provide critical ecosystem services such as food production, biodiversity, and availability and sustainable use of other natural resources during or after conflicts. The two-way relationship between resource availability and armed conflicts is well theorized and studied in social science literature [19]. However, in spite of some dramatic (for example, from burning oil wells in Kuwait [27] and fear of a nuclear war aftermath [28]), and subtle (for example, from landmines



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[22]) demonstrations of the environmental aftereffects of armed conflicts that spur short-lived interest in specific types of warfare, there are only a small number of scientific investigations of the environmental effects of armed conflicts [29].

Findings of the studies that do exist in this area demonstrate that the relationship between natural resource availability in a given nation-state or region and armed conflicts is very complex, even without considering climate change. The one natural resource that has repeatedly been shown to increase the likelihood of conflict in a region is oil. Availability of lootable commodities such as gemstones and drugs has also been shown to increase the length of conflicts, but its relationship with the start of conflicts is weak [30]. There is very little empirical data in publicly available periodicals. Only a few previous studies have calculated the expected impact of warfare on physical and chemical degradation of natural resources, and estimated how long the environmental or resultant socio-economic impacts of armed conflicts last [31]. Previous studies have theorized and simulated the impact of explosions on microrelief disruption and soil degradation. Others have also estimated (given what we know under other circumstances) the longevity and magnitude of environmental impacts from the release of toxic chemicals during the production, storage, and delivery/explosion of warfare. However, very few comprehensive studies exist where scholars have actually gone out to affected areas to measure the intricate and interconnected impacts of armed conflicts and determine how long the impacts persist, and their implications for governance, regional development, and/or start of additional conflicts. The rate of increase of scientific investigations that study the relationship of environmental variables with war has been very slow compared to the speed with which human beings have been able to invent and use environmentally disastrous warfare technologies.

With or without climate change we have a serious shortage of scientific analysis on how armed conflicts impact the sustainability of our natural resource base [19]. But it is increasingly becoming clear that climate change has already become a major factor in conflicts, and its influence is only going to increase over time. Resource depletion, due to our growing population and insatiable appetite for goods, by itself continues to be a big threat. The scientific community needs to urgently address the dearth of data available to relate observed or anticipated climate change to starting of new conflicts or increasing the length of ongoing conflicts. It is abundantly clear that a warming climate can create opportunities for exploitation of otherwise protected resources (for example, oil in the Arctic) that are likely to be sources or collateral damage of new conflicts. We need to take stock of what we know and do not know about the effects of warfare on the productivity and sustainability of natural resources to facilitate further studies on how climate change enters that equation.

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