

Dis-ordnance: climate change meets military waste in Gaza

Nigel Clark
Lancaster University, UK

David Henig
Utrecht University, Netherlands

Dialogues in Human Geography. 2025 1-5
DOI: 10.1177/20438206251406734

abstract

Our commentary picks up on Mikko Joronen's use of the interface between weather and the earth to frame his account of Israel's violent appropriation of Palestinian space. Taking a more general approach, we propose that modern warfare moves between the Earth system and geological strata. Our main concern is the way climate change is stirring up and redistributing the wastes of war both spatially and temporally. In conversation with Joronen's case study, we speculate about the dire convergence between massive bombardment and escalating climate change in the Gaza Strip.

Anthropocene, climate change, derangement, military waste, Palestine/Israel, unexploded ordnance

Israeli accounts of a fatal attack on a bulldozer in Rafah on October 19, 2025, implicated Hamas in a violation of the latest ceasefire, resulting in deadly reprisals. Subsequent reports indicated that the vehicle had struck unexploded ordnance (UXO) originating from the Israel Defence Forces themselves. With estimates that 10-15% of explosive weapons unleashed on Gaza fail to detonate, UXO has long been a lethal problem for Palestinians, but it also punctures settler fantasies of converting an ethnically cleansed Gaza Strip into enterprise zones and coastal real estate. As Mikko Joronen's disturbing but timely article lays out, this is one manifestation of the broader paradox of a settler colonialism reliant on ecocidal technologies of modern warfare and policing: that the

desire to appropriate, purify, and re-inhabitat land is undermined by the drive to render it unlivable for its existing occupants.

In response to the paper and its broader implications, we step back from the specificities of settler colonial violence and look more closely at the material-semiotic relationship between modern war and the physical environment. As Joronen attests, the enmeshing of violent occupation with environmental destruction calls for a ‘volumetric’ account: a conceptual framing that brings the properties and dynamics of the air and those of the solid Earth into articulation. This interface between ‘weather and the earth; *meteora* and *terra*’, we propose, is definitive not just of colonial violence but of modern warfare more generally. Here, we draw on Derek Gregory’s observation that ‘(m)odern, industrial warfare seemed to be waged against the very earth itself’ (2016: 9). This is largely in keeping with Joronen’s narrative, which draws on Sloterdijk’s depiction of the deployment of explosive weapons to penetrate and upheave the ground underfoot while weaponizing the very atmosphere we breathe.

It’s worth ‘dwelling’ on this zone where the airy, watery, life-infused outer Earth system encounters the relatively solid rock of the Earth’s crust, for the thematizing of this planetary conjuncture is one of the main achievements of Anthropocene science. While the question of whether anthropogenic agency has left indelible marks on the Earth’s uppermost geological stratum has been centre stage, it may turn out that a more enduring impact of the Anthropocene debate arises out of the unprecedented collaboration of Earth system scientists and ‘hard rock’ geologists. In order to assess the evidence for a novel geological epoch, researchers from the newer interdisciplinary field of Earth system science – which specializes in human impacts on the fluid envelope of the atmosphere, biosphere and hydrosphere – worked closely with geologists – the older discipline that has historically focused on the layered, rigid and mostly ancient rock comprising the Earth’s crust (Zalasiewicz et al., 2017). From these ongoing exchanges have emerged new understandings of the dynamic, long-term relationship between the fluid materials of the outer Earth and the slower moving lithic crust.

The matter of the meeting and exchange between the outer Earth system and the underlying rocky strata has percolated into social science. Its traces can be discerned in Bruno Latour’s (2014a, 2014b) uptake of the concept of the ‘critical zone’, the section of

the Earth that reaches from the lower atmosphere to the bedrock – and his accompanying notion of a more amorphous and antecedent ‘metamorphic zone’ that underpins the life-suffused critical zone. Variations on the theme of ‘planetary social thought’ have also explored the Earth system/strata juncture and the various ways that human agents situate themselves in this region of intensive mixing and merger (Clark and Szerszynski, 2021). There’s a sense in which social thought had been readied for this theme by way of far-sighted philosophical inquiries into the dynamic and differentiated geo-body of the Earth. In important ways, Deleuze and Guattari’s (1987: 40-1) concern with the articulation between relatively stable and consistent ‘strata’ and more fluid, less-organized or ‘deterritorialized’ matter-energy anticipates key themes of Anthropocene science. Prescient too, as Joronen’s discussion intimates, is the work of Michel Serres. In his *Natural Contract* (1995), Serres explicitly brought his concerns over weather, war, and anthropogenic climate change together, when he wrote that nowadays the Earth is quaking anew ‘not because it is changing, from its deep plates to its envelope of air, but because it is being transformed by our doing’, adding that this crisis deeply affects ‘time and weather and our survival’ (Serres, 1995: 86).

There are many ways in which human actors actively intervene in the interzone between Earth systems and strata, or as Joronen puts it, between *meteora* and *terra*. A great many of these practices, our species’ flair for working with fire, water, wind, minerals and life itself, are predominantly generative or productive. But as Joronen’s concept of ‘malevolent weathering’ suggests, settler colonial violence is a particularly destructive social intercession in the contact zone between the Earth’s fluid envelope and its firmer ground; and in this way, it serves to undermine the practices through which a people have, over the long term, learned to mediate in their own way between *meteora* and *terra* (see p 16).

As Joronen makes clear, here and elsewhere, the agency of dispossessive violence endures. By definition, contamination is both spatially and temporally persistent, in the case he details it is an integral part of a more generalized condition in which ‘Palestinians confront, enact, express, and embody the slowly wounding effects of settler-colonisation’ (2021: 997). It is with regard to this extended spatio-temporality, this afterlife of violent un-worlding, that we want to track malevolent weathering through a further turn. It hardly needs to be said that the weathering implication of contamination now stretches

to the global scale, with numerous researchers teasing out the connections between human-induced climate change and colonialism, as Joronen notes. But what happens, when climate change collides with the residues of armed conflict in the present and future, we ask, not just in the case of colonial violence but wherever modern weapons are deployed?

Our concern here is not with the claim that climate change incites conflict or multiplies threats, nor is it with the evidence that climatic shifts impact particularly harshly on those whose lives have been ravaged by war. What we are interested in, specifically, are the consequences of changing climate for landscapes that are already contaminated by war and its wastes – and how this underscores the point that complete decontamination of landscapes of war is a promise and fantasy that is impossible to realise. Much has been written about the dangers of living and working amidst the toxic residues of modern warfare – including the risks of living and working amidst UXO – the original impetus for Rob Nixon's concept of slow violence (2007). So too is there growing attention to the climatic impacts of maintaining armed forces, waging war, and post-conflict reconstruction. In many parts of the world, however, climate change is already circling back on the toxic and explosive residues of conflict. As the flows and cycles of the Earth system are transformed, wastes of war are unearthed or buried, inundated or washed away, set in motion or set alight.

In postwar Bosnia and Herzegovina, impoverished rural people who rely on forests for fuelwood, timber, and food foraging have painstakingly learned how to navigate a landscape contaminated the remainders of conflict – including landmines, cluster bombs and shrapnel. But intensifying hydrometeorological events, including a 2014 cyclone that delivered the heaviest rainfall in recorded measurement, have triggered landslides and erosion. Minefields, warning signs and familiar pathways shifted or were carried away – with dire consequences for local livelihoods (Henig 2019). Similar problems, arising from soil erosion, flooding, wildfire and melting ice, impact the 70 or so countries with residual minefields and the many other regions harbouring war waste. This potentially includes Greenland, where an abandoned US Cold War missile base project left behind significant amounts of radioactive and chemically toxic waste, which accelerating climate change and thawing ice sheets now threatens to release into freshwater and marine ecosystems (Henig 2024).

Gaza is particularly vulnerable to negative synergies between war waste and climate change. Joronen's malevolent weathering joins an expanding body of work considering the enduring environmental impacts of current and previous conflicts in the Gaza Strip, which includes work on Israel's destruction of infrastructure and agroecosystems, toxic and UXO-contaminated demolition waste and their health impacts, and carbon emissions from conflict and rubble clearance (AbuHamed et al. 2023; al Baraquoni et al, 2020; Abuaward et al. 2025; Neimark et al. 2025; Abdelnour and Roy, 2024). But aside from the direct climate impacts of the conflict, Gaza is extremely susceptible to the effects of global climate change. As a pre-October 7 report noted, the Gaza Strip is already experiencing 'repeated climate shocks and weather variations that destroy homes and infrastructure, reduce agricultural productivity, limit access to water and create fertile ground for health problems' (ICRC, 2023: 17). Research shows that rising sea levels are now compounding the effects of over abstraction to hasten saltwater intrusion into Gaza's aquifers (Mattar and Mogheir, 2025), while the coming decades promise rising temperatures, increasing drought and heatwaves, accelerating coastal erosion, and rainfall that is declining but also arriving in more extreme and unpredictable bursts resulting in intensifying flash flooding (ICRC 2013: 19- 22).

As one of the most heavily bombarded sites in human history *and* a zone of extreme climate vulnerability, Gaza faces a future of indefinite, undelimitable dispersal of war wastes. What we are now witnessing is a nightmarish twist on Anthropocene science's Earth system-strata articulation, or in Joronen's terms – a near unfathomable conjunction of greenhouse gas-infused *meteora* and war waste-contaminated *terra*. In this regard, it's worth remembering Serres' notion of an appropriating pollution which is both spatial and temporal (Henig 2024), and as Joronen reminds us, at once a process of signification and of physical transformation; of matter or 'hard pollution' and signs or 'soft pollution' (see Serres 2011: 38-42), This resonates with Amitav Ghosh's notion of a climatic 'great derangement' which drives home the point that climate change is both a material and a semiotic process, a loss of familiar elemental forms and patterns forces that also confounds the way we make sense of the world (Ghosh 2016) . It's worth recalling that Paul Virilio (1989: 72-3) had earlier noted the centrality of the 'derangement of perception' to modern warfare: the strategic effort to disrupt sensory experiences by transforming landscapes into un-navigable wastelands.

The Palestinians of Gaza, then, are faced with a life-denying synergy of derangements. If Joronen's paper underscores the brutality of Israel's deliberate toxifying of the Gaza Strip, so too does it reveal the ultimately self-defeating logic of poisoning a landscape as a moment in its appropriation. Moreover, as climate changes and the Earth system undergoes its own disordering and reorganization, the wastes of war will not be confined within the prison walls of Gaza but will percolate across different spatio-temporal scales with varying intensities and speeds. Responsibility for this derangement does not lie solely with Israel but with all the western powers who have supported and enabled its war crimes – and in a broader sense with all the major contributors to global climate change.

Confronting radioactive contamination of his people's land that is predicted to last 25,000 years, Aboriginal Australian actor-storyteller Trevor Jamieson declared: 'We can wait' (cited in Gilbert 2013: 206). Palestinians, too, seem resigned to the long term. But having experienced worse things than toxicity and climate change, Gazans are also ready to rebuild as soon as they can. Already they are sifting through the ruins of their world, preparing once more to mediate between *terra* and *meteora*, to reunite - in their own way - the cratered ground beneath their feet with the squalling envelope of the outer Earth.

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