Less War, Less Warming:

A Reparative Approach to US and UK Military Ecological Damages

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Executive Summary

Among all government institutions worldwide, the US and UK militaries bear some of the greatest responsibility for climate crisis.[1] Despite this, emissions from military sources are not addressed in international climate agreements: as a result of US lobbying, overseas military emissions were made exempt from the 1997 Kyoto Protocol and military emissions reporting remained optional in the 2015 Paris Climate Agreement.[2] Even if using opaque official data, the UK and US militaries have jointly emitted at least 430 million tonnes of CO_2 equivalent since the year of the Paris Climate Agreement — more than the total greenhouse gas emissions produced in the UK in 2022.[3] While several other militaries are also leading institutional emitters, this report focuses on the joint climate impact of the US and UK militaries for three reasons: first, their historic role in the development of the global fossil fuel economy; second, their current consumption of fossil fuels, associated greenhouse gas emissions and the environmental damage produced by their military infrastructure; third, the US and UK governments' allocation of public investment towards carbon-intensive industrial sectors to supply their militaries when they could better prioritise green industrial policy.[4]

The US and UK governments and their militaries are important architects of the modern fossil fuel economy. Throughout the twentieth century, the strategies of both militaries were intimately tied to the supply of oil. In the wake of the First World War, for instance, the British empire's division of former Ottoman regions was explicitly designed around plans for hydrocarbon pipelines.[5] As data presented in this briefing demonstrates, the legacy of the US and UK militaries as architects of the fossil economy lives on through their present consumption of fossil fuels — in 2017, the Pentagon produced more emissions than the country of Portugal.[6] Accounting

1. Neta Crawford, "Pentagon Fuel Use, Climate Change, and the Costs of War", Watson Institute Brown University, 2019, https://watson.brown.edu/costsofwar/papers/ClimateChangeandCostofWar

2. "Governments: commit to meaningful military emissions cuts at COP26", Conflict and Environment Observatory, 2021, https://ceobs.org/governments-must-commit-to-military-emissions-cuts-at-cop26

3. "2022 UK greenhouse gas emissions, provisional figures", Department of Energy Security and Net Zero, 2023, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1147372/2022_Provisional_emissions_statistics_report.pdf

4. On the climate impact of other leading militaries, see for instance: Ho-Chih Lin, Nick Buxton, Mark Akkerman, Deborah Burton and Wendela de Vries, "Climate Crossfire: how NATO's military spending targets contribute to climate breakdown", Transnational Institute, 2023, https://www.tni.org/en/publication/climate-crossfire

5. Rachel Havrelock, "Pipelines in the Sand: The Middle East After Sykes-Picot", *Foreign Affairs,* 17 May 2016, https://www.foreignaffairs.com/middle-east/pipelines-sand

6. Benjamin Neimark, Oliver Belcher and Patrick Bigger, "US military is a bigger polluter than as many as 140 countries – shrinking this war machine is a must", *The Conversation,* 24 June 2019, https://theconversation.com/us-military-is-a-bigger-polluter-than-as-many-as-140-countries-shrinking-this-war-machine-is-a-must-119269

for the social consequences of US and UK military emissions since 2015 — using even a conservative social cost of carbon calculation as detailed below — would entail an international climate finance package of approximately $111 billion to be paid to the nations most threatened by climate crisis, far above the US and UK's current contributions through established climate finance channels.[7] Beyond carbon emissions, the US and UK's overseas presence shows the various modes through which military bases, activity and infrastructure produce environmental damage and toxic waste.

The UK and US militaries further rely on an international military industry to supply equipment and services. In both the US and the UK, the military hardware industry is the beneficiary of concentrated public investment and state capacity. In the US for instance, a single year of the Department of Defense budget — much of which is channelled to private contractors — eclipses even the most optimistic estimates of a decade of public investment through the Inflation Reduction Act (IRA) and accounts for the majority of the entire federal government's discretionary spending.[8] The military-focused industrial strategies of both the US and UK have benefitted from state intervention while green sectors have suffered from a lack of support.

The costs of military related pollution and environmental damage have been most sharply realised in Global South countries facing the diffuse, but increasingly intense, effects of global heating. As an initial step to redress their militaries' historic and present contribution to ecological crisis, the US and UK should contribute alongside other leading emitters to independently-governed funds to compensate Global South countries facing both climate crisis and a dearth of climate finance contributions from the North. Reducing the US and UK's global footprint of nearly 900 military bases and introducing a military superfund, similar to that administered by the US Environmental Protection Agency, to pay for environmental remediation for communities affected by hazardous materials, pollution and waste from military bases and infrastructure are also necessary steps to redress the full spectrum of environmental impacts. Domestic policy must also facilitate the development of a new industrial base focused on green manufacturing instead of military production, through state-led conversion plans and social programmes for workers currently in the arms sector and those reliant on its supply chains. These are essential measures to account for the history and present of US and UK military emissions although they only represent initial steps in providing a degree of compensation for their climate impact.

7. R. Daniel Bressler, "The mortality cost of carbon", *Nature Communications*, 2021, 12, pp.1-12.

8. See "Department of Defense Releases the President's Fiscal Year 2024 Defense Budget", Department of Defense, 2023, https://www.defense.gov/News/Releases/Release/Article/3326875/department-of-defense-releases-the-presidents-fiscal-year-2024-defense-budget and "US Inflation Reduction Act: A catalyst for climate action", Credit Suisse, 2022, https://www.credit-suisse.com/about-us-news/en/articles/news-and-expertise/us-inflation-reduction-act-a-catalyst-for-climate-action-202211.html

Policy Recommendations

1 Not Just Less Pollution — Less Military

Since 2001, the US Department of Defense (DOD) has consistently accounted for between 77 and 80 per cent of the US government's total energy consumption while the UK Ministry of Defence (MOD) accounts for at least 40 per cent of British public sector emissions.[9] Scaling back military operations and hardware acquisition is essential to emissions mitigation.

2 Close Bases

There must be a reduction in the US and UK military's sprawling infrastructural footprint. Base closure processes should include environmental assessments and financing for environmental remediation.

3 Pay Countries for Past and Present Pollution

The US and UK should make international climate finance contributions as a first step to compensate for the locked-in impacts of the direct greenhouse gas emissions associated with military activity.[10] The minimum social cost of carbon attributable to the US and UK military's direct emissions since the year of the Paris Agreement alone is $111 billion — $106 billion of this is attributable to US emissions and $5 billion to UK emissions.[11]

4 Create a Global Military Superfund

Invest in remediation undertaken by local communities and local governments across the world through direct payments, technology transfer and job training at sites contaminated by US and UK military bases and operations in all territories both international and domestic.

9. On US government energy consumption see Crawford, "Pentagon Fuel Use, Climate Change, and the Costs of War", Watson Institute Brown University, https://watson.brown.edu/costsofwar/files/cow/imce/papers. For an illustration of the MOD's share of UK public sector emissions see Figure 1.

10. The risk to the environment posed by armed conflicts has started to be recognised in international agreements, see "Protection of the environment in relation to armed conflicts", United Nations General Assembly, 2022, https://documents-dds-ny.un.org/doc/UNDOC/LTD/G22/348/04/PDF/G2234804.pdf?OpenElement

11. The US DOD has acknowledged liabilities from environmental contamination worth $90.6 billion. See "United States Department of Defense Agency Financial Report", 2022, Department of Defense, https://comptroller.defense.gov/Portals/45/Documents/afr/fy2022/DoD_FY22_Agency_Financial_Report.pdf

5 Collate and Publish Transparent Point and Non-Point Source Pollution Data

There must be robust quantification of present and historic US and UK military contributions to climate change. Both the UK and US governments should undertake a comprehensive audit of the environmental damage produced by military bases starting with the highest risk sites and places.

6 Invest in a Just Transition for Arms Workers

Repurposing industrial capacity within the arms sector offers a dual opportunity: to reduce military industrial emissions while expanding the capacity of green manufacturing. Public ownership and coordination can build on a long history of conversion and diversification projects to ensure that conversion delivers security for workers as rapid decarbonisation occurs.

7 Provide Alternative Employment for Military Personnel

The US and UK governments should invest in employment programmes to account for the reduction of military spending, bases and jobs worldwide.

Introduction: Reparations for the Environmental Impacts of US and UK Military Operations

As climate crisis intensifies, there are growing calls to hold the institutions responsible for global emissions financially accountable for the damage wrought by stronger storms, deeper droughts, and rising tides.[12] These proposals and aligned legal actions have mostly focused on corporate fossil fuel producers like Shell and Exxon and less attention has been paid to the largest consumers of hydrocarbons. The largest institutional consumers are often national governments in the Global North, and within governments, militaries are often the primary sources of emissions. Military

12. See Nina Lakhani, "Rich countries with high greenhouse gas emissions could pay $170tn in climate reparations", *The Guardian*, 5 June 2023, https://www.theguardian.com/environment/2023/jun/05/climate-change-carbon-budget-emissions-payment-usa-uk-germany and Olúfẹ́mi O. Táíwò, *Reconsidering Reparations*. Oxford University Press: 2022 and Harpeet Kaur Paul, "Towards Reparative Climate Justice: from Crises to Liberations", Common Wealth, 2021, https://www.common-wealth.org/publications/towards-reparative-climate-justice-from-crises-to-liberations

emissions constitute around 5.5 per cent of global greenhouse gas emissions—civilian aviation, in comparison, accounts for about two per cent — despite the fact that governments have known for decades about the consequences of large-scale fossil fuel consumption even with incomplete data.[13] The fact that militaries are relatively centrally organised and provisioned allows us to better understand the impacts of their climate pollution, along with acute forms of environmental damage like toxic discharges at military bases. Given the outsized contributions that militaries have played in global heating — through direct emissions and their historical role in the creation and maintenance of a global fossil fuel economy — reining in their emissions is an urgent component of decarbonisation, while compensating for past emissions is unavoidable to ensure vulnerable communities have the resources necessary to adapt to a world transformed by climate crisis.

The contributions of the US and UK militaries to climate crisis stretch far beyond their present consumption of fossil fuels. Even if unproven options to decarbonise military technology — such as sustainable aviation fuels for fighter jets — become viable, military activity leads to different forms of environmental damage including deforestation, chemical leaks from military bases and land dispossession.[14] Neither are military emissions and other environmental impacts the result of exceptional conflict: between 2001 and 2018, only a third of US military emissions were related to its major zones of operation.[15] Maintaining military activity even beyond conflict zones has environmental consequences — accounting for environmental damage necessitates more than the preservation of military capacity using unproven alternative energy sources and instead a reduction in size of the US and UK militaries.

Environmental damage connected to the US and UK militaries has deep roots. As detailed in Section Two of this report, over the last two centuries, both militaries have played a foundational role in the development of a global fossil fuel economy, through their massive historical consumption and their strategic expansion and protection of networks of fossil fuel extraction and distribution. In Section Three we present data on the extent of present fossil fuel consumption by both militaries, and we use social cost of carbon (SCC) estimates to provide an approximate calculation of the minimum climate finance contributions both countries should make to compensate for their militaries' role in climate crisis. As explored in Section Four, the US and UK militaries and associated industries have benefitted from the concentrated allocation of public investment far beyond either climate or international climate finance commitments. The focus of US and UK industrial policy on the carbon-intensive military sector lies

13. Mark Akkerman, Deborah Burton, Nick Buxton, Ho-Chih Lin, Muhammed Al-Kashef, Wendela de Vries, "Climate Collateral: How Military Spending Accelerates Climate Breakdown", Transnational Institute, 2022, https://www.tni.org/en/publication/climate-collateral

14. Peter Harris, "Militarism in Environmental Disguise: The Greenwashing of an Overseas Military Base", *International Political Sociology,* 2015, 9, pp.19-36.

15. Crawford, "Pentagon Fuel Use, Climate Change, and the Costs of War", Watson Institute Brown University, https://watson.brown.edu/costsofwar/files/cow/imce/papers

in contrast to underinvestment in green industries — reversing this misaligned focus would present the dual benefit of both emissions mitigation and the development of green manufacturing sectors. Overall, this report makes clear that policy interventions at three levels are necessary to account for the present and historical environmental impacts of the US and UK militaries: first, scaling back military operations, including their networks of military bases; second, making material remediation and reparations payments to communities affected by emissions and toxic waste; third, undertaking public investment in strategic arms conversion programmes to develop a new industrial policy with secure employment for those currently dependent on the military.

Securing the Fossil Fuel Economy: A Historical Perspective

Over the last two hundred years, the US and UK armed forces have been foundational institutions in the creation, expansion and protection of the global fossil fuel economy that has produced climate crisis. In the nineteenth century, the US and UK were early adopters of coal-powered warships. Following the transition of military infrastructure and much of the wider economy to oil in the early twentieth century, the US and the UK made the security of oil supplies a critical military priority.

During the process of British imperial expansion in the nineteenth century, coal-powered steamships helped broaden the empire's overseas territories and its network of resource extraction, gaining access to commodities like cotton and fossil fuels that powered carbon intensive domestic industries such as textiles, iron and steel.[16] This domestic industrial production was itself enabled by flows of finance that depended on military power and a global network of military bases and infrastructure.[17]

The US developed as a global imperial power at the turn of the twentieth century having locked in the use of fossil fuels on a similar timeline to Britain. The US Navy adopted coal-powered vessels in the first half of the nineteenth century and its military reliance on coal grew roughly in line with the wider industrial economy.[18] At the turn of the twentieth century, Theodore Roosevelt launched the "Great White Fleet" — a show of American power that sent a dozen coal-fired battleships on a world tour — although the naval transition from coal to oil, pioneered by the British, would take place

16. Andreas Malm, *Fossil Capital: the Rise of Steam-Power and the Roots of Global Warming*, Verso: 2016.

17. On the British Navy's use of coal, see Steven Gray, *Black diamonds: coal, the Royal Navy, and British imperial coaling stations, circa 1870–1914*, University of Warwick PhD Thesis: 2014. On the interconnection between the earlier industrial revolution, British imperialism and the transatlantic slave trade see J.E. Inikori, *Africans and the Industrial Revolution in England: A Study in International Trade and Economic Development,* Cambridge University Press: 2002.

18. Neta Crawford, *The Pentagon, Climate Change, and War: Charting the Rise and Fall of U.S. Military Emissions*, MIT Press: 2022.

soon after, provoking imperial powers to prioritise their efforts to secure greater oil supplies.[19] Ever since, oil has played a central role in US foreign and military policy and the US has used an expanding patchwork of bases and refuelling stations to backstop widening economic and political objectives across the world.

Meanwhile, in the early twentieth century the British empire helped to lay the foundations for a global economy that was deeply dependent on oil. As Britain carved up the former Ottoman Empire with France, it secured its supply of fossil fuels in oil fields across Mesopotamia.[20] The colonisation of the region, dividing land with arbitrary borders and state repression, was based on gaining and maintaining access to oil. In Palestine for instance, the British targeted control of the port of Haifa which they saw as a critical potential oil terminal.[21] The US also sought to gain control of oil supplies, forcing the British and French to renegotiate their original agreement to enable Standard Oil to secure its interests in Mesopotamia.[22] This strategy set the stage for military expansion in the Middle East and elsewhere almost a century later — most harmfully in Iraq and Afghanistan.[23]

In the latter half of the twentieth century, policymakers in London and Washington worried that oil — the energetic cornerstone of both militaries and, by that point, the global economy — would become scarce and that supplies could plateau or even decline.[24] Oil fields in Asia, Latin America and Africa were slipping out of the control of Anglo-American corporations as post-colonial governments exerted more influence over the social, economic and political conditions of oil extraction, in some cases nationalising its production.[25] Imperial concerns intensified over consecutive decades as the US and UK lost their undisputed grip over oil supplies with the British retreat from the Suez Canal, 1970s oil embargos, the Iranian Revolution and the Soviet invasion of Afghanistan, as well as Iraq's growing interest in the region's oil under the government of Saddam Hussein.[26] As Neta Crawford suggests, the US became the self-appointed protector of Persian Gulf oil as a result of:

> *the threats that it assumed were latent in the region: domestic instability and potential revolution that could put in place regimes hostile to the United States and the West; aggression by local powers in the region and*

19. On the role of the British navy in the transition to oil fuel and the foreign policy implications of the transition, see Warwick Michael Brown, *The Royal Navy's fuel supplies 1898-1939: the transition from coal to oil*, King's College London PhD Thesis: 2003.
20. Timothy Mitchell. *Carbon Democracy: Political Power in the Age of Oil*, Verso: 2013.
21. Ibid.
22. Ibid.
23. Ibid.
24. Giuliano Garavini, *The Rise and Fall of OPEC in the Twentieth Century*, Oxford University Press: 2019.
25. Ibid.
26. Crawford, *The Pentagon, Climate Change, and War.*

external military intervention that could lead to a hostile power controlling a large share of the regions' oil reserves; and external political and economic influence by governments that were hostile to the United States.[27]

Wars to secure oil in the Persian Gulf became their own sources of emissions. During the first Gulf War, in which the US was supported by the UK, the oil fields set ablaze by Iraqi forces responding to the war accounted for two per cent of global emissions in 1991.[28] When the US and UK returned to invade Iraq a decade later, the emissions from operations between 2003 and 2008 alone were estimated at 141 million tonnes of CO_2 equivalent — almost certainly an underestimate. Even at face value these emissions are equal to the electricity usage of 27 million US households in one year.[29]

As the scope and size of joint and individual military operations grew so did their environmental footprint, from the Second World War to Vietnam to the War on Terror. In 1944, the average US soldier accounted for the consumption of one gallon of oil a day; by the second invasion of Iraq, that number had grown to 22 gallons.[30] While recent US interventions have worsened the Pentagon's contribution to climate change, two thirds of military greenhouse gas emissions since 2001 have not been directly related to warfighting; militaries are significant emitters even in the absence of active operations.[31]

Emissions are further locked in by the geographical scope of the US and UK militaries that operate through a global network of bases — the US now has more than triple the number of overseas bases as it does diplomatic missions, all of which require fossil fuels and consumables for operations and generate waste and pollution.[32] On a smaller scale, the UK has also established an extensive network of 145 military sites in 42 countries.[33] Beyond the more diffuse climate impacts of the fuel consumption required to maintain them, military bases and their supporting infrastructure often have negative social and political impacts on host communities — as well as long

27. Crawford, *The Pentagon, Climate Change, and War*, p.67.

28. Peter V. Hobbs and Lawrence F. Radke, "Airborne Studies of the Smoke from the Kuwait Oil Fires", *Science,* 1992, 256, pp.987-991.

29. Elizabeth Bast, "A Climate of War: The war in Iraq and global warming", Oil Change International, 2008, https://priceofoil.org/2008/03/01/a-climate-of-war

30. "US Army Facts ...", US Army, 20 October, 2021, https://www.army.mil/article/66277/us_army_facts

31. Crawford, "Pentagon Fuel Use, Climate Change, and the Costs of War", Watson Institute Brown University, https://watson.brown.edu/costsofwar/files/cow/imce/papers

32. David Vine, Patterson Deppen and Leah Bolger, "Drawdown: Improving U.S. and Global Security Through Military Base Closures Abroad", Quincy Institute for Responsible Statecraft, 2021, https://quincyinst.org/report/drawdown-improving-u-s-and-global-security-through-military-base-closures-abroad

33. Phil Miller, "Revealed: The UK military's overseas base network involves 145 sites in 42 countries," *Declassified*, 24 November 2020, https://declassifieduk.org/revealed-the-uk-militarys-overseas-base-network-involves-145-sites-in-42-countries

term environmental risks associated with the use of munitions and hazardous materials, generation of waste and contaminated land.[34] The localised environmental contamination produced by military bases compounds the climate impacts of the fuel needed to transport troops and material**.** The current lack of consideration of long-lasting risks associated with military bases was clear when the UK government moved asylum seekers to RAF base Wethersfield in north Essex where environmental damage includes undetonated explosives, ground contamination and asbestos.[35]

Meanwhile, communities around the world have exposed the dangerous impacts of US and UK bases in their backyard — movements in Okinawa, for instance, have long fought to end US military presence that has seriously harmed public safety and is compounded by "forever chemical" pollution in nearby rivers.[36] Whether it is through infrastructure damage, toxic waste or the degradation of air, soil and water, armed forces contribute more than just emissions to ecological crisis.[37]

Ultimately, the most important action the US and UK militaries can take to account for their environmental impacts is to reduce their size and scope; given the carbon intensity of day-to-day military operations and the lack of viable decarbonisation pathways for military technology, this would mean the reduction of military activity across the board, rather than unproven "green" fuel projects.[38] While this reduction of military operations will be critical to prevent the intensification of climate crisis, it is not sufficient to account for harms that are already locked in by historical emissions. Neither would scaling back military operations alone account for acute environmental damage as a result of the operations of military outposts or the use of nuclear test sites.[39] To begin to reckon with this history, the governments of the US and UK must take reparative action through environmental remediation and international climate finance while also

34. David Bond, "The US military is poisoning communities across the US with toxic chemicals", *The Guardian,* 25 March 2021, https://www.theguardian.com/commentisfree/2021/mar/25/us-military-toxic-chemicals-us-states

35. Lizzie Dearden, "Asylum seekers moved to RAF base despite Home Office court battle over site", *The Independent*, 12 July 2023. https://www.independent.co.uk/news/uk/home-news/migrants-military-bases-wethersfield-court-b2373877.html

36. See Catherine Cruz, "Drawing parallels between contaminated water near military bases on Okinawa and O'ahu", 24 February 2023, *Hawai'i Public Radio*, https://www.hawaiipublicradio.org/the-conversation/2023-02-24/contaminated-water-near-military-bases-okinawa-red-hill-film and Tomomi Tomita, "Okinawan women's civic group chronicles sex crimes by U.S. military", 18 March 2021, *the japan times,* https://www.japantimes.co.jp/news/2021/03/18/national/social-issues/okinawa-women-military-violence

37. Linsey Cottrell, "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

38. Akkerman, Burton, Buxton, Lin, Al-Kashef, de Vries, "Climate Collateral: How Military Spending Accelerates Climate Breakdown", Transnational Institute, https://www.tni.org/en/publication/climate-collateral

39. Lesley M.M. Blume, "U.S. nuclear testing's devastating legacy lingers, 30 years after moratorium", *National Geographic*, 22 September 2022, https://www.nationalgeographic.com/history/article/us-nuclear-testings-devastating-legacy-lingers-30-years-later

funding robust just transition programs for workers and communities that depend on military budgets. Reparative actions must also be undertaken domestically in places from Vieques, Puerto Rico — which has been polluted by long-running military operations — to Navajo land in the US Southwest that is still poisoned by uranium mining and resource extraction in the pursuit of military objectives.[40]

The Present Scope of Emissions

The US and UK militaries are among the most consequential institutional polluters in world history. However, the two institutions are not currently equal contributors to climate crisis. At present, UK military emissions are at a lower order of magnitude to the US as a result of the gulf in scale of their respective militaries. Nonetheless, UK emissions provide a useful case study as greater data is available on the climate impacts of the UK's wider military industry than the US, as explored below. Accounting for the full scale of military activity, from arms production to military bases, reiterates the need for new policy frameworks to reduce military operations, provide financial resources for those harmed by climate disaster and acute environmental contamination and to ensure a just transition for arms workers. Without a mandate to decarbonise, the US and UK militaries will continue to be among the most concentrated sources of pollution in the world. In this section we outline the extent of US and UK military emissions and apply a social cost of carbon to each country's military emissions, allowing us to propose minimal estimates for international climate finance proportional to their emissions burden.

US Military Emissions

The US military is the largest institutional source of greenhouse gas emissions in the world.[41] If the US military were a country it would be the 47th largest emitter, sitting between Peru and Portugal.[42] The US military is also responsible for myriad environmental and public health harms globally, through its large network of bases,

40. See Valeria Pelet, "Puerto Rico's Invisible Health Crisis", *The Atlantic*, 3 September 2016, https://www.theatlantic.com/politics/archive/2016/09/vieques-invisible-health-crisis/498428; Laurel Morales, "For The Navajo Nation, Uranium Mining's Deadly Legacy Lingers", *NPR*, 10 April 2016, https://www.npr.org/sections/health-shots/2016/04/10/473547227/for-the-navajo-nation-uranium-minings-deadly-legacy-lingers

41. Crawford, "Pentagon Fuel Use, Climate Change, and the Costs of War", Watson Institute Brown University, https://watson.brown.edu/costsofwar/files/cow/imce/papers

42. Neimark, Belcher and Bigger, "US military is a bigger polluter than as many as 140 countries – shrinking this war machine is a must", *The Conversation,* https://theconversation.com/us-military-is-a-bigger-polluter-than-as-many-as-140-countries-shrinking-this-war-machine-is-a-must-119269

the distribution and use of toxic weapons and ammunition, and support of fossil fuel infrastructure.

Data on US Department of Defense (DOD) emissions is opaque and the true scope of emissions are likely much higher than official data suggests. There is no publicly accessible and consistently-updated record of all DOD emissions — the department exclusively reports the amount of fuel purchased to Congress, rather than fuel consumed. The only regularly-available data is from annual datasets of government department emissions published by the Department of Energy.[43] These datasets include emissions for which the DOD is directly responsible or which result from the energy consumption of DOD activities (Scope 1 and 2), but notably do not include emissions resulting from assets owned or controlled by organisations other than the DOD as a result of DOD activities (Scope 3).[44] Scope 3 emissions might include, for example, commuting by DOD employees, the waste generated in DOD operations or emissions produced by the military industries that supply the DOD.[45] Though these are harder to measure, their omission from the available data means that reported emissions figures are likely a significant underestimate.

In addition, it is impossible to discern some of the more complex global warming impacts of carbon-intensive military activities from the available data. For example, 70 per cent of the DOD's energy consumption is classified as "operational energy" — required for "training, moving and sustaining military forces and weapons platforms" — and most of it is taken up by the jet fuel required to power aircraft around the world.[46] Crucially, military aircraft can travel at extremely high altitudes, and jet fuel combustion has uniquely climate-harming properties which are not accounted for in government data.[47]

Carbon emissions are just one of a range of serious environmental harms that result at different levels of military activity. Across the US military's 585,000 facilities and 750 bases worldwide, military land appropriation, warmaking and the supply chain processes and raw materials needed to facilitate it lead to air pollution, ecosystem destruction, biodiversity loss and adverse health impacts.[48] Environmental damage

43. Crawford, "Pentagon Fuel Use, Climate Change, and the Costs of War", Watson Institute Brown University, https://watson.brown.edu/costsofwar/files/cow/imce/papers

44. "Implementing Instructions for Executive Order 14057 Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability", White House Council on Environmental Quality, 2022, https://www.sustainability.gov/pdfs/EO_14057_Implementing_Instructions.pdf

45. "Scope 3 Inventory Guidance," Environmental Protection Agency, 2023, https://www.epa.gov/climateleadership/scope-3-inventory-guidance

46. Department of Defense, "Operational Energy", 2023, https://www.acq.osd.mil/eie/eer/oe/index.html quoted in Crawford, "Pentagon Fuel Use, Climate Change, and the Costs of War", Watson Institute Brown University, https://watson.brown.edu/costsofwar/files/cow/imce/papers, p.8.

47. Ibid.

48. Vine, Deppen and Bolger, "Drawdown: Improving U.S. and Global Security Through Military Base Closures Abroad", Quincy Institute for Responsible Statecraft, 2021, https://quincyinst.org/report/drawdown-improving-u-s-and-global-security-through-military-base-closures-abroad

is thus a defining activity of the US military. Even if the military was run purely on renewables, its core activities which include the appropriation of land to build bases and the destruction of habitats, trees and buildings would still have a significant environmental footprint.

The federal government pours tremendous amounts of money into the DOD to finance these activities. As explored in detail in Section Four, military spending in the US operates at a different order of magnitude to investment in green industries. Since the 2015 Paris Agreement, defence spending has increased year on year, from $634 billion in 2016 to $877 billion in 2022 — consistently between 3.3 per cent and 3.7 per cent of national GDP.[49] The prioritisation of military spending lies in stark contrast to the underallocation of public investment and state capacity to the climate action necessary to enable a just transition at home and abroad. As military spending has continued to climb (despite the US ostensibly being at peace), international climate finance commitments by successive Presidents have been adjusted downward and reneged on.[50] A reparative approach would instead prioritise compensating Global South nations for emissions and acute environmental harms caused by military operations and infrastructure, investment in a just transition, and the provision of robust support for workers that move out of military dependent sectors.

UK Military Emissions

Although at a lower order of magnitude to its senior ally, the UK military is still a significant source of emissions. The Ministry of Defence (MOD) — at least in its conservative official estimate which excludes most Scope 3 emissions — produced 3.13 million tonnes of greenhouse gas emissions in 2022-23, roughly the equivalent of the use of 700,000 cars over a year.[51] In 2022, officially reported emissions from the MOD were greater than those of the Democratic Republic of Congo — a nation of more than 95 million people.[52]

The defence burden alone accounts for nearly half of the UK government's emissions.[53] Even with clear gaps in reporting, the scale of the MOD's emissions is out

49. "SIPRI Military Expenditure Database", Stockholm International Peace Research Institute, 2023, https://milex.sipri.org/sipri. Data is using current US $ values.

50. Joe Thwaites, Jake Schmidt and Brendan Guy, "US International Climate Finance Fails Again to Meet Moment", *NRDC*, 21 December 2022, https://www.nrdc.org/bio/joe-thwaites/us-international-climate-finance-fails-again-meet-moment

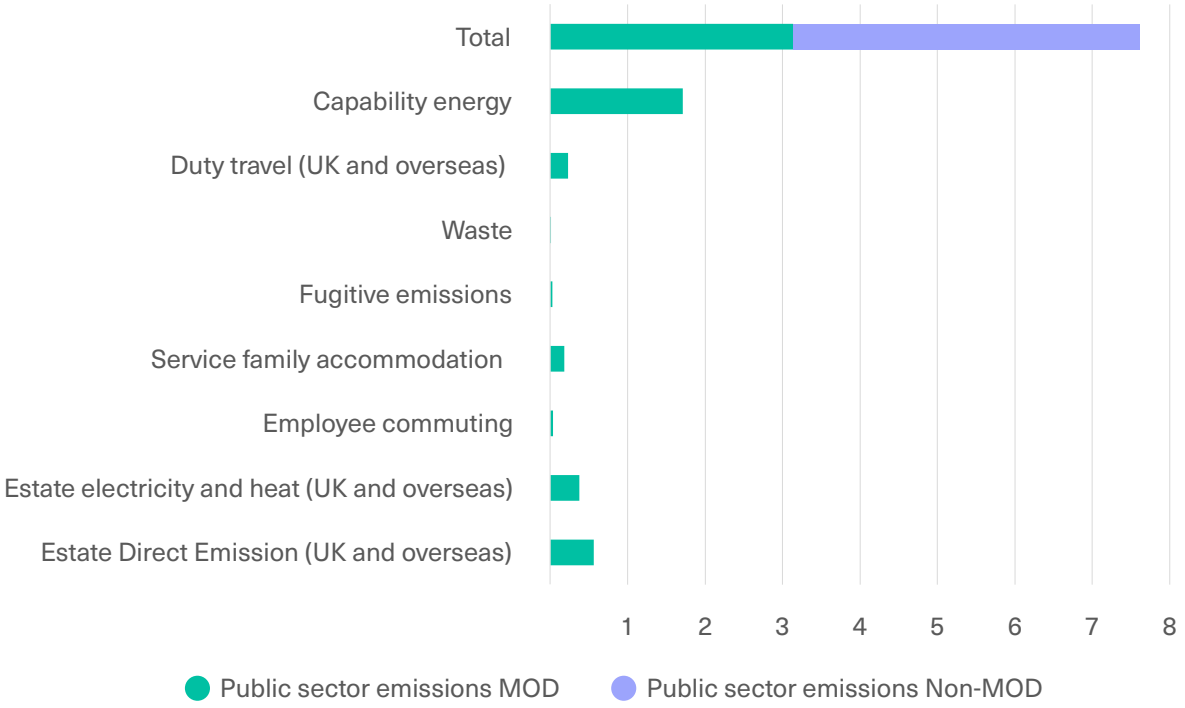
51. "Greenhouse Gas Equivalencies Calculator," Environmental Protection Agency, 2022. https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

52. Monica Crippa et al., "CO_2 emissions of all world countries," Publications Office of the European Union, 2022, https://edgar.jrc.ec.europa.eu/booklet/CO2_emissions_of_all_world_countries_2022_report.pdf

53. "Climate Change and Sustainability Strategic Approach", Ministry of Defence, 2021, https://www.gov.uk/government/publications/ministry-of-defence-climate-change-and-sustainability-strategic-approach

of line with government commitments to achieve net zero emissions by 2050.[54] The MOD splits its emissions sources into two broad categories: estates such as bases and civilian buildings, and capability such as aircraft, land vehicles and water vessels. In 2022-23, UK military aviation alone accounted for one million tonnes of emissions, roughly equivalent to the consumption of 112 million gallons of petrol.[55] There is little prospect of decarbonisation for aviation fuel, given the long lifespans of military systems and the technological limitations of alternative fuel sources.[56] Given the low viability of alternative technology, especially in high emissions areas such as aviation, scaling back military operations is the only plausible means of mitigating climate crisis.

Figure 1 Reported MOD emissions accounted for more than 40 per cent of public sector emissions in 2022-2023 (GHG emissions, $mTCO_2e$)



Source: Ministry of Defence

The MOD has reported emissions from sources it owns (Scope 1) and from sources it does not own (Scope 2) since 2009, but it only began reporting a limited set of its Scope 3 emissions in 2022. The latter account for supply chains and other

54. Fiona Harvey and Jillian Ambrose, "Net zero strategy shows UK will miss 2030 emissions cuts target," *The Guardian,* 30 March, 2023, https://www.theguardian.com/environment/2023/mar/30/net-zero-strategy-shows-uk-will-miss-2030-emissions-cuts-target

55. "Greenhouse Gas Equivalencies Calculator", Environmental Protection Agency, 2022, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

56. Akkerman, Burton, Buxton, Lin, Al-Kashef and de Vries, "Climate Collateral: How Military Spending Accelerates Climate Breakdown", Transnational Institute, https://www.tni.org/en/publication/climate-collateral. For more detail on alternative aviation fuels, see Finlay Asher, "The mirage of zero-emissions flying", *Responsible Science*, 29 April 2022, https://www.sgr.org.uk/resources/mirage-zero-emissions-flying

offsite activities like the transportation of fuels — all of which are some of the most significant emissions sources associated with military activity.[57] Opaque public data therefore makes a full accounting of MOD emissions extremely difficult, obscuring the contribution of institutional emissions to climate crisis. For example, in 2020, Scientists for Global Responsibility estimated the total annual emissions of the MOD and its connected military industrial sector, including UK-based arms suppliers, UK-based arms exporters and related indirect employment at 6.5 million tonnes of CO_2, double its estimate of MOD emissions alone. Accounting for the overall emissions of the sector, the UK military and associated industry is a more significant polluter than 60 countries. If using a consumption-based approach to accounting for emissions — which includes the full range of activities in the life cycle of goods from raw material extraction to manufacture, use and disposal — UK military spending produced 11 million tonnes of CO_2 equivalent in 2018, equivalent to nearly a third of all emissions from the UK's aviation sector that year.[58] The difference between the full extent of UK military emissions (including the military industry and effects of spending) and the available government figures illustrates the effect that better data could have on capturing the scope of US military emissions.

Military operations themselves are associated with long lasting environmental impacts; as a result of the geography of the UK's recent conflicts, this legacy of environmental damage is concentrated in the Global South.[59] Even a comparatively short war like the Falklands/Malvinas conflict 40 years ago had a significant impact on local ecology, for instance damaging the growth of the King Penguin population, while the UK only began the clearance of mines from the war in 2009.[60] The global spread of UK operations demands an accounting of documented local environmental risks to inform any strategy of remediation and reparations.

Conducting military operations also carries considerable expense to the public finances. The UK military spends at least £336 million each year on energy while climate

57. Linsey Cottrell, "The military's contribution to climate change," Conflict and Environment Observatory, 2021, https://ceobs.org/the-militarys-contribution-to-climate-change

58. Stuart Parkinson, "The environmental impacts of the UK military sector," Scientists for Global Responsibility and Declassified UK, 2020, https://www.sgr.org.uk/sites/default/files/2020-05/SGR-DUK_UK_Military_Env_Impacts.pdf. For comparison see "The Sixth Carbon Budget: Aviation", Climate Change Committee, 2020, https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Aviation.pdf

59. Swapna Pathak, "Ecological footprints of war: an exploratory assessment of the long-term impact of violent conflicts on national biocapacity from 1962–2009", *Journal of Environmental Studies and Sciences*, 2020, 10, pp.380-393.

60. Sophie Panel and Antoine Pietri, "God did not save the kings: Environmental consequences of the 1982 Falklands War" *Ecological Economics*, 2022, 201, pp.1-69. On mines and cluster munitions, see "United Kingdom", *Landmine and Cluster Munition Monitor*, 4 February 2021, http://www.the-monitor.org/en-gb/reports/2021/united-kingdom/impact.aspx

transition financing remains sparse relative to needs.[61] The UK has paid BAE Systems far more through defence contracts since 2012 than it committed in international climate financing over that period.[62] From 2021 to 2026, the UK has committed £11.6 billion in climate transition financing — up from 2016-21 (£5.8 billion) and 2011-16 (£3.8 billion) — but this is not close to the amount needed to address climate crisis.[63] For the UK to account for its historic emissions burden, Climate Fair Shares estimates the UK owes at least £1 trillion to poorer countries.[64]

The clearest way to compensate countries threatened by climate crisis is to pay them for past pollution. The unique role the UK played in creating a fossil fuel economy and the vast emissions produced by its armed forces demand specific climate finance contributions to account for an ongoing history of military pollution and climate insecurity.

The Social Costs of Carbon

US and UK military emissions have resulted in social costs that, when apportioned an approximate and imperfect monetary value, reflect the minimum scale of climate reparations owed to Global South countries as a result of military activity. The social cost of carbon (SCC) is a monetary measure of the damage of emitting one additional tonne of carbon emissions — or conversely the damage avoided by reducing emissions.[65] While it is vital that the UK and US militaries pay their share, it is also insufficient to only evaluate the recent emissions from both militaries — which have both polluted and facilitated the expansion of fossil fuel extraction over the last two centuries. Calculating the SCC does, however, begin to offer a framework for redress. SCC estimates offer a conservative approximation of a relief and repair package for each military's contemporary operations. These figures can illustrate the minimum owed by the UK and US militaries to countries threatened by climate crisis, with

61. "Ministry of Defence Annual Report and Accounts 2022–23, Annex D", Ministry of Defence, 2023, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1172507 /MoD_Annual_Report_and_Accounts_2022-23.pdf

62. Since 2012, the MOD has paid BAE Systems at least £3 billion each year through defence contracts. See "MOD trade, industry and contracts: index", Ministry of Defence, 2023, https://www.gov.uk/government/collections/defence-trade-and-industry-index. Between April 2011 and March 2016, the UK government committed a total of £3.8 billion in International Climate Finance while between April 2016 and March 2021 it committed £5.8 billion, see "2021 UK Climate Finance Results", Foreign, Commonwealth and Development Office, 2021, https://www.gov.uk/government/publications/uk-climate-finance-results-2021/2021-uk-climate-finance-results

63. "2021 UK Climate Finance Results", Foreign, Commonwealth and Development Office, https://www.gov.uk/government/publications/uk-climate-finance-results-2021/2021-uk-climate-finance-results

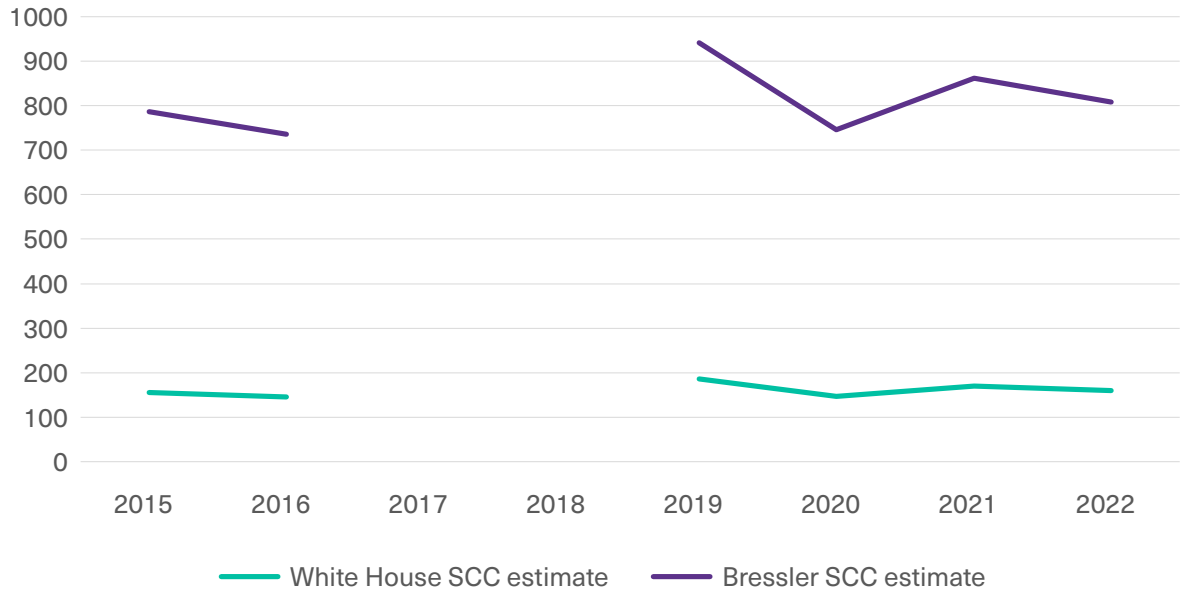
64. "The UK's Climate Fair Share Infographic", War on Want, 2020, https://waronwant.org/resources/uks-climate-fair-share-infographic

65. "The Social Cost of Carbon", Environmental Protection Agency, 2023, https://19january2017snapshot.epa.gov/climatechange/social-cost-carbon.html

remaining cost savings from paring back military operations earmarked for domestic just transition programs.

There are several proposed SCC measures that could be used to calculate the scale of a reparations package.[66] White House SCC estimates of $51 per ton of CO_2 equivalent are low compared to other measures, including a 2022 Environment Protection Agency proposal to raise the cost to $190.[67] Even with incomplete emissions reporting standards and a low SCC estimate, the reparations owed by the US and UK for their military activity would run into the billions per year, as illustrated by figures 2 and 3 below.[68] Given the flawed nature of existing SCC figures, it is prudent to use the upper estimate of the SCC for military emissions; the UK and US militaries would therefore owe a minimum of $14 billion ($862 million paid by the UK, $13 billion paid by the US) to account for a single year of operations in 2021.[69]

Figure 2 UK military emissions led to nearly $900 million in social costs in 2021 (SCC, $mn)



Source: Ministry of Defence.[70]

66. See for instance Bressler, "The mortality cost of carbon", *Nature Communications*; "Valuing climate damages: updating estimation of the social cost of carbon dioxide", National Academies of Sciences, Engineering, and Medicine, 2017, https://nap.nationalacademies.org/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of; Kevin Rennert et al, "Comprehensive evidence implies a higher social cost of CO_2", *Nature,* 2022, 610, pp.687-692 and Tamma Carleton and Michael Greenstone, "Updating the United States Government's Social Cost of Carbon", Becker Friedman Institute for Economics University of Chicago, 2021, https://bfi.uchicago.edu/working-paper/2021-04

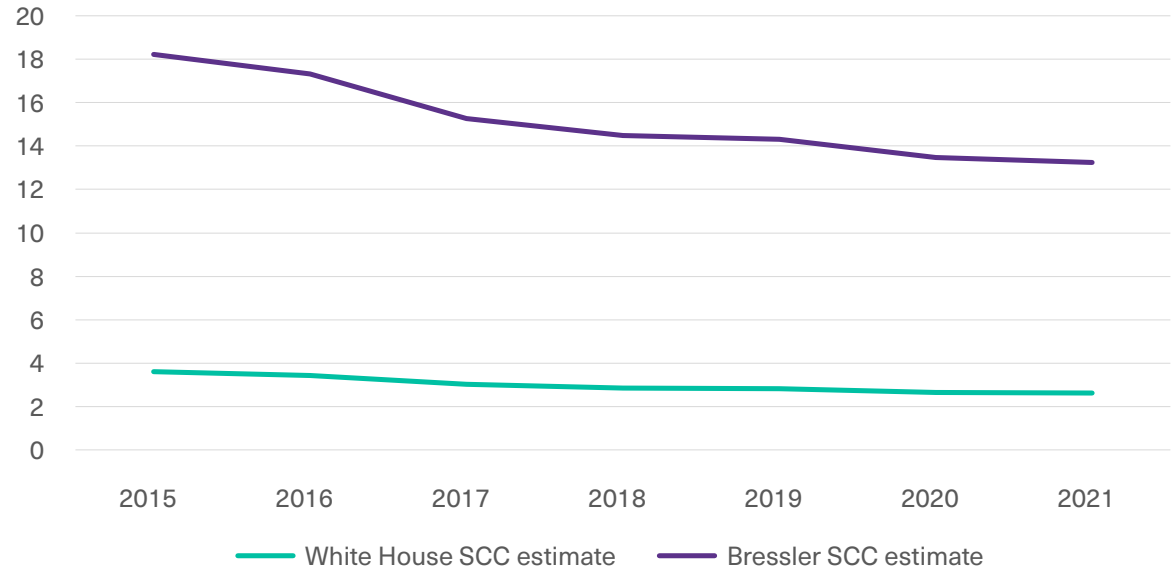
67. Elijah Asdourian and David Wessel, "What is the social cost of carbon?", Brookings Institution, 2023, https://www.brookings.edu/articles/what-is-the-social-cost-of-carbon

68. On the exclusions in White House social cost of carbon estimates see Rennert et al, "Comprehensive evidence implies a higher social cost of CO_2", *Nature.*

69. This is based on the limited data provided by the Ministry of Defence (UK) and Department of Energy (US), using the social cost of carbon calculated in Bressler, "The mortality cost of carbon", *Nature Communications.*

70. Official UK MOD gross emissions estimates for 2017 and 2018 are unavailable. See "MOD annual reports and accounts: index", Ministry of Defence, 2023, https://www.gov.uk/government/collections/mod-annual-reports

Figure 3 US Department of Defence emissions led to more than $13 billion in social costs in 2021 (SCC, $bn)



Source: US Department of Energy. [71]

Climate reparations in line with these SCC estimates are far smaller than the existing shortfall in international climate financing commitments from Global North countries. Wealthy countries have failed to meet their commitment from the 2009 Copenhagen Accords to mobilise $100 billion a year. Oxfam's 2023 climate finance shadow report estimates that the real value of the $83.3 billion rich nations claimed to have paid through international climate finance in 2020 was $21-$24.5 billion.[72] Even a reparations package at this scale remains a fraction of the Pentagon's $842 billion and the MOD's £51.7 billion budgets.[73] An annual $11 billion military reparations package for ten years would be roughly equivalent to the possible return on further investment in the Internal Revenue Service that the White House traded away during recent debt negotiations.[74] However, this money should not be drawn from other sources — it should be a down payment on dialling back military expenditure.

To offer minimal compensation for cumulative military emissions since the year of the Paris Agreement, the UK-US reparations package would require $111 billion

71. "Comprehensive Annual Energy Data and Sustainability Performance," United States Department of Energy, 2022, https://ctsedwweb.ee.doe.gov/Annual/Default.aspx

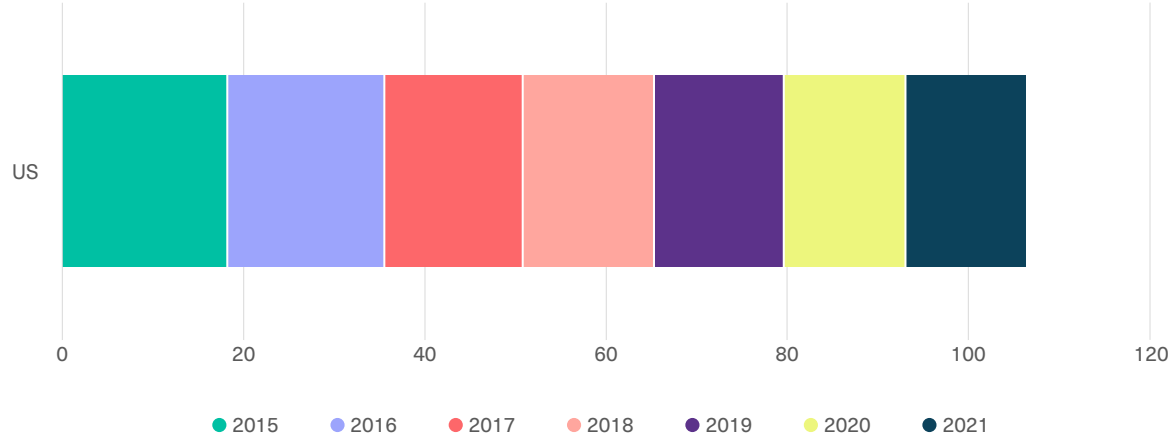
72. Bertram Zagema, Jan Kowalzig, Lyndsay Walsh, Andrew Hattle, Christopher Roy, Hans Petter Dejgaard, "Climate Finance Shadow Report 2023: Assessing the delivery of the $100 billion commitment", Oxfam, 2023, https://policy-practice.oxfam.org/resources/climate-finance-shadow-report-2023-621500

73. "Department of Defense Releases the President's Fiscal Year 2024 Defense Budget", Department of Defense, 2023, https://www.defense.gov/News/Releases/Release/Article/3326875/department-of-defense-releases-the-presidents-fiscal-year-2024-defense-budget; Esme Kirk-Wade, "UK defence expenditure", House of Commons Library, 2023. https://commonslibrary.parliament.uk/research-briefings/cbp-8175

74. "Debt deal sacrifices $140 billion return on investment", *Reuters*, 31 May 2023, https://www.reuters.com/breakingviews/debt-deal-sacrifices-140-bln-return-investment-2023-05-31

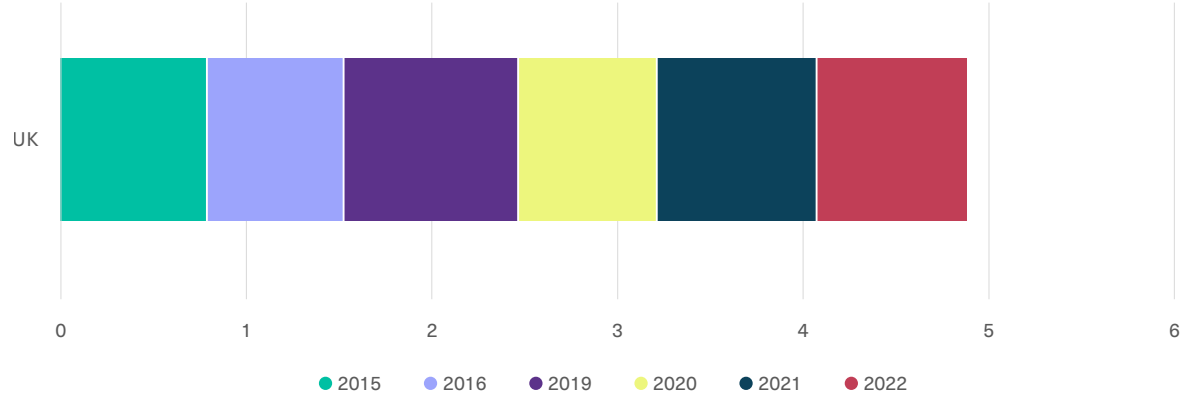
in international climate financing (about $106 billion from the US, and $5 billion from the UK).[75] This is an extremely conservative estimate — as figures 4 and 5 illustrate, it omits the years 2017 and 2018 when the UK military failed to report gross emissions estimates, and 2022, which the US has not yet released. The estimate also uses official DOD and MOD emissions data despite their heavily limited nature, as discussed above. This figure is thus a fraction of the climate debt owed to Global South nations most vulnerable to climate crisis and UK and US military budgets far surpass even this modest proposal for climate reparations.

Figure 4 US military emissions data for 2022 are not available to estimate a social cost of carbon (SCC, $bn)



Source: US Department of Energy.[76]

Figure 5 MOD emissions data for 2017 and 2018 are not available to estimate a social cost of carbon (SCC, $bn)



Source: Ministry of Defence[77]

75. This is based on the estimate for the social cost of carbon in Bressler, "The mortality cost of carbon", *Nature Communications.*

76. Our estimate is based on Bressler, "The mortality cost of carbon", *Nature Communications*.

77. Official UK MOD gross emissions estimates for 2017 and 2018 are unavailable. See "MOD annual reports and accounts: index", Ministry of Defence, 2023, https://www.gov.uk/government/collections/mod-annual-reports

The Opportunity Cost of Military Industrial Strategy

The environmental impacts of the US and UK militaries extend far beyond chemical spills or CO_2 emissions. The industrial policies that support the UK and US militaries have led to an opportunity cost — the concentration of public investment and government capacity in the military sector while decarbonisation or other social needs remain underfunded. Although public investments are not zero-sum choices, both the US and UK governments have prioritised military spending while investment in green industries has been presented as a cost outside of the capacity of the state to bear, even as climate crisis has deepened. In the US, investment in the military has formed such a consequential pillar of domestic and foreign policy since the Second World War that subsequent administrations pursued "military Keynesian" strategies that sought to use military spending to manage aggregate demand in the economy.[78] Even present proposals in the UK and policies in the US that seek to scale green industries, like the Inflation Reduction Act, operate at a lower order of magnitude than investment in their respective military sectors. A new approach to industrial strategy and coordination — that uses public ownership to repurpose existing capacity concentrated within the military industry towards green industries — provides an opportunity to scale back military emissions while using existing technology and skills to increase the size of essential manufacturing sectors. This is a critical pathway to climate mitigation that can sit alongside environmental remediation and reparations payments to compensate for the impact of military activity.

In the US, public investment has historically been concentrated in the military sector and the military industry is currently prioritised over decarbonisation.[79] Military spending accounts for the majority of the federal government's overall discretionary budget. In the 2023 financial year, 55 per cent of total discretionary spending went to defence related activities and $849 billion was allocated to the DOD alone.[80] Discretionary spending is voted on by Congress and operates separately from mandatory spending on areas like social security — the discretionary budget can be used for issues like clean energy, transportation, agriculture, or education as well as

78. See Timothy Barker, "'Don't Discuss Jobs Outside This Room' Reconsidering Military Keynesianism in the 1970s" in Jennifer Mittelstadt and Mark R. Wilson (eds.), *The Military and the Market*, University of Pennsylvania Press: 2022, pp. 135-150.

79. As Michael Brenes outlines this gained support from a broad political coalition: Michael Brenes, *For Might and Right: Cold War Defense Spending and the Remaking of American Democracy*, University of Massachusetts Press: 2020.

80. Heidi Peltier, "We Get What We Pay For: The Cycle of Military Spending, Industry Power, and Economic Dependence", Watson Institute Brown University, 2023, https://watson.brown.edu/costsofwar/files/cow/imce/papers

the military. The scale of US military spending reflects its priority status over and above all other areas of social, environmental and industrial policy.

Within the DOD budget in the 2021 financial year, $400 billion was spent on private contractors, of which 30 per cent went to the "big five": Lockheed Martin, Boeing, Raytheon, General Dynamics and Northrop Grumman.[81] US military industrial policy has created a consolidated industry in which contractors benefit from what a recent Pentagon report described as a business environment defined by "greatly reduced risk, additional revenue and profit" due to high procurement spending and public subsidy for research and development.[82] The Pentagon report found that defence contractors outperformed commercial rivals on total shareholder returns, return on assets and return on equity, which illustrates the profitability of a sector constituted almost exclusively by profligate military spending.[83]

US governments have maintained military spending at a high level since the Second World War. As President Nixon stated in 1973 when discussing priorities for public spending, "to goose the economy, the private sector is the best place. In government the best place is the military."[84] Underlying this Cold War strategy was the political logic that military spending could provide a substitute for a social security safety net; this approach drew support from a diverse coalition of defence contractors, activists, trade unions and politicians.[85]

State capacity, in areas beyond the military, has further been eroded by the military Keynesian approach: 34 per cent of civilian employees of the US federal government are at the DOD while use of the Defence Production Act (DPA) is increasingly relied upon as a mechanism for greater public investment in non-defence sectors. President Trump, for instance, invoked the DPA to scale up production of ventilators early in the Covid-19 pandemic.[86] In June 2022, President Biden used the DPA to stimulate clean energy manufacturing while, in a related dynamic, the Biden administration has presented its climate policy programmes as justified by geopolitical

81. Ibid.

82. "Contract Finance Study Report", Department of Defense, 2023, https://www.acq.osd.mil/asda/dpc/pcf/docs/finance-study

83. Ibid

84. "Memorandum of Conversation: Foreign Relations of the United States, 1969-1976, Volume XXXV, National Security Policy, 1973-1976", State Department Office of the Historian, 1973, https://history.state.gov/historicaldocuments/frus1969-76v35/d28 quoted in Barker, "'Don't Discuss Jobs Outside This Room' Reconsidering Military Keynesianism in the 1970s" in J*The Military and the Market*, University of Pennsylvania Press: 2022, pp. 135-150.

85. Brenes, *For Might and Right.*

86. On civilian employment compared to defence related employment in the federal government see Peltier, "We Get What We Pay For: The Cycle of Military Spending, Industry Power, and Economic Dependence", Watson Institute Brown University, https://watson.brown.edu/costsofwar/files/cow/imce/papers. On the deployment of the Defence Production Act to secure non-defence related policy objectives see Timothy Barker, "It Doesn't Have to Be a War", *Dissent*, 20 March 2020, https://www.dissentmagazine.org/online_articles/coronavirus-defense-production-act-industrial-policy

competition with China.[87] While state capacity and the allocation of resources have remained geared towards the military sector, the US has lagged behind other countries in the development of key green industries.[88]

Even flagship legislation, including the IRA, sets out public investment on climate programmes at a rate of between one tenth and one twentieth of government spending on the military. The US Office of Management and Budget estimate that the cost of energy security and climate change programmes within the IRA will be $369 billion over the next ten years.[89] This does not account for the delivery of much of the IRA in uncapped tax credits; Credit Suisse suggests that the programme could result in $800 billion of federal spending over the next decade.[90] By comparison, taking the upper estimate of public investment, the entire ten year programme would only amount to two years of the DOD's spending on defence contractors alone. Even in the context of a historic shift towards climate investment, defence spending receives far greater funding than climate and related industrial development programmes. In 2019, the Roosevelt Institute estimated that a Green New Deal programme in the US would require between $600 billion to $1 trillion of public investment per year over a decade — roughly equivalent to current annual spending on the DOD.[91] This reflects the past, present and future missed opportunity of an economic strategy that prioritises the military and military industry over addressing climate crisis or any of the other pressing social and environmental needs that languish at the expense of military spending.

The UK military and the private military industry that supplies it, receive a similarly outsized proportion of public subsidy and procurement spending when compared to green industries. While military spending in the UK does not operate on the same scale as in the US or at the level necessary to pursue a military Keynesian strategy,

87. See Mona Ali, "Militarized Adaptation", *Phenomenal World,* 25 January 2023, https://www.phenomenalworld.org/analysis/militarized-adaptation. On the geopolitical foundation of Biden's climate policy see "Remarks by National Security Advisor Jake Sullivan on Renewing American Economic Leadership at the Brookings Institution", The White House, 2023, https://www.whitehouse.gov/briefing-room/speeches-remarks/2023/04/27/remarks-by-national-security-advisor-jake-sullivan-on-renewing-american-economic-leadership-at-the-brookings-institution

88. For instance, the development of the electric vehicles market (including both private vehicles and buses) in the US has lagged significantly behind China. See "Trends in electric light-duty vehicles", International Energy Agency, 2022, https://www.iea.org/reports/global-ev-outlook-2022/trends-in-electric-light-duty-vehicles. On electric buses see Alexandre De Podestá Gomes, Robert Pauls and Tobias ten Brink, "Industrial policy and the creation of the electric vehicles market in China: demand structure, sectoral complementarities and policy coordination", *Cambridge Journal of Economics*, 2023, 47, pp.45-66.

89. "Summary: The Inflation Reduction Act of 2022", Senate Democrats, 2022, https://www.democrats.senate.gov/imo/media/doc/inflation_reduction_act_one_page_summary.pdf

90. "US Inflation Reduction Act: A catalyst for climate action", Credit Suisse, 2022, https://www.credit-suisse.com/about-us-news/en/articles/news-and-expertise/us-inflation-reduction-act-a-catalyst-for-climate-action-202211.html

91. Mark Paul, Anders Fremstad and JW Mason, "Decarbonizing the US Economy: Pathways Toward a Green New Deal", Roosevelt Institute, 2019, https://rooseveltinstitute.org/wp-content/uploads/2020/07/RI_Green-New-Deal_Digital-201906.pdf

the military and its surrounding industry have been afforded a far greater level of state intervention than low carbon investment. The UK is the sixth highest spending country on its military globally with a total expenditure of $68.5 billion in 2022.[92] This has risen faster than in the US over the past decade, with nominal growth of 9.7 per cent in the UK's military spending between 2013 and 2022.[93] Between 1987 and 2009, 35 per cent of the UK's public research and development funding went to the defence sector.[94] Yet despite receiving a higher level of subsidy than other manufacturing industries that are facing an investment gap to decarbonise, such as the automotive sector, the defence sector in the UK adds less in value to the economy and employs fewer people.[95] In fact, the defence sector only added £1.8 billion more to the UK economy than the chemicals industry in the North West of England alone in 2022.[96] Over the next ten years, the MOD plans to spend £242 billion on defence equipment and support.[97] This is roughly equivalent to the public investment pledged to deliver the Labour Party's flagship climate plan for all sectors of the economy.[98] The outsized concentration of past public investment in the military industry and even the relative scale of future plans highlight the lower priority given to climate programmes.

Due to the current prioritisation of military spending in the US and UK and the carbon intensity of military industries, alternative industrial strategies offer significant potential for climate mitigation and can sit alongside a package of reparative policies for both governments.[99] The use of public ownership to convert some UK and US military industrial capacity to green manufacturing sectors offers the possibility of scaling back industrial emissions, reducing the potential for military power overseas to

92. Nan Tian, Diego Lopes da Silva, Xiao Liang, Lorenzo Scarazzato, Lucie Béraud-Sudreau and Ana Carolina de Oliveira Assis, "Trends in World Military Expenditure, 2022", Stockholm International Peace Research Institute, 2023, https://www.sipri.org/publications/2023/sipri-fact-sheets/trends-world-military-expenditure-2022

93. Ibid

94. Enrico Moretti, Claudia Steinwender and John Van Reenen, "The Intellectual Spoils of War? Defense R&D, Productivity and International Spillovers", National Bureau of Economic Research Working Paper, 2019, https://www.nber.org/system/files/working_papers/ w26483/revisions/ w26483.rev0.pdf

95. For defence industry gross value added see "Industry Facts & Figures 2023", ADS Group, 2023, https://www.adsgroup.org.uk/industry-issues/facts-figures/industry-facts-figures-2023; for automotive manufacturing see: "SMMT Motor Industry Facts 2023", Society for Motor Manufacturers and Traders, 2023, https://www.smmt.co.uk/wp-content/uploads/sites/2/SMMT-Motor-IndustryFacts-May-2023.pdf

96. "Economics", Chemical Industries Association, 2023, https://www.cia.org.uk/Policy/Economics

97. "The Defence Equipment Plan 2022-2032", Ministry of Defence, 2022, https://www.gov.uk/government/publications/the-defence-equipment-plan-2022-to-2032

98. The Labour climate plan may be subject to further revision, but still provides an indicator of scale. See for instance Jim Pickard, "Labour waters down commitment to £28bn green plan", *Financial Times,* 9 June 2023, https://www.ft.com/content/07523b2d-5d44-4015-8076-b0196c420ba8

99. See Karen Bell et al, "Decarbonising and Diversifying Defence in the United Kingdom and United States: A Workers' Enquiry for a Just Transition", The British Academy, 2022, https://www.thebritishacademy.ac.uk/documents/4197/Just-transitions-decarbonising-diversifying-defence-uk-usa.pdf

underpin the fossil fuel economy and simultaneously scaling up the capacity of green industries. While public coordination and ownership of industry would be required to deliver this in practice, arms companies have demonstrated that they hold the technological capacity for conversion in the past: Lockheed Martin and BAE Systems developed hybrid buses in Binghamton, New York in the 1990s and the electric battery technology is now being taken forward into new markets including all-electric buses, trams (streetcars) and boats.[100] Investment in green manufacturing further offers increased employment potential to military industries: while modelling in the US context suggests that every $1 billion spent on the defence sector could create 6900 jobs, the same model suggested equivalent investment in solar and wind energy would create 9000 jobs.[101] Emissions reductions in the military industry can form part of a multi-layered strategy to increase manufacturing employment and green industrial capacity simultaneously.

Reparations and Remediation for the Impact of Military Operations

Climate change is a direct result of emissions from the Global North, yet countries in the Global South are bearing the brunt of climate disaster. Despite having contributed about eight per cent of historic global emissions, Global South countries are experiencing the worst impacts of climate change already, including flooding, droughts, hurricanes and sea level rises — as well as the resultant social, economic and political turmoil that accompany them.[102] These countries are also the least financially equipped to mount disaster response and adapt to quickly changing environments as a result of the historic underinvestment in infrastructure and state capacity by European and North American empires in their colonies, as well as the continuation of unequal global economic relations that tie countries up in costly debt service, multinational tax abuse and other forms of fiscal extraction.[103]

Given the scale of military emissions in the US and UK, and the urgent need to redress the harms caused by their military operations, there is a strong case for

100. Miriam Pemberton, "From a Militarized to a Decarbonized Economy: A Case for Conversion", *Watston Institute*, 2023, https://watson.brown.edu/costsofwar/files/cow/imce/papers

101. Heidi Peltier, "Cut Military Spending, Fund Green Manufacturing", *Watson Institute*, 2019, https://watson.brown.edu/costsofwar/files/cow/imce/papers

102. Jason Hickel, "Quantifying national responsibility for climate breakdown: an equality-based attribution approach for carbon dioxide emissions in excess of the planetary boundary", *The Lancet Planetary Health*, 2020, 4, pp. 399-404.

103. Olúfẹmi O. Táíwò and Patrick Bigger, "Debt Justice for Climate Reparations", Climate and Community Project, 2022, https://www.climateandcommunity.org/debt-justice-for-climate-reparations

both countries to introduce a specific military-focused climate reparations approach alongside other leading military powers. This would redirect government money that is currently spent on carbon-intensive military activity, to a reparative project of internationally governed climate financial flows to the Global South. Through the reallocation of resources to those most climate vulnerable and least climate culpable — using multilateral climate financing and the creation of a global military superfund, as well as through base closures, reductions in military operations, increased emissions data transparency and the development of robust employment programming for former arms industry and military workers — the US and UK would start to account for their past and ongoing harms while advancing a national just transition in the process. Channelling funds through existing mechanisms like the UN's Green Climate Fund and Loss and Damage Fund would be a fair start, but new institutions and programs must be launched to meet the scale of the reparative challenge. Olúfẹ́mi O. Táíwò argues that reparations are not limited to recognition and compensation, but also require new policies that transform our social and environmental reality — making a definitive break from the relations that initiated environmental harms.[104]

Steps to Reparations and Remediation

We propose seven steps that the US and UK governments can take to launch a reparative approach to ending the climate and environmental harms of their militaries and to promoting a just transition for workers in military sectors, climate vulnerable Global South nations and communities living in the shadow of overseas bases.

1 Not Just Less Emissions — Less Military

Military operations comprise a substantial proportion of total government emissions. Since 2001, the US Department of Defense has consistently accounted for between 77 and 80 per cent of total government energy consumption while the MOD accounts for at least 40 per cent of UK public sector emissions. This share must fall even as aggregate government emissions are reduced. As so many weapons systems — such as fighter jets — are locked into fossil energy with no near or medium term technological switch available, the most viable path to decarbonisation is less military rather than a "green military".

2 Close Bases

There must be a reduction in the US and UK global military footprint. Many of the 750 installations operated by the DOD and 142 by the MOD are Cold War relics, superfluous in light of technological and logistical advancements, and many more are simply

104. Táíwò, *Reconsidering Reparations*.

unnecessary in a foreign policy agenda that prioritises peace and cooperation.[105] Base closure processes should include detailed plans and financing for environmental remediation and create durable jobs for communities directly and indirectly impacted by closures.

3 Create a Global Military Superfund

Action should be taken to ensure the US invests in environmental remediation through the creation of a Global Military Superfund. The UK should fund a similar programme for environmental damage produced by its network of bases and infrastructure.[106] In both cases, remediation plans should be developed in consultation with affected communities and their governments. Plans should include intellectual property transfer to local companies to ensure access to the most effective clean up technologies, and local labour should be prioritised wherever possible rather than creating a new revenue stream for domestic military contractors or oil companies like Halliburton or Kellogg, Brown and Root. This action should be additional to a rapid acceleration of domestic environmental remediation in places like Pearl Harbor where residents have had their water polluted by fuel leaks, the myriad sites contaminated by "forever chemicals" and Indigenous lands poisoned by mining effluent.[107]

4 Pay Countries for Past Pollution

On top of the additional contributions that the US and UK must make to international climate finance to fulfil their UNFCCC commitments and to provide a fair-share proportion of funds indexed to aggregate historical emissions, both countries should make specific contributions to account for climate pollution resulting from military operations. This additional, non-loan financing should be channelled through multilateral funds administered by democratically-governed global institutions. The minimum social cost of carbon attributable to the US and UK military's direct emissions

105. Tyler McBrien, "Why the US Should Close Its Overseas Military Bases", *Foreign* Policy, 16 May 2023, https://foreignpolicy.com/2023/05/16/military-defense-overseas-bases-united-states-force-posture

106. This can build on existing remediation strategies, see "Land Quality Assessment", Ministry of Defence, 2017, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/62 9398/LQA_Management_Practitioner_Guide_2017_01.pdf and "Installation Management: DOD Needs Better Data, Stronger Oversight and Increased Transparency to Address Significant Infrastructure and Environmental Challenges", Government Accountability Office, 2023, https://www.gao.gov/assets/2023-04/gao-23-106725.pdf

107. Sonner Kehrt, "'It's scary as hell' — PFAS exposure a 'widespread' problem for troops, families nationwide", *Military Times*, 30 June 2022, https://www.militarytimes.com/news/your-military/2022/06/30/its-scary-as-hell-pfas-exposure-a-widespread-problem-for-troops-families-nationwide; Libby Leonard, "Pearl Harbor water poisoning: US military families say they continue to fall ill", *The Guardian*, 2 July 2022, https://www.theguardian.com/us-news/2022/jul/02/pearl-harbor-pollution-water-jet-fuel-hawaii

since the year of the Paris Agreement alone is $111 billion — $106 billion of this is attributable to US military emissions and $5 billion to UK emissions.

5 Collate and Publish Transparent Point and Non-Point Source Pollution Data

The Government Accountability Office should undertake a robust quantification of US military contributions to climate change; the National Audit Office should undertake this independent process in the UK.[108] The DOD and MOD should be directed to create and maintain a publicly available database of localised environmental impacts at overseas installations, similar to identification of superfund sites domestically, but further include qualitative analysis of the communities harmed by these damages in order to identify and remediate knock-on harms beyond acute environmental contamination.

6 Provide Alternative Employment for Military Personnel

Building on the history of the New Deal-era Civilian Conservation Corps, the US and UK governments should invest in employment programmes to account for the scaling back of military operations worldwide. This programme would require careful coordination to meet demand for jobs in new, publicly-owned green industries and their supply chains, as well as nature restoration and remediation for sites of domestic military-industrial contamination, with guarantees on income, conditions and union representation.

7 Invest in a Just Transition for Arms Workers

When compared to other sectors, vastly disproportionate state subsidy flows to military industries on both sides of the Atlantic. This dwarfs funding and state capacity allocated towards environmental manufacturing programmes while supporting a carbon-intensive military industrial sector. Repurposing industrial capacity within the arms sector offers a dual opportunity: to reduce military industrial emissions while also expanding the capacity of green manufacturing. Using public ownership and coordination, this can build on a long history of conversion and diversification projects — from the Lucas Aerospace Alternative Plan of the 1970s to the Oceans of Work proposal in Barrow in the 1980s — and ensure that conversion delivers security for workers as rapid decarbonisation occurs. Guarantees on income, conditions and union representation alongside funding for reskilling and retraining will also be essential to ensure a just transition for workers in sectors that are scaled back.

108. This would build on existing audit approaches: "Environmental Sustainability Overview", National Audit Office, 2020, https://www.nao.org.uk/press-releases/environmental-sustainability-overview

Conclusion

From chemical spills around military bases to their foundational role in the development of the global fossil fuel economy, the US and UK militaries have caused immense harm to communities and ecosystems around the world. At the same time, military spending represents a drain on public resources at a moment in which investment in the green transition is more urgent than ever. As currently constituted, it is virtually impossible to envision a path toward a just transition that leaves US and UK military operations and funding unchanged.

There are a number of concrete steps that must be taken to rectify past social and environmental harms caused by these militaries and to prevent even worse consequences in the future. Given the energy-intensive nature of military operations, funding must be redirected from wasteful activities toward the transformation of the domestic military industrial base and the development of a reparative programme abroad and at home. Using a conservative figure for both annual emissions and the social cost of carbon, the US and UK should jointly supply at least $111 billion in climate reparations to Global South countries that contributed minimally to climate crisis yet face its worst impacts. This funding should be additional to all existing streams of climate finance and further investment will be necessary for environmental remediation through a global superfund. Additional state capacity and coordination will also be necessary to redeploy wasteful defence spending to retrain workers and repurpose industrial capacity for just transition. The US and UK militaries have contributed substantially to the climate crisis — they must compensate for those harms, and, critically, their activities must be pared back to prevent further damage.

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COMMON WEALTH

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Less War, Less Warming: A Reparative Approach to US and UK Military Ecological Damages

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Common Wealth is reimagining ownership for a sustainable and democratic future. Working at all levels, from community and grassroots groups to national and international policymakers, we combine rigorous analysis and research with bold ideas for an economy that works for everyone.

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