CLIMATE REPARATIONS FOR MILITARY EMISSIONS

November 2025

TIPPING POINT NORTH SOUTH
creative campaigning for global justice

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Climate Reparations for Military Emissions is one of Tipping Point North South's ***Transform Defence for Sustainable Human Safety*** series of reports and briefings that offer fresh new thinking for addressing military emissions as well as progressively converting military spending into funding for climate finance, strengthening sustainable human safety, and averting climate catastrophe.

November 2025

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Tipping Point North South is a 'for the benefit of community' co-operative, supporting and initiating creative, campaign-driven projects that advance the global justice agenda.

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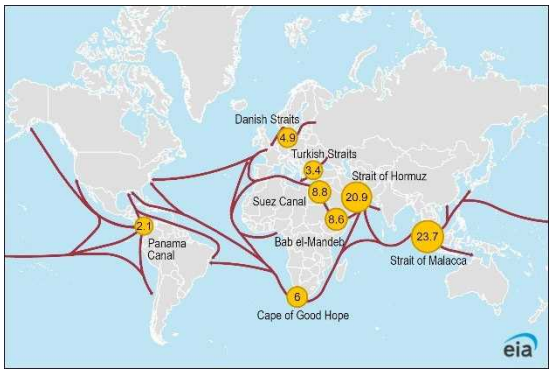
INTRODUCTION

Since the Industrial Revolution, militaries have played an integral role in fomenting and later exacerbating the climate emergency; coal was fundamental to the British Empire and oil was instrumental for the United States to become the supreme superpower in the 20th century.[1] In both cases, with specific use of their militaries, they actively facilitated the transformation and utilisation of fossil fuels to build and maintain their colonial dominance over the world. Moreover, this ensured that the world economy would also become dependent on the fossil fuel they controlled. In other words, militaries, particularly British and American, led the way in bringing the world to its fossil fuel addiction and then went on to police the world in such a way to ensure the addiction was persistent, chronic and effectively incurable.

Fossil fuels have been and remain the life blood of modern militaries and their enormous energy needs make them an effective guarantor of demand for fossil fuel suppliers, which in turn often prompts governments to deploy militaries to protect the interests of fossil fuel companies – Big Oil – in the name of national security.

The Global War on Terror is one such case in point. In the words of researcher Patrick Bigger: "… compare maps of global oil shipping routes and overseas US military bases. The overlap is just as tidy now as it was in 2003 when one of the rallying cries against the invasion of Iraq was 'No Blood for Oil'".[2]



The global military carbon footprint was estimated to be responsible for potentially as high as 5.5% of global annual greenhouse gas (GHG) emissions.[3] Militaries are generally responsible for the majority of a government's direct GHG emissions, often as much as two-thirds.[4] It is well known that the Pentagon (U.S. Department of War) is the biggest institutional consumer of fossil fuels. And latest studies show that rising global military spending significantly increases carbon emission intensity and threatens climate goals.[5]

Military budgets are locked into fossil fuel dependent hardware like tanks, warships and the F-35 fighter jet, which itself drinks nearly 6000 litres of fuel per flight hour. And military GHG

[1] https://mitpress.mit.edu/9780262047487/the-pentagon-climate-change-and-war/
[2] https://turningpointmag.org/2024/07/03/the-three-dimensions-of-militarism-in-the-climate-crisis/
[3] https://www.sgr.org.uk/publications/estimating-military-s-global-greenhouse-gas-emissions
[4] https://transformdefence.org/publication/indefensible/
[5] https://www.nature.com/articles/s41467-025-59877-x

emissions positively correlate to military spending — the more you spend on big ticket fossil-fuel reliant weaponry and equipment, the more emissions you emit.[6]

Global military expenditure rose to another historical high at US$2.7 trillion in 2024, continuing the 10-year trend of breaking record year after year.[7] Think what this trajectory means for GHG emissions and the 1.5°C climate threshold.

U.S. president Trump demanded that other NATO members hike their military spending to go from spending a minimum of 2% of GDP to 3.5% and then 5% of GDP on military. Just a few years ago, 2% was a pipe dream for most NATO members; 10 years ago, only three NATO member states (USA, UK, Greece) achieved the 2% target. This 3.5% is not a pipe dream. The United States already does year on year. UK, Germany, France and many other members of NATO are signing up. NATO military expenditure was US$1.5 trillion in 2024. NATO's new 3.5% of GDP spending goal if implemented over the next 6 years would lead to a total military expenditure of US$13.4 trillion by 2030, a US$2.6 trillion increase above current expenditure level.[8]

Militarism is synonymous with ecological destruction. The US$2.7 trillion annual global military spending spree could have significantly helped fund much-needed adaptation and mitigation finance to developing countries — especially to countries that have contributed the least to climate crisis but will suffer its worst impacts.[9]

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[6] https://transformdefence.org/publication/climate-crossfire/
[7] https://www.sipri.org/publications/2025/sipri-fact-sheets/trends-world-military-expenditure-2024
[8] https://transformdefence.org/publication/natos-3-5-spending-goal/
[9] https://transformdefence.org/publication/climate-collateral-how-military-spending-accelerates-climate-breakdown/

The top 20 military spenders alone, despite comprising a mere 10% of the number of countries in the world, account for more than 80% of the total global military spending. Their excessive and oversized annual military expenditures also ensure they are responsible for the majority of the fossil-fuel powered military emissions that have polluted the world for decades.

In this report, we estimate that the top 20 military spenders alone are responsible for at least 10 billion metric tonnes of CO2 equivalent (tCO2e) of military-related emissions during the first quarter of the 21th century. This has accrued from the US$40 trillion spent on their militaries since 2001. We estimate that collectively they owe the world, especially the poorest and the most climate vulnerable countries, US$2.67 trillion in reparation for their military-GHG-emission-related climate costs *(*as measured by the social cost of carbon). This is more than 8 times the new climate finance pledge of US$300 billion to developing countries set at Baku COP29.

On top of the historical climate cost incurred so far in this 21st century, the top military spenders continue to increase their annual military spending to record level year after year and hence stamp an ever bigger annual military carbon footprint on the world. The climate cost of their 2024 annual military spending is US$163 billion, more than 50% larger than the average over the preceding years in this century (US$109 billion). This annual reparation (arising from the ongoing annual military expenditure), if paid, could have funded the 2009 climate finance pledge of US$100 billion (that never got truthfully fulfilled[10]) year after year, with change to spare.

The top 20 global military spenders – with their associated arms industries – are major climate polluters. This report shows the league table of just how much these 20 countries spend, emit and as a result, owe in climate reparations — especially to the most climate vulnerable countries.

There is money for climate finance and it sits, in no small part, in the trillions spent on the big military budgets. This report illustrates the extent to which those countries must pay for the climate consequences of that expenditure, as a one-off retrospective reparation payment for historical military-related emissions, together with annual reparations for ongoing military emissions from present and future annual military expenditures.

INTERNATIONAL COURT OF JUSTICE ADVISORY OPINION, July 2025

Nations who fail to curb fossil fuels could be ordered to pay reparations, top UN court rules[11]

The unanimous opinion covers a wide range of matters under international law. It says states are liable for all kinds of activities that harm the climate, but it takes explicit aim at fossil fuels. It says that a state's failure to take appropriate action to protect the climate system from greenhouse gas emissions, including through the production and consumption of fossil fuels, the granting of fossil fuel exploration licences or the provision of fossil fuel subsidies, "may constitute an international wrongful act which is attributable to that state".

[10] https://policy-practice.oxfam.org/resources/climate-finance-shadow-report-2023-621500/
[11] https://www.theguardian.com/environment/2025/jul/23/healthy-environment-is-a-human-right-top-un-court-rules

Harj Narulla, a barrister specialising in climate litigation and counsel for Solomon Islands in the case, said the ICJ laid out the possibility of big emitters being successfully sued. "These reparations involve restitution – such as rebuilding destroyed infrastructure and restoring ecosystems – and also monetary compensation," he said.

The Evasion of Historical Responsibility? Colonialism, Temporality and Reparative Justice in the ICJ's Climate Advisory Opinion[12]

The International Court of Justice's (ICJ's) advisory opinion on Obligations of States in Respect of Climate Change has been celebrated as marking the start of a "new era of climate reparations" …. even as the ICJ opened the door to climate reparations, it was evasive on the key temporal questions that are central to any future claims about reparations owed by individual countries for their historical greenhouse gas emissions. Additionally, the advisory opinion avoided addressing how colonial histories continue to shape present day climate injustices and the need to decolonize international law.

Why do historical greenhouse gas emissions matter?

Historical emissions matter, not just because they have caused serious harm (which they have), or because they appropriated atmospheric space (which they also have), but because of what these emissions enabled and the world they produced. They enabled colonial suppression "abroad" and class and racial suppression "at home" …. Historical emissions are constitutive not only of the climate crisis, but also "constitutive in enabling the conditions of dispossession, violence, slavery, racial difference and uneven wellbeing that did – and continue to – generate stark asymmetries between and within countries".

[12] https://blogs.law.columbia.edu/climatechange/2025/09/05/the-evasion-of-historical-responsibility-colonialism-temporality-and-reparative-justice-in-the-icjs-climate-advisory-opinion/

CLIMATE REPARATIONS FOR MILITARY-EMISSIONS CLIMATE IMPACT: AN ADDITIONAL FUNDING SOURCE FOR CLIMATE FINANCE

In 2009, rich countries pledged to fund US$100 billion annually by 2020 to support climate action in developing countries and the goal was extend to 2025 under the 2015 Paris Agreement. US$100 billion is less than 5% of what rich countries have been spending on their militaries year after year. In other words, it is something rich countries can easily fund but they failed to do so every single year.[13] Most of the reported climate finance by rich countries was found by Oxfam to be loans, piling on the debt burden of countries many of which are already heavily indebted, and the 'true value' was no more than £35 billion a year.

Rather than paying up, developed countries (Annex II) have been pushing to expand the traditional donor base for the (still meagre) US$300bn public climate finance goal set for the NCQG (new collective quantified goal) to include relatively wealthy developing countries, particularly China. Understandably, China is resistant to this idea because its economy is still per-capita poor - the proposal is considered a cheap way for the West to 'want more countries to pay so that we can pay less'.[14]

An international military-GHG-emissions-related climate reparation fund paid for by the top military spenders will provide an *additional* source of international climate finance for developing countries in a way that respects the status quo on Annex II countries' responsibilities for international climate finance. Instead, it addresses the present-day responsibility of the top 20 military powers. Although many of the current global top 20 military spenders have long been world-leading (colonial) military powers, a few others, for example some BRICS countries, are also in the global top 20, albeit relative newcomers.

To put it simply, the top military spenders have accumulated enormous historical military-related GHG emissions, vastly disproportionate relative to the rest of the world. The injustice is especially consequential to those poor and climate vulnerable countries with small military carbon footprints.

This report argues that they should be made accountable for climate damages from their military-related emissions and hence be responsible for the relevant climate reparations to be paid. Unlike the national fair shares approach to the global carbon budget with respect to national economies, where most countries in the Global South, including India and China, are still within their boundary fair shares,[15] none of the top 20 military spending nations (including China and India) have a case to argue *against* contributing to a military-emissions climate reparation fund, proposed in this report. Their large militaries and ever-increasing military expenditures mean that all the top military spenders have cast-iron responsibilities to redeem their significant (historical and ongoing) climate costs, as measured by the social cost of carbon (SCC), from their sizable military carbon footprint.

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[13] https://policy-practice.oxfam.org/resources/climate-finance-shadow-report-2025-analysing-progress-on-climate-finance-under-621735/
[14] https://www.carbonbrief.org/interview-chinas-position-on-international-climate-finance-ahead-of-cop29/
[15] https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30196-0/fulltext

MILITARY SPENDING 2001-2024

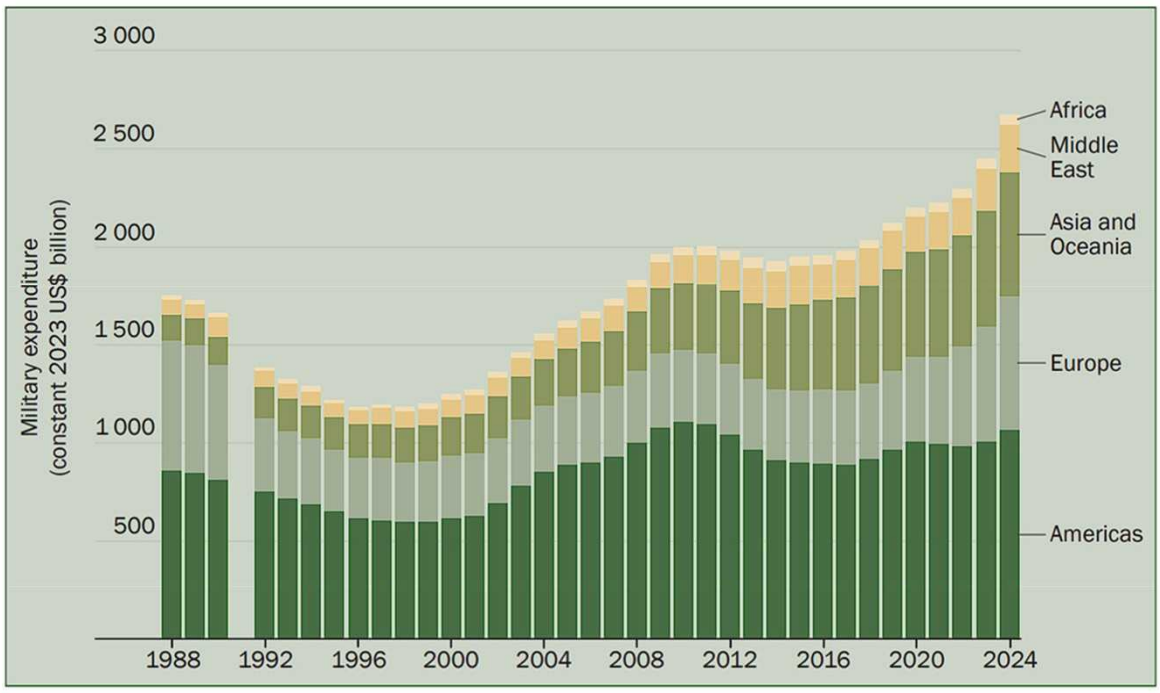


Figure 1. World military expenditure, by region, 1988–2024

Note: The absence of data for the Soviet Union in 1991 means that no total can be calculated for that year.

Source: SIPRI Military Expenditure Database, Apr. 2025.

Global military spending reached the lowest level in late nineties after the end of the Cold War. However, before the *peace dividend* could ever come to fruition, in 2001 U.S. president George W Bush started the Global War on Terror and hence kickstarted another global arms race. Since then, global military spending has more than doubled and reached US$2.7 trillion in 2024.[16] The US$40 trillion that have been spent since by the Top 20 military spenders have not delivered human safety — there has not been a day since when the world is at peace *everywhere* — and wasted valuable but limited (monetary) resources that could have been invested instead in socially, environmentally and economically productive areas for peaceful green prosperity of all humanity.[17] In fact, 2024 saw the highest number of conflicts since WW2.[18]

[16] https://www.sipri.org/publications/2025/sipri-fact-sheets/trends-world-military-expenditure-2024
[17] https://transformdefence.org/publication/value-for-money/
[18] https://www.visionofhumanity.org/the-great-fragmentation-driving-conflict-world-peace-plummets/

THE TOP 20 MILITARY SPENDERS IN THE WORLD

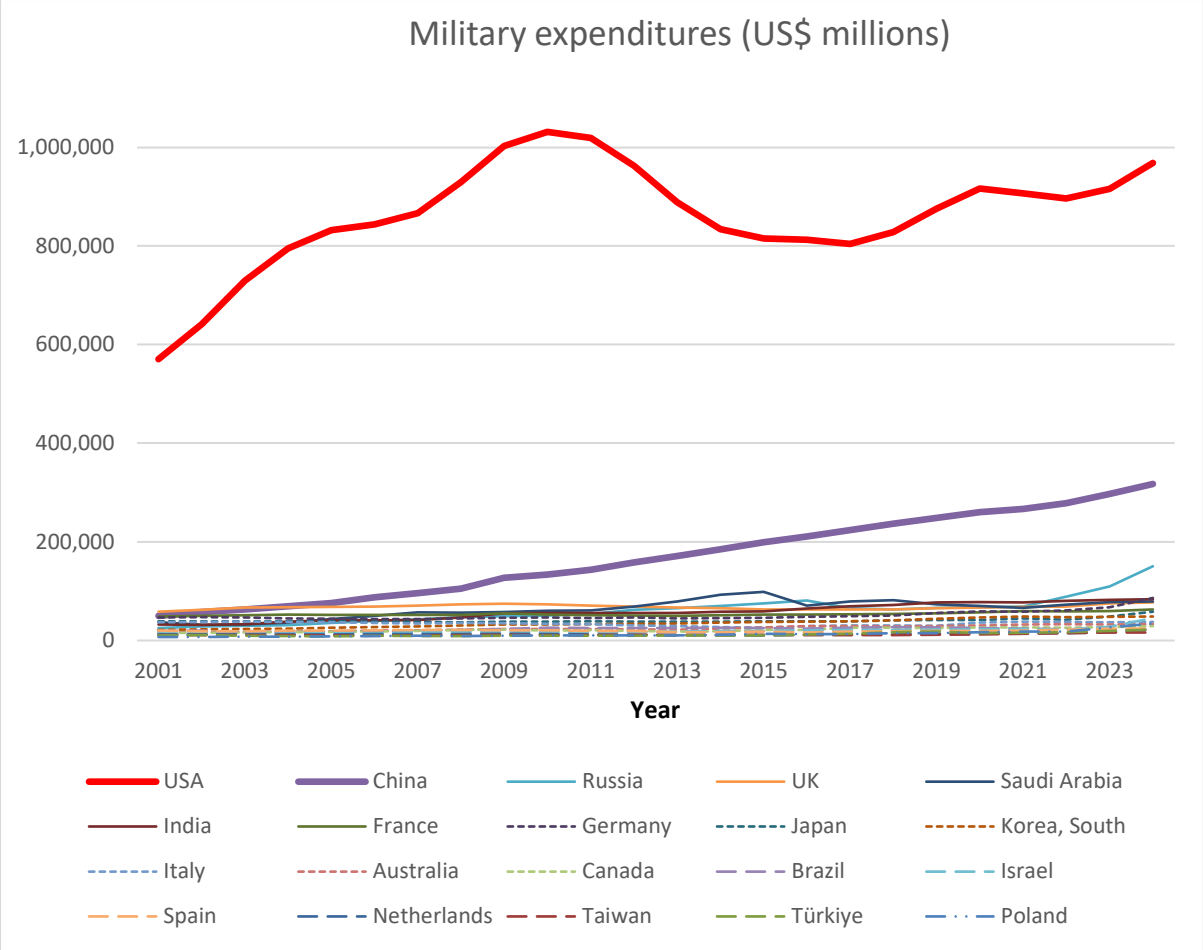
Rank	Country	Total (2001-2024), US$	Average per capita per annum, US$
1	**USA**	20,700,000,000,000	2,080
2	**China**	4,060,000,000,000	111
3	**UK**	1,630,000,000,000	966
4	**Saudi Arabia**	1,530,000,000,000	1,930
5	**Russia**	1,460,000,000,000	424
6	**India**	1,380,000,000,000	37
7	**France**	1,280,000,000,000	774
8	**Germany**	1,220,000,000,000	546
9	**Japan**	969,000,000,000	376
10	**South Korea**	842,000,000,000	654
11	**Italy**	811,000,000,000	505
12	**Australia**	591,000,000,000	951
13	**Brazil**	542,000,000,000	115
14	**Canada**	511,000,000,000	531
15	**Spain**	472,000,000,000	382
16	**Israel**	468,000,000,000	2,112
17	**Netherlands**	313,000,000,000	662
18	**Poland**	308,000,000,000	286
19	**Taiwan**	280,000,000,000	443
20	**Türkiye**	293,000,000,000	207
	total	39,600,000,000,000	

SIPRI, at constant 2023 prices and exchange rates[19]

Military expenditures are not fairly distributed among countries; the top 20 military spenders alone account for more than 80% of global total. These few countries accrue disproportionate economic and societal benefits from their oversized militaries and overwhelming power projection whilst inflicting the accompanying economic, social and environmental costs on the rest of the world; see for example, the Global War on Terror[20].

Between 2001 and 2024, the top 20 military spenders collectively spent US$39.6 trillion on their militaries while year after year falling far short of providing the pledged US$100 billion annual climate finance commitment by rich countries to developing countries. There are eight countries that spent more than US$1 trillion each on military in just 24 years (more than a rich country like Switzerland's annual GDP): the US outspent the rest of the world by far and its total, at US$21 trillion, is more than the next 19 top military spenders combined. China is the second highest military spender at US$4 trillion; the UK, Saudi Arabia and Russia spent approximately US$1.5 trillion each. India, France and Germany all respectively spent roughly US$1.3 trillion on military since 2001.

[19] https://www.sipri.org/databases/milex
[20] https://watson.brown.edu/costsofwar/papers



Annual military expenditures at constant 2023 prices and exchange rates (SIPRI)

With the exceptions of China, Brazil and India, all the remaining top 20 military spenders also ranked among the global top 50 military spenders *per capita*.

Notably the US is ranked among the world's top two military spenders whether in absolute total values or in terms of averages per capita per year. The US does not have the largest population, territory, not even the biggest economy (based on GDP at purchasing power parity) but they have the highest annual military expenditures whether in absolute values or per capita and the highest number of (~750) *overseas* military bases in the world[21]. Power projection is the last remaining pillar of 'American exceptionalism'.

And where the US leads, everyone else follows. The US clearly does not plan to reduce its disproportionate military expenditure any time soon (much to the joy of arms manufacturers). This leads other military powers to close the gap with their own increases in spending. The past two decades has seen a clear case of the rest of the world's military powers trying in vain to catch up with the US. Since the gap was so large, humanity and climate have been damned as a result.

[21] https://responsiblestatecraft.org/2021/08/24/the-all-american-base-world-750-us-military-bases-remain-around-the-planet/

MILITARY CARBON FOOTPRINT

OUR UPDATED METHODOLOGY

It is well-known that militaries and their wars exert enormous social, economic and environmental costs.[22] On top of these unacceptable and unnecessary costs is the climate cost – significant (but inexcusably ignored in international climate negotiations) both in peacetime and conflict. The current best available estimate (by Scientists for Global Responsibility SGR and the Conflict and Environment Observatory CEOBS) put the global military carbon footprint (not including conflict-related emissions) at potentially as high as 5.5% of global greenhouse gas (GHG) emissions.[23] This was an approximate estimate,[24] but it helps put military emissions into perspective — 5.5% is more than emissions from civilian shipping and aviation combined.

We adopted elements of SGR and CEOBS methodology into our own way of estimating military carbon footprint of selected countries. Our methodology, first used in our joint 2023 report with the Transnational Institute and Stop Wapenhandel,[25] is conservative so our estimates generally sit at the lower end of estimates' spectrum of SGR and CEOBS.

There is a high uncertainty in the current available estimates of military GHG emissions because of the severe lack of official data and transparency and this was made clear in the latest 2025 review by SGR of military emission estimation research to date, where it showed, for example, estimates of (scope 1, 2, and 3) emission increases from an additional US$100 billion military spending range from 19 to 59 million tonnes of CO2 equivalent (MtCO2e).[26] Our methodology is unique since it is a formula that relies on a handful of official stats that are generally readily available. The usefulness of our methodology could be demonstrated by comparing to the Norwegian military's official estimate. The SGR review pointed out that Norway is the only country in the world that have tried and published their military carbon footprint by estimating all scopes 1, 2 and 3 military-related emissions. The official 2024 report gave the Norwegian military's carbon footprint in 2023 to be 1.3 MtCO2e.[27] By using 3 stats drawn from SIPRI and NATO databases – military expenditure, the proportion spent on equipment, and the number of military personnel for year 2023 – our original methodology gave a corresponding estimate of 1.5 MtCO2e, differing by 15%.

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[22] https://watson.brown.edu/costsofwar/papers/summary
[23] https://www.sgr.org.uk/publications/estimating-military-s-global-greenhouse-gas-emissions
[24] https://militaryemissions.org/problem/
[25] https://transformdefence.org/publication/climate-crossfire-how-natos-2-military-spending-targets-contribute-to-climate-breakdown/
[26] https://www.sgr.org.uk/publications/military-spending-rises-and-greenhouse-gas-emissions-what-does-research-say
[27] https://www.forsvaret.no/om-forsvaret/miljo/Forsvarssektorens%20klimaregnskap%20for%202023.pdf/_/attachment/inline/c1183920-f674-4c03-bf75-b821a40492ec:b7ad2b1ae98e5290fbe88a59799e40b8be9c5778/Forsvarssektorens%20klimaregnskap%20for%202023.pdf

Our original methodology considered only NATO countries. In this report, we extend our methodology to include non-NATO countries, specifically the top 20 military spending countries in the world.

The 'carbon footprint' (excluding conflict-related) of the military can be divided into three categories: 'stationary', 'mobile', and 'supply-chain'. Stationary emissions are operational GHG emissions (scopes 1 and 2) for military bases (as well as of Ministry of Defence and transport for civilian activities) whereas mobile emissions arise from mobile military activities (i.e. use of aircrafts, marine vessels and land vehicles, spacecraft). Supply-chain emissions (the upstream component of scope 3) include the GHG emissions of the arms industry and other companies which supply the military (such as accommodation and food for active personnel, and private security contractors).

The ratios between emissions from these three categories depend on the composition of the military. For Germany, which used to spend around 17% of military expenditure on equipment, the ratio of mobile emissions to stationary is 0.7:1.[28] In comparison, the ratio for France, which spent around 27% of military expenditure on equipment and has a much larger active air force, is 4.9:1. It is important to note that the supply-chain emissions are generally much larger than the other two categories.[29]

To estimate the military carbon footprint, we proposed this formula:

> **Carbon footprint of military and the associated military technology industry = (military expenditure) × (proportion spent on equipment) × (spend–emission conversion factor) + (number of military personnel) × (average stationary emission per military head)**

The first part (military expenditure × proportion spent on equipment × spend–emission conversion factor) accounts for both the mobile and the supply-chain emissions. Not all aspects of military expenditure, for example pensions, are relevant to mobile or supply-chain emissions; what is most relevant is the proportion spent on military equipment, such as fighter jets, tanks, and warships. The second part (number of military personnel × average stationary emission per military head) accounts for the stationary emissions. The average proportions of military expenditure and the average numbers of military personnel for the top 20 military spenders are listed below:

Country	Average proportion spent on military equipment, %	Average number of military personnel
USA	26	1,370,000
China	37	2,190,000
Russia	40	963,000
UK	24	174,000
Saudi Arabia	28	227,000
India	25	1,37,000
France	25	261,000
Germany	15	216,000
Japan	20	244,000
South Korea	20	636,000
Italy	15	222,000

[28] https://www.sgr.org.uk/sites/default/files/2021-02/EU-MCE-report-by-SGR-CEOBS-GUE.pdf
[29] https://www.sgr.org.uk/publications/military-spending-rises-and-greenhouse-gas-emissions-what-does-research-say

Australia	22	56,000
Canada	13	66,000
Brazil	10	329,000
Israel	37	172,000
Spain	19	124,000
Netherlands	17	45,000
Taiwan	20	251,000
Türkiye	30	492,000
Poland	22	134,000

The spend–emission conversion factors are estimated by using the latest available comprehensive GHG emission reports by arms manufacturers, including Airbus and Lockheed Martin, (where possible, only military-related business activities are considered) while figures for the average stationary emissions per military head are adopted from the SGR and CEOBS methodology. The spend–emission conversion factors and the average stationary emissions per military head for the top 20 military spenders are as follows:

Country	Spend–emission conversion factors, tCO2e/US$	Average stationary emissions per military head, tCO2e
USA	0.000721	12.9
China	0.001080	9
Russia	0.001080	12.9
UK	0.000534	5
Saudi Arabia	0.000721	9
India	0.001080	9
France	0.000534	5
Germany	0.000534	5
Japan	0.000721	9
South Korea	0.000721	9
Italy	0.000534	5
Australia	0.000721	9
Canada	0.000721	12.9
Brazil	0.000534	5
Israel	0.000721	9
Spain	0.000534	5
Netherlands	0.000534	5
Taiwan	0.000721	9
Türkiye	0.000534	5
Poland	0.000534	5

In our original 2023 methodology, we used the same spend-emission conversion factor for the United States and European NATO members but the recent available data showed that was too low for the U.S. The spend-emission conversion factor is now updated to 0.000721 tCO2e per dollar for the U.S. compared to 0.000534 tCO2e per dollar for European countries.

Russian and Chinese (arms) manufacturing have been generally believed to be much less energy- and carbon-efficient than European or American counterparts and therefore their spend-emission conversion factors are noticeably larger than either the European or American ones. Arguably, significant advancement in carbon reduction and energy efficiency has been made in Chinese manufacturing in recent years, but there is lack of transparency to find the turning point year and by how much. Since here we are concerned with the historical emissions of the last quarter of the century, we assume the change was not yet significant to the overall picture in this timespan.

HISTORICAL MILITARY CARBON FOOTPRINT OF THE TOP 20 MILITARY SPENDERS IN THE FIRST QUARTER OF THE 21ST CENTURY

The total military carbon footprint of the global top 20 military spenders between 2001 and 2024 is 10.3 billion tCO2e.

The United States, with the world's highest military expenditure (whether in absolute values or per capita), the biggest arms industry (U.S. arms companies account for 50% of the total arms revenue of companies in the SIPRI Top 100 in the world)[30] and one of world's largest militaries, has the largest historical military carbon footprint of the last quarter of the century by far, totalling 4.37 billion metric tonnes of CO2 equivalent during the 24 years since 2001; this is more than the annual GHG emissions of all EU27 countries (3.2 billion tCO2e in 2024).[31] China, with the world's second highest military expenditure (in absolute values), the second biggest arms industry (16% of the total SIPRI Top 100 arms revenue) and the world's largest military, has half as much as the U.S. historical military carbon footprint, totalling 2.16 billion tCO2e since 2001. Rounding up the top 3 is the Russian military which has emitted nearly 1 billion tCO2e, half as much as China's historical military carbon footprint.

USA, China, Russia, India, Saudi Arabia, South Korea, UK, France, Japan and Israel make up the top 10 (historical) emitters of military emissions; all but one, with Israel being the exception, rank among the top 10 military spenders. Israel is highly militarised and has the world's highest military expenditure per capita, one of the largest active militaries and heavily rely on fossil-fuel guzzling military equipment, and consequently has the 10th largest historical military carbon footprint, despite being the smallest country among the world's top 20 military spenders.

Country	Average annual military carbon footprint, tCO2e	Total military carbon footprint 2001-2024, tCO2e
USA	182,000,000	4,370,000,000
China	90,200,000	2,160,000,000
Russia	38,800,000	931,000,000
India	27,900,000	669,000,000
Saudi Arabia	14,900,000	358,000,000
South Korea	10,800,000	259,000,000
UK	9,590,000	230,000,000
France	8,470,000	203,000,000
Japan	8,020,000	192,000,000
Israel	6,750,000	162,000,000
Germany	5,260,000	126,000,000
Australia	4,490,000	108,000,000
Türkiye	4,370,000	105,000,000
Taiwan	3,910,000	93,900,000
Italy	3,760,000	90,300,000
Canada	2,880,000	69,100,000
Brazil	2,840,000	68,200,000
Spain	2,660,000	63,800,000
Poland	2,460,000	59,000,000
Netherlands	1,430,000	34,200,000
Total		10,300,000,000

Military carbon footprint of the top 20 military spenders

[30] https://www.sipri.org/publications/2024/sipri-fact-sheets/sipri-top-100-arms-producing-and-military-services-companies-2023
[31] https://edgar.jrc.ec.europa.eu/report_2025

AN INTERNATIONAL MILITARY-EMISSIONS CLIMATE REPARATION FUND

MONETARY FRAMEWORK TO ADDRESS CLIMATE COSTS: THE SOCIAL COST OF CARBON (SCC)

The social cost of carbon (SCC) is a monetary measure of the long-term damage done by emitting one additional tonne of carbon emissions — or conversely the benefit of reducing a tonne of carbon emissions.[32] The SCC gives us a framework to address the climate (ie carbon) costs of military in addition to its other more well-known social (eg civilian casualties, refugees, human rights and built-environment destruction), economic (opportunity cost and war profiteering) and environmental (habitat loss, pollution and health) costs. SCC estimates give conservative estimates of reparations that military powers owed to the rest of the world, especially countries most vulnerable to climate emergencies.[33]

Several SCC estimates have been proposed; considering the past, present and future scale of irreversible climate change, it is sensible to use the upper estimate of the SCC for our purpose: US$258 per tonne of CO2 equivalent.[34]

HISTORICAL (SCC) CLIMATE COST OF MILITARY EMISSIONS IN THE FIRST QUARTER OF THE 21ST CENTURY

Country	Total Social Cost of Carbon 2001-2024, US$ billion
USA	1,130
China	558
Russia	240
India	173
Saudi Arabia	92
South Korea	67
UK	59
France	52
Japan	50
Israel	42
Germany	33
Australia	28
Türkiye	27
Taiwan	24
Italy	23
Canada	18
Brazil	18
Spain	16
Poland	15
Netherlands	9
total	2,670

(SCC) Climate costs of military-related emissions by the top 20 military spenders

[32] https://19january2017snapshot.epa.gov/climatechange/social-cost-carbon_.html
[33] https://www.common-wealth.org/publications/less-war-less-warming-a-reparative-approach-to-us-and-uk-military-ecological-damages
[34] https://doi.org/10.1038/s41467-021-24487-w

The massive historical military carbon footprint since 2001 of the global top 20 military spenders means that they collectively owed to the rest of the world, especially the countries most threatened by climate emergencies, a total amount of US$2.67 trillion, for damages to the society and environment due to their military-related GHG emissions.

The United States, the preeminent and only military superpower in the world since the end of the Cold War, accounts for 42% of the total and is therefore responsible for paying US$1.13 trillion to the international military-emission climate reparation fund to partially remedy the climate damages the US military inflicted on the world between 2001 and 2024.

China, as a result of trying to catch up and become a peer competitor with the US military, has accumulated half as much historical military emissions as the US in the last quarter of the century and is therefore responsible to pay US$558 billion climate reparations. Russia, despite being a former military superpower, has always maintained large annual military expenditure and a sizable military, and hence is responsible to pay US$240 billion climate reparations. Even though India is one of the most climate vulnerable developing countries, its big and highly climate inefficient military and consistently high annual military expenditure means that India is responsible to pay US$173 billion climate reparations to other developing countries. Saudi Arabia, on top of being one of the most important petrostate (69% of its fiscal revenue from the oil and gas industry),[35] has an outsized military carbon footprint and is responsible to pay US$92 billion climate reparations.

Traditional colonial powers, namely UK, France, Japan, Germany, Italy and Spain, all accumulated sizable military carbon footprint since 2001 and therefore are responsible for climate reparations at US$59 billion, US$52 billion, US$50 billion, US$33 billion, US$23 billion and US$16 billion respectively. Except the Netherlands, all other top 20 military spenders are responsible for more than US$10 billion to the international military-emissions climate reparation fund.

Israel is the smallest country in the top 20 of military spenders but being a fully militarised occupying military power has made their responsibility for climate reparations far larger than many other larger and more populous countries, such as Brazil.

The (SCC) climate cost calculated here do not take conflict-related military emissions into account. If the conflict-related emissions are included,[36] the climate reparations will be substantially larger, especially for 'trigger-happy' countries, including the US,[37] Russia[38] and Israel[39].

[35] https://www.theguardian.com/environment/article/2024/jul/24/drill-us-petrostate-climate-crude-oil
[36] https://transformdefence.org/publication/military-and-conflict-related-emissions-report/
[37] https://priceofoil.org/content/uploads/2008/03/A%20Climate%20of%20War%20FINAL%20(March%2017%202008).pdf
[38] https://en.ecoaction.org.ua/climate-damage-by-russia-24-months.html
[39] https://transformdefence.org/publication/climatereparationsforpalestine/

AN ADDITIONAL SOURCE TO FUND CLIMATE FINANCE URGENTLY NEEDED

At Baku COP29, a new climate finance goal of at least US$300 billion a year to developing countries by 2035 was set.[40] It was considered a paltry sum — civil society called for US$5 trillion per annum.[41]

The first '*Needs Determination Report of the Standing Committee on Finance*' in 2021 showed nearly US$6 trillion is needed cumulatively to implement developing countries' climate action plans by 2030; of these, US$2 trillion for mitigation and US$800 billion for adaptation.[42] Collectively, African States need US$2.5 trillion, Asia-Pacific States need US$3 trillion while Latin American and Caribbean States need US$170 billion. The climate reparation of US$2.67 trillion could cover nearly half of US$6 trillion cost needed by the developing countries.

According to UNEP, the climate finance required for adaptation in low- and middle-income countries are estimated to be between US$215 billion and US$387 billion per year this decade.[43] The US$2.67 trillion one-off historical climate reparations by top 20 military spenders could fund this every year up to 2030.

The US$2.67 trillion one-off compensation paid by the top 20 military spenders for the historical military-emissions-related climate cost in the first quarter of the 21st century to an international military-emissions climate reparation fund could be *an additional funding source* for these climate finance targets.

Historical (2001-2024) climate reparations by top 20 military spenders		US$2.67 trillion
could pay for either		
The US$300bn climate-finance goal	US$300 billion	100% for 8 years
(UNFCCC) Developing countries' climate action plans by 2030 need	US$6 trillion	45%
African States	US$2.5 trillion	100%
Asia-Pacific States	US$3 trillion	89%
Latin American and Caribbean States	US$170 billion	100%
(UNEP) The adaptation finance gap for low- and middle-income countries	US$387 billion a year	100% for 6 years

[40] https://www.carbonbrief.org/analysis-why-the-300bn-climate-finance-goal-is-even-less-ambitious-than-it-seems/
[41] https://transformdefence.org/publication/summit-of-the-future/
[42] https://unfccc.int/topics/climate-finance/workstreams/needs-report
[43] https://www.unep.org/news-and-stories/press-release/climate-impacts-accelerate-finance-gap-adaptation-efforts-least-50

ANNUAL (SCC) CLIMATE COST OF MILITARY EMISSIONS: PAST, PRESENT AND AVERAGE

As long as the militaries fail to fully decarbonise, their carbon footprint will always be significant. This state of affairs cannot be ignored if the world is to achieve net-zero by 2050. Unfortunately, the big military spending nations face a hard truth and it is this: "militaries can't transition to renewable energy"[44] — no amount of greenwashing can disguise the fact that militaries will continue to be the largest institutional consumers of fossil fuels for many decades to come, simply because all existing (and potential) forms of renewable energy are "poor substitutes that don't meet the operational needs of armed forces".

In addition to a one-off climate reparation for their historical (2001-2024) military emissions, this report calls for the top 20 military spenders to pay annual climate reparation as part of the push to *reduce global military spending* and get the global military *completely decarbonised*. On top of the damages from conflicts and wars, every single year fossil-fuel-reliant militaries will continue to impose an enormous climate burden on the world, simply by their day-to-day operations and maintenance.

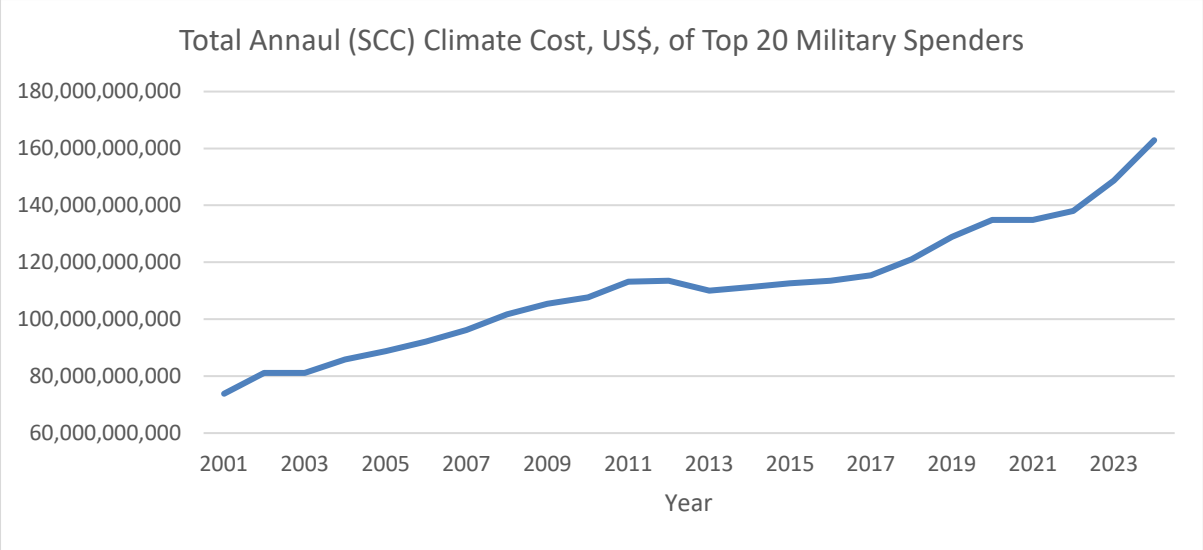
Country	Average Annual SCC, US$ billion	SCC for 2024, US$ billion
USA	47.0	56.5
China	23.3	41.0
Russia	10.0	20.6
UK	2.5	3.7
Saudi Arabia	3.8	4.7
India	7.2	9.3
France	2.2	2.7
Germany	1.4	2.8
Japan	2.1	2.7
South Korea	2.8	3.0
Italy	0.97	1.3
Australia	1.2	1.7
Canada	0.74	1.8
Brazil	0.73	0.78
Israel	1.7	3.5
Spain	0.69	1.2
Netherlands	0.37	0.77
Taiwan	1.0	1.0
Türkiye	1.1	1.6
Poland	0.63	2.3

Annual (SCC) climate costs of military-related emissions by the top 20 military spenders

The average annual climate cost, as measured by the social cost of carbon (SCC), of the global top 20 military spenders for the period 2001 and 2024 is US$111 billion a year, more than the US$100bn-a-year climate finance goal. The top 3 military emission emitters, USA, China and Russia, account for more than two thirds of the total.

[44] https://archive.is/0f2an (https://foreignpolicy.com/2024/07/26/military-energy-defense-renewable-oil-gas-transition-weapons/)

Climate reparations for military emissions (2025)



The annual (SCC) climate cost due to military-related emissions has been steadily rising since 2001 and the international community's failure to bring ends to multiple ongoing conflicts around the world (including in Ukraine, Palestine and Sudan) means that the annual climate costs of the top 20 military spenders will not come down anytime soon. Indeed, some countries have been actively adding fuel to the fire by regularly supplying armaments to the warring parties.

Top 20 military spenders have much more (SCC) climate costs in 2024 than their averages of preceding decades. This could be the result of the evolving great power competition between USA and China; NATO's support of Ukraine's defence capacity against Russia's invasion; and Israel's ongoing genocide of Palestinians in Gaza. Therefore, we could expect annual military expenditures and hence the total annual (SCC) climate costs of the top 20 military spenders to rise further in the foreseeable future, and certainly it is highly unlikely to drop below the historical average.

In 2024, the top 20 military spenders are responsible for paying US$163 billion into a military-emissions climate reparation fund to compensate for their military-emissions-related climate damages in that year.

THE BRAKES MUST BE APPLIED TO RUNAWAY MILITARY SPENDING

In response to Russia's invasion of Ukraine and US president Trump's demand that other NATO members hike their spending, NATO now wants its members to go from spending a minimum of 2% of GDP to 3.5% and then up to 5% of GDP on military.

NATO military expenditure was US$1.5 trillion in 2024. NATO's new 3.5% of GDP spending goal if implemented over the next 6 years up to and including 2030 would lead to a total military expenditure of US$13.4 trillion by 2030, a US$2.6 trillion increase above current expenditure.[45] Just a few years ago, 2% was a pipe dream for most NATO members; 10 years ago, only three countries (USA, UK, Greece) achieved the 2% target. This 3.5% is not a pipe dream. The United States already spends this year on year. UK, Germany, France and many other members of NATO are signing up.

NATO's new 3.5% spending goal would also lead to 2,330 MtCO2e of total carbon emissions by 2030, almost the same amount as the combined annual GHG emissions of Brazil and Japan; an additional 692 MtCO2e emitted above current levels. It would also cancel out the annual emission reduction of 134 MtCO2e needed to achieve the EU's 2030 target of reducing GHG emissions by at least 55% compared with 1990 levels.

Note that NATO is an alliance of 32 nations — accounting for more than half of global annual military spending (US$2.7 trillion in 2024).[46] How about everyone else? India, Brazil and even Japan may all yet follow this 3.5% push as they did to the earlier higher spending push.

And what of China?

If China were to adopt the same 3.5% of GDP goal, it would immediately double China's military expenditure to US$646bn, with the consequent impacts on military emissions.

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[45] https://transformdefence.org/publication/natos-3-5-spending-goal/
[46] https://www.sipri.org/publications/2025/sipri-fact-sheets/trends-world-military-expenditure-2024

China has consistently responded to NATO's earlier 2% push to increased their spending to nearly 2%. Unlike NATO, China's spending (GDP wise) has so far been reactive. GDP wise, an arms race between NATO and China hasn't happened and China's spending has fluctuated between 1.5% and 2% since 1990. This is because NATO's average spending (despite the USA's high expenditure) had been lower than 2% during the roughly same period. Now the average has surpassed 2%, NATO is pushing the new equilibrium dangerously close to 3.5%. Unlike Europe's stagnating economy, China's economy is still growing much faster at around 5% so the gap between two continental-sized economies is growing. This means that if the new 3.5% of GDP target provokes China to also aim for the same target, Chinese annual military expenditure will start 'running further away' in absolute terms, widening the spending gap even more.

The USA has consistently spent almost 3.5% of GDP on military. China is the world's biggest economy which means they now have the (financial, technological and industrial) means to respond to (follow) NATO's moves. The world cannot afford an arms race between NATO and China. It is unsustainable on every level — the 3.5% madness needs to be stopped for the sake of the planet and all human safety.[47]

CASE STUDY: WHY TAIWAN IS ONE OF THE TOP 20 MILITARY SPENDERS

The Two Sides of the Taiwan Strait

The continuous hawkish support given by the Western powers to the current independence-minded Taiwanese (DPP) regime has started to backfire — the approval for President Lai keeps dropping to new historic lows, widely interpreted as backlash against Lai's anti-China rhetoric and actions. Prominent hardcore anti-China influencers changed stance to pro-China overnight.[48] Since both Taiwan's and mainland China's Constitutions recognise Taiwan as part of China (whether Republic of or People's Republic of) this leaves the cross-strait "invasion" rhetoric somewhat empty — especially in the absence of a formal declaration of Independence.

The only tangible result of this long-standing power posturing by both sides (since 1949), aided by foreign meddling, is ever-rising profits of American and Chinese arms manufacturers. Consequently, both mainland China *and* Taiwan have places in the global top 20 military spenders league table. And with this, the attendant military-related GHG emissions burden.

Why has this happened?

For decades, America's interest in Taiwan has been rooted in its strategic importance as a bulwark against Chinese Communists. U.S. General Douglas MacArthur made clear Taiwan's role as an unsinkable aircraft carrier as early as 1950.[49] Taiwan held the upper-hand in the cross-strait power posturing until Deng Xiaoping's economic reforms which reversed the power dynamic. Nowadays, Taiwan's once super-successful 'Asian Tiger' economy, eclipsed by mainland China's astronomical economic growth, is now more of a 'kitten' with an economy barely larger than Tier 1 Chinese cities, such as Shanghai. So since Taiwan will never be able to outgrow mainland China economically, or outspend it militarily, why is Taiwan still allocating so much public money on

[47] https://transformdefence.org/publication/how-to-transform-defence-10-talking-points-for-a-difficult-conversation/
[48] https://x.com/AngelicaOung/status/1954806322559701389
[49] https://history.state.gov/historicaldocuments/frus1950v07/d86

ineffective (and often undelivered) expensive foreign-made weaponry?[50] Along with Taiwan's position as a top 20 military spender, many, if not all, arms sellers regard Taiwan as 'a sucker'.[51] Taiwan is a bell-weather for the consequences of the USA's push to get ever-rising military spending taken up around the world. The Trump administration is asking Taiwan to spend an extra-ordinary 10% of its GDP on the military — a sudden *quintuple* rise from the past decades' average at around 2% that will wreak havoc on Taiwan's public spending on other essential areas, decimating presently first-rate public education and universal healthcare.[52]

Taiwan is not Israel. It will never be the "unsinkable aircraft carrier" of the Pax Americana. Contrary to the Western narrative, 'unification' is not the priority of China but 'Taiwan not declaring Independence' is. For those who live there, it is clear: the status quo remains acceptable to Chinese leadership and unification can take as long as it takes.

The most sensible course of action in the foreseeable future is for Taiwan to take itself out of the USA's power competition with China.

"Western claims about China posing some kind of military threat are pure propaganda. The material facts tell a fundamentally different story. In fact, China's military spending per capita is less than the global average, and 1/10th that of the US alone. Yes, China has a big population, but even in absolute terms, the US-aligned military bloc spends over seven times more on military power than China does. The US controls eight nuclear weapons for every one that China has.

China may have the power to prevent the US from imposing its will on it, but it does not have the power to impose its will on the rest of the world in the way that the core states do. The narrative that China poses some kind of military threat is wildly overblown.

In fact, the opposite is true. The US has hundreds of military bases and facilities around the world. A significant number of them are stationed near China – in Japan and South Korea. By contrast, China has only one foreign military base, in Djibouti, and zero military bases near US borders.

Furthermore, China has not fired a single bullet in international warfare in over 40 years, while during this time the US has invaded, bombed or carried out regime-change operations in over a dozen Global South countries. If there is any state that poses a known threat to world peace and security, it is the US.

The real reason for Western warmongering is because China is achieving sovereign development and this is undermining the imperial arrangement on which Western capital accumulation depends. The West will not let global economic power slip from its hands so easily."

Anthropologist Jason Hickel[53]

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[50] https://warontherocks.com/2023/01/the-real-reasons-for-taiwans-arms-backlog-and-how-to-help-fill-it/
[51] https://www.scmp.com/news/china/politics/article/3282034/national-day-revelations-weapons-price-gouging-make-taiwan-us-sucker
[52] https://www.reuters.com/world/asia-pacific/taiwan-needs-hike-defense-spending-10-gdp-pentagon-nominee-2025-03-04/; https://focustaiwan.tw/politics/202503120011
[53] https://www.jasonhickel.org/blog/2025/8/6/the-real-reason-the-west-is-warmongering-against-china

THE CASE FOR MILITARY & CONFLICT-RELATED EMISSIONS & CLIMATE REPARATIONS FOR PALESTINE (1948-2024)

A companion paper on the case for climate reparations for Palestine by Israel was published, together with the Palestinian Institute for Climate Strategy, prior to this report.[54] In that paper, we quantified the historic military and conflict-related emissions of the 77 years of Israel's occupation of Palestinian land since its founding in 1948, culminating in the ongoing genocide of Palestinians for nearly two years. The paper calculated the *climate* reparation owed to date by Israel to the Palestinian people as a result of these historic military and conflict-related emissions.

Ultimately, the purpose of that research was to argue that military & conflict-related emissions must be recognised as a core component of the reparations owed to the Palestinian people. They must be added to the broader list of damages for which Israel and its allies are accountable, from decades of military and financial support for Israel's apartheid regime to present-day material backing for its genocide of the Palestinian people.

This reckoning must also address the intertwined realities of genocide and ecocide.[55] The international movement to add ecocide as the fifth international crime prosecuted by the International Criminal Court (ICC) alongside genocide, war crimes, crimes against humanity and aggression, provides the definition of ecocide as *"unlawful or wanton acts committed with knowledge that there is a substantial likelihood of severe and either widespread or long-term damage to the environment."* This legal tool must be wielded to evidence the deliberate environmental destruction committed against Palestinian lives and lifeforms, in demand for prosecution.[56]

To date, the total estimated amount of the **military and conflict-related climate reparations** owed by Israel and its allies to the Palestinian people **since the Nakba** is **US$148 billion.** Of this Israel is responsible for US$103 billion, the U.S. is responsible for US$40.8 billion while Israel's allies share further responsibility: Germany US$2.7 billion, France US$1 billion, the UK US$0.5 billion, and Italy US$0.17 billion.

These figures represent the *measurable climate liability* of military and conflict-related emissions. Yet, they capture only one entry point into the broader reparations reckoning for Palestine to date, which must also encompass the wider harms of occupation, genocide, ecocide and systemic destruction of Palestinian life. Many of these aspects are beyond what we can quantify in simplified carbon metrics, and we must not lose sight of this complexity in rebuilding just futures for Palestine.

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[54] https://transformdefence.org/publication/climatereparationsforpalestine/
[55] https://www.palclimateinstitute.org/manifesto
[56] This argument draws strength from international jurisprudence. In her declaration to the recent International Court of Justice advisory opinion on climate change, Judge Cleveland affirmed that states' obligations under climate treaties and customary international law extend to harms caused by armed conflict and military activities. Excluding such harms distorts the global picture of warming and undermines collective action. Conflict-related emissions are not peripheral but central to climate accountability and must be included in any reparations framework.

CONCLUSION

The global top 20 military spenders – with their associated arms industries – are major climate polluters. This report shows just how much these 20 countries spend, emit and as a result, owe in climate reparations, especially to the most vulnerable.

It also reveals the particular reparations case to be made against Israel (and its allies) for its occupation since 1948, culminating in the genocide of the Palestinian people.

We need our world to urgently move toward a state of peaceful prosperity.[57] Ever-increasing military spending does not bring greater human safety; it has the opposite effect. All it does is guarantee ever-more military emissions.

We may have failed to stop the Earth breaching the 1.5 °C climate limit,[58] but we cannot afford to give up on the next 2 °C climate limit. While the whole of society is expected to take accountability and embark on full decarbonisation within this century, the military is getting an immoral and unacceptable free pass. [59] Countries are not required to report their military emissions to the UN, using national security as the excuse. Military emissions are not included in the national emission reduction targets for Nationally Determined Contributions (NDCs).

Demanding climate reparations for military-emissions-related climate costs therefore serves three purposes:

Firstly, the 'polluters pay' imperative must include financial reparation for historic and ongoing military-related GHG emissions to be paid for by those states which are responsible – in this case the top 20 military spenders – with reparations being paid into a 'Military-Emissions Climate Reparation Fund' directed at the poorest and the most climate vulnerable countries least responsible for the climate crisis.

Secondly, it should shape debate about ways in which to rein in excessive and ever-increasing military spending. The substantial amount calculated in this report should provoke serious consideration of the damage done to the planet by the top military spenders and the enormous opportunity costs of the US$40 trillion spent on the big militaries in just 24 years. One proposal for universal cuts to annual military spending is TPNS's 5% formula.[60]

Thirdly, more broadly, it raises a serious question about the relevance and utility of 20th century fossil-fuel powered foreign and defence policy-making. Is this really what humanity needs at this existential, pivotal point in our history? The recent UN report *Rebalancing Military Spending for a Sustainable and Peaceful Future* addresses this issue head on.[61] We need a "shift towards a human-centred and multidimensional approach to security, one that prioritizes diplomacy, cooperation, sustainable development and disarmament over military build ups".

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[57] https://www.jcfj.ie/article/overturning-the-economics-of-war-to-deliver-a-co-operative-future-and-peaceful-green-prosperity/
[58] https://www.nature.com/articles/d41586-025-00010-9
[59] https://transformdefence.org/publication/military-and-conflict-related-emissions-report/
[60] https://transformdefence.org/the-five-percent-proposal/
[61] https://www.un.org/en/peace-and-security/the-true-cost-of-peace

RECOMMENDATIONS

1. **Global top 20 military spenders should be held accountable for the damages caused by their enormous accumulated military emissions of the first quarter of the 21st century and pay historic climate reparations of US$2.67 trillion** into the international military-emissions climate reparation fund. This military-emissions climate reparation fund will be an additional funding source to much-needed climate finance for countries in the Global South on the frontline of the climate emergency caused by the most advanced, well-armed, economies.

2. **Top military spenders to pay annual climate reparation into an international military-emissions climate reparation fund** to compensate for their ever-rising annual military spending. Top 20 military spenders on average collectively owe US$111 billion a year of SCC climate cost from their annual military-related emissions (over the last quarter of a century).

3. **All nations to compulsorily submit comprehensive military GHG emission reporting** to IPCC/UNFCCC.

4. **All nations to include their militaries and military technology industries in their NDC** GHG emission reduction plans and targets.

5. **The UNFCCC must explicitly recognise the climate and ecological dimension of war and occupation. In particular, the Intergovernmental Panel on Climate Change (IPCC) AR7 Special Report on Cities** should include a dedicated chapter on war- and conflict-related emissions, with attention to the wholesale destruction of cities and systems such as Gaza City and its surrounding lands.

6. **International institutions charged with adjudicating war crimes and reparations to ensure that military- and conflict-related emissions are incorporated into the reparation framework**. Such work can build on the figures calculated here and in the companion paper on the case of Palestine.

7. **Top military spenders to reduce their annual military expenditures** and divert the money saved to fund sustainable human safety needs. One way to do this is TPNS's 5% Formula.