

# The global surge in military spending and military carbon emissions

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*These slides will be made available at: <https://www.sgr.org.uk/>*

Presentation given at Aberdeen Climate Café (via video link), 7 July 2026  
(Some data in slide 5 updated: 1 August; all references listed at the end)

# About Scientists for Global Responsibility

- UK research/ advocacy organisation
- Membership includes hundreds of scientists & engineers
- Concerns include:
  - climate change; militarism in science & technology; military greenhouse gas emissions; nuclear weapons
- Numerous reports, articles etc



For more details, see: <https://www.sgr.org.uk/>

# The military spending surge

## Growing military spending

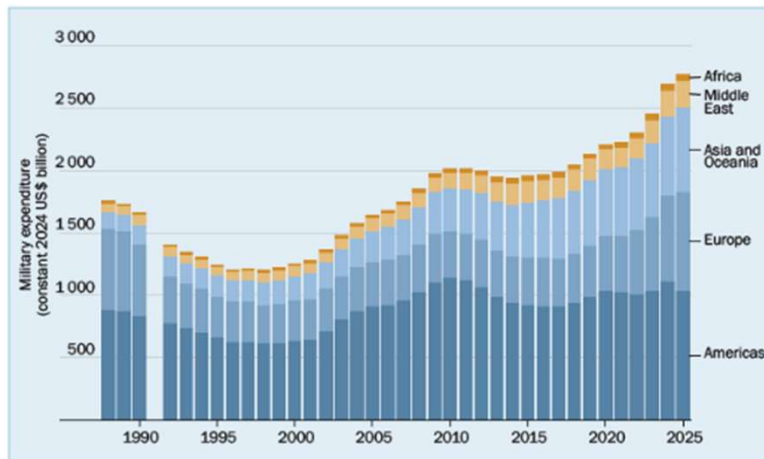


Figure 1. World military expenditure, by region, 1988–2025

SIPRI (2026)

- 2025: \$2.9 trillion
- UN projections for 2035:
  - Low: \$4.4 tr
  - High: \$6.6 tr

(inflation-adjusted figures)

- Historical data from: SIPRI (2026)
- UN projections for 2035 (UN, 2025):
  - Low estimate extrapolated from trend of past 5y
  - High estimate assumes 5% of global GDP spent on military activities

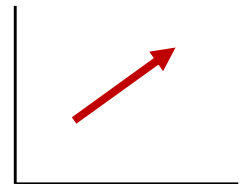
## NATO military spending

- NATO nations currently responsible for **55%** of global military spending
- Spending increases (2018-2025)
  - All member nations: +34%
  - Europe & Canada: **+74%**
- Spending targets given as fraction of national economy
  - % of Gross Domestic Product (GDP)
  - Earlier target: 2% for military only
  - Target for 2035: 5% (3.5% on military; 1.5% on 'security-related measures')
- Spending increase for Europe and Canada (2024-2035):
  - **+130%** for military only

- NATO nations currently responsible for 55% of global military spending (SIPRI, 2026)
- Spending increases (2018-2025) – inflation-adjusted figures calculated from Table 2 of: NATO (2025a)
- Details on NATO spending targets: NATO (2025b) - 'security-related measures' include arms industry subsidies
- Spending increase of 130% for Europe and Canada (2024-2035) – calculated from data in Appendix 1 of: NATO Watch (2026); spending increase if 5% target reached through additional security spending as well as extra military spending would be about 190%

## UK military spending

- Latest figures (2024-25): £60bn
  - 27% rise in 7y
- Planned rise (2029-30): £73bn (est.)
  - 22% rise in 5y
- Related to NATO targets
  - 2024: 2.3% GDP military spending
  - 2027: 2.6% GDP military spending
  - 2027: 4.1% GDP military and security spending
  - 2035: 5.0% GDP military and security spending
- ***UK military spending is highest since World War II***



- Figures from House of Commons Library (2025) and latest govt announcement (MOD et al, 2026)
- Spending figures (£) are inflation-adjusted; from p6&13 of HoCL and similar GDP deflators applied to latest MOD figures
- Annual UK spending rises much less than most European nations as UK spending was already at high levels
- Spending figures (% GDP): from p13-16
  - 2027 figures will also include 0.1% GDP on intelligence
  - 2027 figures will include 1.5% on “homeland security and national resilience, like protecting our cyber-security and our energy networks” – much of this spending is already taking place
- Military spending has already risen above Cold War peak (p17)

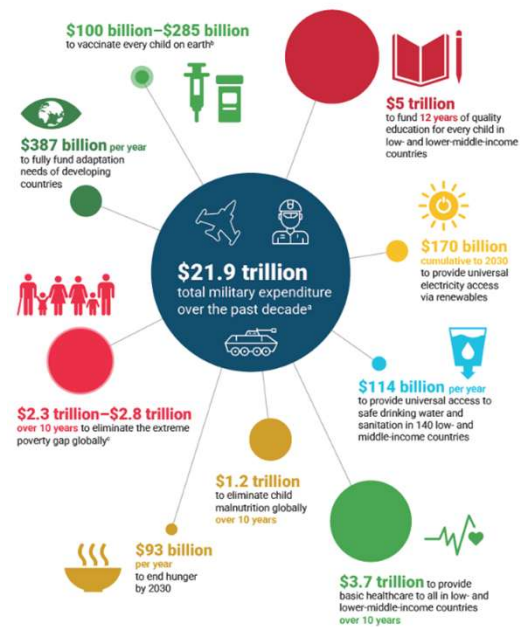
## Where is the money coming from?

- Cuts to foreign aid budgets, welfare budgets, and climate budgets
- Tax rises
- Increased government borrowing
- Relabelling existing budgets
- UK as an example:
  - 2020: UK aid spending at 0.7% Gross National Income (GNI)
  - 2021: Cut to 0.5% GNI
  - 2027: Cut to 0.3% GNI
  - Equivalent to total cut of **£13bn+** per year
  - Aid cuts redirected to military spending

- Gross National Income (GNI) is another measure for the size of national economy – not that different to GDP
- For details of UK aid reductions, see: House of Commons Library (2026)
  - 2021 cut made by PM Johnson
  - 2027 cut made by PM Starmer
  - In both cases, the funding raised from the cut was used to increase military spending
  - Total reduction of £13bn/y from 2027 onwards – calculated from data on p20
  - Total rise in annual military spending over same period: £19bn/y (see previous slide)

Military spending  
displacing spending  
to tackle poverty,  
climate change etc

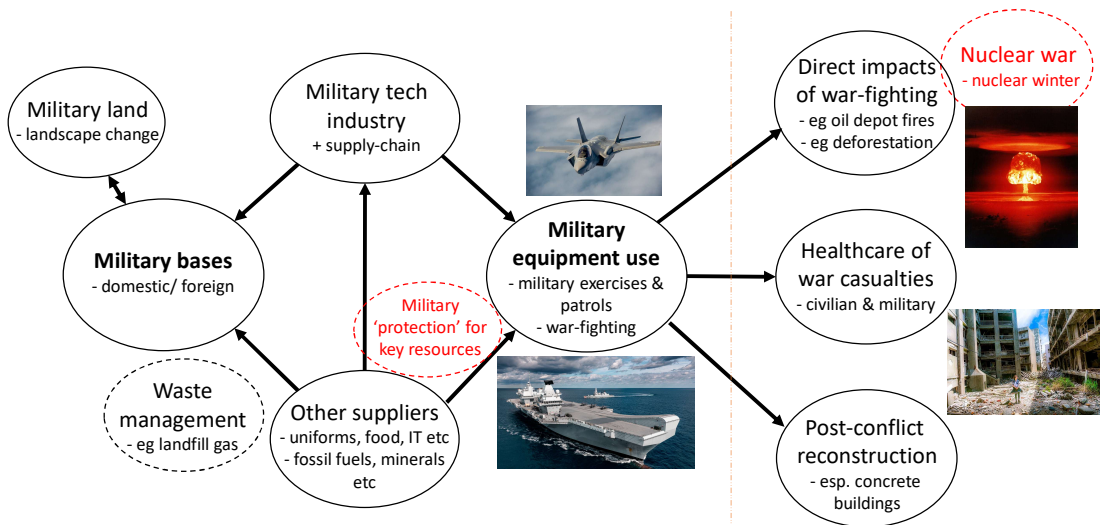
Figure 11: The world's total military expenditure over the past decade



- Diagram from UN (2025: 30)
- \$2 trillion needed annually to meet energy and climate Sustainable Development Goals (UN, 2025: 29)

Military carbon emissions:  
How big are they?

# Military carbon footprint: key components



- 'Core' carbon emissions highlighted in bold
- 'Carbon footprint' covers (black) items to the left of dotted line – and is comparable with impacts seen in civilian sectors
- 'Carbon footprint' is broader and also includes the items to the right of dotted line
- Data quality is poor
- For more analysis, see (e.g.) SGR (2020).

*[image credits: MOD; Gerd Altmann; Free Photos]*

## Key terminology

- **Core** carbon emissions (organisational/ operational)
  - Direct fuel use of military vehicles
  - Direct fuel use of military bases, eg heating
  - Electricity use of military activities
- Carbon **footprint**
  - Core emissions plus supply chains, logistics etc
- Carbon **bootprint**
  - Carbon footprint plus impacts of war-fighting
- *'Carbon emissions', 'greenhouse gas emissions' and 'GHG emissions' widely used interchangeably*

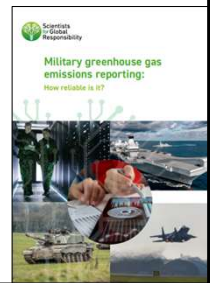


- GHG – greenhouse gas
- Core carbon emissions known as 'scope 1 & 2' emissions
- Supply chain includes military tech manufacture, component manufacture, raw material extraction, and all military supplies – known as 'scope 3'
- Impacts of war-fighting includes urban fires, damage of ecosystems, healthcare of survivors, refugee movement, post-conflict reconstruction – known as 'scope 3+'

*[Image: C1ker-Free-Vector-Images]*

## Data on military GHGs is very poor

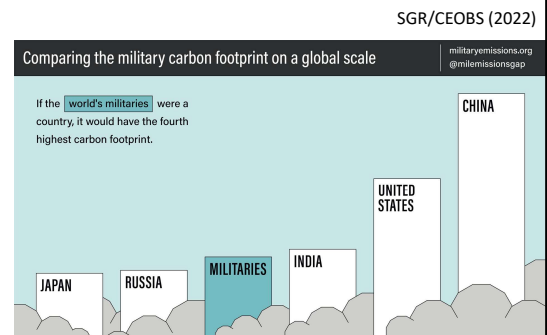
- National reporting of *direct* military GHGs is riddled within exemptions and inconsistencies
- National reporting of *indirect* military GHGs is almost non-existent
- Militaries thought to report less than 10% of their military carbon footprints – and no GHG data on war-related impacts
- IPCC has *never* published any data on military GHG emissions
- Lack of data is used to falsely argue that military and war emissions are very small



- IPCC – Intergovernmental Panel on Climate Change; UN advisory body
- Militaries typically report less than 10% of their military carbon footprints (SGR, 2025a)

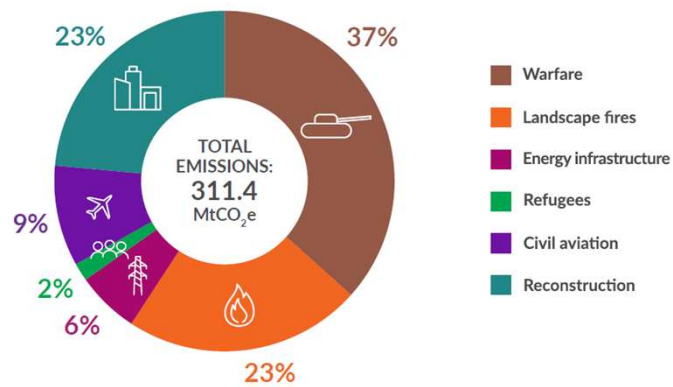
## Global estimate: military carbon footprint

- Global total (best estimate): **2,750 million tCO<sub>2</sub>e/ 5.5%**
- **Larger than Russia's** total carbon footprint
- Extrapolated from US/UK/EU data, using proxy data
- Uncertainty range
  - 3.3% to 7.0% of global GHG emissions
- Incomplete estimate (no war impacts)



- Data from 2019 (i.e. before COVID-19 pandemic and Russian invasion of Ukraine)
- Proxy data includes: number of military personnel; ratio of stationary to mobile emissions
- Supply chain multiplier (over 5 times) derived from UK data; data from Norwegian military has since confirmed figure of over 5 times
- Main source: SGR/CEOBS (2022)

## Russia-Ukraine War: GHG emissions



Due to 48 months of war; De Klerk et al (2026)

- Emissions from reconstruction occur after war has ended

## Links between military spending and carbon emissions

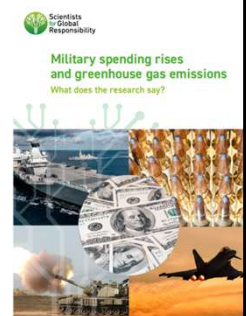
| Aim of additional funding                          | Effect on core emissions | Effect on wider emissions |
|----------------------------------------------------|--------------------------|---------------------------|
| Extra fuel for increased military activity         | High                     | Low                       |
| Increased numbers of personnel                     | Medium                   | Medium                    |
| Increased wages for personnel                      | Low                      | Low                       |
| Increased stockpiles of ammunition                 | Low                      | High                      |
| Increased numbers and capability of military craft | Mixed                    | High                      |

Based on SGR (2025b)

- Table summarised from information in SGR (2025b)
- Increases in emissions hard to monitor due to data quality problems (as discussed earlier)

## SGR review: findings

- For *increase* in military spending of \$100bn, carbon emissions rise by 32 million tonnes (range: 4-59 Mt)
- For *decrease* in military spending of \$100bn, carbon emissions fall by 43 Mt (range: 26-59 Mt)
- NATO
  - 2019-2024: +64 Mt (equivalent to Bahrain)
  - 2024-2035: +132 Mt (equivalent to Chile)
- *Additional findings*
- UN projections for 2035
  - Low projection: +540 Mt (equivalent to Pakistan)
  - High projection: +1,250 Mt (equivalent to Brazil)

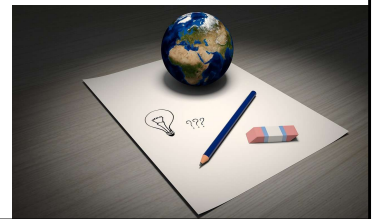


- SGR review of 11 research studies by academics and NGOs: SGR (2025b)
- NATO projection for 2035 based on all NATO nations reaching 3.5% GDP spending on military (currently only USA, Poland, Estonia close to this level)
- Additional findings based on SGR (2025b) and UN (2025) – see earlier slide
- Pakistan is 18<sup>th</sup> highest emitting nation in world, while Brazil is 6<sup>th</sup> highest (European Commission et al, 2025)

Reducing military emissions

## Key options

- Military preference: Lower carbon weapons systems
- Alternatives
  - Reducing 'peacetime' military activities
  - Reducing armed conflict
  - 'Common Security' approaches
  - Arms control & disarmament treaties
  - Reducing military spending



- For data on reductions in emissions due to reduction of war, see earlier example of Ukraine
- The rest of the talk will focus on the other alternatives, which can also help reduce armed conflict

*[Image credit: Arek Socha via Pixabay]*

## Lower carbon military technologies

- Only approach considered within military climate strategies
- UK Ministry of Defence climate document
  - Aim: “seek to use the green transition to add to [military] capabilities”
  - Aim: “fight and win in ever more hostile and unforgiving physical environments”
- Main technologies
  - Fuel efficiency improvements in mobile tech
  - Use of biofuels/ synthetic fuels especially in military planes
  - More drones/ robotic/ AI tech
  - More nuclear power in warships/ at bases
  - Solar panels, insulation, heat pumps etc at bases
- Also: carbon offsets; forest projects on military land

*Report of the  
Defense Science Board Task Force  
on  
DoD Energy Strategy*  
“More Fight – Less Fuel”



- Quotes and info from (e.g.) MOD (2021)
- Title of US DoD report shows the main motivation for energy saving measures - from: Lorincz (2015)

## Will these technologies reduce military GHGs?

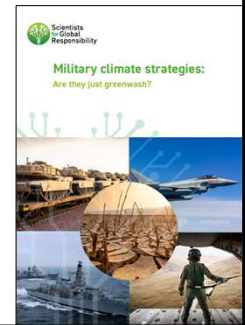
| Option                                 | Key obstacles                                                                 | Timescale         | Chance of success by 2040s |
|----------------------------------------|-------------------------------------------------------------------------------|-------------------|----------------------------|
| Fuel efficiency                        | Rebound                                                                       | Ongoing           | Limited                    |
| Biofuels                               | Sustainable resource already used; land use/ technical limits                 | Near term         | Very limited/ negative     |
| More drones, AI etc                    | High failure rate; data centre expansion; rebound; human rights impacts       | Near/ medium term | Limited/ negative          |
| Synthetic fuels                        | Immature tech; low conversion efficiency; high costs                          | Medium term       | Limited/ negative          |
| Nuclear power                          | High radiation risks in battle-space; nuclear proliferation risks; high costs | Medium term       | Limited/ negative          |
| Carbon offsets                         | Major loopholes                                                               | Ongoing           | Negative                   |
| Forestry on military land              | Vulnerable to climate impacts                                                 | Ongoing           | Reversible                 |
| Solar/ insulation/ heat pumps at bases | Adaptation to military conditions                                             | Near-term         | Significant                |

- Military tech overlaps with 'hard to abate' civilian sectors: aviation; shipping; heavy-duty road freight; iron & steel; synthetic chemicals
- Any improvements will not reduce environmental impacts of weapons use
- SGR research in this area is ongoing

# Military climate strategies: greenwash?

- Example: UK

- Headline target: 30% GHG reduction; 2017-2025
- Loophole 1: target only applies to 42% of core emissions
- Loophole 2: target includes electricity grid decarbonisation (civilian action)
- Loophole 3: target includes military base 'optimisation'
- Loophole 4: targets beyond 2025 still under negotiation
- Loophole 5: no targets at all for supply-chain emissions or war-fighting impacts



- Carbon intensity (gCO<sub>2</sub>e/kWh) of grid electricity fell by 28% during target period
- Military base optimisation includes closing/ selling-off/ demolishing old buildings and replacing these with new buildings, but construction emissions are not counted
- For details of this and other examples, see: SGR (2026)

## Common security, disarmament & reductions in military spending

- Common security approaches
  - Mutual respect for security considerations of all nations/ groups
  - 'Win-win approach' based on diplomacy, negotiation, mediation etc
  - Bodies include: UN; ICJ; ICC; OSCE
- Arms control & disarmament treaties
- Non-offensive defence strategies
- These improve conditions for reductions in:
  - Numbers/ capability of offensive weapons systems (long-range = high carbon)
  - Military spending (related to GHG emissions)

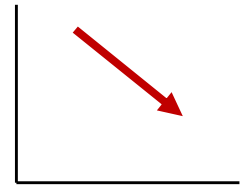


- In addition to the United Nations, common security bodies include:
  - ICJ – International Court of Justice – for violations of international law by nations;
  - ICC – International Criminal Court – for violations of international law by individuals;
  - OSCE – Organisation for Security and Co-operation in Europe – ran common security initiatives after Cold War
- Non-offensive defence strategies focus on defending national territory while avoid deploying weapons systems that threaten the territory of other nations
- For more discussion, see: Unfold Zero (2022)

*[Image: UN flag; credit: UN]*

## Will these reduce emissions?

- Historical data shows potential of carbon emission reductions due to demilitarisation
- After end of Cold War (1991-2000)
  - US armed forces: core emissions fell by 44%
  - UK air force & navy: core emissions fell by 32%
  - Reductions in Soviet Union/ Eastern Europe probably much larger



- Calculations based on US data from Crawford (2019) and UK data from Parkinson (2023) – both of which are analyses of government data

Related issues

# Unspoken strategy: Militaries helping to preserve global inequalities

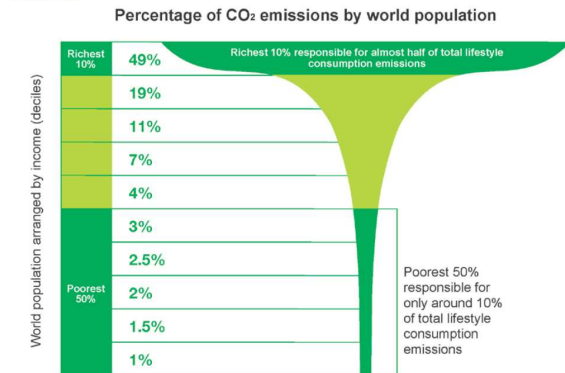
Militaries used to secure (e.g.):

- access to limited oil resources
- ability of wealthy to overconsume



“Almost two thirds of EU military missions are linked to fossil fuels”

Figure 1: Global income deciles and associated lifestyle consumption emissions

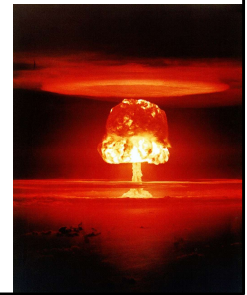


Source: Oxfam

- Analysis of EU military missions from Greenpeace (2021) – and 2026 Iran war also demonstrates the problem
- Carbon emissions inequality
  - ‘Champagne glass’ graph from: Oxfam (2015)
  - This research has just been updated - Oxfam (2021). Their projections, based on existing international policies, show this inequality will persist to at least 2030 – with richest 1% share increasing to 16% of carbon emission by then.

## Threat from nuclear winter

- Nuclear war can cause catastrophic climate cooling, known as 'nuclear winter'
- Updated academic research shows impacts to be high, even from 'regional' nuclear war
  - Large areas of 'severe fire zone', injecting 5m tonnes of soot into stratosphere
  - Sudden major drop in surface temperatures lasting over 7y
  - Severe frosts/ drought lead to much shorter growing season/ reduction in crop yields for years
  - **Global famine affecting about 2,000,000,000 people**
  - (In addition to 10-21 million direct deaths from explosions)
- Impacts from global nuclear war far worse



- Key findings from Toon et al (2007); Robock et al (2007) – other studies give comparable results
- Global famine affecting 2 billion – IPPNW (2013).

*Image credit: Gerd Altmann*

## What campaigners can do

- Raise awareness – especially with climate campaigners and politicians
  - ‘Militarism steals funds from climate action’
  - ‘Militarism fuels the climate crisis’
- Speak out against NATO spending targets
- Be very wary of ‘green militarism’
- Promote green jobs
- Promote divestment from fossil fuels *and* arms companies
  - Where is your pension invested?



*image credit: Escif - <https://www.facebook.com/Escif-116160785113488/>*

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