Future War:
Will it really be clean and green?

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Scientists for Global Responsibility

Download slides from: https://www.sgr.org.uk/

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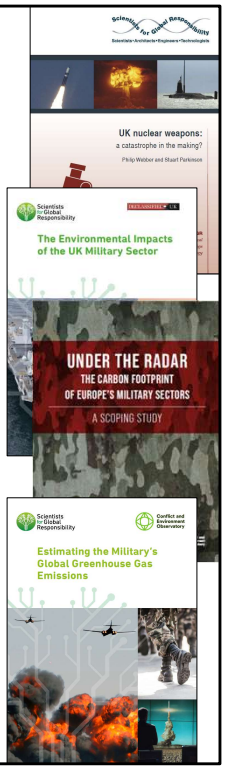
(All references listed in final slides)

About Scientists for Global Responsibility

- UK research/ advocacy organisation
- Membership includes hundreds of scientists and engineers
- Concerns include:
  - climate change; military misuse of science & technology; military greenhouse gas emissions; nuclear weapons
- Recent publications include:
  - 3 reports on UK, EU & global military GHGs
  - 2 technical papers on UK military GHGs
  - 2 reports on threats to env/ humans from UK nuclear weapons



- Nuclear weapons reports published in 2013, 2015; military GHG reports published in 2020, 2021, 2022 and technical papers published in 2022, 2023
- For a list of main outputs on military GHGs, see: https://www.sgr.org.uk/projects/climate-change-military-main-outputs
- For a list of main outputs on nuclear weapons, see: https://www.sgr.org.uk/projects/nuclear-weapons-threat-main-outputs
- Some of SGR's recommendations on military GHG accounting and target-setting endorsed by 2023 report by House of Commons Defence Committee
- SGR's reports on nuclear weapons used by ICAN in their successful campaign for UN Treaty on the Prohibition of Nuclear Weapons

[image credit: SGR]

Technologies and practice

[image credit: RAF]

Emerging military visions of future war

1. Minimal casualties among ‘our’ forces
2. Minimal civilian casualties
3. Minimal environmental impacts

We’ll look at (2) and (3) in more detail…

- Image is report cover of early example of military efforts to reduce climate impacts (US DOD, 2008)

Minimal civilian casualties?

- Myth: ‘Precision warfare’
- Reality:
  - Search for ‘battlefield advantage’ driving quest for more accurate weapons
  - Small, guided weapons are still destructive
  - Military attacks often use mixture of guided and unguided weapons
  - Adverse weather conditions reduce accuracy of guided weapons
  - Increased use of ‘human shields’ can raise casualty level
  - Increased frequency of use can raise casualty level
  - Concept undermined by continued deployment of nuclear weapons

- Search for ‘battlefield advantage’ driving quest for more accurate weapons, rather than desire to reduce civilian casualties; meanwhile, little effort is directed to reducing international confrontation which would reduce casualties
- Small, guided weapons are still destructive - ‘Likely injury radius’ of Hellfire missile is 20m (nearly the width of a football field) (see data below)
- Military attacks often use mixture of guided and unguided weapons - Guided weapons are (much) more expensive; supplies are more limited (see data below)
- Adverse weather conditions reduce accuracy of guided weapons - Even light cloud can affect accuracy of laser-guided bombs (Lee, 2021)
- Increased use of ‘human shields’ can raise casualty level - Response to increasing accuracy can be combatants hiding in civilian areas, so civilian casualties still difficult to avoid
- Increased frequency of use can raise casualty level - Over-confidence in targeting, e.g. use of AI, can lead to higher weapons use and no reduction in civilian casualties

Further data:

- ‘Likely kill radius’: small guided missile (Hellfire) – 15m; large bomb (2,000lb; guided or unguided): 34m (OHCHR, undated)
- ‘Likely injury radius’: Hellfire – 20m; large bomb: 350m (OHCHR, undated)

- Guided bombs/ air-to-surface missiles cost from 2x to over 100x cost of unguided bomb (Trevithick, 2020)
- Typical bomb sizes (guided & unguided): 230kg (500lb) to 900kg (2,000lb) – about 50% of bomb weight is explosive (Webber & Parkinson, 2024)
- Missiles: greater range of sizes; fraction of explosives is often smaller – weight of explosive from about 10kg (Hellfire) to 1,000kg+(CSIS, 2024)

[image credit: Don White via Pixabay]

Examples

- Gaza, 2006-2016
  - Lancet study: “drone-delivered weapons caused significantly more severe injuries than explosives delivered by other mechanisms”
- Israeli bombardment of Gaza, 2023-
  - Mixture of guided and unguided weapons used
  - IDF used AI-targeting system ‘Hasbora’ – claimed to reduce civilian casualties
  - First 35 days
    - Targets hit per day 3x higher than previous IDF bombardments
    - Civilian deaths extremely high – 12,000+
- Worldwide: war casualties, August 2023-July 2024
  - 85% of casualties of explosive weapons in 60 nations were civilian

Gaza; Oct, 2023

- Reliable data is very difficult to obtain in this field
- Israeli Defence Force (IDF) is one of the most frequent users of armed drones globally
- Data sources:
  - Gaza, 2006-16: Heszlein-Lossius et al (2019)
  - Israel-Gaza War, 2023: Webber and Parkinson (2024); BBC News (2023)
  - Worldwide: Explosive Weapons Monitor (2024)

[image: North Gaza, 7 October 2024; image credit: IDF]

Minimal environmental impacts?

- Myth: 'Green warfare'
- Reality:
  - Search for 'battlefield advantage' driving quest for lower carbon technologies
  - Many military lower carbon technologies at early stage of development
  - 'Rebound' can eliminate energy savings
  - Shift of environmental impacts rather than reduction
  - Potential to slow down civilian low carbon transition
  - Lower carbon tech will not reduce environmental impacts of weapons use
  - Environmental exemptions for military likely to continue
  - Concept undermined by continued deployment of nuclear weapons

- Search for 'battlefield advantage' driving quest for lower carbon technologies, rather than desire to reduce environmental impacts; meanwhile, little effort directed to reducing international confrontation which would reduce impacts
- Many military lower carbon technologies at early stage of development – Timescales are too slow for significant contribution to Paris targets
- High risk of 'rebound' - Improved efficiency can lead to greater energy consumption overall (known as the 'Jevon's Paradox')
- Shift of environmental impacts rather than reduction - Reducing carbon emissions, but increasing other environmental impacts
- Potential to slow down civilian low carbon transition – If funding is redirected from civilian transition programmes, which are generally cheaper and quicker, then that transition will be slowed
- Lower carbon tech will not reduce environmental impacts of weapons use – Using a more environmentally-friendly fuel to deliver a weapon to its target will not reduce the impact of its use
- Environmental exemptions for military continue – If transition is difficult, existing exemptions to regulations and targets will continue
- Concept undermined by continued deployment of nuclear weapons – even a 'limited' nuclear war could cause a 'nuclear winter' (SGR, 2015)
- Example of military climate/ environment plan – UK MOD (2021) (pictured)

Examples – lower carbon energy

- Biofuels
  - In theory, carbon release from combustion is balanced by uptake during crop growth
  - In practice, lifecycle emissions offset most/ all of savings
  - Energy crops also compete with food crops for land
  - Biofuels from waste already completely utilised by civilian sectors
- Synthetic fuels
  - Fuels industrially manufactured from CO_2 using electricity from renewable sources
  - Early stage of development/ high cost
  - Inefficient use of renewable energy compared with other options
- Nuclear power
  - High costs/ limited practical options
  - Replaces carbon emissions with radioactive waste – much greater environmental risks in war

- Further discussion of limitations of biofuels/ synthetic fuels in Asher (2022)

[image credit: Clker-Free-Vector-Images]

Examples – more efficient technologies

- Armed drones (RPAS)
  - Lower energy consumption, but lower payload
  - High crash rate
  - Potential use in greater numbers – offsetting energy savings
  - Potential to undermine international law
  - Gateway to fully autonomous weapons
- Electric propulsion
  - Early stage of development
  - Quieter, but heavier – unsuitable for large or long-range aircraft
  - Less dependent on fossil fuels, more dependent on rare minerals
  - Limited range – so hybrid is preferred, limiting carbon benefits

- Official term – RPAS (remotely-piloted aerial systems)
- For a discussion of the high crash rate of drones, see: Drone Wars UK (2019)
- For a discussion of the erosion of human control in military systems, including armed drones, see: Drone Wars UK (2021).

[image credit: RAF]

Capturing the war narrative

[image credit: Defense Visual Information Distribution Service]

Selective history

- Example of Britain in World War II
- Glamorising 'our' military successes
  - Britain and Allies defeating Nazis
  - Heroic military actions – e.g. Battle of Britain, D-Day, Dambusters raid
  - Britain remembered as 'underdog' although actually a 'great power'
- Downplaying/ ignoring 'our' military atrocities
  - Allied bombing of Germany: 600,000+ civilian deaths
  - British war policies in India contributed to 1943 Bengal famine: 3 million+ civilian deaths

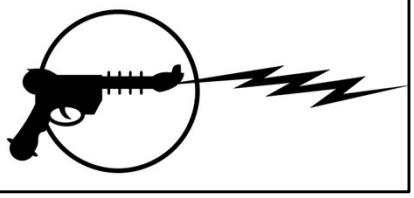
British bomber over Hamburg

Figures from: World History Encyclopedia (2024); BBC News (2023)

[image: Lancaster bomber over Hamburg; credit: Ian Dunster (public domain)]

Sanitised popular culture

- Examples from TV/ movie science fiction
- Dominance of war-themed stories
  - Star Wars, Battlestar Galactica, Transformers etc
  - Also significant element of Star Trek, Doctor Who, Stargate etc
- Weapons technologies glamorised
  - Prevalence of ‘clean’ weapons – e.g. laser cannons, stun guns
- Failure to foresee speed of ICT development
  - Internet, mobile phones, artificial intelligence



[image credit: OpenClipart-Vectors via Pixabay]

Imagining future peace

- Military & technology-driven options are dominating over peace-orientated policy & strategic options
  - Accelerating arms races and confrontation
  - Increasing human rights abuses and environmental damage
- We need to prioritise reduction of conflict
  - Diplomacy/ negotiation/ 'common security'/ 'non-offensive defence'
  - Tackle the roots of insecurity
  - From 'national security' to 'human security'

[image credit: Escif - https://www.facebook.com/Escif-116160785113488/]

References (p1)

Asher F (2022). The mirage of zero-emissions flying. Responsible Science, no. 4. April. https://www.sgr.org.uk/resources/mirage-zero-emissions-flying

BBC News (2023). Israel-Gaza: What Gaza's death toll says about the war. 20 December. https://www.bbc.co.uk/news/world-middle-east-67764664

BBC News (2024). Bengal famine: Tracking down the last survivors of WW2's forgotten tragedy. 23 February. https://www.bbc.co.uk/news/world-asia-india-68311520

CSIS (2024). Missiles of the World. Center for International Strategic Studies. https://missilethreat.csis.org/missile/

Drone Wars UK (2019). Military drone crash data undermines MoD case to fly Protector drones in UK. June. https://dronewars.net/2019/06/09/military-drone-crash-data-undermines-mod-case-to-fly-protector-drones-in-uk/

Drone Wars UK (2021). Meaning-less human control: Lessons from air defence systems for lethal autonomous weapons. February. https://dronewars.net/2021/02/19/meaning-less-human-control-lessons-from-air-defence-systems-for-lethal-autonomous-weapons/

Explosive Weapons Monitor (2024). July. https://explosiveweaponsmonitor.org/data/2024-07-01/

Heszlein-Lossius et al (2019). Traumatic amputations caused by drone attacks in the local population in Gaza: a retrospective cross-sectional study. The Lancet, vol.3, no.1, pp.e40-e47. January. https://doi.org/10.1016/S2542-5196(18)30265-1

Lee P (2021). Modern warfare: 'precision' missiles will not stop civilian deaths – here's why. The Conversation. November. https://theconversation.com/modern-warfare-precision-missiles-will-not-stop-civilian-deaths-heres-why-171905

OHCHR (undated). Kill Radius Compared. Office of the United Nations High Commissioner for Human Rights. https://www.ohchr.org/sites/default/files/Documents/HRBodies/HRCouncil/CoIGaza/Kill_Radius_Compared.pdf

SGR (2015). UK nuclear weapons: a catastrophe in the making? Scientists for Global Responsibility. August. https://www.sgr.org.uk/publications/uk-nuclear-weapons-catastrophe-making

References (p2)

Trevithick J (2020). Here Is What Each Of The Pentagon's Air-Launched Missiles And Bombs Actually Cost. The War Zone. February. https://www.twz.com/32277/here-is-what-each-of-the-pentagons-air-launched-missiles-and-bombs-actually-cost

UK MOD (2021). Climate Change and Sustainability Strategic Approach. UK Ministry of Defence. https://www.gov.uk/government/publications/ministry-of-defence-climate-change-and-sustainability-strategic-approach

US DOD (2008). Report of the Defense Science Board Task Force on DOD Energy Strategy: "More Fight – Less Fuel". US Dept of Defense. https://apps.dtic.mil/sti/pdfs/ADA477619.pdf

Webber P, Parkinson S (2024). Gaza: one of the most intense bombardments in history? Responsible Science, no.6. March. https://www.sgr.org.uk/resources/gaza-one-most-intense-bombardments-history

World History Encyclopedia (2024). Allied Bombing of Germany. 18 April. https://www.worldhistory.org/article/2430/allied-bombing-of-germany/