

European Conference of Defence and the Environment

ECDE 2024

THORBJØRN THORESEN
Director General
Norwegian Defence Estates Agency



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European Conference of Defence and the Environment

ECDE 2024

ANDERS MELHEIM

Director General

Royal Norwegian Ministry of Defence



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Norwegian Ministry of Defence

On a greener pathway together – more operational capability and more environment

Anders Melheim, Director General of the Investment Department in the Ministry of Defence

Oslo, June 12 2024



Welcome to all and a big thank you to our agencies



Serious backdrop

- The international security situation is more unstable, dangerous and competitive.
- Looking to increase combat power, availability, endurance and sustainability of the Armed Forces.
- The climate crisis and loss of biodiversity are also among the biggest and most dramatic challenges the world faces.



Footprint on climate and nature may increase with more activity

The sector will be an active contributor to a better environment



Photo: Onar Digernes Aase, Forsvaret



Photo: Sjøforsvaret/Royal Norwegian Navy



Implementing measures on a wide front





Photos: Gry Støvind Hoell,
Norwegian Defence Estates Agency



New Norwegian Long Term Plan on Defence: 'A historic plan'



Photo: Peder Torp Mathisen, Norwegian Armed Forces



Photo: Norwegian Armed Forces



A win-win with simulators – better training, reducing costs and reducing effects on climate and nature



Environmentally sound procurements

- Using our purchasing power to reduce environmental impact



Cooperation is vital

An increased focus on sharing information, experiences and practices will be highly beneficial.



Photo: Norwegian Armed Forces



Photo: Torbjørn Kjosvold, Norwegian Armed Forces



On a greener pathway – discuss and stay in touch on how to get both operational capability and sustainable solutions to work great together.



Photo: Gry Støvind Hoell,
Norwegian Defence Estates Agency





Norwegian Ministry of Defence

Thank you!



Photo: Anette Ask, Norwegian Armed Forces

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NICOLAS DE LA GRANDVILLE

Ambassador

Head of the European Union Delegation to Norway



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#EUGreenDeal



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PAUL RUSHTON

Team Leader for Climate Change and Security

NATO's Innovation Hybrid and Cyber (IHC) Division



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INNOVATION, HYBRID AND CYBER DIVISION
DIVISION INNOVATION, HYBRIDE ET CYBER



NATO's Approach to Climate Change and Security Challenges

European Conference of Defense and the Environment – 12 June 2024

Paul Rushton, Team Lead, Climate Change and Security

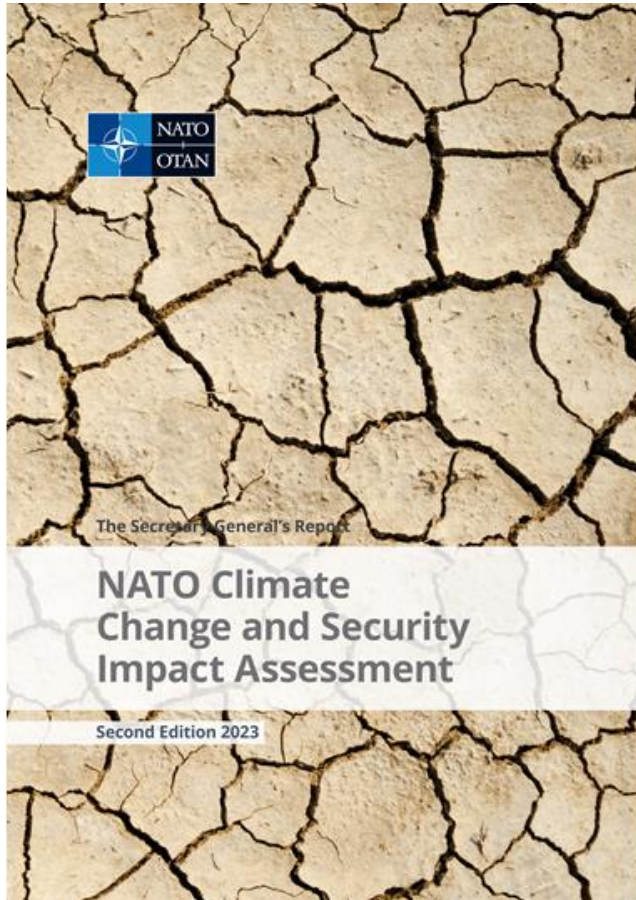
Innovation, Hybrid and Cyber Division, NATO International Staff



*“Climate change is one of the **defining challenges of our times**. It is a **threat multiplier** that impacts Allied security, both in the Euro-Atlantic area and in the Alliance’s broader neighbourhood.”*

- NATO’s Climate Change and Security Action Plan, 2021

Security Impacts on NATO's Strategic Environment



- **Intensifying vulnerability across all assessed regions.**
- **Concurrent climate hazards:** intensifying storms, floods, heatwaves, drought, ocean acidification & sea level rise.
- **NATO's Assets and Installations** at risk from extreme heat, rising seas – e.g. key naval bases and ports.
- **NATO forces in higher demand** – operations, disaster relief.
- **Critical infrastructure and enablement under strain:** roads, power lines, pipelines - all essential to military operations.
- **Operational risks** to personnel, equipment from extreme heat.
- **Strategic competition intensifies** as geophysical conditions shift – e.g. High North.

NATO's Core Tasks



- **Deterrence and Defence:** *“...assist each other in the event of armed attack...”*
- **Crisis Prevention and Management:** *manage, prevent & respond to crises that can affect our security*
- **Cooperative Security:** *“Political dialogue & practical cooperation with partners ... contribute to stability beyond our borders, enhance our security at home and support NATO’s core tasks.”*

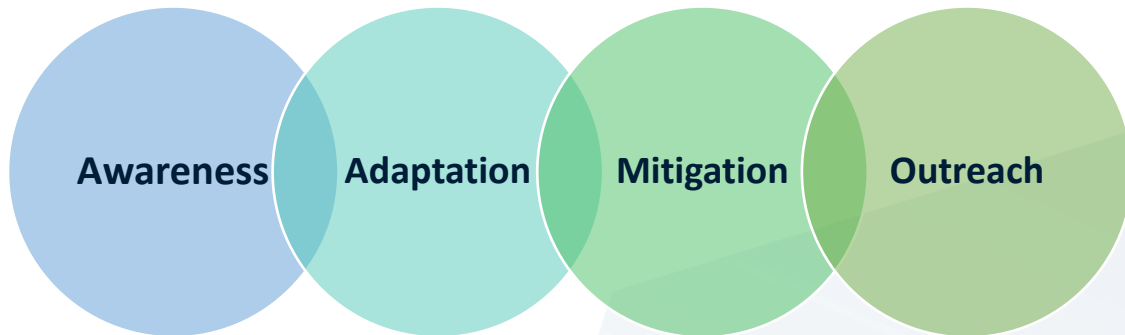
*“NATO should become the leading international organisation when it comes to **understanding** and **adapting** to the impact of climate change on security.”*



Military Adaptation to Climate Change?

NATO's Climate Change Commitments

Climate Change and Security Action Plan (2021)

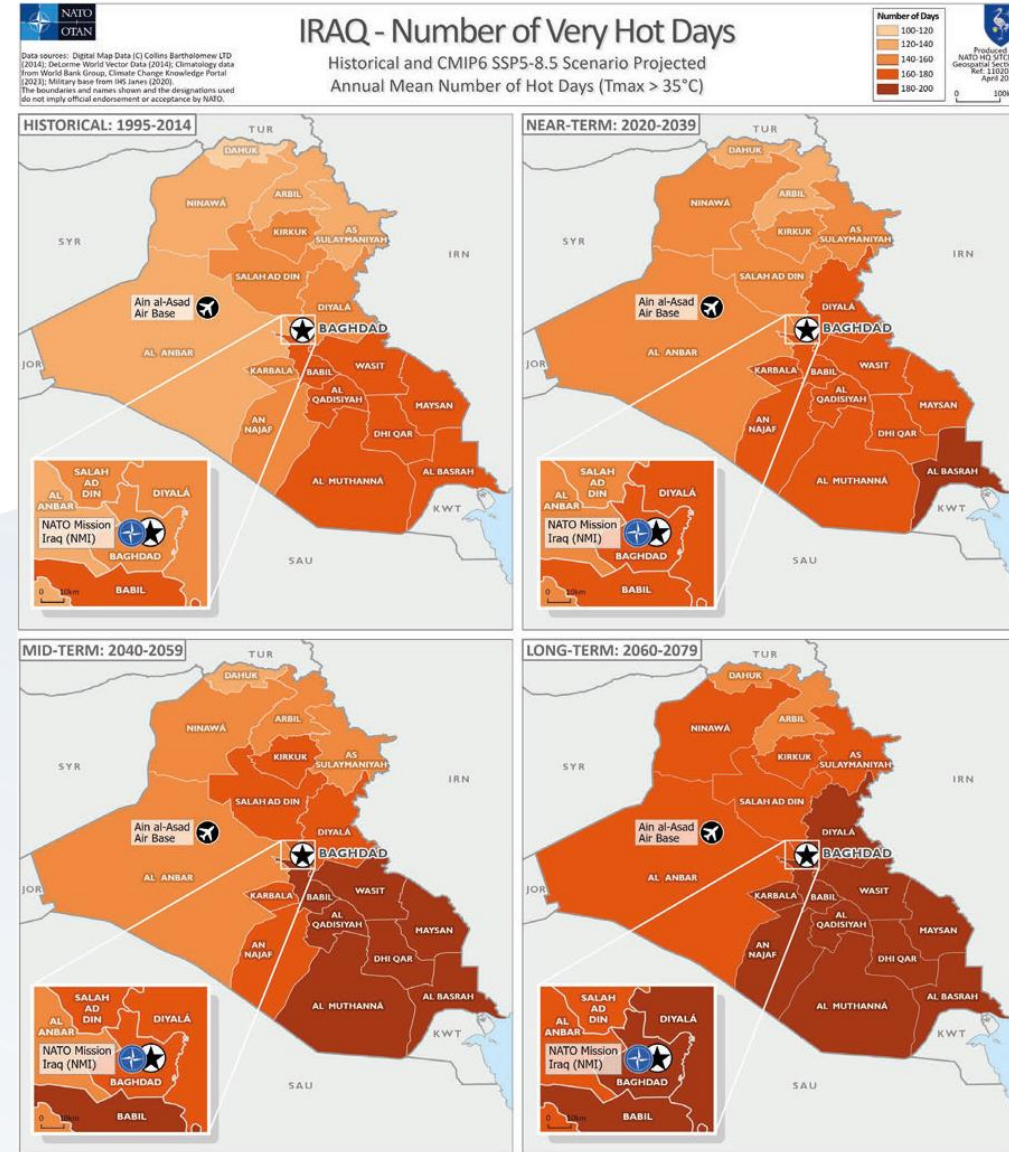


**But NATO will never compromise
on collective security**

- **Operational Effectiveness**
- **Interoperability**
- **Innovation**

Awareness

- Understand the security challenges climate change poses – and where, how and when we’ll feel the impacts.
- Advise policy-makers, military planners, operational commanders in making decisions.
- Impact Assessment (2024 coming soon)
- Risk Management Framework (ongoing).
- Scientific and technical cooperation.



Mitigation

- **Maintain effectiveness & interoperability**
- **Find operational advantages from green tech**
- Mainstream defence investment in:
 - Alternative fuels & propulsion; efficiency
- ***Energy Transition by Design***
 - Position NATO for the global low-carbon future
 - Avoid new dependencies
- ***GHG cuts: 45% by 2030 – net zero by 2050***



Bushmaster PMV – All-Electric

Adaptation

- Mainstream climate change into **all NATO work**
- Adapt capabilities, material, technology to tomorrow's operating environment.
- Adapt operational planning & procedures to extreme environments and disaster relief.
- Build resilience of logistics and supply chains (food, energy, manufacturing)
- Incorporate climate into training and exercises

Every capability area has specialized needs



Outreach

- Strengthening outreach with dozens of national partners
 - Huge priority for partners
- Civil-military cooperation with IOs: including UN, EU, OSCE.
- Engage with industry, academia, & scientific community.
- COP / IPCC processes
- External events:
 - Roundtable on Climate Change and Security
 - Secretary General's High Level Climate Dialogue.



Challenges and Opportunities Ahead

- Advance the climate change and security agenda **and** fulfil our core tasks
- Ensure effectiveness and interoperability while mainstreaming climate change
- Avoid new strategic dependencies
- Identify specific adaptation needs for each domain & capability area.



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STIG SCHJØLSET
Acting General Manager
ZERO – Zero Emission Resource Organisation



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Security, geopolitics and climate change

Stig Schjølset
CEO at Zero

(Just to state the obvious)

**Climate
change is**

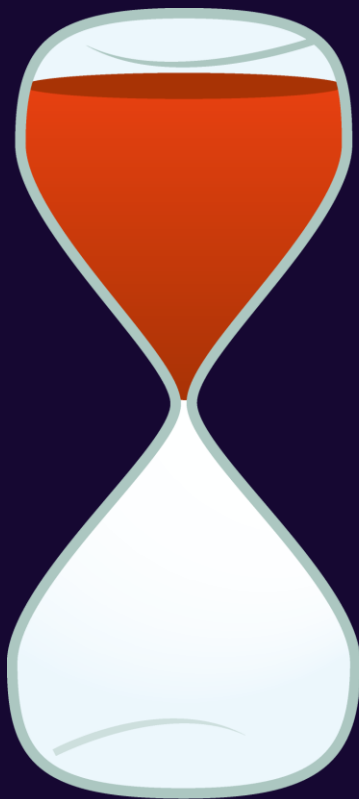
A security risk

A threat multiplier

**An existential threat
to poor countries**

**So how are we
actually doing?**

1750



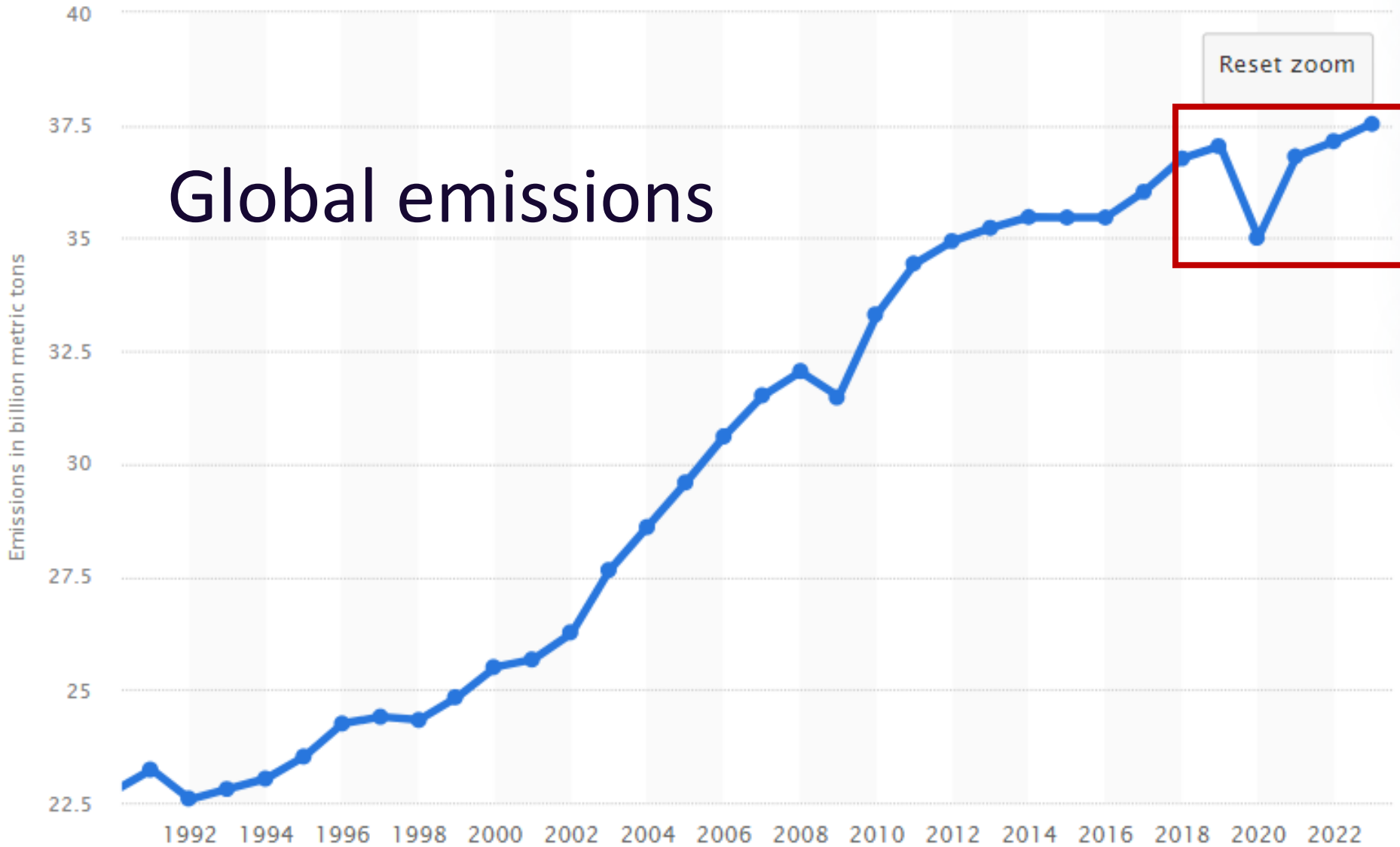
2020



2028



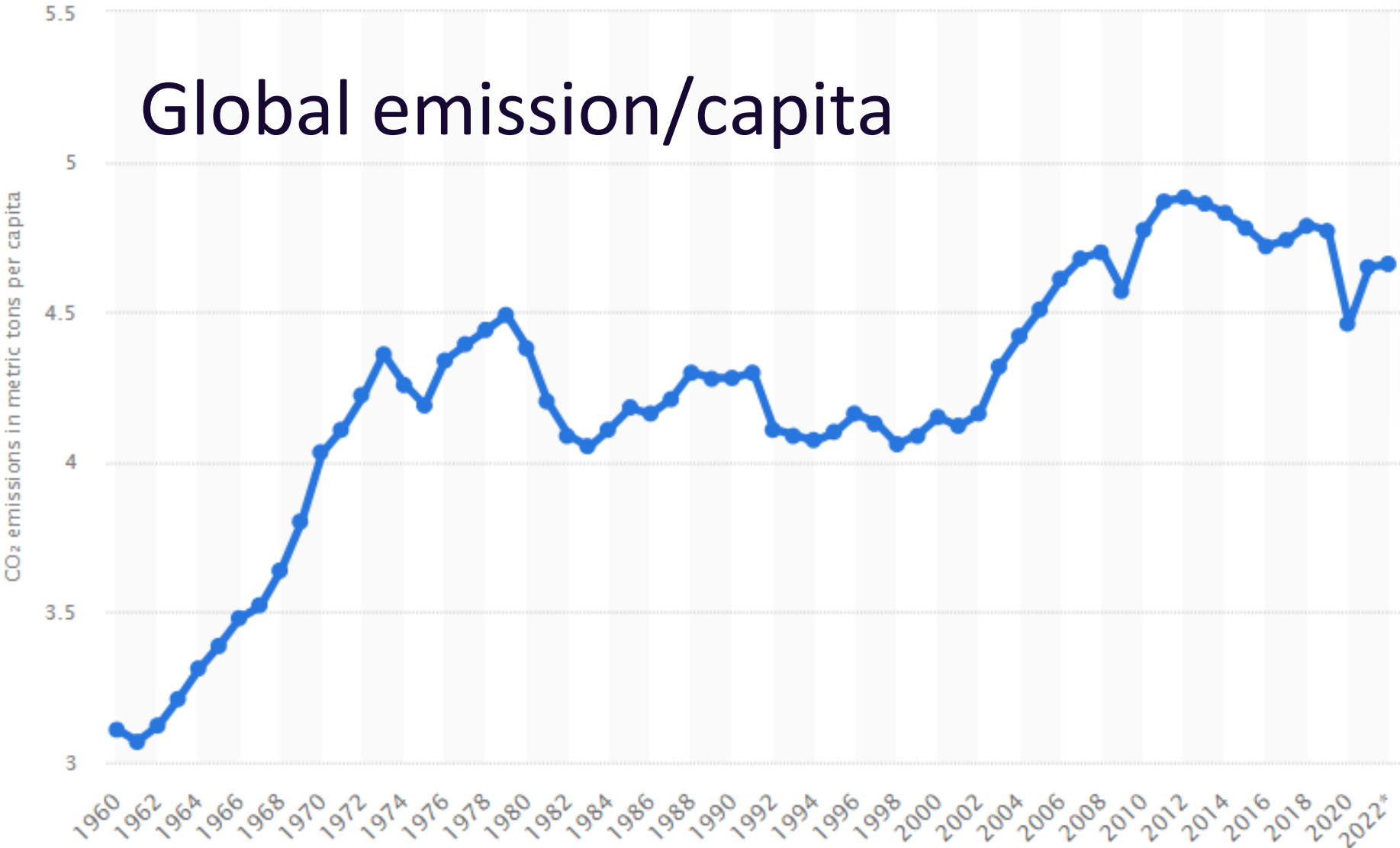
Global emissions



Source: Statista



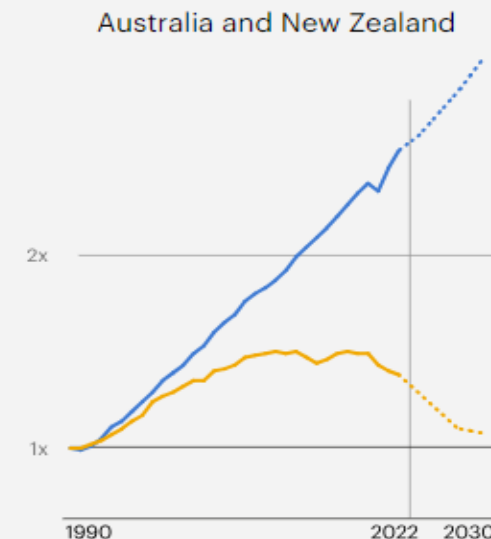
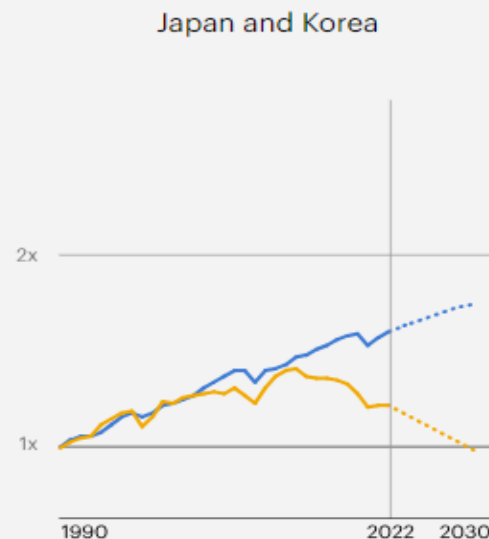
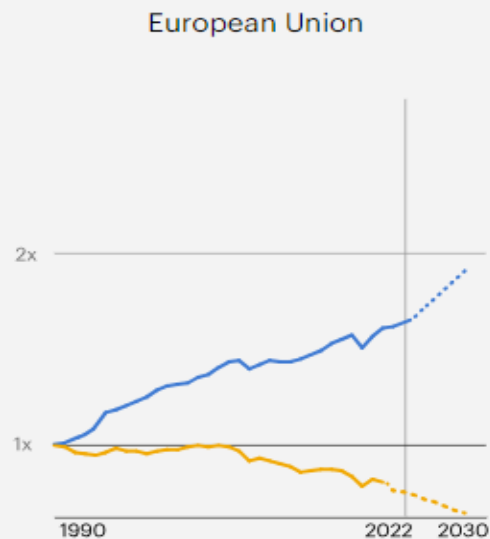
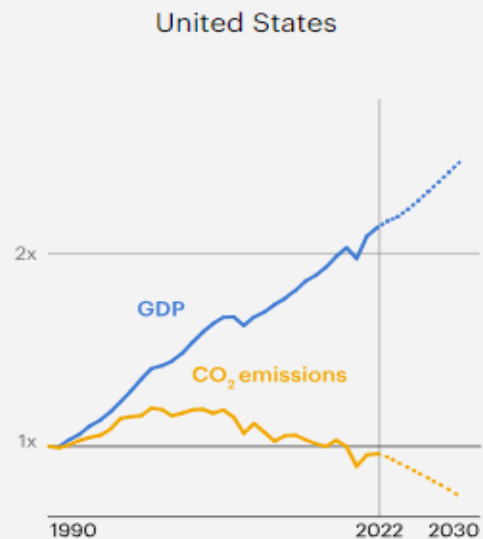
Global emission/capita



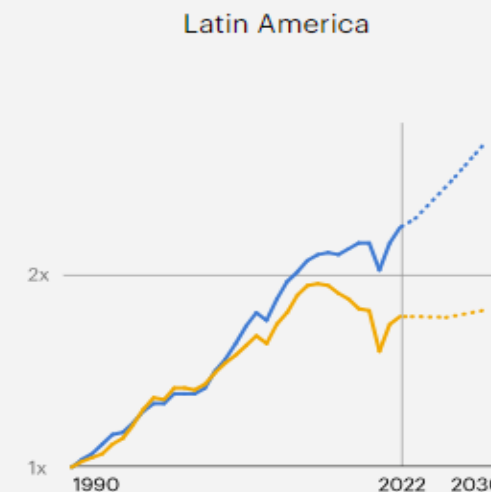
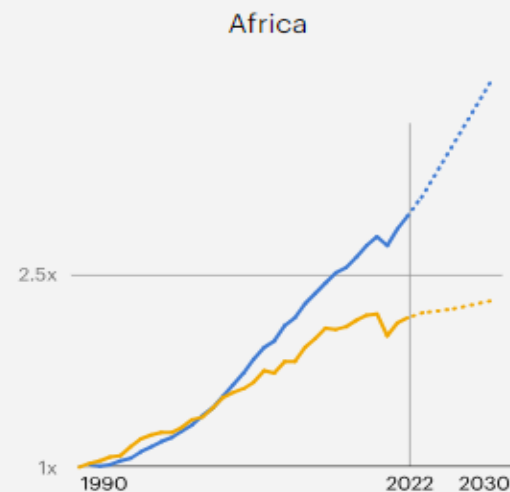
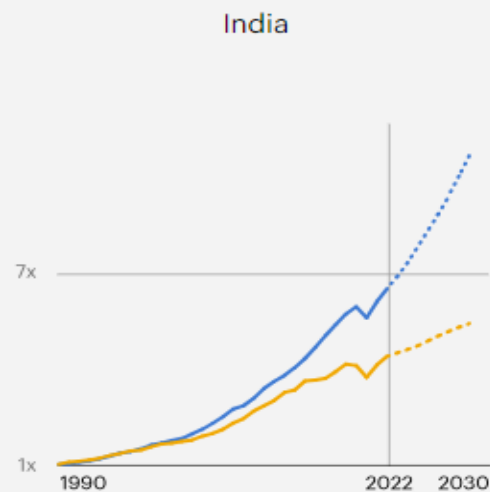
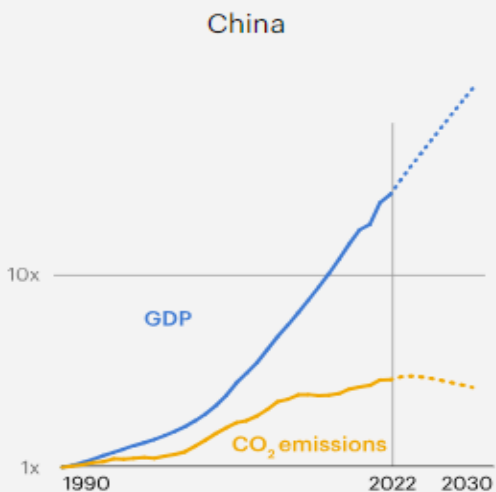
Kilde: Statista

GDP and CO₂ emissions by region

Regions where emissions are falling while GDP continues to grow...



Regions where emissions and GDP growth are diverging...



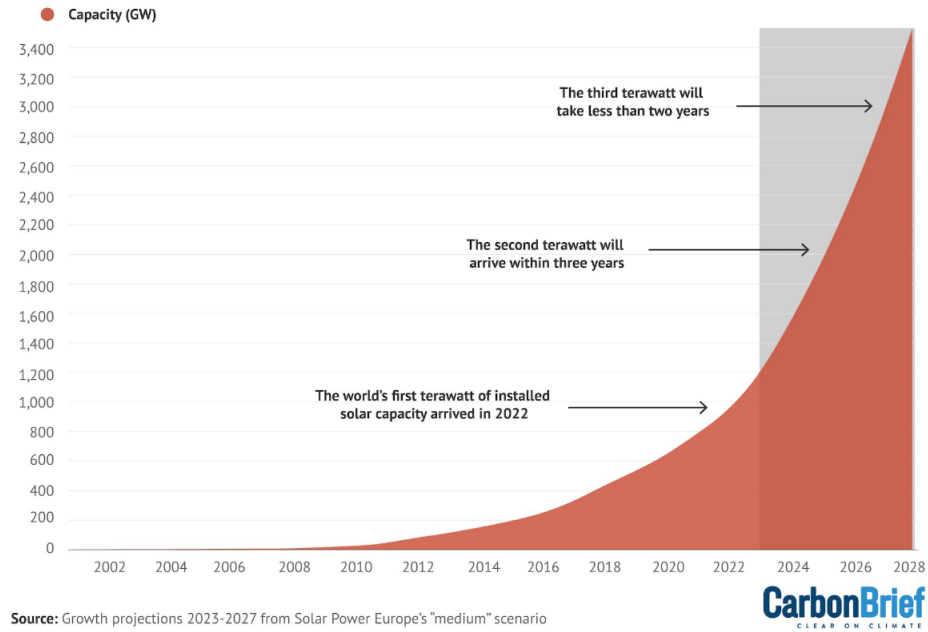
Hard



«Easy»

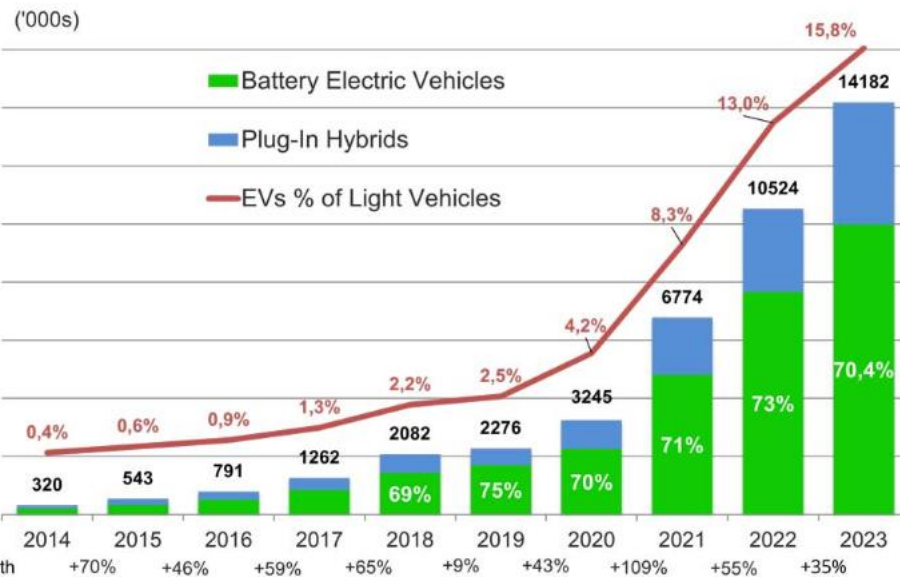


It took 22 years for the world to install its first terawatt of solar power capacity. The second and third terawatts are now expected to arrive within five years.



GLOBAL BEV & PHEV SALES

EV VOLUMES

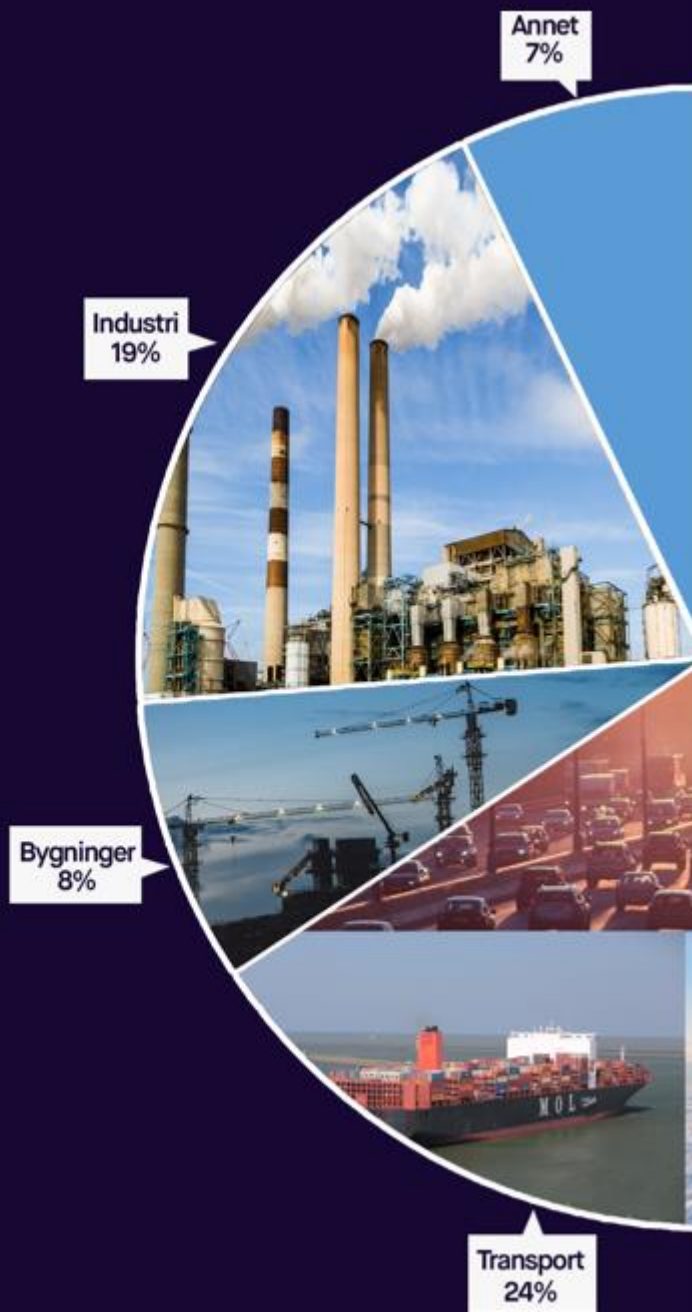


«Easy»

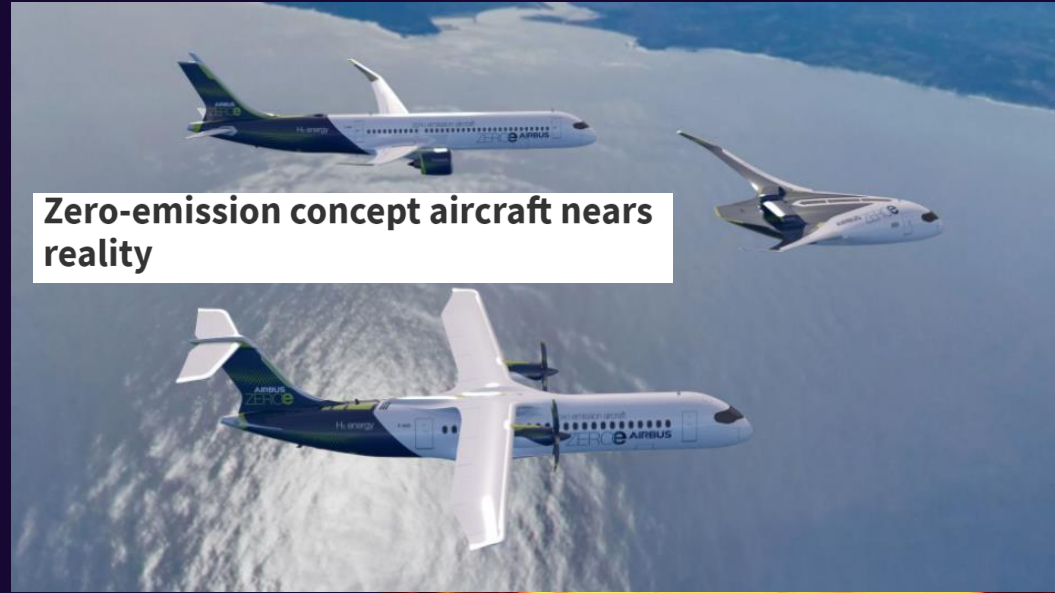
Elektrisitet og varme
42%



Hard



Zero-emission concept aircraft nears reality



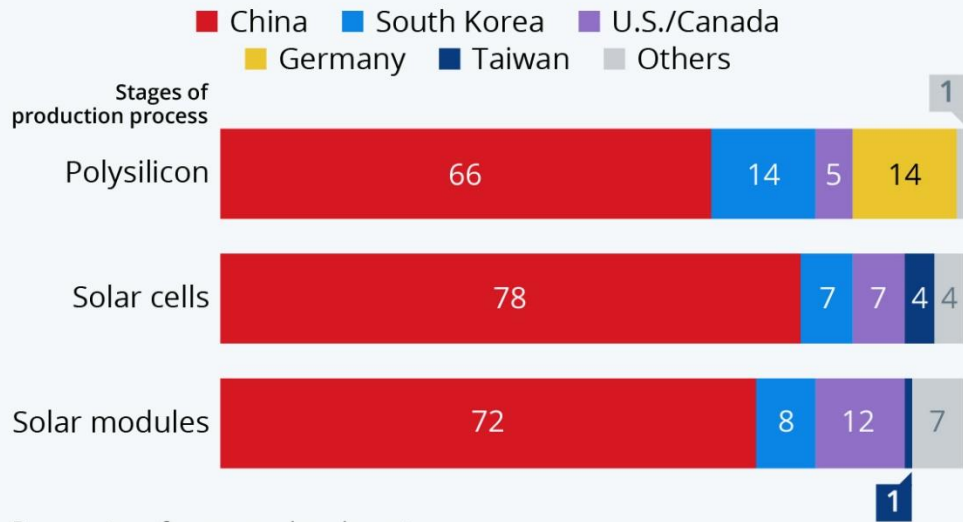
Shipping giant Maersk orders 8 'carbon-neutral' vessels



**Energy policy is
geopolitics**

China Dominates All Steps of Solar Panel Production

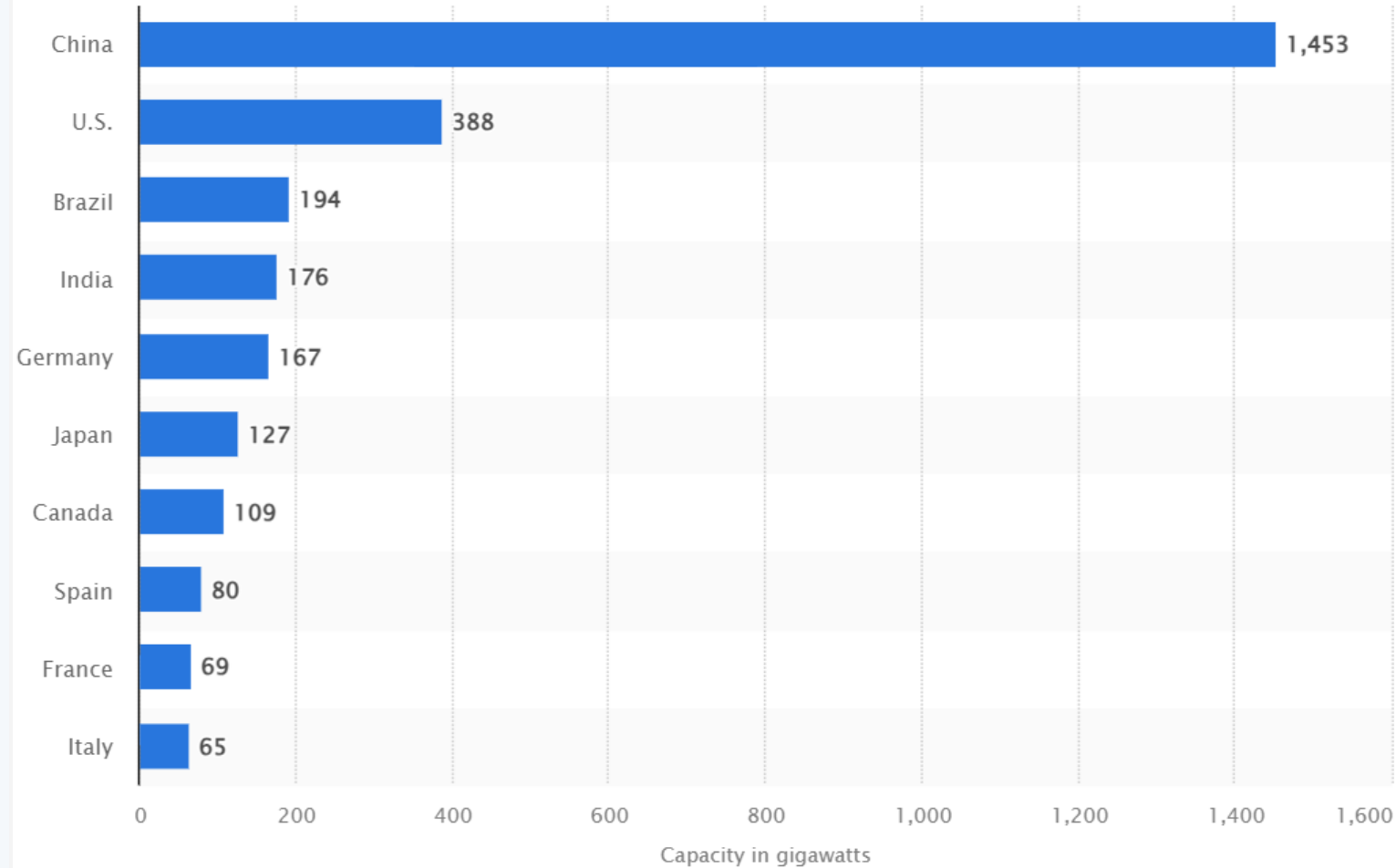
Country market shares of different products of global solar photovoltaic manufacturing in 2019 (in percent)



By country of company headquarter.
Totals measured in tons (polysilicon), gigawatts (cells, modules)
Source: Bloomberg NEF



statista





Kilde: Statista

**We (likely) won't meet the
targets. But a huge
transition is under way**

Implications for defence and security sector

All long-term investments must plan for fundamental changes in the energy and transport

Huge investments in infrastructure is needed to support the green transition

Challenge to all actors: Tag along or help drive the change?



Vi sees **24. oktober** på **The Hub**
eller på **zerokonferansen.no**

Norges viktigste møteplass for klimaledere

European Conference of Defence and the Environment

ECDE 2024

LENNARD DE KLERK

Lead author of the *Initiative on GHG accounting of war*



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Climate footprint of the war in Ukraine



Initiative on
GHG accounting
of war

ECDE 2024: Defence, climate and environment, 12 June 2024



Content

1. Introduction
2. Environmental Damage
3. Climate footprint of war
4. Climate footprint of war: Warfare
5. Accountability
6. Military emissions



1. Introduction



Background

- Full-scale invasion of Ukraine by the Russian Federation triggered the **largest armed conflict** on the European continent since WWII
- Ukraine is an industrialized country with a highly educated population with a **strong civil society**
- From the onset of the war, many grassroots initiatives popped up to track and register damages, including **environmental damage**
- Kyiv School of Economics: Russia will pay



Tracking environmental damage

Only very few precedents:

- Deforestation following the civil war in Syria and Afghanistan
- Land degradation in Yemen
- Oil pollution from destroyed oil wells following Iraq's retreat from Kuwait

Remote sensing by satellites and social media made registering environmental incidents easier.



Tracking environmental damage

Ecoaction (largest environmental NGO in Ukraine):

- en.ecoaction.org.ua/warmap.html

Greenpeace:

- maps.greenpeace.org/maps/gpcee/ukraine_damage_2022

Zoï Environment Network:

- ecodozor.org

Ministry of Environmental Protection of Ukraine:

- ecozagroza.gov.ua



Consequences of the Russian blow-up of the Kakhovskaya HPP dam

₴146,4 bln uah

estimated amount of environmental damage

🏠 1144 pcs

populated areas flooded

💧 14,395 bln cubic km.

reduced water volume by

🌳 63 447 ha

the area of flooded forests is

💧 Water Normal

🌬️ Air Normal

♂️ Soils Normal

[More details](#)



Consequences of military actions and impact on the environment

₴ 2,456 billion

+ 0 per day

Approximate damage calculations were calculated by the State Environmental Inspection in accordance with approved methods

📄 5079 documented

+ 0 per day

The facts were documented by DEI employees

📄 5079 recorded facts

+ 0 per day

Facts of causing damage and losses as a result of russian armed aggression

Damages caused

Atmospheric air

₴1,17 trillion

+ 0 per day

📄 1 622 acts have been drawn up

+ 0 per day

[More details](#) >

Land resources

₴1,10 trillion

+ 0 per day

📄 2912 зафіксовано фактів

+ 0 per day

[More details](#) >

Aquatic resources

₴83,94 billion

+ 0 per day

📄 216 зафіксовано фактів

+ 0 per day

[More details](#) >



Application

Download the app for your convenience.
Add data and follow the development of
the project



Google Play



App Store





Conflict and Environment Observatory

- UK based NGO
- Team of 8 person (4 FTE) monitoring and registering environmental incidents
- Data sources are **OSINT**: mass media, social media, satellite observations and occasional ground-based monitoring
- Data base of incidents to be used for advocacy, **remediation/recovery**, and **accountability**
- Project funded by OSCE, UNDP and UNEP



War damage to industry





Impacts on the Black Sea and the Sea of Azov

Oil, gas and coal

- Oil fields
- Gas fields
- Oil and gas fields
- Oil pipelines
- Gas pipelines

Protected areas

- Major
- Smaller

Grain export

- Major ports for grain export or transit from Ukraine
- Grain export corridor (Black Sea Grain Initiative Shipping Route)

Background information

- Line of contact per 28 February 2023
- Areas outside of government control per 28 February 2023
- Former areas outside of government control in 2022
- State borders / exclusive economic zone (Black Sea)
- Sea depth in metres

Impacts on the marine and coastal environment

- Cetacean (dolphins, porpoises) sightings, dead or injured, on the coast between February and July 2022 *
- Impact on the marine biota due to military activities (e.g. sonar) in the Black Sea, approximate delimitation *
- Military exercises in protected areas (marine and land)
- Main areas of natural and man-made fires in 2022
- Potential oil spills between March and September 2022

Incidents of damage or disruption to industry, infrastructure and settlements in coastal areas

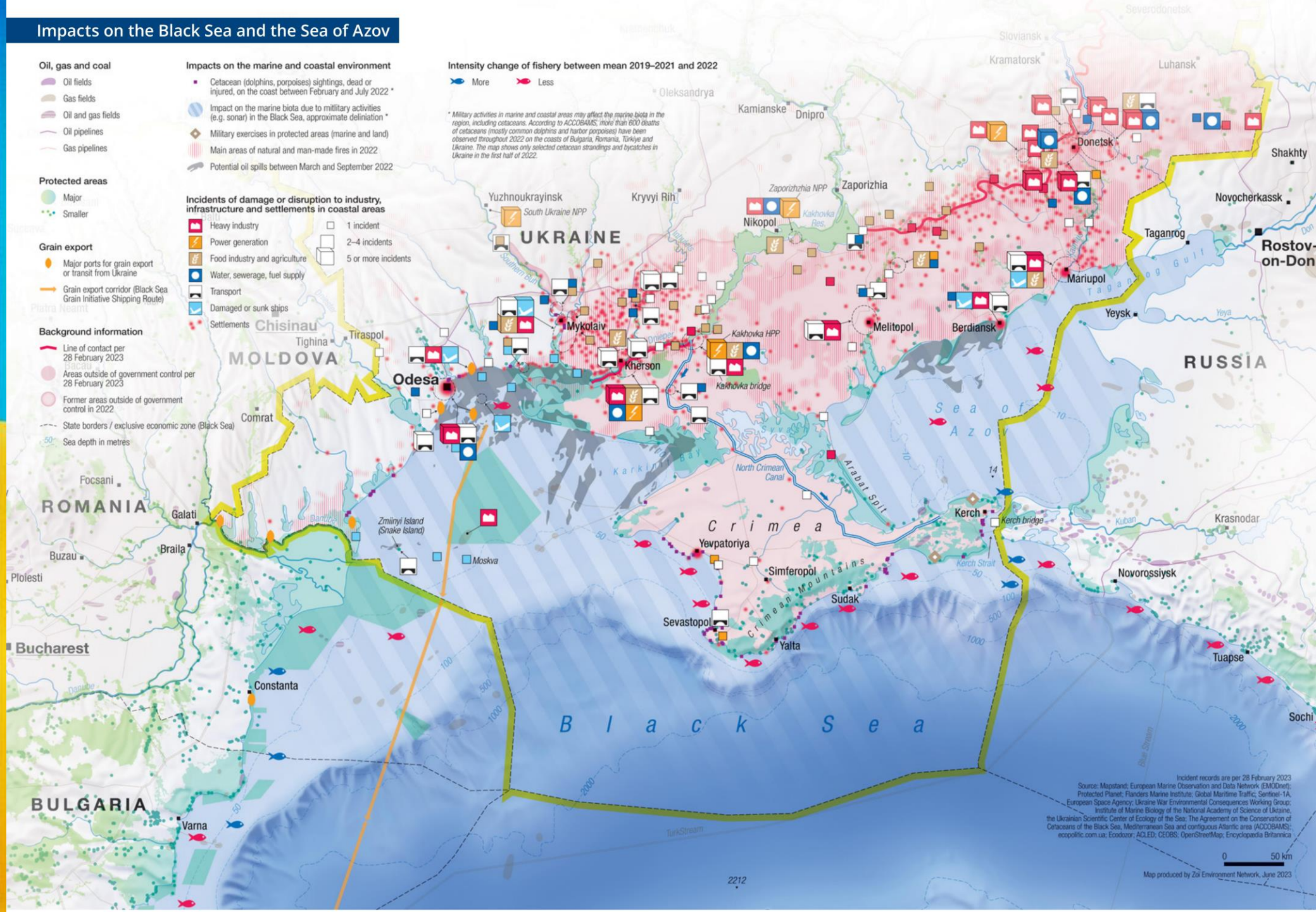
- Heavy industry
- Power generation
- Food industry and agriculture
- Water, sewerage, fuel supply
- Transport
- Damaged or sunk ships
- Settlements

- 1 incident
- 2-4 incidents
- 5 or more incidents

Intensity change of fishery between mean 2019-2021 and 2022

- More
- Less

* Military activities in marine and coastal areas may affect the marine biota in the region, including cetaceans. According to ACCOBAMS, more than 600 deaths of cetaceans (mainly common dolphins and harbor porpoises) have been observed throughout 2022 on the coasts of Bulgaria, Romania, Türkiye and Ukraine. The map shows only selected cetacean strandings and bycatches in Ukraine in the first half of 2022.



Incident records are per 28 February 2023
 Source: Mapstard; European Marine Observation and Data Network (EMODnet); Protected Planet; Flanders Marine Institute; Global Maritime Traffic; Sentinel-1A; European Space Agency; Ukraine War Environmental Consequences Working Group; Institute of Marine Biology of the National Academy of Sciences of Ukraine; the Ukrainian Scientific Center of Ecology of the Sea; The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS); ecopolitic.com.ua; Ecodozor; AQLED; CEBS; OpenStreetMap; Encyclopaedia Britannica



Incidents at the Zaporizhzhia Nuclear Power Plant



1. Hole in roof
29.08.2022
2. Armoured vehicles on site
05.08.2022
3. Damaged distilled water tank
20.11.2022
4. Armoured vehicles "hidden"
29.08.2022
5. Crater and UXO near spent fuel storage
07.08.2022



Zaporizhzhia Nuclear Power Plant

- Industrial area
- Buildings

Background information

- Roads
- Railway tracks
- Transmission lines
- Pipelines
- Buildings
- Tailing ponds
- Rivers and lakes

Zaporozhye NPP
Cooling Pond

Zaporizhzhia Nuclear
Power Plant

Sources: Openstreetmap; Bing Maps

0 500 m

Map produced by Zoi Environment Network, April 2023



6. Damaged and leaking cooling pipeline
20.09.2022
7. Damaged spray pond
20.11.2022
8. Damage from loitering drone attack
20.07.2022
9. Nearby grassland fires
23.08.2022
10. Firefight as Russian troops attack plant
04.03.2022
11. Substation fire
05.08.2022



Image sources: original or modified satellite data (©MAXAR, Copernicus Sentinel-2), Daily Mail, Jurnalul Național, Nuclear Engineering International, The Insider, «Българската национална телевизия», «Запорізька АЕС», «Радіо Свобода».



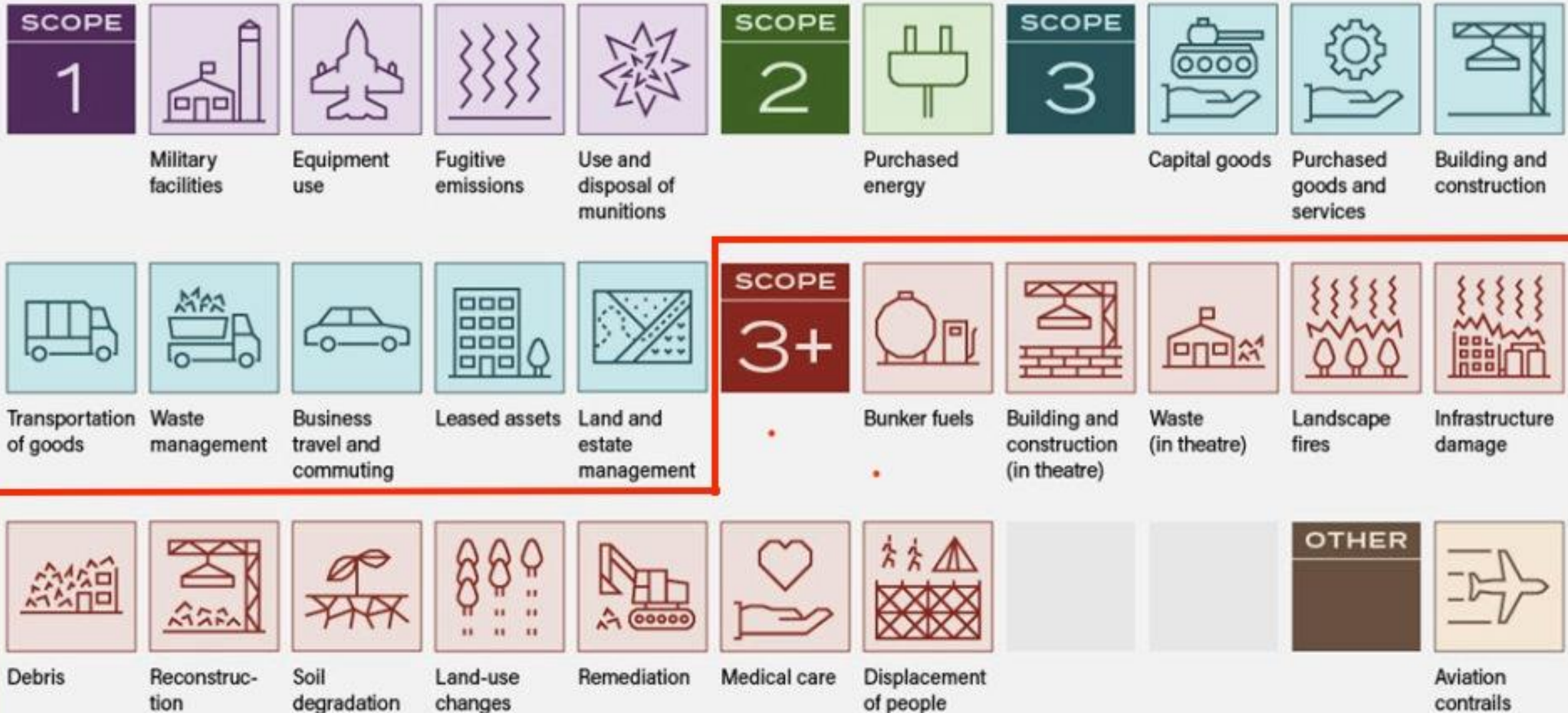
3. Carbon footprint of war



3. Carbon footprint of Russia's invasion

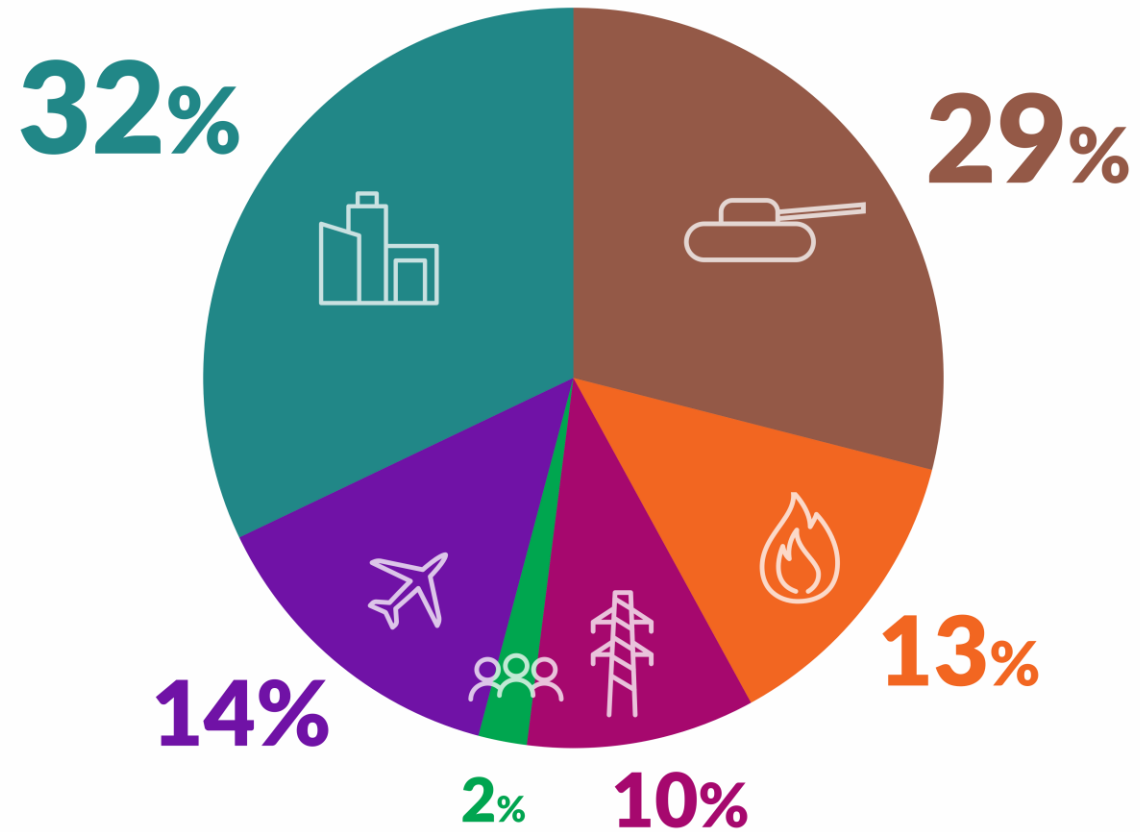
- Carbon experts joined forces to estimate the impact of Russia's invasion on the climate
- Impact on the climate through the **additional** emissions of greenhouse gases **attributed** to the war
- Show the **transboundary** impact of the war
- Never done before, no previous examples, no methodologies available

Proposed scopes of military greenhouse gas emissions





Total emissions 24 months of war



- Warfare
- Refugees
- Landscape fires
- Civil aviation
- Energy infrastructure
- Reconstruction

TOTAL EMISSIONS:
175
MtCO₂e



Comparison

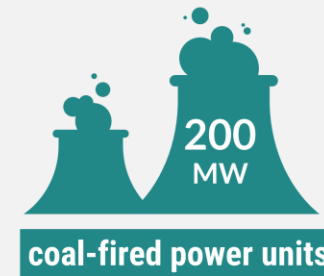
 **2** years
of war



175M

>

 **1** year
The Netherlands



260

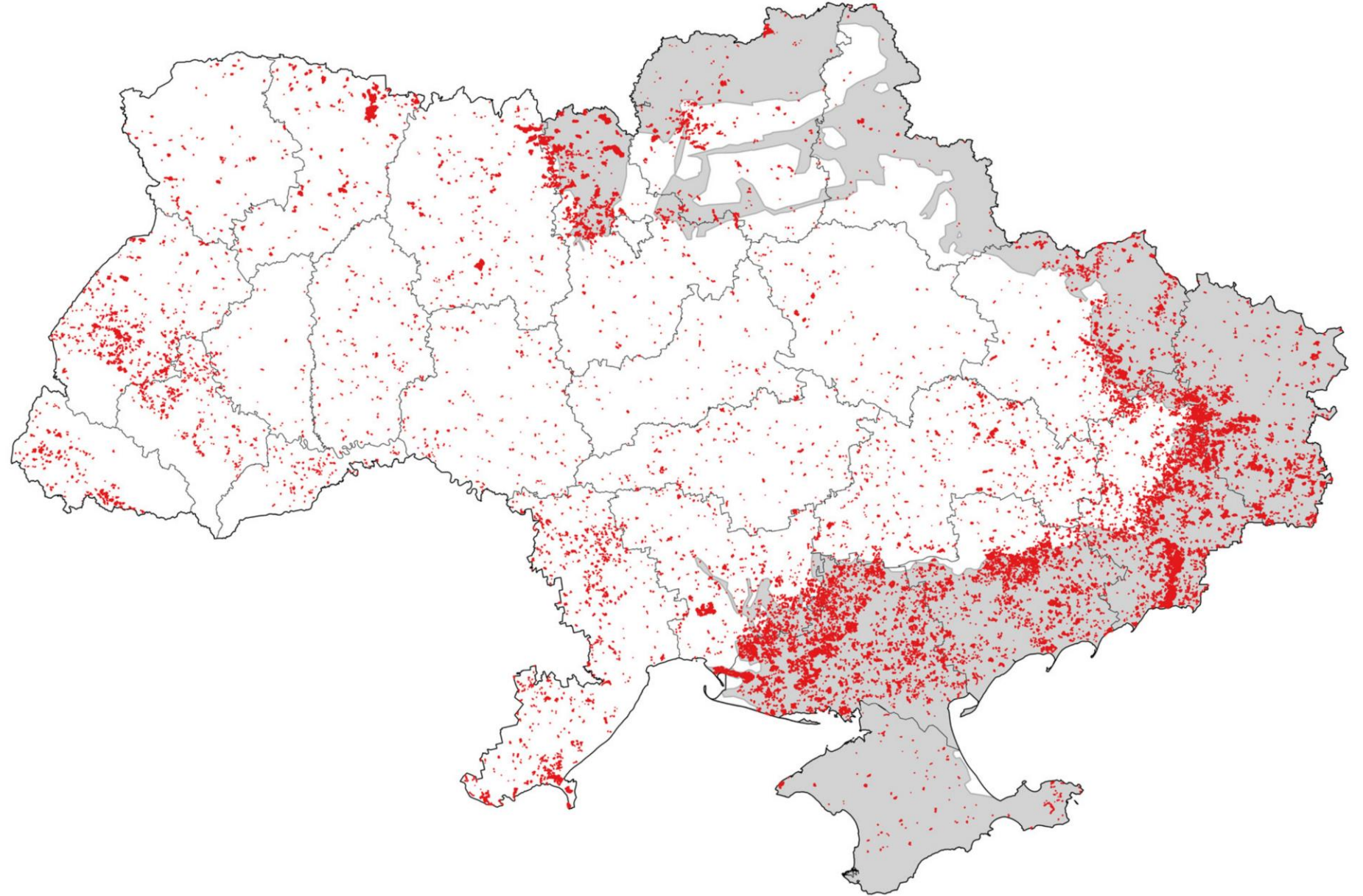
or



90M



Landscape Fires: Fire points





Landscape Fires: Attribution

Season	FWI classes	Crop lands, %	Coniferous forests, %	Deciduous forests, %	Other vegetation lands, %
Spring 2022	low	58.0	92.6	56.9	64.3
	moderate	60.2	96.2	66.3	62.7
	high	70.0	81.6	85.3	92.7
	very high	64.0	100.0	100.0	99.9
	extreme	100.0	100.0	100.0	100.0
Summer 2022	low	95.8	100.0	97.0	98.6
	moderate	72.6	99.9	90.6	96.2
	high	93.5	99.0	98.6	92.2
	very high	89.1	100.0	99.2	97.6
	extreme	90.0	99.9	99.9	98.8
Autumn 2022	low	88.1	73.1	60.8	73.7
	moderate	-20.0	-99.4	-97.7	46.2
	high	98.2	100.0	100.0	97.8
	very high	100.0	0.0	100.0	100.0
Winter 2022/23	low	95.8	100.0	99.9	98.6



Landscape Fires: Emissions

Land cover	Area covered by fires (thousand ha)	Immediate loss of biomass (thousand tonne of dry matter)	Immediate GHG emissions (thousand tonnes CO ₂ e)	Future losses of forest biomass (thousand tonne of dry matter)	Future GHG emissions from forests biomass losses (thousand tCO ₂ e)
ZONE 2 (30-km buffer zone)					
Wetlands	10.74	81.54	134.70		
Other vegetation lands	225.73	661.75	1093.18		
Deciduous forests	20.12	109.88	164.39	2163.25	3562.87
Croplands	423.74	2750.14	4543.12		
Coniferous forests	56.57	525.47	821.13	4968.26	8182.72
TOTAL	736.9	4128.78	6756.52	7131.51	11745.60

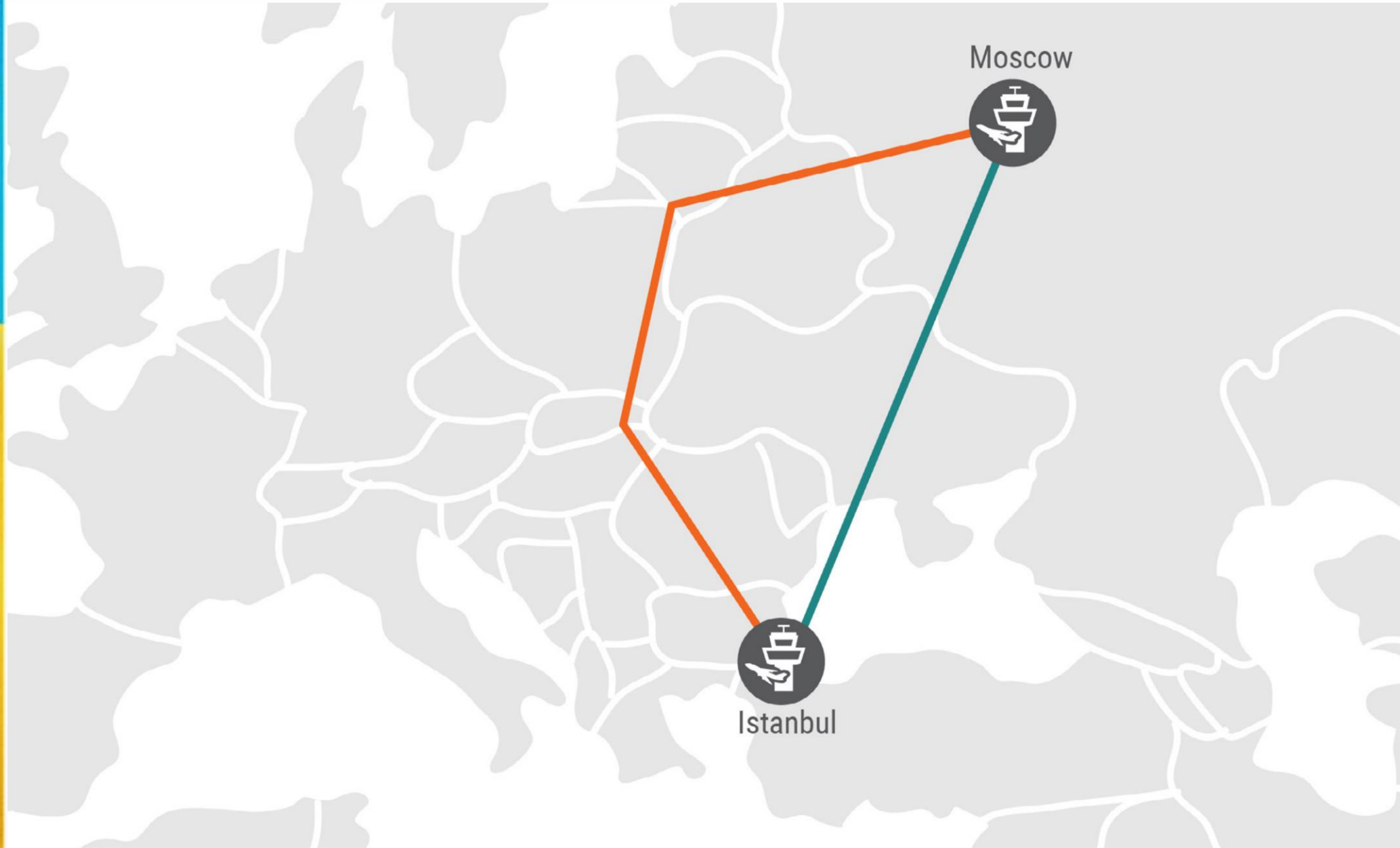


Energy Infrastructure

SOURCE OF EMISSIONS	MtCO ₂ e
Sabotage of the Nord Stream 1 & 2 pipelines	14.6
Gas flaring at the Black Sea gas platforms	0.34
Damage to natural gas transportation and distribution infrastructure	0.1
Attacks on oil depots and refineries	1.12
SF ₆ emissions from electric equipment	1.0
TOTAL	17.16



Aviation: Europe





Flightradar24.com

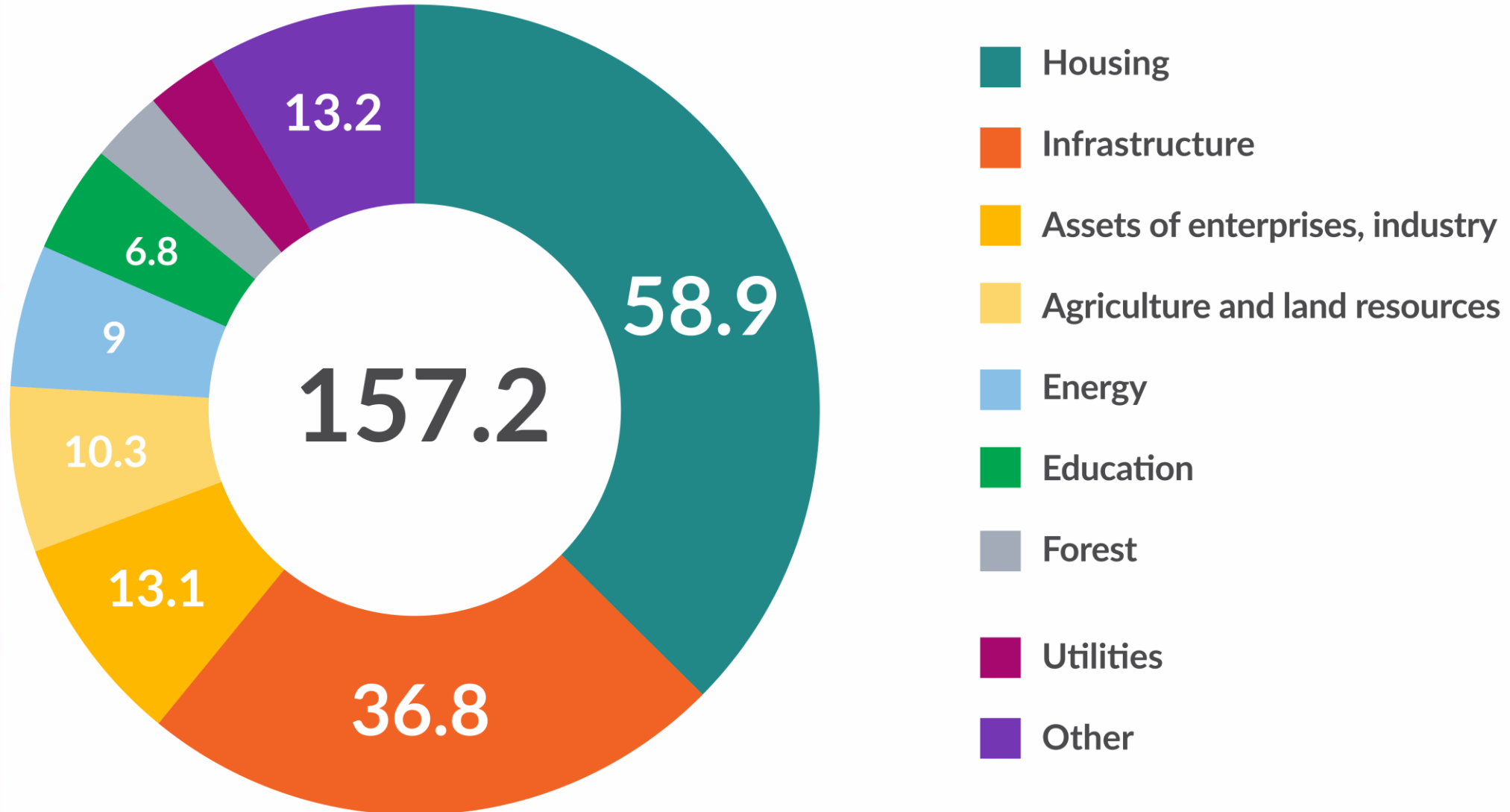


Aviation: Europe - Asia








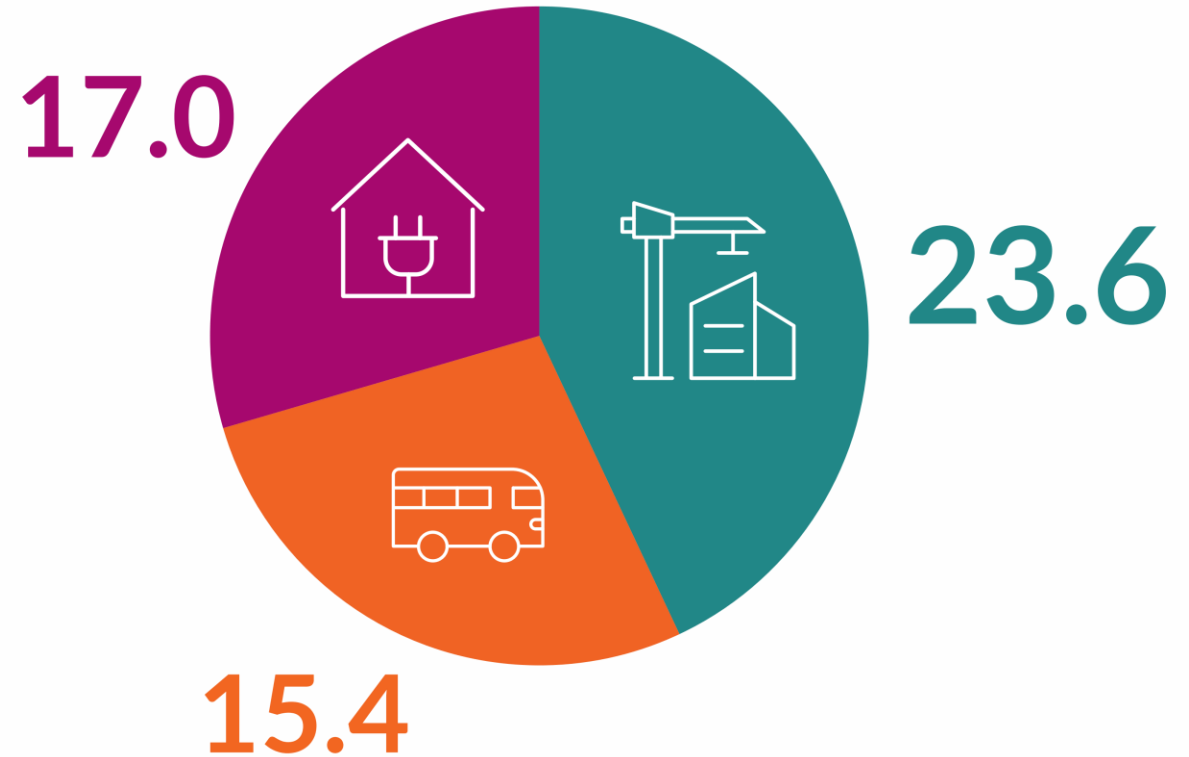
Damage to civil infrastructure (billion USD)





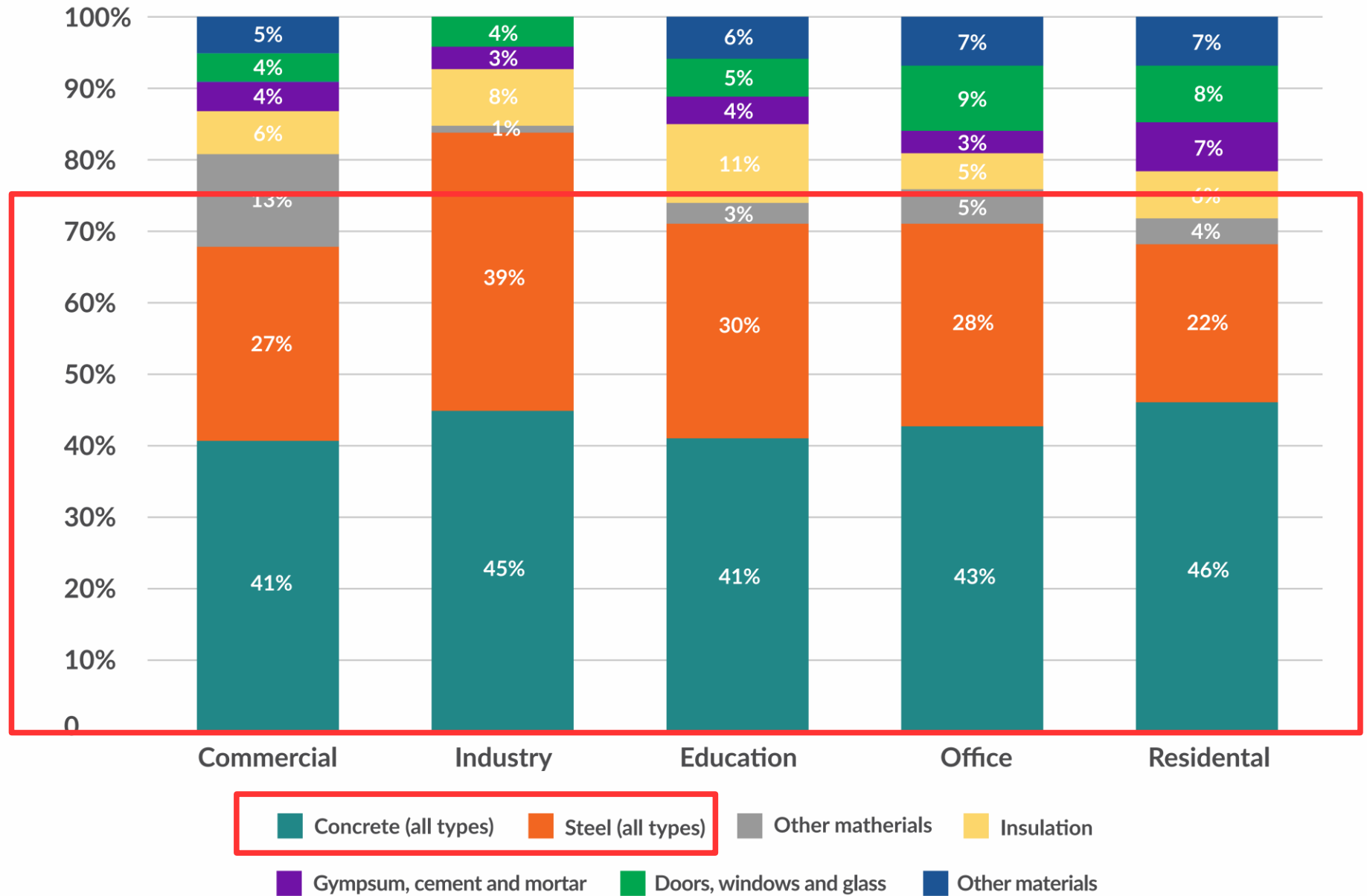
Reconstruction emissions (MtCO₂e)

-  Buildings
-  Transport & Infrastructure
-  Industry & Utilities



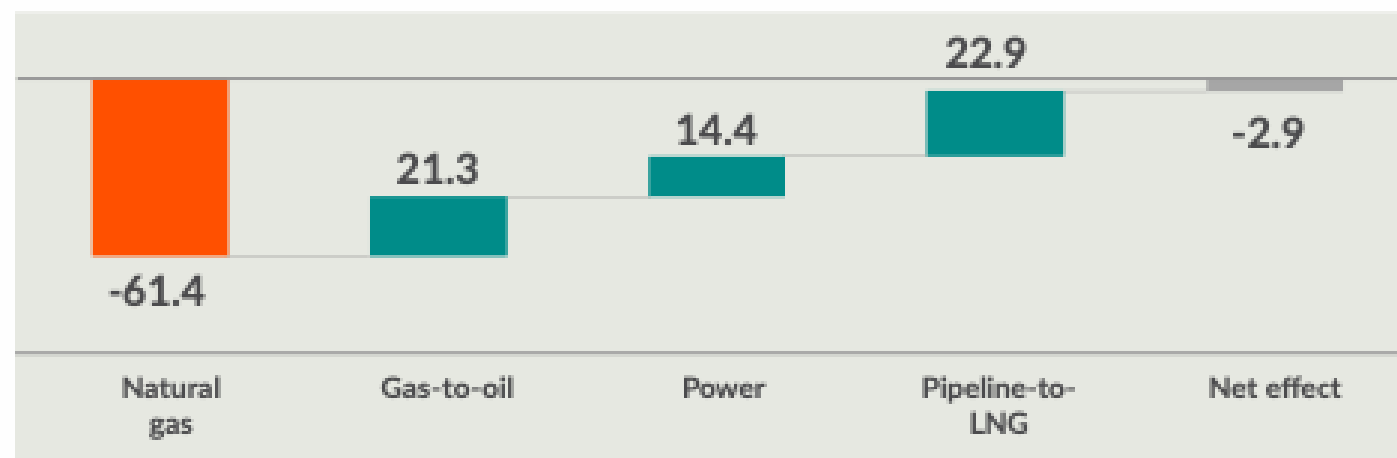


Breakdown of construction emissions



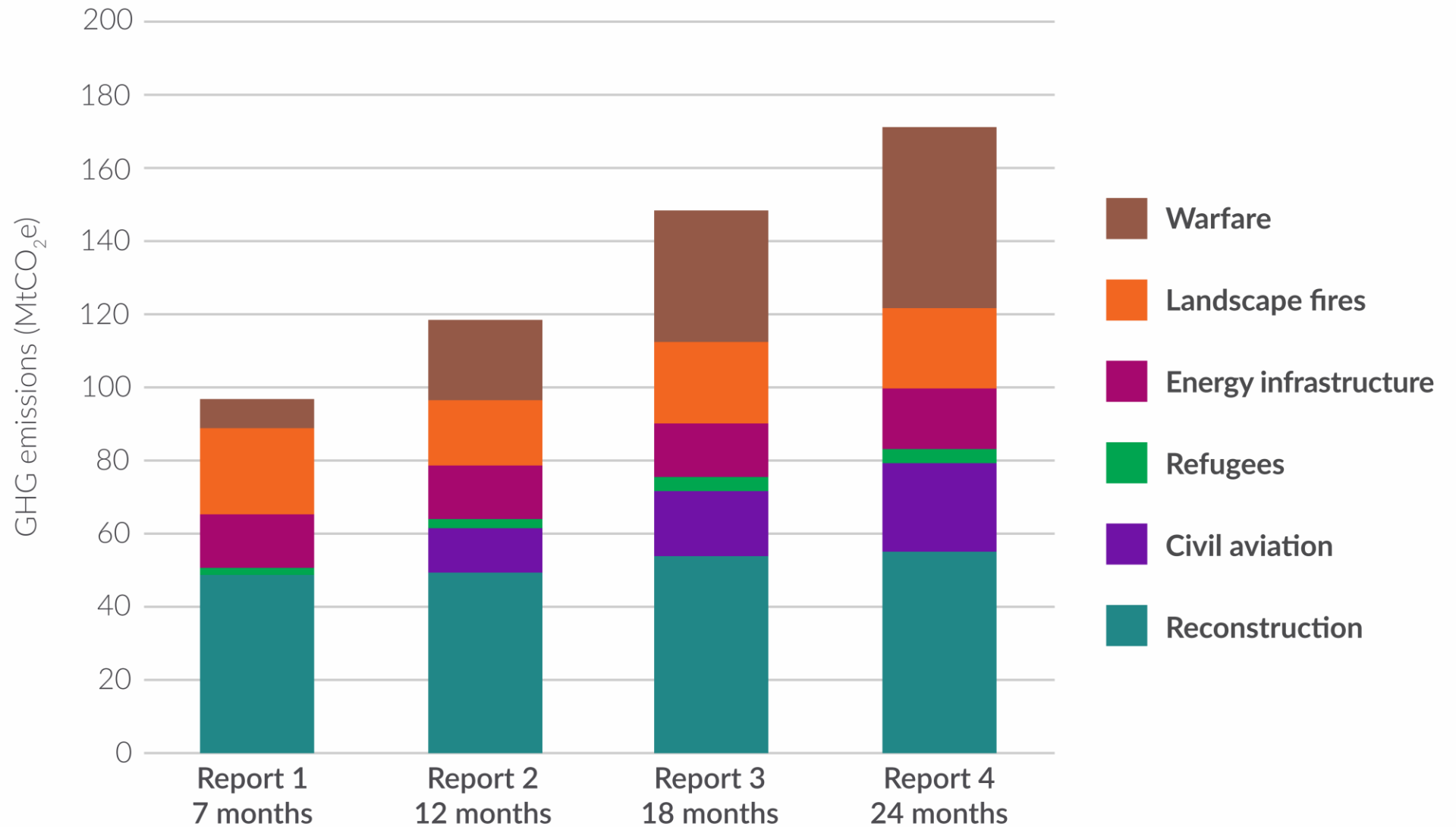


Country-wide impact and energy sector



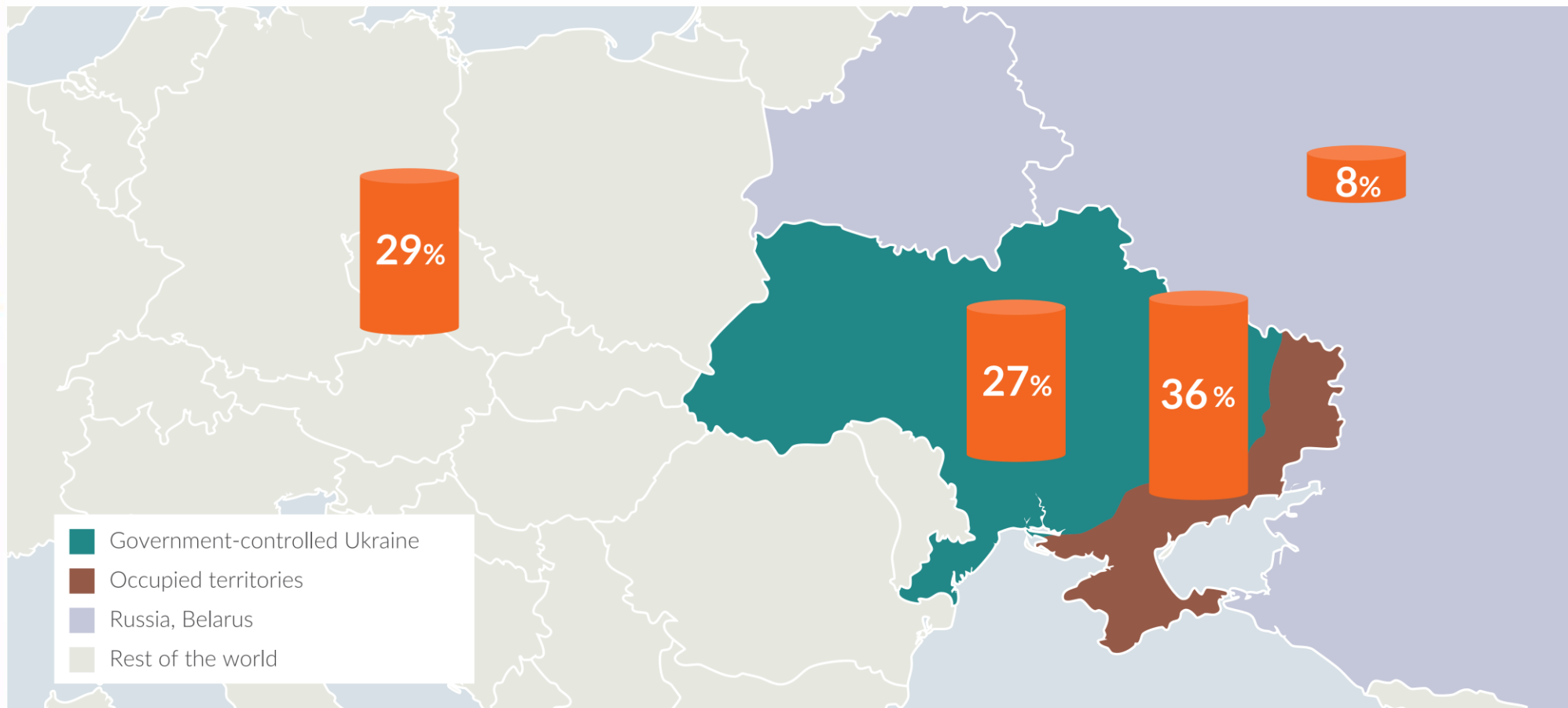


Growth of war emissions





Geographical distribution

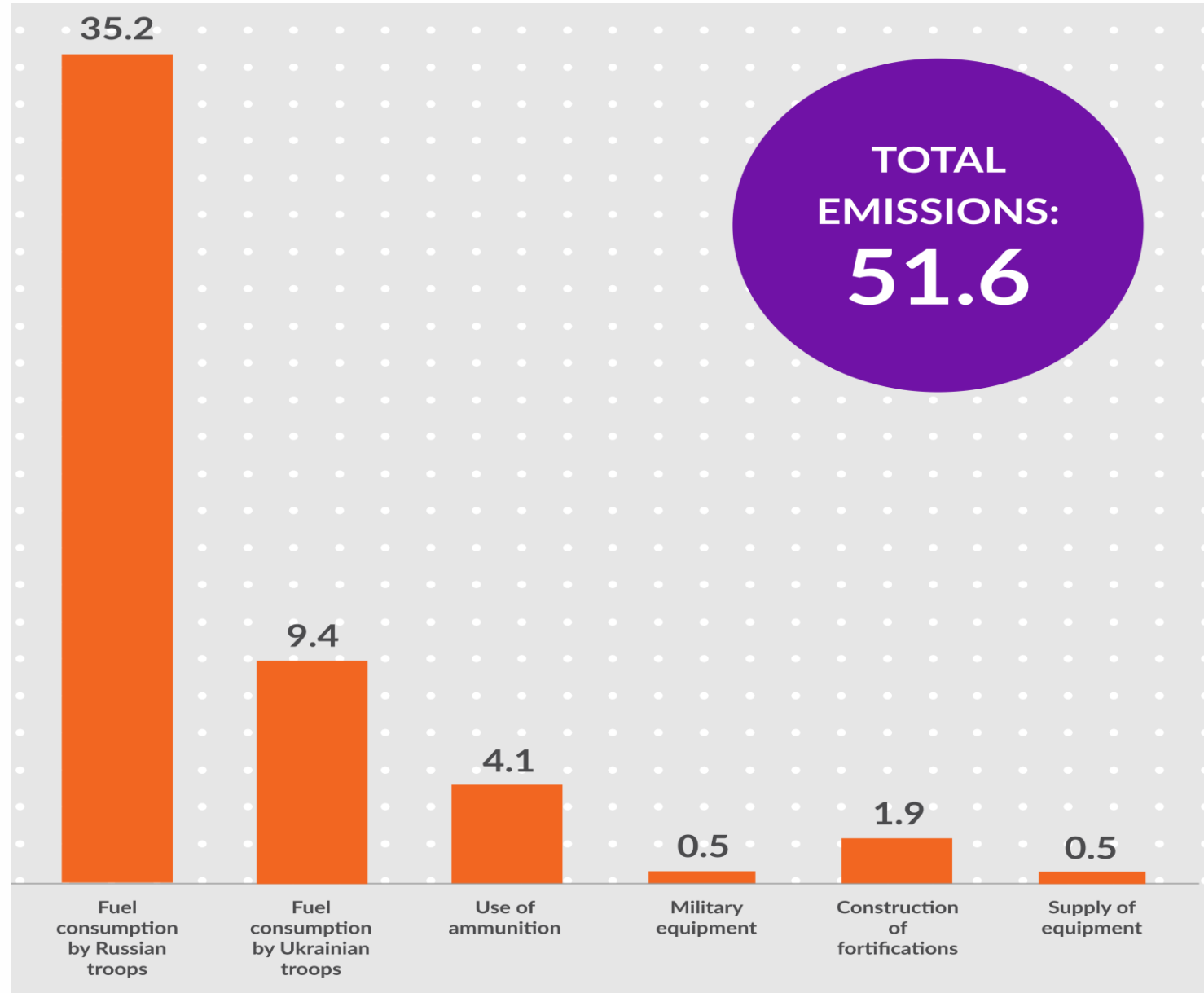




4. Carbon footprint: Warfare



Warfare emissions (MtCO₂e)





Fossil fuel usage

Very little data available, during peace time let alone during conflict

Top down approach:

- Reported shipments of fuel to the border with Ukraine
- Average fuel consumption per soldier
- Pre-war reported military emissions

Bottom up approach:

- Specific fuel consumption of military equipment



Use of ammunition

TOTAL NUMBER OF SHELLS USED DURING THE ASSESSMENT PERIOD (24 February 2022 – 28 February 2024), million shells

Assumed use of shells by Russia	13.1
Assumed use of shells by Ukraine	4.8
Total	17.9

SOURCE	TOTAL (MtCO ₂ e)
Manufacturing of ammunition (steel casing and explosives)	2.4
Manufacturing of propellants	1.0
Emissions at the point of firing	0.048
Emissions from detonation at the point of impact	0.003
Total GHG emissions	3.5

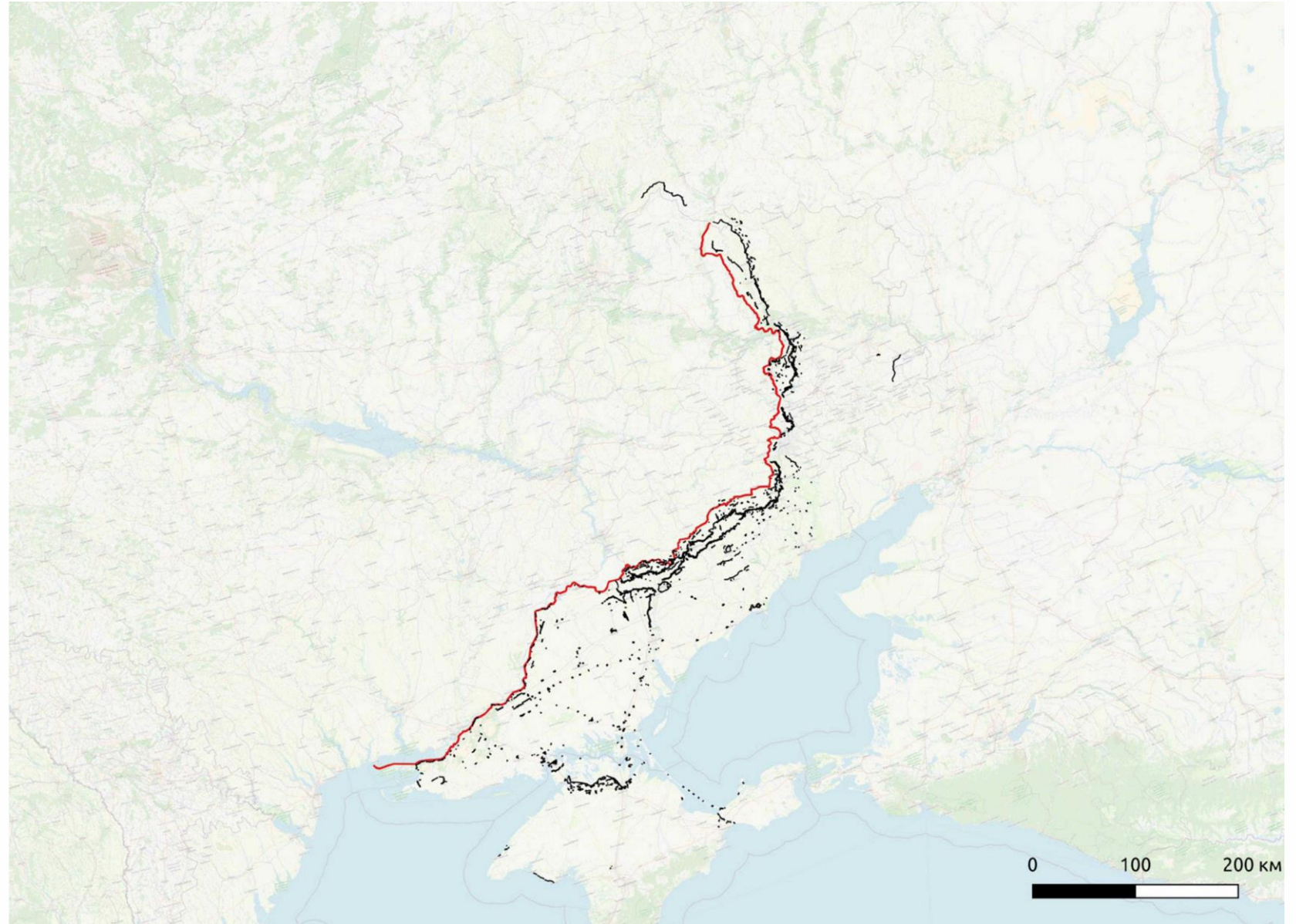


Destroyed and damaged equipment

Data	Russian Forces	Ukrainian Forces	Total
Indicative mass of destroyed equipment, t	195,169	55,586	250,754
Indicative mass of damaged equipment (only one third accounted for in calculations), t	16,480	9,935	26,415
Total mass of equipment accounted for in embodied carbon calculation (including assumed 20% not visually confirmed), t	240,794	70,677	311,471
Total embodied carbon, tCO₂e	1,444,766	424,062	1,868,828

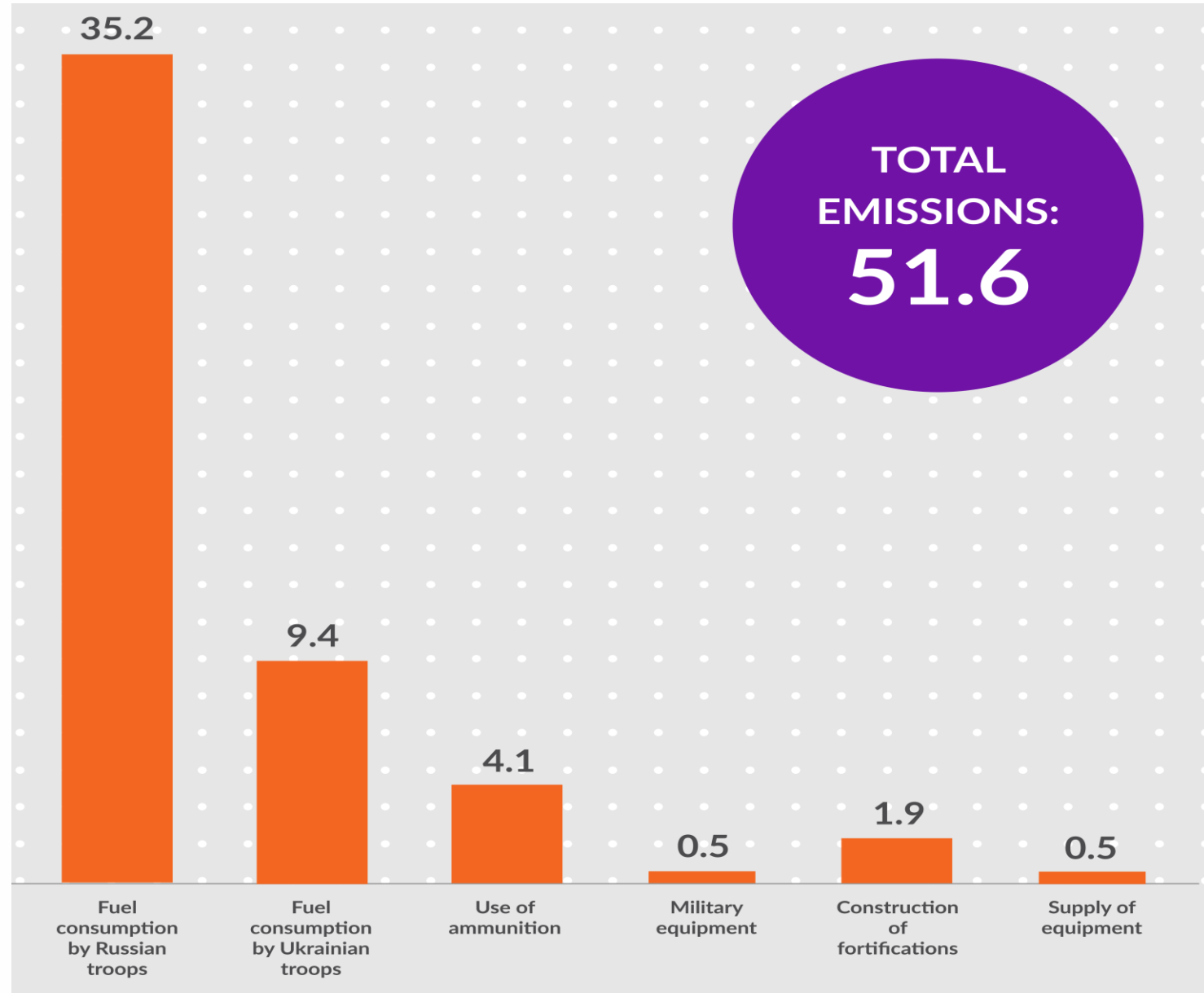


Fortifications





Warfare emissions (MtCO₂e)





5. Accountability



Holding the aggressor accountable

- International Criminal Court issued **arrest warrants** against Vladimir Putin and Maria Lvova-Belova
- UN General Assembly adopted resolution on **compensation mechanism**
- Several proceedings at the **International Court of Justice**



Environment in focus

Zelenskyy's 10-point peace plan:

- Point 1: Radiation and Nuclear safety
- Point 8: Immediate **protection** of the environment
- General prosecutor of Ukraine appointed a special advisor on **environmental crimes**
- Kakhovka incident could be the first case for **criminal** environmental liability at the ICC
- Renewed push to have **Ecocide** recognised as the 5th war crime under the Rome Statute



Accountability Climate Damage

Without Russia's act of aggression these emissions would not have happened

- War emissions 24 months: 175 million tCO₂e
- Social cost of carbon: 185 USD/tCO₂e
- Total climate damage: 32.4 billion USD

Social cost of carbon: net present value of future global economic damage caused by each incremental emitted tCO₂.



International Compensation Mechanism

- Established following resolution of UN General Assembly
- Compensation could be paid from **confiscated** Russian assets
- A registry is has been created and will include environmental damages under the auspices of the **Council of Europe**

Climate related damages to be included in the damage registry under the section Environmental damage.



Outlook: Conflict emissions

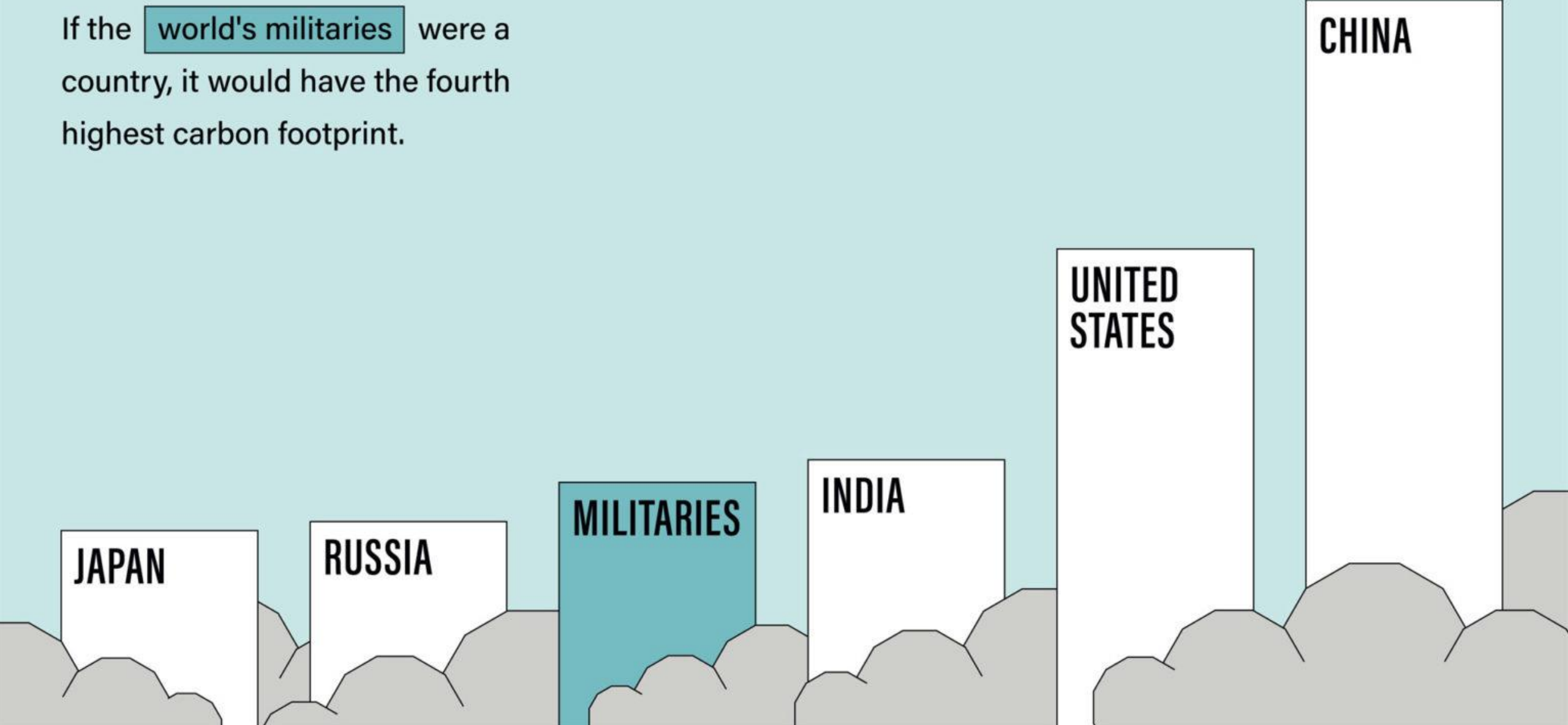
- Generic conflict methodology: application to other conflicts
- Unaccounted emissions
- Accounting emissions from occupied territories:
 - **Double counting:** Crimea, annexed provinces
 - **Undercounting:** North Cyprus, Transdnistria, Abkhasia, South-Ossetia
- Emissions from international military exercises



6. Military emissions

Comparing the military carbon footprint on a global scale

If the **world's militaries** were a country, it would have the fourth highest carbon footprint.





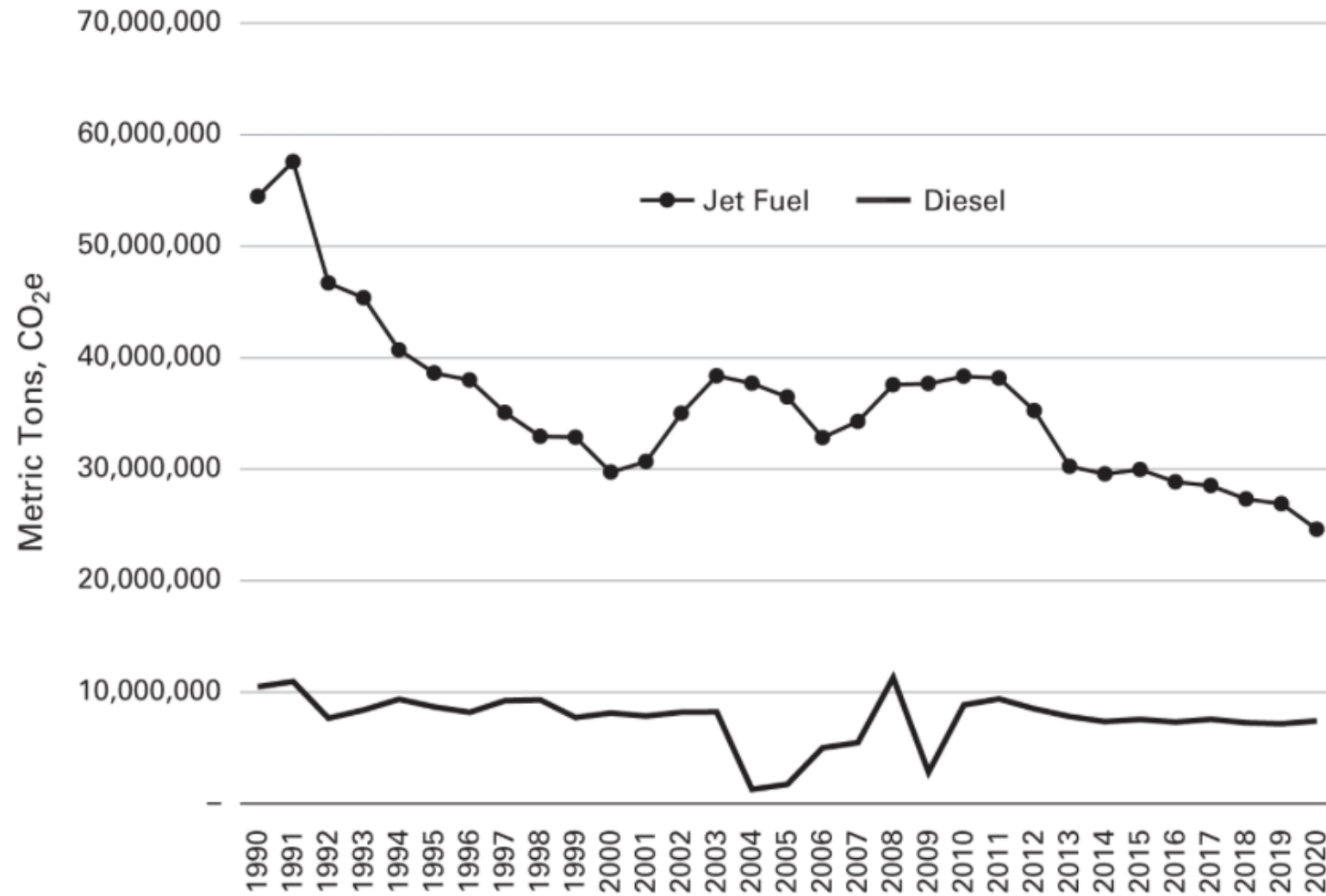
Military emissions – a blind spot

Causes:

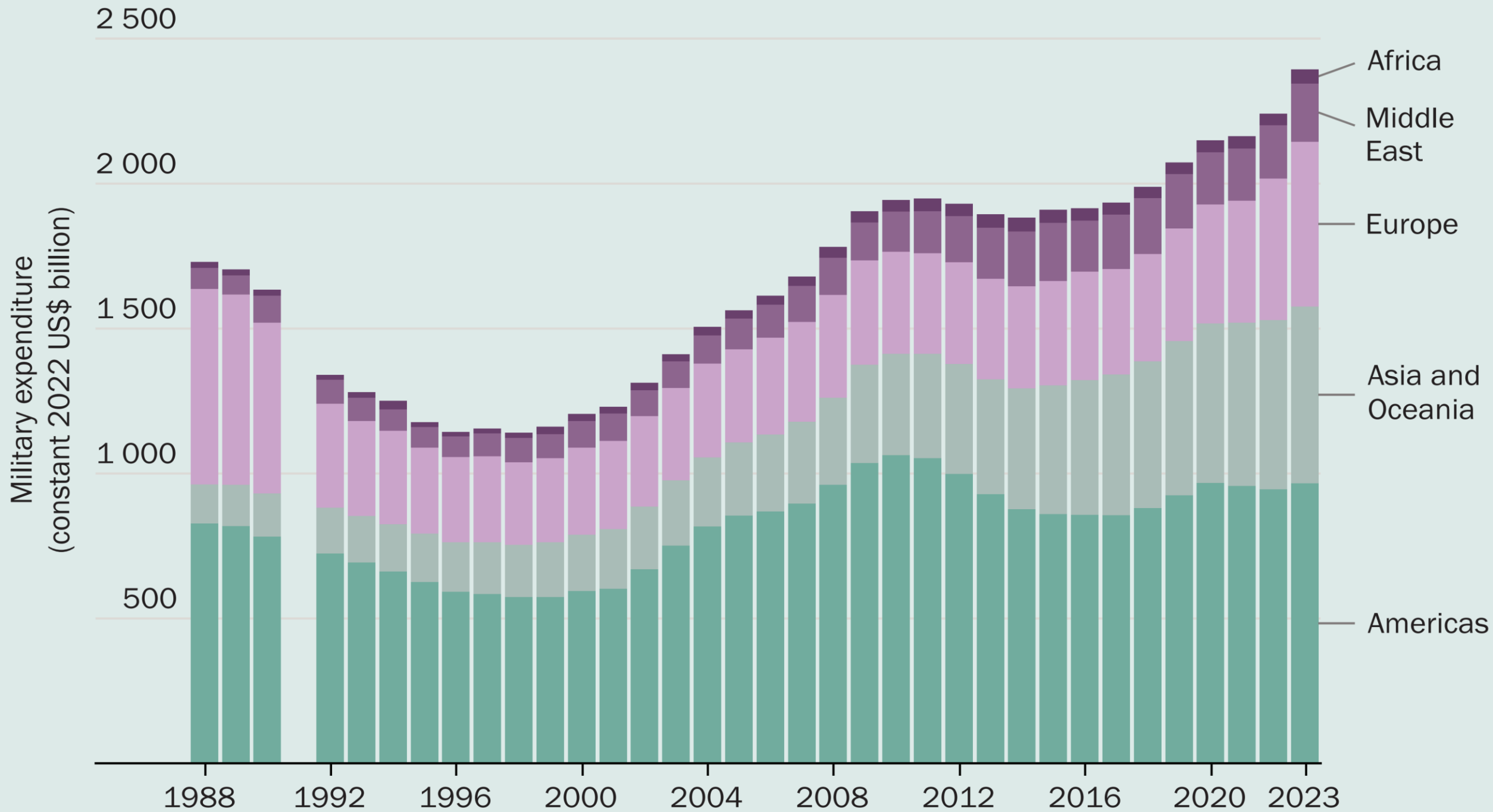
- Specific **exemptions** for reporting military emissions under the Kyoto Protocol and the Paris Agreement
- Only very few militaries report their carbon footprint (scope 1, 2, 3)
- The **environmental** movement ignored the topic
- After the cold war, military activities and investments started a steady downward path



US fuel emissions



Source: The Pentagon, Climate Change, and War (Net C. Crawford, 2022)





Outlook: Military emissions

As military spending in fossil fueled equipment goes up, emissions are locked-in for decades to come

BUT

- Military emissions can no longer be ignored: **Net zero = net zero**
- First small steps are made to decarbonize by (Western) militaries
- While the civil world decarbonise, military emissions will only rise, both in **absolute** and **relative** terms



Outlook: Military emissions

Pressure from society on the military to decarbonize will only increase

You can't manage what you don't measure

Directions:

- Improve **fuel-efficiency** of equipment
- **Greening** equipment and installations
- Alternative modes of warfare
- **Sufficiency**: Limit mission to defense and deterrence



Thank you for your attention

en.ecoaction.org.ua/climate-damage-by-russia-24-months.html

Initiative on GHG accounting of war

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Confronting military greenhouse gas emissions:



European Conference of Defence and the Environment

ECDE 2024

EIRIK KRISTOFFERSEN
Chief of Defence, Norway

and

EIRA HOGNESTAD VON WERDEN
Junior Specialist in the Norwegian Armed Forces



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NORWEGIAN
ARMED FORCES

A greener force

Reducing direct emissions

Reducing indirect emissions

Resilient and self-sustained units

Economic effects



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GRO JÆRE
Director General
Norwegian Defence Materiel Agency



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