Simulating the Carbon Cost of a Conflict - A Monte Carlo Approach

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Context & Objectives

- Armed conflict produces substantial but often hidden **CO_2 emissions** from vehicles, logistics, and infrastructure.
- **Objective:** Quantify conflict-related vehicular CO_2 emissions using simulation, examine temporal peaks through campaign phasing and assess their climate significance.
- **Approach:** Daily- and component-level emission estimates, with uncertainty bands from Monte Carlo simulations.

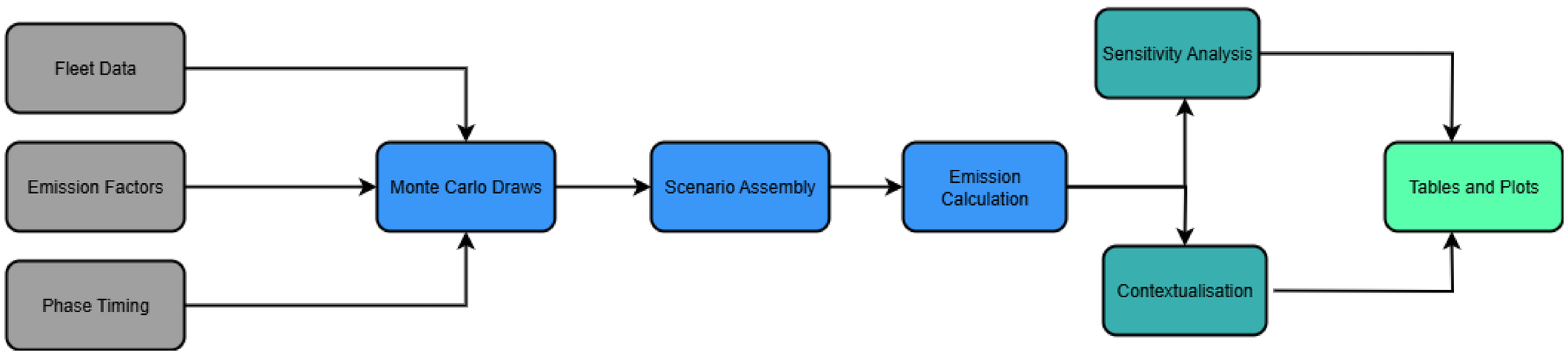
Data & Methodology

Methodology

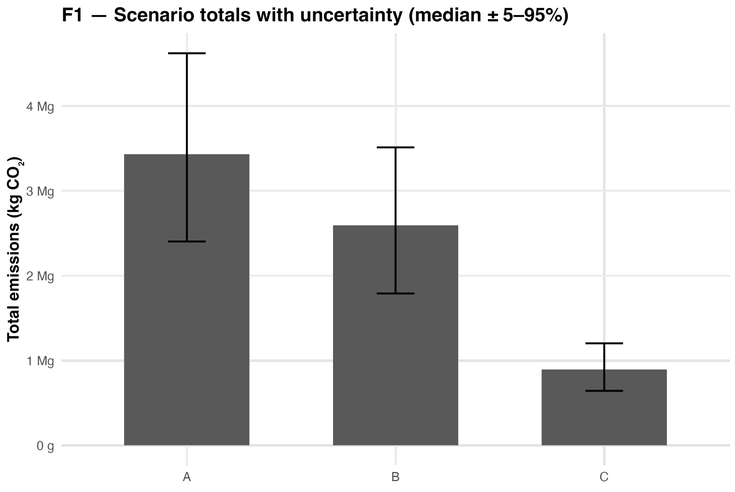
- MC simulation of vehicle activity, fuel burn, emission factors.
- Medians and 5–95% uncertainty bands.
- Daily profiles and component-level splits (air, tanks, trucks).

Data Sources

- **Emission factors:** IPCC guidelines.
- **Vehicle activity and fleet composition:** published military fuel-use data.
- **Equivalences:** Cars—CSO & ICCT (2025). Trees—FAO/USDA. Smartphones—LCA studies.

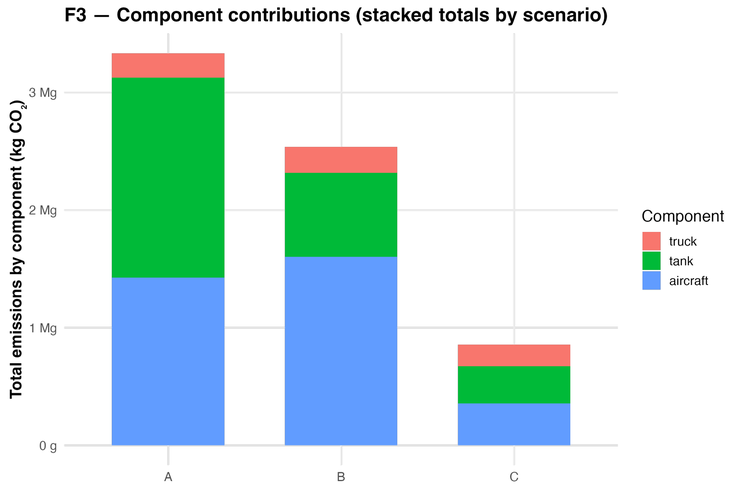


Totals (with Uncertainty)



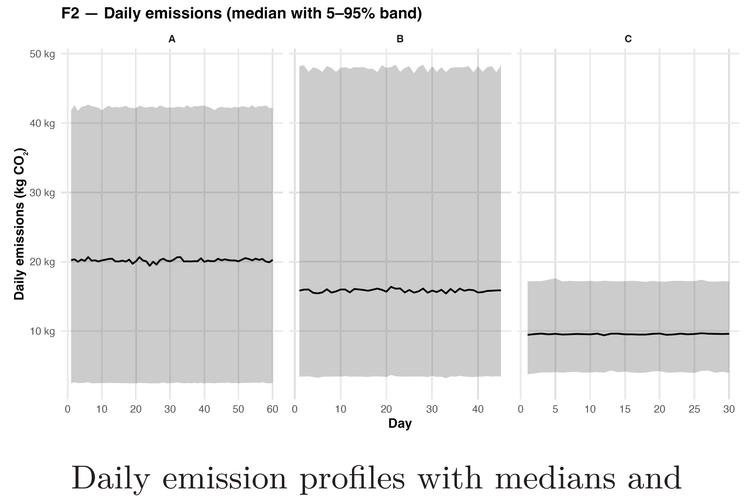
Median and 5–95% bands across scenarios. This is equivalent to the annual emissions of roughly 113, 84, 55 cars for scenarios A, B and C.

Vehicle Class Contributions



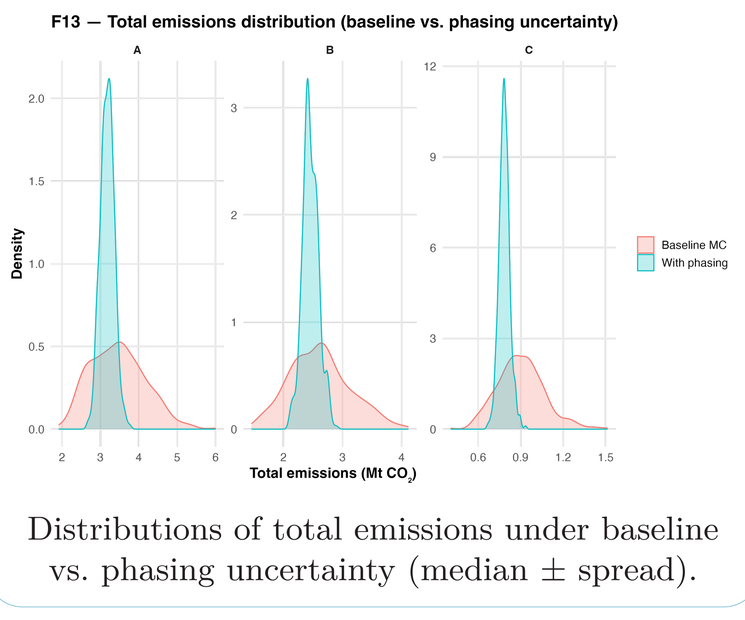
Tanks, trucks, aircraft's shares of total emissions. Comparable in scale to producing about 25,222 14,831 and 5,965 smartphones respectively.

Tempo (Daily Dynamics)



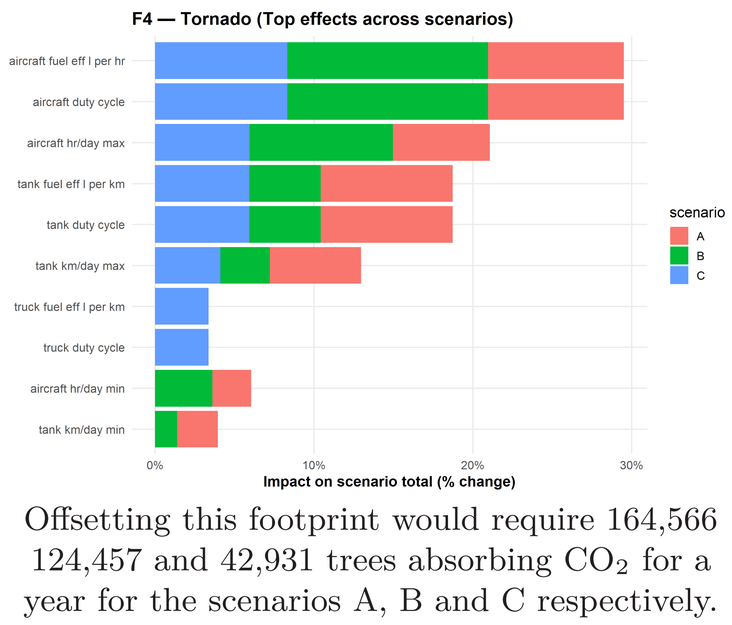
Daily emission profiles with medians and uncertainty bands show sustained peaks in A, variable intensity in B, and lower but steady emissions in C.

Baseline vs Phasing



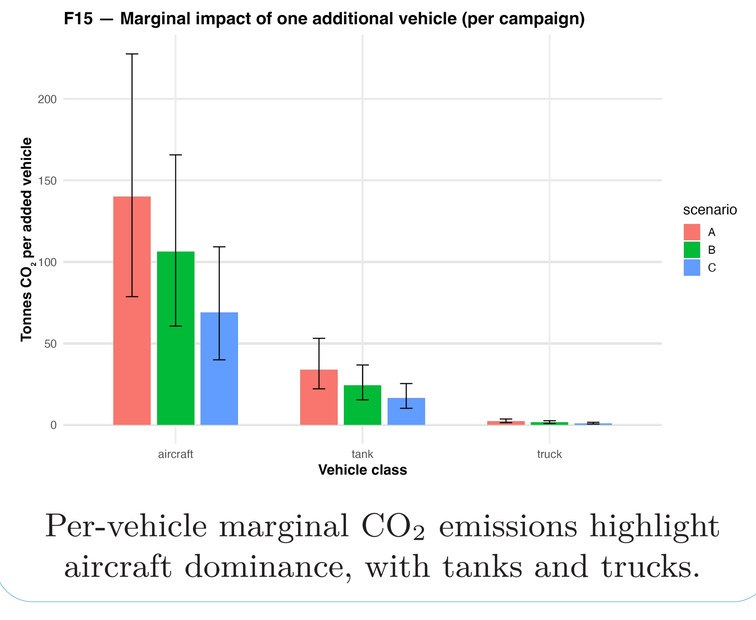
Distributions of total emissions under baseline vs. phasing uncertainty (median ± spread).

Emission Drivers



Offsetting this footprint would require 164,566 124,457 and 42,931 trees absorbing CO_2 for a year for the scenarios A, B and C respectively.

Marginal Impact



Per-vehicle marginal CO_2 emissions highlight aircraft dominance, with tanks and trucks.

Conclusion

- Conflict emissions rival **communities of cars**, **tens of thousands of smartphones**, or forests needing **decades** to offset.
- War leaves a persistent **climate burden**—environmentally unsustainable on top of human and economic harm.
- **Further expansion:** assess *second-order effects* such as infrastructure destruction (cement/steel rebuild emissions), refugee displacement and humanitarian logistics, and land-use change or fires triggered by conflict. These amplify the total climate cost.