# Study links fossil fuel emissions to surge in deadly heatwaves as climate crisis accelerates



A peer-reviewed study published in Nature has revealed a direct link between the increasing frequency and intensity of global heatwaves and emissions from the world's largest oil and gas suppliers. This comprehensive research analysed 213 major heatwaves recorded between 2000 and 2023, demonstrating that climate change, driven substantially by fossil fuel emissions, has intensified every single one of these heat events. The additional heat attributed to climate change ranged from 0.3°C to 2.9°C, with a marked upward trend over the decades. For example, heatwaves during 2000–2009 were on average 1.4°C hotter due to climate change, increasing to 1.7°C hotter between 2010 and 2019, and further rising to 2.2°C hotter in the early 2020s.

The study employed a framework by the World Weather Attribution initiative to compare present-day climate conditions with those from the preindustrial era (1850–1900), highlighting the significant anthropogenic influence on heatwaves. Importantly, it found that the likelihood of heatwaves occurring has surged dramatically—from being about 20 times more likely in the early 2000s to roughly 200 times more likely by the 2010s, underlining the accelerating impact of global warming.

Delving deeper, the research team connected heatwave changes to emissions from the 180 largest fossil fuel and cement producers worldwide, commonly referred to as the "carbon majors." These include multinational companies like ExxonMobil, Shell, as well as state-owned entities such as Saudi Aramco, and the coal and cement industries of China. According to the Carbon Majors database integrated into the study, this group has been responsible for 57% of all human-caused CO2 emissions since 1854 and 75% of the emissions from fossil fuels and cement production specifically. Climate modelling with the Oscar tool indicated that by 2023, these carbon majors contributed about half (0.67°C) of the approximately 1.3°C rise in global average temperatures linked to human activity, with the top 14 major emitters alone responsible for roughly a quarter (0.33°C).

The effects of these emissions have not only raised global temperatures but also significantly boosted the intensity of heatwaves. The study estimates that emissions from individual carbon majors have made between 16 and 53 heatwaves possible—events that would otherwise have been virtually impossible without climate change. This attribution underscores the disproportionate role of a relatively small number of fossil fuel producers in exacerbating extreme heat events worldwide.

These findings come amid growing concerns about the resilience of nations to climate extremes. For instance, the UK experienced its warmest spring on record in 2025 followed by drought declarations and severe heatwaves, raising questions about preparedness for continued warming. Climate scientists have long established that global warming intensifies heatwaves, but this research uniquely traces those impacts back to specific industrial contributors, marking a significant advance in attribution science.

Complementary research has similarly highlighted the societal toll of heatwaves. A separate study examining the 2003 European heatwave estimated that anthropogenic climate change increased heat-related mortality risk by about 70% in Paris and 20% in London, illustrating human-induced climate change's severe consequences on public health. This adds a stark human dimension to the growing body of work linking fossil fuel combustion with extreme weather events.

On the broader emissions front, additional studies emphasise that attributing responsibility for carbon emissions requires considering the full supply chain. A significant portion of global emissions stem from the extraction and consumption of fuels across borders, with 37% linked to burning imported fuels and 51% linked to fuel extraction for external use. This complexity suggests that assigning climate responsibility involves both producers and consumers.

Moreover, the contribution of other pollutants like black carbon, a potent climate forcing agent, magnifies the challenge of fully understanding and managing anthropogenic climate impacts. Research shows that black carbon levels have increased due to human activity and significantly affect warming, reinforcing the need for comprehensive mitigation strategies beyond CO2 emissions.

As climate change drives more frequent and intense heatwaves, studies underline the importance of robust attribution to inform policy and accountability. Accurate identification of emissions sources not only clarifies responsibility but also strengthens the case for urgent global action to curb fossil fuel combustion and enhance adaptation efforts, particularly as the toll from heat-driven mortality and damage mounts.

### 📌 Reference Map:

* Paragraph 1 – [[1]](https://www.newcivilengineer.com/latest/more-intense-heatwaves-linked-to-worlds-biggest-oil-and-gas-suppliers-peer-reviewed-study-reveals-11-09-2025/)
* Paragraph 2 – [[1]](https://www.newcivilengineer.com/latest/more-intense-heatwaves-linked-to-worlds-biggest-oil-and-gas-suppliers-peer-reviewed-study-reveals-11-09-2025/)
* Paragraph 3 – [[1]](https://www.newcivilengineer.com/latest/more-intense-heatwaves-linked-to-worlds-biggest-oil-and-gas-suppliers-peer-reviewed-study-reveals-11-09-2025/)
* Paragraph 4 – [[1]](https://www.newcivilengineer.com/latest/more-intense-heatwaves-linked-to-worlds-biggest-oil-and-gas-suppliers-peer-reviewed-study-reveals-11-09-2025/), [[3]](https://www.nature.com/articles/nclimate3117)
* Paragraph 5 – [[2]](https://www.nature.com/articles/nclimate1315)
* Paragraph 6 – [[4]](https://www.nature.com/articles/s41586-022-05518-y), [[1]](https://www.newcivilengineer.com/latest/more-intense-heatwaves-linked-to-worlds-biggest-oil-and-gas-suppliers-peer-reviewed-study-reveals-11-09-2025/)
* Paragraph 7 – [[1]](https://www.newcivilengineer.com/latest/more-intense-heatwaves-linked-to-worlds-biggest-oil-and-gas-suppliers-peer-reviewed-study-reveals-11-09-2025/), [[6]](https://www.nature.com/articles/nclimate1961)

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## Bibliography

1. <https://www.newcivilengineer.com/latest/more-intense-heatwaves-linked-to-worlds-biggest-oil-and-gas-suppliers-peer-reviewed-study-reveals-11-09-2025/> - Please view link - unable to able to access data
2. <https://www.nature.com/articles/nclimate1315> - This article discusses the attribution of carbon emissions from fossil fuels, highlighting that 37% of global emissions result from burning imported fuels, and 51% are due to the extraction of fuels used elsewhere. It emphasizes the need to consider the entire value chain in attributing emissions to accurately assign responsibility for climate change.
3. <https://www.nature.com/articles/nclimate3117> - The study quantifies the role of human activity in heat-related mortality during the 2003 European heatwave, finding that anthropogenic climate change increased the risk of heat-related deaths by approximately 70% in central Paris and 20% in London, underscoring the significant impact of human-induced climate change on heatwave mortality.
4. <https://www.nature.com/articles/s41586-022-05518-y> - This article examines the attribution of black carbon emissions, discussing how human activities have led to increased black carbon levels in the atmosphere, contributing to climate change. It highlights the importance of understanding the sources and impacts of black carbon to inform mitigation strategies.
5. <https://www.nature.com/articles/nclimate2524> - The study quantifies the separate contributions to observed Arctic land temperature change from greenhouse gases, other anthropogenic forcing agents (dominated by aerosols), and natural forcing agents, revealing that approximately 60% of greenhouse-gas-induced warming has been offset by other anthropogenic forcings.
6. <https://www.nature.com/articles/nclimate1961> - This article discusses the attribution of loss and damage due to climate change, emphasizing the challenges in assigning responsibility for specific climatic impacts. It highlights the need for robust attribution methods to inform societal responses and policy decisions related to climate-induced losses.
7. <https://www.nature.com/articles/s41558-020-0851-8> - The article addresses the reality of African heatwaves, reconciling theoretical models with observed data. It discusses the factors contributing to heatwaves in Africa and the challenges in accurately predicting their occurrence and intensity, emphasizing the need for improved understanding and adaptation strategies.