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## **Oil, gas, and coal producers' contribution to rise of atmospheric CO<sub>2</sub>, surface temperature, and sea level is modeled**

*New paper informs debate over carbon producers' responsibility for climate change*

**SNOWMASS, COLORADO**--In a peer-reviewed study published today in the leading journal *Climatic Change*,<sup>i</sup> the Climate Accountability Institute and colleagues with Union of Concerned Scientists and University of Oxford, demonstrated a methodology for attributing and apportioning climate impacts among major carbon producers and identified potential responsibilities of key producers.

Drawing on CAI's landmark analysis of the Carbon Majors,<sup>ii</sup> the team applied the tools of attribution science to model the impact on atmospheric CO<sub>2</sub> and methane concentration, increased radiative forcing driving global surface temperatures, and sea level rise from emissions traced to fossil fuels produced by the world's largest oil, natural gas, and coal companies since the 1880s. This includes emissions from extracted carbon fuels marketed and used as intended by millions of consumers and from company supply chains (e.g., vented CO<sub>2</sub>, flaring CO<sub>2</sub>, own fuel use, and fugitive methane). Emissions from product use accounted for approximately 90% of the total impact, with supply chain emissions accounting for only 10%.

Employing a simple climate model to characterize equilibrium climate sensitivity and transient climate response to increases in atmospheric CO<sub>2</sub> and methane, the team evaluated each company's carbon production for two time-periods: 1880 to 2010, and 1980 to 2010. The latter period takes account of the period during which companies were aware of the climate risks of their products and should have taken steps to warn governments, shareholders, and consumers of those risks.<sup>iii</sup> Fully half of industrial carbon emissions since 1750 have occurred since 1988.

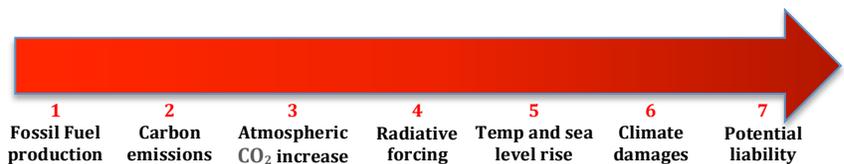
"Although the full extent of anthropogenic climate damages — such as sea level rise — will not fully manifest for centuries or millennia, severe impacts of climate change are already being felt worldwide," said study co-author and CAI Founder Richard Heede. "Many of these impacts, such as increased mortality from heat waves, extreme weather, droughts, forest fires, or damages to fisheries from acidification, can already be estimated."

The authors demonstrate that the carbon contributed by major fossil fuel companies

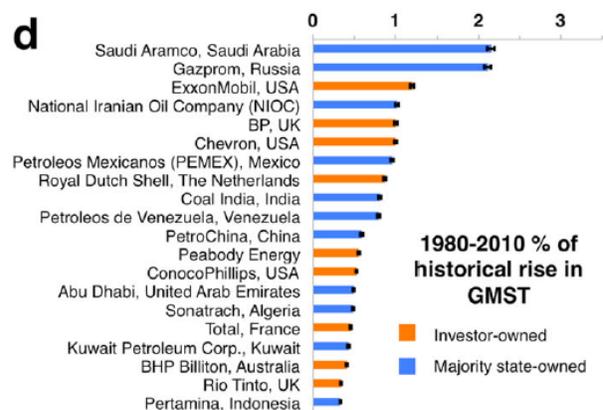
result in temperature rise and sea level increases that are both quantifiable and substantial. The largest investor-owned and state-owned companies have contributed more than 1% each to atmospheric CO<sub>2</sub> concentration and global mean surface temperature since 1980 alone. (See Fig. d below.)

"This paper is a stepping-stone for future analysts to allocate the costs of adaptation and mitigation to the parties responsible for anthropogenic climate change," said Heede.

"Like the Carbon Majors analysis that it builds on, this report demonstrates the growing precision with which major carbon producers' responsibility for climate change and climate impacts can be quantified, allocated and, ultimately, litigated," said Carroll Muffett, President of the Center for International Environmental Law and member of the CAI Board of Directors. "Government investigators and private attorneys around the world will be parsing these findings carefully. Investors and decision-makers would be well-advised to do the same."



Quantifying the role of major carbon producers does not relieve governments of their own responsibilities or potential liabilities with respect to climate change.<sup>iv</sup> However, a number of factors point to the significant risk posed by fossil fuel producers' moral and legal culpability: early scientific research identifying risk factors, repeated communication of these risks to senior management by industry scientists, evidence companies used this information to protect their own investments even as they funded climate denial and misinformation campaigns, efforts to derail climate legislation that might impact profitability, lobbying for carbon subsidies, campaign contributions to industry-friendly legislators. Similar patterns of practice in industries such as tobacco and asbestos have exposed companies involved to investigation, regulatory backlash, and successful litigation for recovery of damages.



“Fossil fuel companies could have taken any number of steps, such as investing in clean energy or carbon capture and storage, but many chose instead to spend millions of dollars to try to deceive the public about climate science to block sensible limits on carbon emissions,” said Peter Frumhoff, study co-author and director of science and policy at UCS. “Taxpayers, including those living in vulnerable coastal communities, should not alone have to pay the high costs of these companies' irresponsible decisions.”

Professor Henry Shue, University of Oxford, said in his [Commentary](#) to our paper that “a number of investor-owned companies have long understood the harm of their products, yet carried out a decades-long campaign to sow doubts about those harms in order to ensure fossil fuels would remain central to global energy production. Companies knowingly violated the most basic moral principle of 'do no harm,' and now they must remedy the harm they caused.”

Mary Christina Wood, Philip H. Knight Professor, Univ. of Oregon Law School: “behind destructive hurricanes, wildfires, floods, heat-waves, and sea level rise is a terribly damaged climate system. This study connects the dots between the science and the corporations responsible. It is vastly important for laying the legal groundwork to hold corporations accountable before it is too late.”

[Ekwurzel et al.](https://link.springer.com/content/pdf/10.1007%2Fs10584-017-1978-0.pdf): <https://link.springer.com/content/pdf/10.1007%2Fs10584-017-1978-0.pdf>

**About Climate Accountability Institute:** CAI is a tax-exempt research institute focusing on anthropogenic climate change, dangerous interference with the climate system, the contribution of fossil fuel producers' carbon production to atmospheric carbon dioxide and methane content, the risk and disclosure requirements of fossil fuel producers regarding emissions of greenhouse gases, and modeling how oil and gas companies can align investment and production options with science-based targets not to exceed the 2°C target of the Paris Accord. CAI gratefully acknowledges financial support from Wallace Global Fund and Rockefeller Brothers Fund as well as the peer reviewers of the paper in *Climatic Change*.

**About Union of Concerned Scientists:** UCS puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with citizens across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe and sustainable future. For more information, see [www.ucsusa.org](http://www.ucsusa.org)

<sup>i</sup> Ekwurzel, B., J. Boneham, M.W. Dalton, R. Heede, R.J. Mera, M.R. Allen, & P.C. Frumhoff (2017) The rise in global atmospheric CO<sub>2</sub>, surface temperature, and sea level from emissions traced to major carbon producers, *Climatic Change*, <https://link.springer.com/journal/10584>

<sup>ii</sup> Heede, Richard (2014) Tracing anthropogenic CO<sub>2</sub> and methane emissions to fossil fuel and cement producers 1854-2010, *Climatic Change*, vol. 122(1): 229-241. <http://link.springer.com/article/10.1007/s10584-013-0986-y>

<sup>iii</sup> As documented by numerous sources, the fossil fuel industry and its trade associations have known since the 1960s that there is a serious problem with continued production and use of oil, gas, and coal. See, for example, Banerjee, Neela et al. (2016) CO<sub>2</sub>'s Role in Global Warming Has Been on the Oil Industry's Radar Since the 1960s, *Inside Climate News*; Center for International Environmental Law, *Smoke & Fumes*: [www.smokeandfumes.org](http://www.smokeandfumes.org); Union of Concerned Scientists (2015) *The Climate Deception Dossiers: Internal Fossil Fuel Industry Memos Reveal Decades of Corporate Disinformation*, [www.ucsusa.org/decadesofdeception](http://www.ucsusa.org/decadesofdeception); Frumhoff, Peter C., Richard Heede, & Naomi Oreskes (2015) The climate responsibilities of industrial carbon producers, *Climatic Change*, vol. 132(2):157-71.

<sup>iv</sup> The UN *Framework Convention on Climate Change* (1992) and subsequent agreements of the Conference of the Parties, such as the Paris Accord (December 2015) have focused climate burdens, leadership, and remedies chiefly on the rich developed (Annex 1) nations. Large emitters, such as carbon-intensive utilities and industry, or wealthy individuals, may share proportional responsibility. See Chakravarty, Shoibal, et al. (2009) Sharing global CO<sub>2</sub> emission reductions among one billion high emitters, *Proc Natl Acad Sciences*, vol. 106:11884-88.