

## New study maps financial ownership of over \$1 trillion of the fossil fuel industry's projected 'stranded asset' loss

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Driven by technological, societal and political change, renewable energy technologies are progressively replacing fossil fuels.



Under an expectation that governments will fulfill their net-zero emissions pledges, these changes will accelerate, with the consequence that current oil and gas assets may be overvalued by more than \$1 trillion, a figure that exceeds the subprime housing mispricing that triggered the 2007-2008 financial crisis.

While reduced future demand for oil and gas has previously been quantified under a range of scenarios, and the most vulnerable assets can be identified as those likely to be uncompetitive due to high extraction costs, the ultimate ownership of this financial risk is unknown.

How much resides with governments, and of which countries? How much resides with average Americans through pension funds and other investments?

To answer these questions, an international team of researchers led by economist Gregor Semieniuk of the University of Massachusetts Amherst mapped the financial shocks associated with mispriced oil and gas reserves, from the oil companies that directly own them via financial intermediaries, such as banks and investment funds, through to the ultimate owners.

The researchers examined the economics of 43,439 oil and gas production assets and estimated their production and value under a scenario with strict but plausible climate policies, namely where climate pledges of zero emissions by mid-century in Europe and East Asia already enshrined in law are met.

They compared those asset values with a scenario where current asset prices initially reflect investors' anticipation of much higher projections of future demand.

In their analysis, published today in the journal Nature Climate Change,



Semieniuk and his colleagues found that the stranded assets—the discounted future lost profits—from a realigned expectation about future production and profitability from one to the other scenario may total \$1.4 trillion.

They mapped these losses initially to oil and gas companies, and then through intermediaries like financial institutions to their ultimate owners, passing through an equity ownership network of 1.8 million companies before they were finally allocated to either governments or individuals through funds or shareholdings.

"We expected some international transfer through the financial ownership, but were surprised to find that in all scenario combinations we analyzed, there was a substantial net transfer of loss of between 15-20% of global stranded assets to countries that are part of the OECD, a club of mostly rich countries, from the rest of the world," says Semieniuk, an assistant research professor of economics at the UMass Amherst Political Economy Research Institute (PERI) and Department of Economics.

When valued at the site of the oil and gas fields, the researchers found that approximately \$550 billion of losses are located in OECD (Organization for Economic Co-operation and Development) countries, including nearly \$300 billion at fields with high production costs in the United States.

"However," highlights co-author Philip Holden from the Open University, "the ownership transfer that takes place through the equity network transfers more than \$200 billion of additional stranded asset risk to OECD-based investors, including \$100 billion of losses originating at Russian fields, which sustain about the same amount of stranding as the U.S."



Several European countries and various offshore financial centers—including countries that do not themselves extract any oil and gas—also receive substantial loss transfers, while some producer countries such as Kazakhstan and Nigeria transfer more than half the losses at their domestic production sites abroad due to substantial foreign ownership of production there.

Meanwhile, most OPEC member countries have relatively modest losses in absolute terms due to their lower production costs and an assumption that they move to capture additional market share in a declining market.

Institutionally, most losses—\$1.0 trillion—are booked by stock marketlisted oil and gas companies.

The financial sector owns losses of \$438 billion, 88% of which sit in OECD countries, and these losses could potentially be amplified by up to 29% from cross-ownership within the financial sector.

As they pass through the network of corporate ownership, losses exceed equity by a total of \$129 billion in 239 companies with total debt of \$361 billion, potentially leading to substantial insolvencies.

Ultimately, governments directly own losses of \$484 billion, or about one-third of all losses, with private persons owning the other two-thirds via funds—including pension funds—and shareholdings, the researchers found.

"Wealthy stakeholders have a larger stake in how the transition to renewable energy is managed than the geographical distribution of fossilfuel production suggests, both through their support of the fossil-fuel economy and through their potential exposure to stranded assets," Semieniuk says.



"Decarbonization efforts by countries in which these stakeholders are based may therefore be more effective in reducing oil and gas supply than previous research might suggest.

"For instance, policymakers could work with investors to lower capital expenditure of oil and gas companies rather than simply divest, transferring ownership to other, perhaps less responsive parties ('ownership leakage').

"On the other hand, expectations of government bailouts of financial companies in these wealthy countries could also lead to perverse incentives for increasing overinvestment and reaping the dividends while they flow."

The financial geography should be of interest to financial regulators in OECD countries and the major exposure of pension funds raises questions about the sustainability of some private pension funds.

Yet, the direct economic consequences of unemployment and adverse consequences for government finances, Semieniuk and his colleagues write, are likely to be largest in undiversified developing producer countries where governments hold most of the risks.

The authors note that the global equity ownership network has considerable gaps, and that some asset ownership has changed since their data collection, which reports holdings from 2019.

"Recent months have seen major asset write-downs, which could affect our baseline or be interpreted as a staggered asset stranding," co-author Pablo Salas from Cambridge says.

He adds that "importantly, although we can say much about the allocation of stranded asset risk and draw historical analogies, our model



does not allow us to predict specific implications for financial stability."

Co-author J-F Mercure, of the Global Systems Institute at the University of Exeter, puts the study in context: "This study quantifies and attributes, for the first time, the systemic risk and its ownership that fossil-fuel assets impose onto the global financial system.

"This information will be very useful for financial regulators worldwide, as it forms a basis to act to protect assets and pensions from the high volatility of fossil fuel markets that can be expected to affect oil, gas and coal markets looking forward."

The research was carried out by the University of Massachusetts Amherst in the United States, and the Open University, the University of Exeter, the University of Cambridge (C-EENRG and CISL), Cambridge Econometrics and the University of London in the United Kingdom.

The overall project was coordinated and led by the Open University.

Co-author Neil Edwards of the Open University comments, "The huge complexity of the global financial system is a major source of concern for its potential to redistribute and amplify <u>financial risk</u> arising in the climate transition—our study shows it is possible to track and quantify at least part of that risk, and its implications for individuals and governments."

**More information:** Gregor Semieniuk et al, Stranded fossil-fuel assets translate to major losses for investors in advanced economies, *Nature Climate Change* (2022). DOI: 10.1038/s41558-022-01356-y

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