RESEARCH HIGHLIGHTS

Environmental Consequences of Hydrocarbon Infrastructure Policy

by Thomas R. Covert and Ryan Kellogg

Does blocking construction of fossil fuel pipelines reduce emissions? And at what cost?

Context

For more than a decade, environmental advocates and climate-focused regulators have argued for restrictions on fossil fuel development. One such "keep it in the ground" strategy has been to block the construction of fossil fuel transportation infrastructure, often pipelines, so that the fuels that would have been transported might instead never be developed. Four major U.S. oil and gas pipeline projects—the Dakota Access Pipeline, Mountain Valley Pipeline, Atlantic Coast Pipeline, and Keystone XL—have been the subject of vociferous opposition, and it is unlikely that the latter two will ever be built. The U.S. Federal Energy Regulatory Commission has also been debating whether its natural gas pipeline permitting procedures should account for CO2 emissions from the new gas production that each pipeline might induce. These debates are not confined to the United States. Internationally, the East African Crude Oil Pipeline, Eastern Mediterranean Pipeline, and Canadian Trans Mountain Pipeline projects have all been opposed over their potential climate impacts. This paper studies whether preventing construction of infrastructure that transports fossil fuels, such as pipelines, inhibits production of those fuels, and analyzes what the tradeoffs to preventing this construction might be.

> "Blocking pipelines does indeed reduce some carbon emissions, but not as much as one might think and the tradeoff to the local environment is substantial as rail cars emit a significant amount of pollution. This presents an environmental justice dilemma, as the reduction in global climate damages comes with increased local pollution damages for communities near rail lines."
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> **RYAN KELLOGG**
> **PROFESSOR, HARRIS SCHOOL OF PUBLIC POLICY**

Research Design

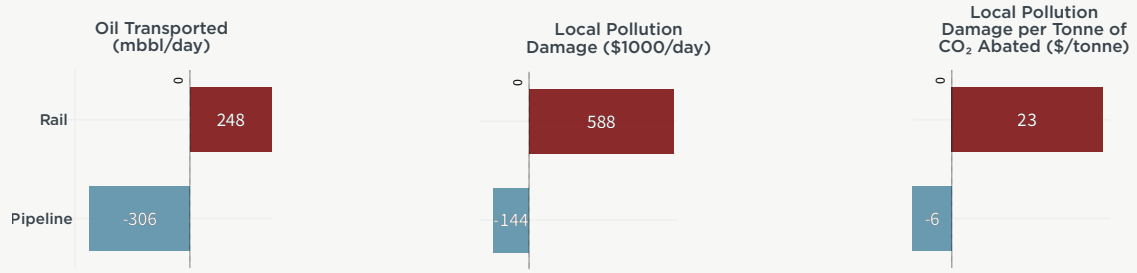
The researchers developed a model of fossil fuel production and transportation mode choice, as well as pipeline capacity investment. Applying the model to oil transportation from the Bakken Shale in North Dakota (one of the largest deposits of oil in the United States), the researchers estimate crude-by-rail costs using the history of rail flows and price differentials from the Bakken to downstream markets. Additionally, they create a model of Bakken upstream oil supply through the use of data on drilling and production in the region. The researchers use their estimated model to analyze what would have happened if the Dakota Access Pipeline, which moves more than 500,000 barrels of oil a day from North Dakota to the U.S. Gulf Coast, had not been completed in June 2017. The researchers quantify the implications of changes in oil production and transportation flows by evaluating firms' lost producer surplus, and the changes in pollution associated with both pipeline and rail transport. They do this by using per-barrel damage estimates that account for spill risks, air pollution from diesel railroad locomotives, and air pollution from electricity generators that power pipeline pumping stations.

Findings

Had construction of the Dakota Access Pipeline been blocked, most of the oil would have been transported by rail instead and not kept in the ground. If the Dakota Access Pipeline's construction had been halted, 81 percent of the oil would instead have been transported to demand centers by rail. Bakken oil production would have decreased by only 4 percent.

Blocking construction of the Dakota Access Pipeline would have increased local pollution damages for those living near railroads. The researchers estimate that if the Dakota Access Pipeline had been blocked, the cost of local pollution from rail locomotives would increase by $588,000 per day, while the decreased cost of local pollution from pipeline transportation would be just $144,000 per day. Because blocking Dakota Access would reduce Bakken oil production, the policy would "leave in the ground" 26 metric tons (tonnes) per day of CO2. The increase in local pollution from railroads is then equivalent to $23 per tonne of CO2 abated, and the decrease in local pollution from the pipeline is $6 per tonne.

Figure · Changes if Dakota Access Pipeline Were Blocked



Note: These reported values are expectations, as of 2014, over 2017-2027.

Blocking construction of the Dakota Access Pipeline would have decreased oil producers' surplus. In aggregate, the cost of blocking the pipeline would be $45 per tonne of CO2 abated. Blocking the pipeline would decrease oil producers' surplus by $716,000 per day. Accounting for the carbon that would be "left in the ground," the authors find that the combined producer surplus and local pollution cost per tonne of CO2 abated would be $45. This value is on par with the contemporaneous U.S. social cost of carbon of $42 per tonne, but significantly lower than the value of $190/tonne social cost of carbon recently proposed by the U.S. Environmental Protection Agency. The cost of blocking the pipeline could be as high as $159 per tonne after accounting for global oil market impacts that might lead to increased production from other basins.

A policy that directly regulates upstream production would cost less to reduce CO2 emissions by the same amount and lead to less local pollution. The authors consider an alternative policy that would reduce the same amount of CO2 as would be achieved by blocking the pipeline: a production tax that would directly regulate upstream production. This production tax would be similar to the royalties that producers pay when production occurs on public lands. Because most Bakken oil production comes from private land, the production tax would be in the form of a state-imposed severance tax. Unlike blocking pipeline construction, a policy that directly regulates upstream production would reduce local pollution and overall impose a small cost per tonne of CO2 abated of between $1.01 and $2.68 (combining the loss of producer surplus with gains from reduced local pollution)—considerably less than the $45 per tonne cost of blocking the pipeline.

> "Blocking pipelines isn't the most efficient approach to reducing emissions. Each tonne of CO2 avoided by blocking a pipeline costs more than simply taxing or regulating oil production at the source. That said, taxing or regulating upstream production can be legally and politically difficult, so blocking a pipeline may still be an attractive option for climate advocates and policymakers."
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> **THOMAS COVERT, SCIENTIFIC DIRECTOR, ENERGY & ENVIRONMENT LAB**

CLOSING TAKE-AWAY

Blocking the Dakota Access Pipeline would indeed have reduced Bakken oil production, but at a cost per tonne of CO2 abated that is significantly greater than what could have been achieved by directly taxing or regulating upstream supply. Additionally, blocking the pipeline presents an environmental justice dilemma, since this would reduce global climate damages while imposing local pollution damages onto communities near railroad corridors. Of course, taxing or regulating upstream oil production may not be legally or politically feasible. In that case, blocking pipeline infrastructure may therefore still present itself as an attractive option to advocates and policymakers who strongly value carbon reductions.

The Energy Policy Institute at the University of Chicago (EPIC) is confronting the global energy challenge by working to ensure that energy markets provide access to reliable, affordable energy, while limiting environmental and social damages. We do this using a unique interdisciplinary approach that translates robust, data-driven research into realworld impacts through strategic outreach and training for the next generation of global energy leaders.