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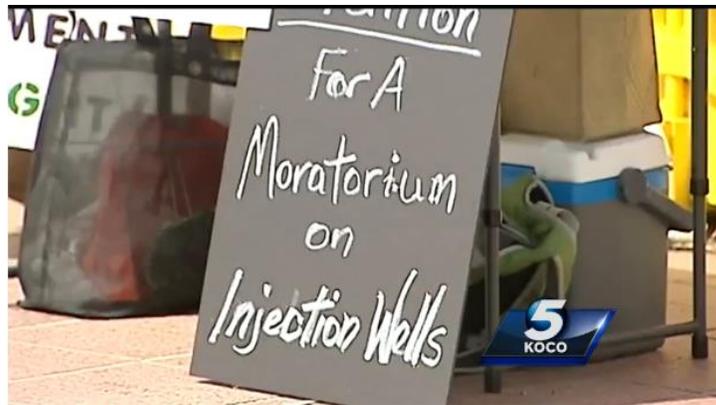


A project of the INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA

Why Banning Wastewater Injection Is the Wrong Response to Earthquakes in Oklahoma

Over the past several years, [much](#) has been [written](#) about the increased rate of earthquakes in Oklahoma. Although the Sooner State has a [long history of seismic activity](#), scientists and regulators are examining whether [injection wells](#) may be contributing to the recent uptick. More specifically, researchers have been studying whether underground disposal of produced water that comes out of oil and natural gas wells could be triggering seismic events by lubricating faults.

Meanwhile, drilling critics have been using the earthquakes to call for a [ban](#) or [moratorium on wastewater injection](#). The activists claim this would either stop the seismic activity or at least provide a period of time to better assess the situation.



A sign from anti-drilling groups during a rally in Oklahoma City on March 7, 2015.
SOURCE: [KOCO-TV](#)

But the activists' theory is neither scientific nor economic. In reality, banning wastewater injection is not an effective solution for Oklahoma's earthquakes.

Cost of a 'Pause' on Injection

Despite the fact that induced seismicity [requires a complex combination of forces to occur](#), environmental activists have oversimplified the situation. For example, the left-wing group [MoveOn.org currently hosts a petition](#) from Food & Water Watch calling on Oklahoma's governor to enact a "statewide moratorium on oil and gas wastewater injection wells," which the activists claim will "stop the earthquakes."

Other major environmental groups have endorsed the idea of at least a temporary ban. The head of the Oklahoma chapter of the [Sierra Club recently said](#):

*"We think a **12-month moratorium** [on injection] would be a long enough pause to get a much better handle on what is going on... We do think it would be enough time to give some indication on whether it is having an effect on the overall occurrence of earthquakes." (emphasis added)*

Earlier this year, another representative from the Sierra Club claimed it was "[inhumane](#)" not to ban injection wells in Oklahoma.

Such a ban would not only prohibit the operation of a [legally permitted activity](#), but also shut down wells that are not linked to earthquakes. In fact, experts say shutting down injection could make the earthquakes worse, and even create larger environmental problems.

As Oklahoma's state seismologist Dr. Austin Holland has observed, [stopping injections could actually cause new earthquakes](#), adding that there is "a fair amount of modeling that shows that might be the case." There are also many cases where earthquakes continue after injection ceases, according to Holland.

A recent study from researchers at Stanford University determined that, even without wastewater injection, "[the earthquakes in Oklahoma would have happened eventually](#)," given the geology in the state. The Stanford team theorized that injection activities simply "advanced the clock and made them [the earthquakes] occur today."

There's also no scientific basis for suggesting a blanket ban is necessary. As the U.S. Geological Survey has observed, "[most injection wells are not associated with felt earthquakes](#)," and only a "[small fraction](#)" of wells have "induced earthquakes that are large enough to be of concern to the public." In fact, the USGS says "[there is no conclusive example linking injection operations to triggering of major earthquakes](#)," though the agency says it can't eliminate the possibility altogether.

The reason induced seismicity is rare is because it requires the alignment of many site-specific factors, as the [USGS has previously explained](#):

"A combination of many factors is necessary for injection to induce felt earthquakes. These include: the injection rate and total volume injected; the presence of faults that are large enough to produce felt earthquakes; stresses that are large enough to produce earthquakes; and the presence of pathways for the fluid pressure to travel from the injection point to faults."
(emphasis added)

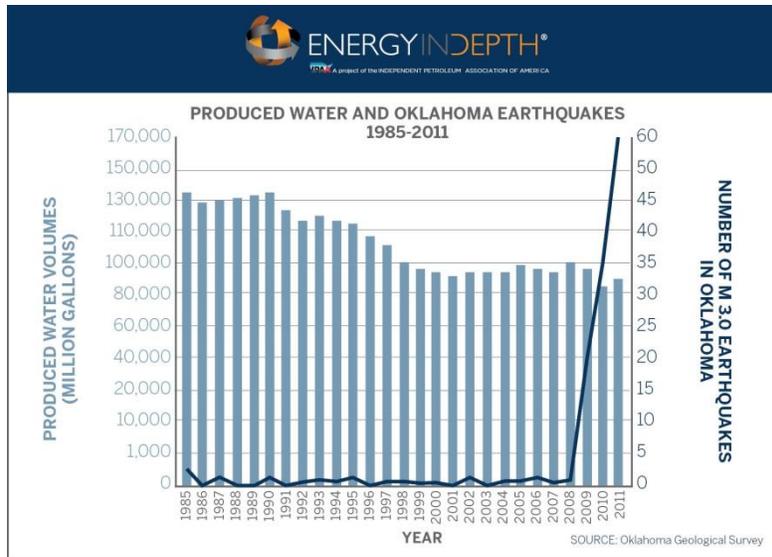
Interestingly, according to [Reuters](#), many of Oklahoma's recent earthquakes have "occurred in the Oklahoma City metropolitan area, **where there are no high-volume wastewater injection wells.**"

Meanwhile, the economic and environmental impacts of prohibiting injection would be staggering.

All oil and natural gas wells yield wastewater in some quantity, most of which is called "produced water" or brine. This water occurs naturally in all hydrocarbon bearing zones, and it must be disposed of in accordance with federal and state regulations.

According to the U.S. EPA, "[widespread use of injection wells began in the 1930s to dispose of brine generated during oil production](#)." These wells are regulated under the federal Safe Drinking Water Act's Underground Injection Control (UIC) program. In the United States, underground injection remains the most common method for disposing of wastewater from oil and natural gas operations.

Interestingly, produced water volumes in Oklahoma were actually about 30 percent higher in the 1980s than they have been in recent years, yet there were only a handful of recorded earthquakes in Oklahoma during that time. Some scientists have suggested that certain types of injection are more prone to triggering seismic events, and the location of wells – including proximity to faults – also plays a role. Regardless, this demonstrates that the state's recent seismic activity is far more complex than a simple correlation with injection may suggest, and shows why blaming injection is an oversimplification at best.



Although drilling critics have suggested a wastewater injection ban is necessary to reduce earthquakes, produced water volumes in Oklahoma in the 1980s were actually greater than they have been in recent years.

In some regions, there are alternatives to underground wastewater injection, but they are often cost prohibitive or present potentially bigger environmental challenges. If wastewater injection were banned in Oklahoma, it would likely mean one of two things: more surface handling (including increased wastewater shipments into neighboring states), or even stopping oil and natural gas production altogether.

Considering that several environmental groups have already claimed [truck traffic](#) to be a [reason to ban oilfield activities](#), it's unlikely that those groups – who are also calling for bans or restrictions on wastewater injection – would support shipping wastewater over longer distances.

Coincidentally, this is why some responsible environmental organizations have cautioned against banning injection altogether, suggesting that the environmental risks from injection's alternatives may actually be worse than earthquakes that scientists say ["pose little danger to the public."](#)

Indeed, as the [Environmental Defense Fund](#) has observed:

*"Permanent storage using underground injection wells remains **by far the most common disposal method. At this point, it also appears to be the least risky, not to be confused with 'unrisky'.**" (emphasis added)*

The Oklahoma Corporation Commission has also said that there ["are other ways \[of managing wastewater\] but they carry with them their own environmental problems."](#)

Kim Hatfield, chairman of the Oklahoma Independent Petroleum Association's (OIPA) regulatory committee, recently noted that banning wastewater injection ["would completely shut down oil and gas production"](#) in Oklahoma. At the very least, such a ban would force companies to ship their wastewater over much longer distances, potentially across Oklahoma's highways and into neighboring states. As a result of these arbitrary restrictions, Oklahoma's economy would likely take a significant hit.

Since 2010, the Oklahoma [oil and natural gas industry has accounted for nearly two-thirds of all jobs](#) created in the state, according to an economist at Oklahoma City University. Roughly one in every five jobs statewide is supported by oil and natural gas development, and the industry is the ["largest single source of tax revenue"](#) in the state, according to a 2014 report prepared for the State Chamber of Oklahoma. Over 20 percent of all state taxes come from the oil and natural gas industry.

Thus, any policy that bans or seriously restricts drilling would ultimately put hundreds of thousands of Oklahomans out of work and deny millions of tax dollars to state and local governments. For many Oklahomans, this “solution” would be far worse than the problem it was designed to fix.

What’s Being Done?

Although Oklahoma’s earthquakes have attracted a great deal of media attention, very little has been written on what the oil and natural gas industry has been doing in response. This has left many with the impression that the industry is either denying the problem or refusing to be a part of the solution. Neither is correct.

In fact, the oil and natural gas industry has been actively collaborating with state experts and other research institutions. Many of the recent studies published on this subject have benefitted from industry participation. Matthew Hornbach, a seismologist with Southern Methodist University who has been studying earthquakes in North Texas, [observed earlier this year](#):

“We’re lucky that companies have been willing to work with us. They have gone far above the call of duty.”

In Oklahoma, the industry has:

- Shared information on deep geological formations with geologists and regulators, including previously unmapped faults
- Helped scientists identify data gaps to better understand subsurface geology
- Partnered with research institutions – such as Stanford University and the University of Oklahoma – to study seismicity
- Drafted potential best practices on wastewater disposal, in coordination with the Oklahoma Geological Survey and the Oklahoma Corporation Commission
- Secured funding for additional seismic monitoring stations in Oklahoma

Meanwhile, Oklahoma regulators have implemented what’s known as the “[traffic light](#)” system, a policy recommended by the National Academy of Sciences, which ascribes a color-coding policy for injection well permitting based on seismic data and history. A green light region has normal permitting. Securing a permit in yellow light conditions requires additional review and potentially different operating procedures, while a red light condition indicates a complete stoppage.

Earlier this year, the Oklahoma Corporation Commission also [implemented a new set of requirements](#) in certain “[Areas of Interest](#),” focusing on injections below the Arbuckle formation. The directive forced operators to prove that they were not injecting below that zone, or reduce disposal volumes by 50 percent. The state recently [expanded that directive](#), and [committed an additional \\$200,000](#) to help regulators respond to concerns about earthquakes.

While stopping a process that some think is responsible for Oklahoma’s earthquakes – i.e. wastewater injection – may sound like the most obvious response, research from the scientific community strongly suggests that the situation is far more complicated. The fact that a ban would negatively impact both the economy and the environment is more reason to doubt whether calls for a “time out” is the responsible path forward.

As Kim Hatfield from OIPA recently said, wastewater injection is “an integral part of the business,” adding that it [“has been done safely for 60 years and it will be done safely.”](#) Hatfield suggested that scientists, regulators, and industry simply “need to establish the conditions that permit us to do that” – as opposed to an economically-destructive ban that’s not based on the best science.