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The Environmental Impacts of Fracking

Nick Nardone
University of Nebraska Lincoln

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By

Nick Nardone

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Abstract

Hydraulic Fracturing or commonly known as fracking has helped the oil and gas industry making it easier for us to extract oil and gas from the ground. While we have benefited economically from this boom, the process of injecting high amounts of water and chemicals deep into the earth's surface at extremely high pressures puts an negative effect on the environment. The purpose of my study is to identify and understand the environmental impacts associated with fracking. Analyzing the environmental impacts will give us the needed information and knowledge to help reduce the environmental harm associated with Fracking. The public has much concern due to all the hazardous effects from fracking, such as water pollution and the release of greenhouse gas emissions, along with other consequences. Fracking is prevalent in developed nations and now occurs in more than 30 states. Even though fracking has some benefits in the short-run, continuous use will be hazardous to our environment and our society if we don't have stronger regulations on fracking. As fracking has become widely popular in the last decade and provided benefits to the oil and gas industries, but the lack of information and support has made it difficult to put restrictions on fracking. We need to start focusing on better methods and stronger policies when dealing with fracking, so we can understand and tackle the environmental impacts associated with fracking.

Introduction

Fracking is of major concern because of its environmental impacts and the lack of regulation of the process. Since fracking is considered a better alternative because we can extract natural gas, which is cleaner than coal and produces less

greenhouse gas emissions than coal, it seems to also get more leniencies towards aggressive policies, which makes it harder to watch and control fracking. “Natural gas is a non-renewable fossil fuel, which is one of the commonly used sources of energy. Its composition varies depending on the place of production. The emission of GHG from combustion of natural gas is relatively lower than GHG from other fossil fuels” (1). Why should we care about how much GHG’s we emit? Most people would agree that humans are the cause of climate change and it poses a serious threat to our world. Human activity such as burning fossil fuels and deforestation are the main causes of the earths rise in temperature. When we burn fossil fuels we cause the release of carbon dioxide and other greenhouse gases into the atmosphere. These gases are known to trap heat into the atmosphere. According to NASA, “ The industrial activities that our modern civilization depends upon have raised atmospheric carbon dioxide levels from 280 parts per million to 379 parts per million in the last 150 years (1). ” Since the industrial revolution the amount of human produced gases have risen by a third. Human produced gases have been linked to the cause of higher global temperatures. Gases that contribute to the greenhouse effect are water vapor, carbon dioxide, methane, nitrous oxide, and CFCs. The five hottest years on record have all occurred since 1997. The earth is continuing to rise in temperature, “Averaged over all land and ocean surfaces, temperatures warmed roughly 1.53°F (0.85ºC) from 1880 to 2012”(2). This might not seem like a big difference in temperature, but even the tiniest amount of increases poses a threat to our environment.

"Natural gas might seem like a better alternative because of its lower emissions of greenhouse gases"(11), but using and even extracting natural gas, requires a significant amount of work and energy, that still releases a relatively high amount of GHG's. Methane is a main component of natural gas, "25 times more potent in trapping heat in the atmosphere than carbon dioxide"(12). In natural gas, "more than 90% of the composition is methane and to transport natural gas requires large number of raw materials for investments, including pipelines. The energy demands required in compressor stations that pump the gas from remote locations to the target are significant. Each element, which is used for the flow of the gas has its separate impact on the environment and should not be omitted in the overall environmental impact analysis" (1). This is why we need to have better policies in place that will bring us better standards and make fracking more efficient without harming people or the environment around us.

The heavy use of fracking has caused more complaints from the public, which demands for stronger policies that would make fracking more efficient and less pollutant. The contamination/pollution of water from fracking has drawn great attention in the U.S. "Contamination can happen through blowouts, surface spills from storage facilities, or improper disposal of fracking fluids. In Texas, flowback fluids are disposed of through deep injection into abandoned gas or oil wells. But such wells are not available every- where" (5). We have seen many complaints about chemicals in our water system from fracking due to leaks in the pipes and wells. Environmental concerns about hydraulic fracking are growing. Directional

drilling and hydraulic-fracturing technologies are dramatically increasing natural-gas extraction.

Regulations on fracking are up to the state with federal law being a very minor piece to the puzzle. This allows states to proceed with fracking operations with little hassle. With lenient fracking policies companies will keep getting away with their operations with usually no supervision from an environmentalist or someone qualified to make sure the fracking company is following protocol. "Thousands of Texas oil and gas facilities are allowed to self-audit their emissions, and pollution complaints rarely result in punishment for the companies. Out of 284 oil and gas industry-related complaints in the Eagle Ford region between January1, 2010 and November 19, 2013, only two resulted in fines" (3). There is major distrust between the fracking companies and the public regarding to the data the fracking companies record and also fracking companies refusing to release what chemicals they use during the fracking procedure. With fracking already being a concern this puts a red mark on fracking companies that do not wish to comply with the state or federal governments. We need to be concerned with all the fracking going on in the world and not let it pass by because it would be more costly to rebuild or cleanup after the damage is done. The United Nations Environment Program has concluded, "Hydrologic fracking may result in unavoidable environmental impacts even if (unconventional gas) is extracted properly, and more so if done inadequately. Even if risk can be reduced theoretically, in practice many accidents from leaky or malfunctioning equipment as well as from bad practices are regularly occurring"(16).

Fracking does have some beneficial aspects, such as being able to extract more gas and oil giving us more energy to use and produce, but at the same time it is just another short-term method that helps us extract oil and gas. This study is important because we are carelessly causing damage to our planet with little precaution. We only have one earth and to destroy it would be a shame. As children of the earth we should care about the environment we live in because everything in this world is connected and to disrupt or neglect one area will cause problems to another area. Continuing fracking will be destructive to our health and our world. We need to focus on stronger policies that will limit and regulate fracking, while at the same time finding better methodologies that will make fracking more efficient and less polluting. Fracking should be just temporary, until we find better ways through technology or renewable resources that will give us clean and efficient energy.

My objective in this study is to identify and understand the environmental impacts associated with fracking. My hypothesis is that there is a strong link between fracking operations and environmental degradation. For my study I will be analyzing previously recorded environmental impacts associated with fracking. I will be looking through previous documents, data and research papers to help me gain knowledge in this field. By understanding the fracking procedure and what impacts fracking has on the environment, we can then make better decisions to a greener future.

Methods and Materials/Results

For my research I will be looking at current policies on fracking, previous environmental disasters or concerns from fracking, and data related to fracking. By looking at previous information and data we can hopefully have a better understanding about fracking. This will then allow us to make better decisions when it comes to the environmental impacts associated with fracking.

Is there evidence of fracking causing harm to the environment? Yes. Fracking has caused significant damage to our environment. There have been previous encounters with water contamination and fracking to date, including the Marcellus Shale in Pennsylvania. A study was conducted near the Marcellus Shale, which tested underground drinking wells for contamination. "The study analyzed 68 private water wells ranging from 36 to 190 meters in depth. Methane concentrations were detected in 85% of the wells and were 17 times higher on average in wells from active drilling sites. An active drilling site means there are one or more gas wells within one kilometer of each other. As neighboring gas wells were found closer together, methane concentrations in the water increased. On average, the concentration of methane in the water wells was 19.2mg/L, with a maximum concentration of 64mg/L. This average methane concentration falls within the U.S. Office of the Interior's range of methane concentration for hazard mitigation (10-28mg/L), with the maximum value exceeding this range. Although no evidence was found directly linking this methane contamination to the Marcellus Shale gas fracking fluid, it should not be eliminated as a potential source of contamination for

the future"(15). When dealing with operations, such as fracking, that drill deep holes and inject chemicals into the earth, you have to be aware of the possible outcomes. "Thus, even though the rate of problems with shale gas wells has remained small on a per well basis, pushback has grown in areas of increasing density of drilling and fracking. This may be especially true when consequences are fearsome such as flaming tapwater, toxic contamination, or earthquakes"(4).

We should not be playing guessing games on whether fracking is causing damage to our environment or not, we should know what we are dealing with, so we know what decisions we can make. "Our results show evidence for methane contamination of shallow drinking-water systems in at least three areas of the region and suggest important environmental risks accompanying shale-gas exploration worldwide"(15). This study found evidence of contamination near fracking operations, which makes us think what else could be in our water. Another study found evidence of contamination in Texas from the Barnett Shale, which they found residents living near the Barnett Shale, had high levels of toxic chemicals in their body. This was a major concern due to the rise in popularity of fracking, especially in Texas, where oil and gas thrives. "On December 7, 2010 EPA issued an endangerment order against a Barnett Shale gas company in Fort Worth, Texas," after residents repeatedly complained of, "flammable and bubbling drinking tap water. EPA testing confirmed that high levels of methane gas in the water posed an immediate risk of explosion or fire" (14). The EPA has warned Texas about the continued use of fracking and the implications it imposes. Texas believes that

fracking does no harm to the environment when practiced correctly and will continue to use fracking as a effective method to extract gas and oil.

Lenient policies on fracking have made it easy for companies to drill and extract oil and gas from the ground. The regulation of oil and gas extraction falls mainly to the states, including enforcement of the federal Clean Air Act, but rules vary widely from state to state. Texas for instance is one of the biggest fracking states and has the most oil and natural gas production of the 50 states. This is no surprise with Texas legislators continue to pass pro fracking laws and ban/kill fracking regulations. “On May 18, 2015, Texas Governor Greg Abbott signed HB 40, a bill that prohibits towns and municipalities from banning fracking” (8). This act was in response to a law that prohibited fracking in Denton, Texas, which is known as the birthplace of fracking. The city of Denton now prohibits fracking due to human health concerns, environmental degradation, and now earthquakes. “Over the last decade, the most common disposal practice in the U.S. has involved injection of FP water into Class 2 brine disposal wells, which has recently been reported to induce micro-scale earth-quakes”(6).

“The U.S. Geological Survey, in a March report on "induced earthquakes," said as many as 7.9 million people in parts of Kansas, Colorado, New Mexico, Texas, Oklahoma and Arkansas now face the same earthquake risks as those in California” (9). The report found that oil and gas drilling activity, particularly practices like hydraulic fracturing or fracking, is at issue. Scientist believe that fracking waste injection wells are the main cause for earthquakes because “brine from injection

wells may be able to flow into nearby faults and soften the friction holding the faults in place, making it easier for a fault to slip, release the stress that was already there, and cause an earthquake" (10). Texas has had a significant increase in earthquakes since 2008. "Of the 162 Texas earthquakes with magnitudes of 3 or greater between 1975 and 2015, the study categorized 42, or 26 percent, as "almost certainly" human-caused, and 53, or 33 percent, as "probably" human-caused. Only 13 percent of earthquakes were natural." (10). With more and more drilling going on we will have focus our attention to fracking causing earthquakes.

Discussion/Conclusion

Fracking poses a threat to our health and our environment. We have now seen through collecting and analyzing data that there is a negative relationship between fracking and the environment. "The disposal and leaks of hydraulic fracturing wastewater (HFW) to the environment pose human health risks"(7). Studies have shown multiple amounts of traces of methane and other toxicities in the water. "Scientists found methane contamination of drinking water associated with shale-gas extraction. Average and maximum methane concentrations in drinking-water wells increased with proximity to the nearest gas well. Researchers also found a potential explosion hazard with the related concentrations of methane"(13). Now that we have more information about the negative externalities of fracking, we can start implementing ways to have better research and studies conducted related to fracking, review potential health and environmental concerns,

develop and use cleaner and more efficient technology, and ultimately have stronger polices that will regulate fracking.

Fracking is a booming business that will keep on thriving as long as there is oil and gas to extract from the earth. Fracking has been beneficial to us, in a sense that it has given us more power and energy, but that comes with a price. That price is our own health and the environment we live in. Fracking is still a harmful practice that puts a great amount stress on our environment with many unknown outcomes. We should slow fracking down to get a better understanding on what issues are related to fracking and how can we solve these issues. While fracking is a short-term solution to our energy needs, we should be looking into cleaner alternative resources for the future such as wind or solar power. This will then supply us with clean renewable energy, so we can have a healthy planet to thrive and live on.

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