

Fractured: Perceptions of the Frac Sand Mine Industry in the Chippewa Valley

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Abstract

This project is an attempt to gain a better understanding of public opinions about sand mine expansion in west-central Wisconsin. Opinions on the expansion of mining are mixed, with many stating this expansion is a good thing for Wisconsinites. They claim the mines and processing centers are increasing jobs in the area, which will, in turn, boost the local economies. Others have concerns about the potential environmental impacts of the mining. There are many unanswered questions, however, involving health effects, environmental degradation, and economic usefulness. This project will attempt to gain further statistical knowledge on this topic. We explore three themes that are correlated to environmental and economic issues. They are: Awareness/Education, Opinion, and Involvement. Previous research has shown the importance of the public's opinion of developing environmental concerns, but such research has not been conducted in the context of frac sand mining (Hunter & White, 2009). With all of the controversy behind hydraulic fracturing, frac sand mining remains an understudied topic. This research is an attempt to understand the social, economic, and political dynamics of frac sand mining and how/why it affects local stakeholders.

Keywords: Frac, Sand, Mining, Perceptions, Society, Industry, Public

Introduction/Literature Review

The need for silica sand in the process of natural gas extraction has given rise to a new entity. The frac sand industry of northwestern Wisconsin is now bustling and expanding at a fast pace. Local mediascapes are heading the pro- and anti-mining ideologies in the area. Most bystanders sit by and watch the squabbling between those who are "for" and those "against"

the frac sand industry. This creates a disjuncture between what a select few and what the public perceives as a local issue. What is the general consensus amongst the population?

The word “environmental” can be construed in a different ways, but two senses of the word predominate. One is an idealized version of the environment which sees it as pure and untouched nature. The other perspective lies in the way that humans act and react to environmental forces. Humans often act upon their surrounding environment for basic needs. For the sake of this discussion, environment will be understood as a product of human interaction with nature. This connection between humanity and ecology is a basic tenet of environmental sociology. This school of thought recognizes the fact that we are a species that has co-evolved and followed the same evolutionary patterns as other species on our planet. However, as a species, humankind has gained the ability to use different cultural establishments to move our species to an apex position (Walker, 2005). Humans have the ability to become extremely innovative and advanced in our thinking patterns. This innovation has provided humankind the ability to act upon its surroundings (Walker, 2005). In the most basic sense, humans have created the idea of environment. It is nearly impossible to talk about the topic of environment without talking about human interaction.

Environmental issues have been central to frac sand mining. From initial surveying, we have found that fugitive silica sand, water sanitation, and dust are the important perceived issues within the Chippewa Valley. Such concerns led the Wisconsin Department of Natural Resources (DNR) to produce a report on silica sand and the health risks. The study stated that the silica dust is a known human carcinogen. Without proper equipment and regulation, this dust travels freely through the air. Crystalline silica particles can then be inhaled and, “engulfed by cells in the lungs called alveolar macrophages.” Macrophages are essential in the process of suppressing pathogens in our bodies. Macrophages line the lungs and react to inflammation by producing antibodies to fight foreign bacteria, virus, etc. The DNR study claims, “...silica is toxic to the macrophages, and the silica particles are not soluble, they are not easily cleared from the lung. Particles build up in lung and lymphatic tissues.” Furthermore, silica dust provokes inflammation in the lungs, which leads to silicosis (lung fibrosis) and cancer. If the crystalline

silica were to go unmonitored and unregulated, these particles would be free to travel through the air. The most exposed are plant workers and those who live near the sand processing plants and the mines.

The second environmental issue is related to water sanitation and possible pollution. This potential problem originates from information gathered at a 2011 town-hall-style meeting, which the Wisconsin Towns Association sponsored. This open-session meeting generated an assembly of local legislators, Wisconsin DNR representatives, members of the mining industry, and the general public.

The processing plants harbor settling ponds, allowing water used in the washing process to settle out. Any debris collected in this process generally sinks to the bottom. If the ponds are not properly lined, there is a potential issue of acrylamides leaching into groundwater. Acrylamides are used in the process of cleaning silica sand and are a known carcinogen to humans, and without the correct protocols in place, acrylamides could potentially enter the watershed. This could be damaging to society if proper precautions are not taken.

Every action has a reaction and human society is so deeply integrated in our ecosystems and environments we start noticing that ecological disturbances lead to social inequalities (Laurent, 2013, pg. 2). Examples in the existing literature help provide evidence to this. The interconnectedness of societal issues and resource mining will be discussed in the next section.

Another concern owing to large scale mining is the issue of population displacement and possible extinction of the surrounding communities. Different countries have different regulations, some being less stringent than others. Abigail Abrash (2001) provides one such case, involving an operation was located in Papua New Guinea. Freeport is an American mining company who wanted to mine the lands of the Amungme and Kamoro people for gold and copper. The inhabitants of this region were diligent laborers who practiced sustainable agriculture. Much of their land held both sacred and ritualistic meanings for daily life. With the aid of the government, Freeport was allowed to mine these native lands. As a result, the Kamoro and Amungme were displaced from their homes and villages. The mining corporation of Freeport almost destroyed the indigenous land, leaving the people with little to survive on

(Abrash, 2001). Not only was the mining process depleting resources for humanity, it was also tainting other essential resources needed for survival. Though this isn't common in the United States, it transpires throughout other regions in the world. Mining practices executed by Freeport almost caused the disappearance of two communities (Abrash, 2001). This example leads us to wonder, what can sand mining do to the future of Wisconsin communities? Of course, different countries have different regulations, some being less stringent than others.

Our literature review highlights previous social and environmental problems stemming from resource mining around the world. From the information gathered, we can understand the extreme positives and negatives of the sand mining industry. Initial interviews has shown us that the general population does not entirely stand for or against the new industry as a whole, but when it comes to specifics, we tend to see changes in this trend. In our research, we noticed a trend of "out of sight, out of mind". We can equate this to Bibb Latane's Social Impact Theory. The theory states that social impact relies on forces that include: the strength of the source, the proximity of the event, and the number of "sources" exerting the pressure (Latane, 1981). Simply stated, the forces and pressures of having sand mines and processing plants within an individual's scope of being, makes them more aware of said mines. Consistent with this theory, we found that individuals who live closer to sand mines or plants will be 79% more likely to be against mining.

A town hall meeting we attended in 2011 provided captivating information. Much like Freeport, the Wisconsin DNR has been helping the frac sand industry grow. Governor Scott Walker's prior state budget plans included the downsizing of DNR staff. To allow sand mine companies to start exploiting silica sand, they need to prospect the land and start mining as soon as possible. The DNR simply does not have enough staff to permit and regulate every mine throughout northwestern Wisconsin. In response to the staffing shortage, they have issued air and water permit waivers. This has allowed mines and processing plants to begin production without initial air and water surveying. However, the DNR fervently stands by its findings that fugitive silica dust is not an issue that the public should worry about.

Ulrich Bach and Anthony Gibbons' risk society theory can help explain part of the trend we are observing towards reduced

regulation. It states that risk is a systematic way of dealing with hazards and insecurities introduced by modernization. Often, people wait for scientists to figure out problems, in regards to environmental issues. This has proven to be quite problematic. People are beginning to question the institutions of modernity because the security they are supposed to provide may fail: 3 Mile Island, Chernobyl, etc. People are reluctant to trust new technologies because of the risks that they may involve (Bach and Gibbons, 1992). With frac sand mining, it is possible that this may lead to an individual's reluctance to trust the scientific data on the topic. As a result, this individual may rely on gathering their own information, which may develop a bias towards a specific side of the debate. As will be addressed in table 2 of the results section, there is a clear difference in an individual's education levels and their perceived knowledge on frac sand mining.

News outlets, forms of social media, and initial canvassing clarified that many proponents believe that a benefit of the frac sand mining industry is the increase in local jobs. Several articles from the Eau Claire Leader-Telegram validate the benefits of the new mining industry. One such headline read, "MR. SANDMAN brings more than a dream" (Marlaire, 2011). Marlaire stated that "MR. SANDMAN" (Frac Sand Industry), "delivers jobs and money to the region, and a host of industries and area residents are expected to benefit financially from the industry." Deeper into this November 6th edition of the Leader-Telegram, Marlaire wrote another story with the headline "Frac sand industry bringing jobs to region" (Marlaire, 2011). The article briefly communicates how the sand mining industry is offering jobs to soon-to-be graduates of the University of Wisconsin-Eau Claire. Indeed, these are good, high paying jobs, but the article tends to only focus on the jobs that are for highly trained "professionals."

In many cases, the frac sand mine debate comes down to job creation versus environmental degradation. Is it possible to achieve job creation and environmental sustainability at the same time, or will these forces always clash? Obach (2002) states that many labor workers are in favor of the environment because it is what provides them with a job. In contrast, Obach states that, often times, environmentalists place the blame on the labor workers and make false claims, stating they hate the

environment, which in most cases, is not true (Obach, 2002). During this time of economic uncertainty, we tend to focus on economic benefit over environmental benefits.

Economic benefit is the main catalyst for this sudden surge of sand mines in Wisconsin. As discussed above, our perceptions of the world as presented to us by mediascapes, such as newspapers, radio, and television tell us that frac sand mining has an economic value. It will create new jobs and stimulate the local economy. Arjun Appadurai's disjuncture theory helps us think about how different "scapes" might drive the frac sand industry. By creating these disjunctures in our society via ideoscapes (international flow of ideologies) and mediascapes the industry also creates deterritorialized areas of the US. These areas are no longer small villages, but the homes to corporate mining operations, where there is a lot to be gained (Appadurai, 2007). We see conflicts between the common idea, presented in the media, that the sand mining industry is beneficial and the views of some of these communities who see what is actually happening to their landscape. To some in these communities, "economic gain" seems to only support powerful entities, such as corporations and special interest groups, who are at the forefront of promoting frac sand mining. Corporations have taken these steps in the context of a movement to lessen our dependence on foreign crude oil and move to local energy sources. This region of the country has large amounts of silica sand, and industry is drawn to extract this natural resource which aids in natural gas removal.

Despite the importance of this issue, previous literature has not addressed public perceptions of frac sand mining and its costs and benefits. Not only has the existing literature not focused on the issue of frac sand mining, it is also lacking in terms of public perceptions from both sides of the debate. By surveying, interviewing, and observing members of the general public, we will be contributing to a greater understanding of the positive and negative perceptions of local impacts of frac sand mining.

Methodology

We conducted an online survey that asked respondents to provide demographic information, to rate their knowledge of global and local news, to rate their knowledge of the frac

sand mining industry, and to state their views on the costs and benefits of the industry. We also provided an open forum for respondents to voice their opinions on the industry. Our sample population included community members 25 years old and older. The reasoning behind choosing this demographic was because we thought that 25 year-olds and up are more instilled in their community. We assume that the majority of this large age group are involved in careers and out of the typical “college age”. The university’s research clearinghouse provided the emails of all the UW Stout’s participants, including faculty, staff, and non-traditional students. In addition, we contacted local media outlets around the Chippewa Valley and asked them to share our survey link with the public.

We also canvased randomly selected neighborhoods in the Chippewa Valley region, as well as high-traffic public areas to find subjects to whom the survey would be administered. We chose this method because we felt we would reach a more representative sample of the community population. We successfully collected a total of 421 survey responses from our canvassing and our online surveying, which had a response rate of approximately 33%. Of these responses, 398 were fully complete. This not only provided us good information for statistics, but it provided us with significant amounts of qualitative information. Themes and statistics can be found in the quantitative and qualitative analysis section below. We also conducted interviews with members of the local frac sand industry and local government officials. We gained access to these individuals via a snowball sampling methodology.

The questions in the survey focused on the participants’ awareness, opinions, and involvement in the frac sand mining industry in their area. Additional probing questions involved: “good neighbor” policies, governmental regulations, and other initiatives aimed at facilitating sustainability and corporate responsibility. The data gathered from the survey and interview process were then analyzed with a mixed methods approach to gain a full picture of the local issues and perceptions surrounding sand mining in our region. The survey also gave the respondents an option to address their views in the open forum field. These responses were transcribed along with the interviews we performed and the data was coded to find underlying patterns in our respondent’s responses.

Analysis

We found patterns in both the perceived benefits and the perceived issues of frac sand mining. Among the benefits, our respondents generally focused on the economic impacts. The respondents also had many perceived issues. 98% of the people who took the survey believed that the industry causes harm to the environment. 48.3% of the individuals surveyed also believe that the industry brings property damage to the nearby citizens. They believed that it devalues homes in the area and creates an unnecessary form of noise pollution. According to a local government employee, much of the population also believes that the industry creates road degradation and a net economic loss for the community.

We utilized two binary logistic models to further analyze our data. The first model included a dependent variable corresponding to the question "Do you believe more regulations should be in place for frac sand mining?" and explanatory variables relating to demographics of the respondent. The second model we used had a dependent variable corresponding to the question "Do you believe that frac sand mining has benefits?" and included the same explanatory demographic variables. Our main explanatory variables of interest were: Gender, educational background, and the respondents perceived knowledge on frac sand mining. Demographic results of our survey data are summarized in Table 1.

Table 1: Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Gender	398	1	4	1.64	.566
Age	398	1	6	4.35	1.357
Education	398	1	6	5.03	1.290
Perceived Knowledge	377	.00	10.00	6.5915	2.04932
Valid N (Listwise)	377				

Of the 398 survey responses, 238 respondents identified themselves as female, 154 respondents as male, and six chose not to answer the question. The educational background of the respondents was a very significant element when analyzing socio-economic issues. For this question, participants had six options for educational attainment: some high school, high school graduate (or equivalent), some college, two year degree, four year degree, and higher degree. If the respondent chose higher degree, they were asked to explain. Since we chose a sample including UW-Stout faculty and staff, about 50% of the total population had a higher degree. The last area we chose to address in detail was their perceived knowledge of frac sand mining. We asked that the respondent rates their overall frac sand knowledge on a one to ten scale. We found that, generally, people were most likely to rank themselves somewhere between five and nine on the scale.

Table 2 shows the results of the binary logistic regression with the dependent variable corresponding to the first question of interest: "Do you believe more regulations should be in place on frac sand mining." We chose to use a binary logistic regression because of the dichotomous dependent variable. Doing this allowed us to better fit the model to the data.

Table 2: Binary Logistic Regression Results
Dependent Variable: Do you believe that more regulations should be in place for frac sand mining?

Variables	Coefficient	P. Value
Gender	2.360*	.004
Age	.869	.207
Education	1.333*	.009
Knowledge on Frac Mining	.825**	.027
Constant	2.086	.506
**** Signifies P. Value of 1%, 5%, and 10%		

Table 2 reveals that two of the four explanatory variables were statistically significant. This regression showed us a correlation between gender and views on frac sand regulations. We found that females are more than twice as likely (136% more likely) to believe that more regulations should be in place for frac sand mining. In the same model we see high significance in the level of educational attainment. This regression states that respondents with higher educational attainment are more likely to believe that frac sand mining should be regulated. To paraphrase Socrates, one possible explanation is that the more you know, the more you know you don't know. In other words, it seems that highly educated people may be more likely to believe that there are unknown issues about mining that might need to be covered by regulations and oversight.

Finally, we explored the importance of an individual's perceived knowledge of frac sand mining. The more people thought they knew about frac sand mining, the more likely they were to believe that new regulations were not needed. To be more specific, for every one unit increase in perceived knowledge on the ten-point scale, a person is 17.5% less likely to believe that there is any need for increased regulation.

There are a couple possible explanations for the result that the higher an individual perceives their knowledge on frac sand mining, the more likely they are to believe that fewer regulations need to be in place. One possible explanation is that these individuals are, in fact, correct in that there really is no need for the amount of regulations in place. Another possible explanation for this result is that the readily available information and "knowledge" on the debate is that sand mining results in job creation. The side of the debate that focuses on the possible risks involved with frac sand mining has not been well enough or loudly enough articulated, resulting in many individuals missing out on that knowledge.

Our second model was estimated using a binary dependent variable corresponding to the belief that frac sand mines have benefits. The results are summarized in Table 3. The dependent variable for this regression was the belief that frac sand mines have benefits.

Table 3: Binary Logistic Regression Results

Dependent Variable: Belief that more regulations should be in

place for frac sand mining.

Variables	Coefficient	P. Value
Gender	2.361*	.000
Age	1.008	.924
Education	1.118	.183
Knowledge on Frac Mining	1.134*	.020
Constant	.000	.045
*, **, *** Signifies P. Value of 1%, 5%, and 10%		

Table 3 illustrates that with every one unit increase in an individual's perceived knowledge on frac sand mining; they are 13% more likely to believe that frac sand mining has benefits.

In order to gain a richer understanding of these perceived risks and benefits, we also analyzed the qualitative information acquired from our interviews and the responses in the open forum sections of the survey. The theme of perceived issues largely centered on topics of environmental health and human well-being. 98% of respondents found that environmental degradation was a major issue with frac sand mining in the Chippewa Valley. These environmental factors included: altering major landscapes; the loss of aesthetic value; air/water quality issues; and subsequent health risks. These factors portray environmental issues as threats to the human aspects of environment.

The perceived issues can also be characterized as threatening to personal monetary gains. For instance, one of the main perceived issues is that of property degradation and home value. If there was sufficient evidence proving that the industry had adverse effects to the air, water, and human health, we would most likely see a loss in property value to those centrally located by processing plants and mines. According to our initial survey, 22% of respondents believed that property damage (physical damage and depreciating property value) was a consequence of the new frac sand mine industry. The survey also showed that 31% of the opposition believed environmental issues were an issue and 27% thought noise pollution was a

major consequence of the frac sand mine industry.

One of the last perceived issues is degradation to public roadways. Road degradation is to be expected when large semi-trucks filled with sand operate at maximum capacity. The public believes that their tax money will be the only capital funding road repair and upkeep. One would believe that this could be a major issue; however, an interview with a local government employee eases the worry. When asked how road repairs will be funded, the government official stated, "we hold the hammer. When the mining operation came into [the area], we found that they were operating at higher levels than previously expected. We then made a point to maintain strict road guidelines to force the industry to pay us for road repair." The official then explained that they had the regulatory power to freely raise and lower weight restrictions on county roads. This forces companies to comply with weight regulations. If they did not offer compensation, their production would be halted due to lack of transportation options. While the total figure was not disclosed, we had learned that one company was allocating \$5 million per year for road renewal/upkeep. The figure seems quite large, however, another interviewee who works in road construction stated that it costs nearly \$95,000 to pave one mile of county road. With both figures in mind, we understand that the aforementioned sand company can repave approximately fifty-two miles of road. Local citizens seem to be unaware of this road repair allowance, however, in their responses to our survey.

The primary benefits that were cited qualitatively were generally focused on the economic impacts. They saw it as beneficial on both personal and institutional economic levels. 63% of the respondents believed that the industry would provide jobs to the general public and provide growth in local business. 63% believed that the frac sand industry brings tax benefits to the state. The respondents also believed that the industry would help the nation as a whole, providing institutional gains. These responses focused on the energy needs of the country, and the belief that the use of natural gas is the best way to wean the nation off of foreign oil and to use forms of energy that can be produced locally. When looking at the recent election, President Obama stated:

Right now Congress needs to extend the tax credits for clean energy manufacturers that are set to expire at the end of this year. I was talking to Dave Cote. The issue of energy efficiency and everything we need to do to shift away from dependence on foreign oil, we're making huge progress. We're actually importing less oil than any time in the last 8 years. We're down under 50 percent, but we can do more (Obama, 2012).

President Obama and Governor Mitt Romney also focused on job creation throughout the recent presidential campaign. Most of the rhetoric focused on how to focus on industry and job expansion. Frac sand mining falls within this scope of "building industry" and "decreasing dependency" on foreign oil. The survey results validate the themes of the election as a direct connection between mediascapes and the given audience. The messages are not just coincidental. As one would expect from field theory, it seems that "skilled actors" have helped shape a coherent narrative of the benefits of frac sand mining.

We are noticing that institutional frameworks are coinciding with one another to manifest dissonance amongst the general population. This leaves the local population confused and unwilling to take a cohesive stance on how they feel about the frac sand industry.

Conclusion

The frac sand industry has created an interesting political climate in the Chippewa Valley. As researchers, we have had the rare opportunity to witness how local citizens feel about a relevant, pressing issue. We have found that there is a dividing line within the public sphere that is creating a disjuncture within our communities. We have to wonder what will happen within these communities if we maintain these feelings over a long period of time.

The research may seem inconclusive; however, we found that new questions were raised. The local community needs to consider these questions, because they are a part of the big picture and they may be the key to restoring cooperation within our communities. Our results show that a significant proportion of respondents saw both important risks and important benefits in the potential for an increased frac sand mining presence in

the region. We found that there were significant divides across gender lines and across lines of educational background (an important consideration for the region with its numerous higher education institutions situated among rural communities). We also found an interesting result in the level of public knowledge and information and its impact on perceived benefits and costs. These findings leave us with two key questions surrounding the future of frac sand mining: First, should we strive to grow our economic sector in a manner that integrates society and environment in a sustainable way? Second and perhaps more importantly, how will the perceptions about this issue be shaped within the community?

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