

**“It Stinks to High Heaven to Us”: How the Smells of a Proposed Manure Lagoon in Ohio  
Emerge as a Community Stressor**

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## **Abstract**

When a renewable energy and organics management firm sought to install a ten million-gallon manure lagoon in Wayne County, Ohio in early 2018, community members of Canaan Township began to rally together to oppose the proposal. One of the most frequently cited concerns was unwanted odors emanating from the lagoon. Through the analysis of public testimonies (N=28), this study examines how smell – or even fear of prospective smells – can come to represent a community stressor. Using qualitative data analysis software, recurring keywords in all 28 testimonies were coded and then theory-driven codes were developed to identify the ways that smell manifests as a community stressor. Using this method, residents' testimonies identified both direct and indirect effects of unwanted smells associated with the lagoon. More than simple physical stimuli, the smells described by residents were associated with a host of problems, including potential health risks, projected decreases in residential property values, and disruption of everyday social life. Furthermore, residents' testimonies showed how smells can emerge as a shared community problem. This paper thus highlights how undesirable odor can be perceived as both a source and symptom of social problems in a community, particularly in a time of imminent change.

## **Introduction**

Community stressors are a well-studied construct within public health and social psychology. Community stressors generally capture the effects of a neighborhood environment on a particular community and "... problems that affect a large number of people in a given area." (Bachrach and Zautra 1985). A variety of studies has investigated community stressors and their effects through specific analyses of inadequate infrastructure, crime rates, or economic disadvantage – often known as psychosocial factors (Jaffee et al. 2005; Cohen et al. 1982; Greif and Nii-Amoo 2015). Physical and environmental factors have also been identified as community stressors, including chemical toxins and loud noise (Baum, Fleming, and Davidson 1983; Bowler et al. 1994; Pedersen 2015). Bachrach's and Zautra's (1985) research on community stressors is a prime example in which they looked at the coping strategies used by a community when facing the threat of living near a hazardous waste facility. The study, conducted near Phoenix, Arizona, found that community members perceived a hazardous waste facility as threatening to their overall well-being, so they adopted various strategies to cope with

the community stressor such as becoming more involved in their community, signing a petition, researching the topic, and attending public hearings (Bachrach and Zautra 1985). Another useful case study looked at the mental health effects of community stressors, by examining the impacts of a nuclear plant accident at the Three Mile Island (TMI) facility in Dauphin County, Pennsylvania and widespread unemployment in the vicinity of western Pennsylvania three years later. The study found that both community-wide stressors did predict an increase in symptoms of mental health and psychological distress following an incident (Dew, Bromet, and Schulberg 1987). The environment in which a community finds itself situated can generate stress, which manifests in tangible consequences.

Community stressors are important to investigate and are often overlooked when studying health outcomes for specific communities. The detrimental effects of community stressors are often conflated with other more quantifiable factors. In fact, community stress and health risks should be assessed together to inform environmental decision-making in issues of public health (Couch and Coles 2011). While some case studies have examined both community stress alongside scientifically objective health risks such as those related to landfill sites and petroleum refineries (McClelland, Schulze, and Hurd 1990; Luginaah et al. 2002), few have focused on the role of sensorial experience in these analyses. I argue that smell, in particular, is an influential human sense that is critical to the formation and understanding of a community stressor. A sensorial experience, one that is shared among a social group, brings about the emergence of a “common sense”. From this “common sense”, groups of people are able to share a sense of concern, urgency, and purpose (Kiechle 2017). In this case study, I extend the concept of “common sense” and community stressors to Wayne County’s residents and their response to a proposed manure lagoon.

The addition of a manure lagoon would imply that smells and odors would follow suit. It might be intuitive to suggest that bad smell negatively affects community life as a stressor, but case studies like this allow us to understand a bigger context: how smell can be a stressor not just as a physical stimulus, but as a social index of larger impending problems for everyone in the community.

The research questions that guide this study are:

1. How is smell perceived as a stressor by the community? Specifically, what are the descriptions, effects, and associations of smell cited by the community?

## 2. How do people react to the smell as a collective threat to the community?

By closely mapping out smell and its cultural context – its association with disgust, disease, and disruption – we can better understand how smell can be perceived of as a community stressor.

### **Study Site**

New additions to a neighborhood are not always welcomed. For residents of Canaan Township, their addition was proposed to them first in December 2017. The proposal was for a 10 million-gallon manure lagoon that would hold waste material from humans and animals. Quasar, the renewable energy and organics management firm that would install the manure lagoon, intended to use the lagoon as a storage facility that would contain effluent, which is a byproduct from the production of natural gas.

Canaan Township is one of the 16 townships in Wayne County, Ohio. It is located in northeast Ohio with a population of 4,926 people, of which 4,882 are White, 31 are Black, 40 are Native American, while 25 are Asian (U.S. Census Bureau 2017). In a 2010 Decennial Census, Canaan Township reported about half of its population as living in rural regions (U.S. Census Bureau). Thus, the community of Canaan Township can be described as a predominantly white rural community.

In December 2017, Quasar applied for a permit to install a manure storage facility in the vicinity. Quasar has ten other facilities in Ohio, including notable ones in the cities of Haviland, Cardington, and Wooster. The proposed facility would hold ten million gallons of treated and processed waste, which would consist of municipal waste, animal waste, and human-derived wastes known as biosolids (i.e. treated sanitation sludge). The organic waste materials are directed into an anaerobic biodigester that eventually creates natural gas for generation of electricity and turns the material into effluent that can be used as an agricultural supplement. The process also produces methane that is captured and used as a renewable source of energy. Due to limited storage capacity on-site, Quasar has actively sought land to establish lagoons where effluent can be stored and later applied on to nearby farmland as an agricultural fertilizer.

In this particular case, the lagoon has several safety designs that are important to highlight. The lagoon is lined with clay liner, which is intended to prevent the material from seeping into the ground during storage. Due to the nature of the material, a crust of several inches also forms on the surface of the lagoon, which prevents the spread of smell. The lagoon is

also surrounded by existing tree buffers that help reduce odor and conceal the lagoon from plain sight. Quasar also has an Odor Hotline for odor complaints. As per Quasar's website, they are "... dedicated to maintaining positive relationships with the communities in which [they] do business", which suggests that Quasar has serious considerations on controlling odor and smell from their facilities (Quasar Energy Group n.d.).

Despite all these factors, the residents of Canaan Township fully opposed the proposal. In February 2018, concerned residents grouped up to form a Facebook community group called Canaan Residents Against Pollution (CRAP). Soon enough, the residents worked together to get their voices heard – making yard signs, signing petitions, contacting officials, and organizing a town hall meeting. On March 14, 2018, CRAP organized a town hall meeting in a middle school gymnasium that was packed full of people who were voicing their protest of the proposal. Ohio EPA eventually gave way to the pressure from the residents and granted a public hearing to address the proposal of the storage facility. The public hearing allowed the EPA – and indirectly, Quasar – to engage with the community: provide information, answer questions, and receive comments. The following 28 transcripts of testimonies were taken from the public hearing held on Tuesday, April 17th, 2018 in Fisher Auditorium at Ohio Agricultural Research and Development Center.

Since the proposed manure lagoon had yet to be installed at the time of the public hearing, a combination of both hypothetical scenarios and experiences of those who had visited or lived near lagoons or other operations run by the firm in question - including those in Haviland, Cardington, and Wooster - gave considerable weight to the testimonies that sought to oppose the proposal. In many instances, the smells or odors originating from the lagoon were presented as an unwelcomed disruption to the community and as a threat to their well-being.

## **Methods**

I requested transcribed public testimonies from the Ohio EPA, which were provided to me. These were imported into MAXQDA 12, a coding software package (VERBI Software 2017) and coded for analysis.

A preliminary content analysis was first conducted on the testimonies. The words from all 28 transcripts were identified and arranged by their frequency. A stop-list from MAXQDA helped to systematically exclude commonly used words in the English language (i.e.

conjunctions, prepositions, and pronouns) (VERBI Software 2017). This preliminary content analysis provided a basis for developing a coding system to quantify and categorize the content of each testimony. Some of the most frequent words used in the testimonies were not contextually meaningful since the words were verbs, adverbs, or articles. To improve the relevance of the content analysis, I refined the criteria to look at the top fifteen most used nouns and I removed all proper nouns from the criteria. I also removed terms added to the transcripts that were not articulated by the people at the hearing (e.g. “applause”, “hearing officer”, “Mr.”, “Mrs.”, etc.). The word “guys” was also removed because all usage of the word was as a pronoun (i.e. “you guys”). As part of the hearing process, the residents or representatives were asked by the hearing officer to state their name. Hence, I excluded the words “state” and “name”, since they were mostly used by the hearing officer and the person who was being addressed (e.g. “... if you would come forward, *state* and spell your last *name* for the record, sir.”, “My *name* is...” [Testimony 3]). After adjusting for all the most frequently used words, I summarized the top fifteen most used nouns into a table. The most frequent words reflected several focal themes of interest to this research, including notably: “smell”, “odors”, “people”, “community”, and “lagoon”.

First, I coded the number of times scent was mentioned (e.g. “smell” and “odor”). Next, I expanded on the coding system to examine the context of how scent was mentioned in the testimonies. This coding system looked at the number of instances where residents described smell and odor (e.g. “They said it is like you live beside a dump all the time” [Testimony 19] or by using adjectives such as “horrendous” or “atrocious”). I also looked at how smells and odors were associated with other problems attributed to the proposed manure lagoon (e.g. water pollution or runoff or decreasing property values). From this analysis, I coded for keywords that are relevant to the associated problems of smells and odors.

I was also interested in identifying aspects of the testimonies that go beyond the *in vivo* keywords I coded. I identified three main themes: *being outside*, *decreasing property values*, and *collective identity*. Then, I went back through the testimonies to inductively code for references to these three main themes. For *being outside*, I found three community members mentioning being outside (e.g. “don’t like to go outside”, “sit out on their decks”, “cannot have picnics”, “won’t go out”, “run a campground”, “can’t go outside”) in their testimony. I also found four community members who touched on the issue of decreasing property values (e.g. “nobody

wants our homes”, “drop in value”, “property values are going to plummet”). Finally, I found mentions of a collective identity across six testimonies (e.g. “I wanted to represent them”, “everybody is upset about the smell”, “everybody needs to look out”). These inductive codes allowed for the analysis of these themes in the testimonies without relying too heavily on word searches, which provided greater thematic accuracy.

## Results

In the initial content analysis generated by MAXQDA, the word “smell” and “odor” appeared 21 times and 15 times respectively throughout the testimonies. However, the content analysis only counted the root words of “smell” and “odor” without counting other forms of the word such as “smelling”, “smells”, and “odors”. After recoding for these word modifications (or lemmatization) as similar items, the word “smell” and “odor” appeared 27 and 23 times respectively. Altogether, the two words fall only behind “people” (63 times after lemmatization), “lagoon” (60 times after lemmatization), “water” (32 times after lemmatization), and “years” (27 times after lemmatization). No other nouns surpassed the words mentioned after recoding for lemmatization.

Five different adjectives – occurring seven times – were used to describe smell, which was coded under smell descriptors. Four words (“health”, “picnic”, “barbecue”, and “wedding”) were used in close association with odors and smells, which appeared 13 times in total. In assessing community threat, the word “community” appeared 15 times throughout the testimonies.

When I began coding inductively, I found six occurrences of *being outside* and four occurrences of *decreasing property values*. Lastly, I found seven unique occurrences of *collective identity* that are separate from my coding of the word “community”. There was one other occurrence of *collective identity* that overlaps with the word “community”, producing a total of eight occurrences of *collective identity*.

Table 1. Content Analysis by Noun Frequency in EPA Public Hearing Testimonies of the Proposed Manure Lagoon in Canaan Township, Ohio

Word	Frequency	Original Ranking
people	63	11
lagoon	55	15
water	32	35
years	27	40
property	25	43
county	22	46
right	21	49
road	21	50
<b>smell</b>	21	51
time	18	58
way	17	61
community	15	67
<b>odors</b>	15	72
record	15	74
stuff	15	75

*Note.* The total word count in n = 28 is 7,011. 1,575 unique words were used.



Table 2. Content Analysis with Lemmatization by Codes and Frequencies for EPA Public Hearing Testimonies of the Proposed Manure Lagoon in Canaan Township, Ohio

Code	Frequency	Number of testimonies
Scent		
<i>smell</i>	27	9
<i>odor</i>	23	7
Smell Descriptors		
<i>irritate</i>	1	1
<i>horrible</i>	3	2
<i>atrocious</i>	1	1
<i>horrendous</i>	1	1
<i>noxious</i>	1	1
Associations with Odors and Smells		
<i>health</i>	8	7
<i>picnic</i>	3	2
<i>barbecue</i>	1	1
<i>wedding</i>	1	1
Community Threat		
<i>community</i>	15	9
Inductive Codes		
Being outside	6	3
Decreasing property values	4	4
Collective identity	8	6
TOTAL	202	

*Note. Terms in italics are in vivo codes (i.e. keywords in context).*

### *Descriptors of Smell*

The perception of smell by the Canaan community can be understood through their descriptions during the hearing. In eight instances, smells and odors appeared in testimonies simply through their description. This included qualifying adjectives as “bad,” “horrendous,” “atrocious,” “horrible,” and “unbelievable.” All of the descriptors applied to the odors emanating from the lagoons were either explicitly negative or indicated a pronounced potency. For example, one resident and her husband shared their experience from visiting the community in Haviland, where another manure lagoon had been previously installed. The resident reported:

“I asked [the local residents], ‘what do you think of the lagoon?’ ...they put their head down, every one of them and said the smell is horrendous. Every one of them said it is a smell of garbage. They said it is like you live beside a dump all the time.” (Testimony 19).

In visiting a second manure lagoon site in Cardington, the same resident shared: “It smelled so bad it is unbelievable. It is in your car, you can’t stand it”. This resident made clear that the smell at the location they visited was an inescapable concern for them and the local residents currently living near the lagoon. While other descriptions of the smells associated with such lagoons were less dramatic, they were no less critical. Another community member, responding to the representatives hosting the public hearing, highlighted that the EPA’s duty was to protect the community, which she perceived them as failing to do. To conclude her testimony, she stated:

“I am just saying everybody needs to look out for more than what the eye sees or what you can smell. And yeah, it is bad.” (Testimony 17).

Such descriptions suggest that the smells emanating from the proposed lagoon would be difficult – if not impossible – to cope with. Moreover, these testimonies suggested that such noxious odors would ultimately become a threat to the community’s sense of well-being.

Of all the 28 testimonies, there were no instances of smells and odors being described in a positive context, except in their absence. For example, one resident described Quasar’s

operations in the neighboring city of Wooster, where the firm managed a biodigester, commenting:

“Since [Quasar] have left, there is no smell, neither from the lagoon or from their biodigester.” (Testimony 2).

In referencing the same operation in Wooster, another community member said:

“It still smells a little bit, but it was horrible [before]. It was horrible. Nothing was ever done...until the shit hit the fan literally.” (Testimony 11).

These statements echo the general sentiment that smells associated with Quasar’s operations were unpleasant and unwelcomed. Even in other testimonies that lacked explicit descriptors, it was implied that the odors would be offensive. For example, a resident asked rhetorically:

“...you want to have family picnics and have people come out and eat, and they will be smelling this stuff?” (Testimony 7).

Although the smell is not explicitly characterized in this instance, it is clearly evoked in a stress-inducing context that compromises residents’ ability to enjoy the simple pleasures of being outside, such as a family picnic. For residents of Canaan, smell is contextualized as a stressor that is highlighted in the descriptions used during the public hearing.

### ***Being outside***

Beyond negative characterizations of the smells associated with manure lagoons, stressful effects of odor were also commonly cited in several of the public testimonies. Five residents specifically explained how the smell or odor emanating from the lagoon would interfere and disrupt everyday social activities. For example, one resident noted that her grandchildren did not like being outside when manure is spread on farmlands, insinuating that matters would be made worse by the installment of a lagoon (Testimony 7). Another mentioned how conversations with a household in Cardington, Ohio revealed that the family’s dogs would not even go out because

of the stench emanating from the lagoon in that location (Testimony 19). A third resident, who owned a campground in Wayne County, stated that people would not want to go camping in the area if such a lagoon were put in place. He asked the panel:

“How am I supposed to run a campground with that kind of odor less than a mile away from my campground?” (Testimony 13).

The same individual mentioned that such impacts would not simply disrupt his business but also affect many other forms of outdoor recreation, noting: “...we had the gentleman that came in ... from the Wooster water treatment plant and was telling about how he couldn't even have a barbecue in his backyard because it clung to people's clothes.” This statement also points out how residents even assign agentive qualities to smell as it figuratively grips people's clothing. Another resident echoed this same idea:

“I haven't been to Seacrest, so I don't know if there is a smell emitting from there, but when they turn around and start bringing stuff from other places... the smell, it sticks to your clothes.” (Testimony 2).

In these statements, both individuals perceive smell as a force or even agent that acts out on the residents.

Ironically, the auditorium where the public testimonies were given was located on an agricultural research campus that included a biodigester built and operated in partnership with Quasar. Individuals who worked in the adjacent arboretum on the research campus were also present to share their views on the issue. One stated for the record:

“...if you have a comment about the smell, ask any bride who has used our arboretum in the last several years since Quasar has been here. It is kind of a joke to make sure that the wind is going the opposite way, or it is going to ruin her wedding day. Here in this building for ten years we have had events where people complained of the smell inside the auditorium, and we are - what? - three-quarters of a mile from it. It still gets inside

the building.” (Testimony 18).

The community members use these instances of ordinary experiences for the community to depict the negative effects of smell. The smell itself, as a physical stimulus, is unpleasant, but its effects extend well beyond this and into the everyday life for the residents of Canaan Township. With the presence of smell in their neighborhood, the residents predict that none of them would be able to engage in activities like walking their dogs, have a family picnic, or have their wedding outside. The residents’ outdoor activities would be restricted by the manure lagoon, as one resident stated simply: “We are also concerned with the odor that potentially could be drifting into our area and have a negative impact on our quality of life.” (Testimony 24). These perceptions of smell by Canaan’s residents manifests itself into a stressor that can tangibly interfere with their everyday life.

### *Decreasing property values*

Four residents, in their testimonies, mentioned the decreasing values of their property should the manure lagoon be built. The residents implied that the smell and odor emanating from the manure lagoon would be a strong deterrent for any investors or buyers, which would drive their property value downward. Based on a property’s vicinity to other infrastructures, smells become a critical factor in real estate that mediates property values – explained by pricing models such as the hedonic property value model (Cameron 2006). This model is used in economics to estimate the market value of a property in relation to its environment. In these cases, the hedonic property value model would predict a decrease in property values surrounding the proposed manure lagoon in Canaan. One resident who visited and talked to a resident of Cardington, Ohio said that she told them “...Nobody will come in. We can’t get out anymore. Nobody wants our homes anymore. We are done.” (Testimony 19). Another resident went with her husband to speak to an auditor:

“We understand our property is going to drop in value. When will you be out to reappraise this so that our taxes will go down?” (Testimony 15).

The auditor then went on to tell her that this will not happen for up to five or six years. This suggests that smell and odor would hinder residents' financial options to cope with their current situation. Their possibility of relocating would be equally affected by the decrease in their current property value. The resident who owned a campground in the area (mentioned previously) also made clear that the smell and odor would damage his business and bring him to "complete financial ruination" (Testimony 13). Taken together, the four community members call attention to the economic problems that would follow the installation of the manure lagoon in Canaan Township.

### *Collective identity of a "rural community"*

The residents of Canaan Township do not perceive smell simply as a personal and individual problem. In fact, smell is often contextualized as a shared community problem. Those who mentioned smell and odor as a problem spoke in a way that represented their entire (or the majority of their) community with an understanding that others, too, find smell and odor to be a problem. Although residents might provide a personal anecdote or concern about the smell, the residents are also fully aware that everyone else would be affected by the proposed manure lagoon's smell. One resident eloquently articulated this in their statement:

"Odors are subjective. You say that, okay, maybe it smells. But it is subjective. It might not smell bad to you guys, but it stinks to high heaven to us, and we have to sit here and smell that the rest of our lives. We are a community. We fight for each other. I have learned that, and I love that about us down here." (Testimony 10).

The resident is reinforcing the idea that the nature of the stressor – a physical stimulus – is an indiscriminate community stressor that will affect everyone in Canaan Township indefinitely. As such, the residents formed a collective identity because of the similar way it negatively impacts their lives, as discussed above. Another resident also addressed their community:

"I agree with everything these people said. Everybody is upset about the smell. Everybody is upset about the land values. Everybody is upset about the sludge that is going to run off the roads and off the gravel pit into the creeks." (Testimony 17).

It appears that the repetition of the word “everybody” is used to elicit a collective unity and reaffirm the shared nature of the problem. Phrasing smell as an individual problem would diminish the weight of concern that the residents have. Phrasing smell as a shared problem, however, emphasized the collective threat that the proposed lagoon brings to the community of Canaan Township.

Interestingly, one resident whose family are farmers in the community also aligned with the community’s response and voiced their opposition to the proposed lagoon. Although the products of the lagoon – the effluent – are used for agricultural fertilization, this resident made it clear that the farmers of the community are similarly dissatisfied with the proposed lagoon. The resident appears to represent the farming community in this statement to clarify that farmers are also opposing the proposed lagoon. They said:

“...we have been good citizens to this community, and this is not a farming issue. This lagoon is going to give farmers a bad name. It is not what farmers do. This is not how farmers act.” (Testimony 9).

The collective identity of Canaan residents is also linked to the rural landscape, which is sometimes placed in opposition to urban and metropolitan areas. By juxtaposing themselves against their urban counterparts, the residents of Canaan also assert their identity as a community with shared rural struggles. For example, one resident mentioned that urban spaces are afforded the privileges of clean and sanitized spaces, arguing:

“.. when you are in the city, you don't worry about it, but because we live in the country, we are almost being penalized because there is open air. There is open ground that you can spread [sewage sludge]. I mean, Washington, D.C., all these cities, where does all that stuff go? They don't want it in their cities. How many people that live in the cities want to entertain their families, sit out on their decks or by their pools?” (Testimony 7).

The resident argues that metropolitan areas are unlikely locations to store sewage sludge because large numbers of people are potentially exposed to noxious odors or other undesirable

environmental conditions. Instead, sewage sludge is placed in rural areas because of existing “open air” and “open ground.” The same resident elaborated further on this point, asking rhetorically: “How would the Cleveland Metro Parks like to have a 10-million gallon soaking pit where there are runners and joggers and bikes and families that want to have picnics or whatever?”

The qualities often associated with rural life, such as openness and rusticity, make rural communities more prone to the deposition and storage of sewage sludge (Ching and Creed 2013). One resident who moved to Canaan from an urban area described her discontent with the lagoon as well as her pride in the community’s opposition to it:

“I moved down here from the city. I am a transplant. My husband and I moved down here about 15, 16 years ago. I've always wanted to live in the country. I've always wanted to live on a farm. I love these people, and I love what's going on here today... I didn't move from the city down here to know that this is happening... I would like to say thank you to all of you for welcoming us, and I am proud to stand up here today and say that I am proud of our community and to fight for this.” (Testimony 10).

Another resident added further support to this resident’s sentiment:

“And just like this other lady that moved down here, you expect to be in the country and live for the benefits of the country, but this is going to affect us for a long time. We all know and you all know that they have got a bad track record, Quasar [the organics firm].” (Testimony 17).

Here, these residents show that the community is acknowledging their rural identity and mobilizing in opposition to an incoming threat. Through their testimonies, these residents assert that it would be unfair for their community – a rural, white, working-class community – to be subjected to the risks and stressors of the proposed manure lagoon.



## **Discussion**

### ***Smells as “Out of Place”***

It is not surprising that residents’ testimonies refer either explicitly or implicitly to smell as being bad, horrendous, horrible, or atrocious. Because smell is often understood as an innate biophysical experience, offensive smells that are unavoidable are perceived to be particularly threatening and impactful. The idea of having to endure a bad smell can be understood as both disgusting and morally unjust (Curtis and Biran 2001). As such, smell becomes a significant presence conceived not only by its perception but also by its negative associations. Although these odors would fall below the odor thresholds for hazardous air pollutants according to the Ohio EPA, the effects of this stimulus reveal themselves in real concerns for the residents. In a study by Mariwah and Drangert (2011) examining attitudes and perception of the use of human excrement as fertilizer in Ghana, they found that smell and health risk are two main factors that contributed to the respondents’ hesitance in using human excreta as fertilizer. In another study looking at community perception of using human excreta as fertilizers in Vietnam, it was found that respondents “...feared bad smell because the bad smell could transfer bacteria and cause diseases through airborne transmission, but most [respondents] were not able to say what diseases the bad smell could cause (Mackie Jensen et al. 2008: 436)”. This could be reflected in the testimonies in this research as well since community members highlighted both the smell and the health risks associated with the proposed manure lagoon. Although people often associate offensive smell with health risks, people rarely make clear the mechanisms of how smell causes health issues. Past research has suggested the possible mechanisms that could account for why people believe that smell implies health risks; mechanisms such as odor aversions, odor conditioning, stress-induced illness, and mass psychogenic illness (Shusterman 1992). Thus, the community member voicing their reluctance to being outside with the smell that would be emanating from the lagoon can be rationalized. The perception of Canaan’s residents on the manure lagoon and its impending smell can be attributed to the public’s lack of knowledge on wastewater management and material composition of the solids used at the facility (Robinson et al. 2012). It could be suggested that the heightened descriptions of smell and its perceived effects are a response stemming from not knowing the rigorous process and procedures in place at Quasar’s manure lagoon.

### *Social Disruptions and Effects on Everyday Life*

Offensive smells are more than just inconvenient stimuli – they disrupt people’s domestic lives and compromise their ability to enjoy “fresh air” and outdoor forms of recreation. This dates back to the early history of modern urban development. In the 19th century, the miasmatic theory of disease was still the prominent paradigm in Western epidemiology. It was believed that miasma, or bad airs, were the causes of diseases, and as bad airs spread, so too did disease. Coincidentally, removing the sources of bad airs (e.g. installing sewage drains) also removed many of the sources of contamination that were responsible for the diseases (Bloom 1965). At the same time, access to fresh air was considered an important counter to miasma.

With the arrival of the germ theory of disease, the control of bad airs became a secondary concern but one linked to class privilege. As Paul Sutter notes: “fresh air became less a tool for reforming an unnatural urban environment and more a privilege of one’s class position and ethnic status.” (Kiechle p. xiv). By the middle of the 19th century, people of middle and upper classes moved away from industrial neighborhoods and were afforded cleaner environments free from lingering odors and smells. Instead, those of lower working classes had to endure the odors and smells emitted from their surrounding environment (Kiechle 2017). This led to the association of “fresh air” with the modern public health movement, even when miasmatic theory of diseases was later displaced by germ theory. Urban planning has sought to eliminate “bad” smell and create what Jonathan Reinartz described as “odorless utopias” (pg. 179 2014). A modern urban landscape demands that odors be scrubbed clean or removed entirely where they remain unconscious because its consciousness is often perceived a symptom of a problem (Reinartz 2014).

Today, subjecting people to foul smell and odors can be equated to essentially stripping away someone’s autonomy or challenging their class status, In other words, it places them into the imagined environments of a lower working class where smell and odors exist. Cities like New York and Los Angeles are still grappling with historic racial and class divides that still impacts the lives of communities to this very day. While low-income and marginalized communities suffer from greater risks of contamination, pollution, danger from their

environment, white and middle-class communities are able to enjoy access to being outdoors in cleaner neighborhoods (Pulido 2000; Morrison 2019).

### ***Problems by Proxy***

The concern over the decrease in property values in Canaan Township highlights how a biophysical problem also has profound socio-economic consequences. In a study observing how risk beliefs affected property values in a Los Angeles neighborhood, it was found that beliefs of health risk, which included the presence of odor and distance to a landfill site, was detrimental to the property values in the community. It was estimated that the overall decrease in property value was \$40.2 million across 178 homes near the landfill site (McClelland, Schulze, and Hurd 1990). It is important to note that odor and distance predicted a respondent's believed health risks associated with the waste site, which means that the further away the location from the waste site and the less noticeable the smell emanating from the waste site – the less likely it is for the property to decrease its value. This phenomenon could be examined with a hedonic property value (HPV) model commonly used in economics. These models used to consider environmental factors that affect the evaluation of a property. One factor that this model can take into account is pollution. In studies observing the effect of smell on property values, smell is directly implicated in decreasing property values (Batalhone, Nogueira, and Mueller 2002; Eyckmans, De Jaeger, and Rousseau 2013).

These smells are usually associated with higher pollution levels since the presence of smell alone is a perceived signal of poorer air quality. Regardless of these signal's validity, individuals pick up these signals and make evaluations that significantly affect the market values of houses and properties located near a source of smell. This indicates that smell and odor would collectively affect the financial and economic stability of the community in the foreseeable future, which extends beyond the presence of the unwanted stimulus itself.

### ***Unwanted Smells as a Threat to Community***

This case shows how people both individually and collectively use their senses and subjective embodied experiences to develop a “common sense” (Kiechle 2017). It is at this intersection that we see smell and odors becoming both the source of community stress and the

means by which people rally against the proposed lagoon. The scientific standards set by regulators, legislators, and industry professionals are useful in curbing pollution and ensuring safety but are often closed off to the target group the standards were designed to protect – the general public population (Scott 2016). As such, there exist a discrepancy between what is deemed “acceptable” by people in positions in power and the general public. So, even when assured by the EPA and Quasar about the safety and control of the impending smell, the community of Canaan Township used their senses to demonstrate their dissatisfaction with the objective and authoritative claims. In understanding the public’s strong opposition to the manure lagoon, it is important to understand how people associate health risks with their physical and lived experiences (Winderman, Mejia, and Rogers 2019). The testimonies given in the hearing is an example of the general public bringing attention to the collective threat to their wellbeing through their physical and visceral experiences. This is not to say that issues of public health should only concern the public perception and rhetoric, but that public perception and rhetoric is crucial in contemporary public health movements (Winderman, Mejia, and Rogers 2019).

Under circumstances of collective threat, communities often come together and engage in collaborative strategies to cope with their community stressors. Multiple studies have looked at the adaptation and coping strategies that communities employ – such as organizing a community opposition, gathering and researching information, signing petitions, and conveying the issue to an authoritative figure (Culley and Hughey 2008; Luginaah et al. 2002). Stressors from the environment activate automatic responses on an individual level, but these responses are then amplified on a communal level within groups of people (Evans 1982). These amplified responses then cause people to “...view problems in a larger social context, because efforts to combat such stressors rarely can be resolved by the individual alone; rather, collective action is required” (Bachrach and Zautra 1985 pg 137). In the case of Canaan Township, the residents band together to form CRAP - an important effort of community involvement in coping with impending community stressors.

This study also suggests that community stressors should be examined alongside lines of race, class, and the rural-urban divides. Racial and class divides appear in discussions of environmental decision-making. However, a number of studies have focused on either marginalized communities of color in rural or peri-urban areas accessing environmental

resources such as clean water, air, land, and food (Szasz and Meuser 1997; Mohai, Pellow, and Roberts 2009) or in urban communities living in large urban spaces with issues such as waste management and distribution or the assessment of health and pollution risks (Bryant and Mohai 1992; Heynen, Kaika, and Swyngedouw 2006). This study locates itself in the middle by examining how a white, working-class community responds to an environmental hazard in ways that may differ from that of a marginalized community of color. This is not to say that white working-class communities should take precedence in discussions of environmental injustice, but that these communities should also inform broader conversations regarding environmental decision-making.

## **Conclusion**

Smell matters. The sense of smell plays a pivotal role in understanding public perception of health, safety, and comfort. The perceived threat of undesirable smells can have profound impacts on individuals and households. As these testimonies bear out, the residents of Canaan Township stand in strong opposition to the proposed manure lagoon from Quasar. All the testimonies given in the public hearing highlighted the community's growing concern over the lagoon's threat to their sense of autonomy, class status, forms of access and privilege, and property values. The lagoon also has consequences for these individuals as a community – this threat has also become a rallying point that has united the community, which is explicitly expressed in several of the testimonies. The coping strategies of the community clearly reflect the communal aspects of the stressor, where people come together in a Facebook group to share information, organize hearings, and voice their opinions. Even beyond the smell and odor, the community members are concerned about the long-lasting and transgressive impact of a manure lagoon that would not only impact their lives, but also the lives of the future generation. In one testimony, a resident of Canaan Township shared the following: "... I mean, [waste] is just endless when you start thinking about it ... So, I think it has to be addressed as to what's going to happen down the road, even for my children, your children, your grandchildren, your great-grandchildren because it is going to be a problem, and I don't want to be eating sewage." (Testimony 7).

This case study further shows how communities perceive and respond to a threat beyond the physical stimulus. As discussed in this study, shifts in perception of a community have

profound socioeconomic consequences that affect their livelihoods and financial stability. Our perceptions reflect more than the reception of a simple stimulus and could set social problems in motion. Further research to elaborate on understanding public issues beyond physical and biological indexes and focus on the subjective embodied experiences of a collective would be invaluable for policy change. Scientific knowledge must be acknowledged as not being exhaustive, and that local and community-based knowledge are important supplements in informing existing scientific knowledge for environmental decision making (Corburn 2003). It is important to address public perception and responses to perceived threat, stress, and risk without dismissing the validity of the mentioned threat, stress, and risk. As succinctly put by one of Canaan's residents:

“My ending statement is, we are not the only people; we are not the only community that is speaking out against this. I want everyone to hear our voices, which I know you are, and I would love to see some sort of change happen. I realize that maybe you can't do that, but all of us need to come together and have lawmakers and understand that this just isn't okay. This isn't okay.” (Testimony 10).

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