Student: Sharon Wright, MSN, APRN, FNP-C
Advisor: Alexia Green, PhD, RN, FAAN
Content Expert:
MAT Date: July 28, 2019

Air Quality and the Limestone Aggregate Industry in Comal County, Texas: A Call for Policy Change

In this paper, I will propose a policy analysis focused on regulation and air quality in the aggregate industry in Comal County, Texas. Comal County is the second fastest growing county in the U.S. (Carnett, 2019).

A construction boom has increased the demand for limestone and its related products across Central Texas. The land between Uvalde, TX and Comal County contains more than 93,000 acres of aggregate industry operations. The Texas Hill Country is the source of 80% of all limestone quarried in Texas. Comal County has 40,000 acres of the aggregate operations (Shelly, 2018). An additional quarry site has been proposed in the county (Randolph, 2018). The proposed quarry is raising questions about how the mining and crushing process and increased diesel truck traffic will affect ambient air quality, physical and psychosocial health, and property values of local residents. Described below is an overview of the problem, the aim of the proposed DNP project, a framework and a proposed plan for conducting a policy analysis focused on air quality and the limestone aggregate industry in Comal County.

Problem

Clean air is a basic requirement for human well-being and health, yet air pollution continues to pose a significant threat to worldwide health (WHO, 2005). Particulate air pollution

is a mixture of solid, liquid or solid and liquid particles suspended in the air and are classified based on size. Particulate matter (PM) can negatively impact health by, passing through the nose and mouth (PM_{10}), and particulates can be deposited into the lower respiratory tract ($PM_{2.5}$) Current evidence states that $PM_{2.5}$ is strongly associated with mortality and other endpoints such as hospitalization for cardio-pulmonary disease (WHO, 2005).

The Clean Air Act requires the US Environmental Protection Agency (EPA) to set air quality standards for PM and determine levels that meet or exceeds standards. The EPA delegates to state agencies to determine sources of pollutants, how they impact health and the environment, and develop strategies to help reduce pollutants (US EPA, 2013).

Comal County residents living in close proximity to the quarry, where both quarry mining and transporting quarry products via diesel fueled trucks are contributing to potential health hazards. The average exposure of Comal County residents to $PM_{2.5}$ from 2008-2013 has been very near the World Health Organization (WHO) hazardous level of 10 µg/m3. The Comal County data was collected using estimation models rather than direct measurement by air sensors (Randolph, 2018). There are no air quality monitors in Comal County, and the nearest station measuring PM dust, diesel emissions, and ozone is in San Antonio, 17 miles upwind. The Texas Commission on Environmental Quality (TCEQ) only considers monitoring inside the gravel pit site and not in the surrounding community. (Stop Vulcan Quarry 3009, n.d.). TCEQ continues to grant air quality permits to the aggregate industry despite data that suggests particulate matter emissions and exposures are very near WHO hazardous levels (Randolph, 2018).,

Purpose

The purpose of this project is to conduct a policy analysis related to air quality regulation in Comal County, Texas, with a focus on PM in the aggregate industry in anticipation of

providing specific policy recommendations focused on protecting the health of Comal County residents.

Literature Synthesis

The literature search included databases PubMed, CINAHL and Google Scholar. Three cohort case studies, three meta-analyses, three systematic review papers and two scientific white papers were reviewed. Long-term exposure to $PM_{2.5}$ is significantly associated with increased risk of premature mortality, and even low levels of exposure are associated with atherosclerosis, vascular inflammation, pulmonary and systemic stress (Vodonos & Schwartz, 2018). There is an association between high levels of ambient PM and a greater prevalence of acute lower respiratory tract infections in children, especially in the very young (Horne, et. al., 2018).

The average exposure of Comal County residents to $PM_{2.5}$ have been very near the WHO hazardous levels during 2008 – 2013 timeframe. A grass roots organization, Stop Vulcan Quarry 3009, posed a question to TCEQ: On what basis are they continuing to grant more air quality permits to the aggregate industry when emissions are already near dangerous levels? Randolph (2018) believes that adding another quarry will have a significant effect on public health.

There is a bi-directional relationship between air pollution and CV risk, and abundant evidence that air pollution contributes to the risk of CV disease and associated mortality. Health professionals play an important role in supporting educational and policy initiatives as well as counseling their patients (Newby, et al., 2015).

Ristovski, et. al. (2012) states that exposure to diesel fuel particle matter (DPM) has a negative effect on respiratory health, causing respiratory problems via inhalation. The effect of DPM on lab animals reveals that once inhaled, DPM can translocate to other organs. Ristovski and team recommends that inhalation toxicologic studies should consider not only the respiratory

impact of DPM, but also the negative effects on other body organs. Understanding the mechanism of lung injury from DPM will enhance efforts to protect individuals from the harmful respiratory effects of air pollutants (Ristovski, et al., 2012).

Liu, et. al. (2018) recommends that authorities focus on finding solutions to reduce emissions, monitor and forecast the level of air pollutants and provide timely warning to at-risk populations when necessary. Their recommendations are to provide education and warnings to those at risk such as the elderly, the very young and asthmatics to avoid exposure (Liu, et al., 2018).

Morakinyo, et. al. (2018) states that the biologic and chemical components of PM play a significant role in respiratory and pulmonary disease, cancer, cardiovascular disease, emergency department visits and hospitalizations. Morakinyo and team state that their findings justify the importance of the synergistic effects of PM constituents on health, and provides information that informs policy that establishment of $PM_{2.5}$ exposure limits need to be created, which will allow more effective strategies to improve outdoor air quality (Morakinyo, et al., 2018).

Ethical Considerations

This project is a policy analysis and does not require Institutional Review Board (IRB) approval. DNP Council approval is required. The author has no conflicts of interest to report, and no relationship with the aggregate industry.

Policy Framework and Design

Luciana Herman (2013) described a structure (framework) for conducting an in-depth policy analysis in her work with students at the Stanford Law School . This proposed policy analysis will utilize Herman's framework which includes an overview of the problem, targeted

analysis and actionable recommendations (Herman, 2013). The core components of Herman's policy analysis structure are outlined in Appendix I.

Methods & Proposed Analysis

Herman's (2013) policy analysis structure, as noted in Appendix I, will guide the methodology which includes the use of "Heurisitics". Hoppe (2018) describes heuristics as a socio-cognitive theory of problem processing, suggesting that policy analysis and design are an iterative process of problem sensing, problem categorization, problem decomposition and problem definition. A thorough review of existing policies related to the regulation of PM will be conducted searching federal, state, and local laws and regulations which are currently guiding establishment/operation of aggregate mining in Comal County. Once all existing policies are identified and analyzed, a summary of the findings will be generated into a competing policy options format. Herman then suggest that heuristics be used to access the competing policy options, including feasibility charts, PEST (political, economic, social & technologic factors), matrices and SWOT analysis (Strengths, Weaknesses, Opportunities and Threats). Each of these heuristic methodologies – charts, matrices, and/or analysis will be generated to help guide formulation of the final policy recommendations.

DNP Level Project Focus

This proposal focuses on policy analysis in anticipation of creating change to improve air quality and monitoring in Comal County. Review of the literature, evaluation of regulations, and evaluation of best practices in other areas will drive policy recommendations and potential implementation. This project is likely to impact health policy. Sustainability is not able to be assessed at this time, as this is a health policy analysis. Essential V: Health Care Policy for Advocacy in Health Care, prepares the DNP graduate to analyze the policy process. This

provides a working knowledge of legislative and regulatory language. It is anticipated that this project should assist in preparing the author as a DNP prepared nurse to with capacity influence healthcare policy quality and content.

Timeline/Associate Costs

The timeline for this project begins July 2019, with submission of the proposal. Public meetings, personal interviews, and potential meetings with local and state leaders will be held after this date and conclude through February 2020. Manuscript completion is anticipated January 2020 through March 2020. Submission to a peer reviewed journal for dissemination will occur April 2020. Dissemination will be made to policy makers, legislators, members of the community, and publications. Specific publications venues being considered are the American Journal of Public Health, Environmental Health Perspectives, and Policy, Politics and Nursing Practice.

Resources for the policy analysis will consist of the author's unpaid time to perform the analysis. Guidance with the project will be provided by my DNP project expert, R. Keith Randolph, PhD, who has a similar interest in the project. Any office supply will be donated by the author.

Conclusion

An additional quarry in the Comal County, Texas, may have a negative impact on public health, communities, and businesses. Policy analysis with potential to create change is being evaluated in order to protect the health of Comal County Residents. It is anticipated that the author will continue to engage in policy work post-graduation and will impact policy changes to improve the health of Comal County residents.

Key words: quarry dust, diesel air particulate matter, particulate matter and respiratory health, public health air quality and policy change.

References

Carnett, L. (2019, April 18). Comal still second fastest growing county in nation. *The New Braunfels Herald-Zeitung*. Retrived July 24, 2019 from http://herald-zeitung.com/community_alert/article_c1c49a10-6231-11e9-8558-9fd2c5d29cee./

Herman, L. (2013). Tips for writing policy papers: a policy lab communications workshop. Retrieved July 3, 2019 from https://www-cdn.law.stanford.edu/wp-content/uploads/2018/04/White-Papers-Guidelines.pdf

Hoppe, R. (2018). Heuristics for practitioners of policy design: Rules-of-thumb for structuring unstructured problems. *Public Policy and Administration*, Vol. 33(4) 384–408. https://doi.org/10.1177%2F0952076717709338

Horne, B. D., Joy, E. A., Hofmann, M. G., Gesteland, P. H., Cannon, J. B., Lefler, J. S., … Pope, C. A. (2018). Short-term elevation of fine particulate matter air pollution and acute lower respiratory infection. *American Journal of Respiratory and Critical Care Medicine*, *198*(6), 759–766. https://doi.org/10.1164/rccm.201709-1883OC

Liu, H.-Y., Dunea, D., Iordache, S., Pohoata, A., Liu, H.-Y., Dunea, D., Pohoata, A. (2018). A review of airborne particulate matter effects on young children's respiratory symptoms and diseases. *Atmosphere*, *9*(4), 150. https://doi.org/10.3390/atmos9040150

Morakinyo, O., Mokgobu, M., Mukhola, M., Hunter, R., (2016). Health outcomes of exposure to biological and chemical components of inhalable and respirable particulate matter. *International Journal of Environmental Research and Public Health*, *13*(6), 592. https://doi.org/10.3390/ijerph13060592

Newby, D. E., Mannucci, P. M., Tell, G. S., Baccarelli, A. A., Brook, R. D., Donaldson, K., Storey, R. F. (2015). Expert position paper on air pollution and cardiovascular disease. *European Heart Journal*, 36(2), 83–93. https://doi.org/10.1093/eurheartj/ehu458

Ristovski, Z. D., Miljevic, B., Surawski, N. C., Morawska, L., Fong, K. M., Goh, F., & Yang, I. A. (2012). Respiratory health effects of diesel particulate matter. *Respirology*, *17*(2), 201–212. https://doi.org/10.1111/j.1440-1843.2011.02109.x disease. *European Heart Journal*, 36(2), 83–93. https://doi.org/10.1093/eurheartj/ehu458

Randolph, R.K. (2018). Evidence that comal county residents may be at risk for exposure to Air Pollution from the aggregate industry. Retrieved from https://www.stop3009vulcanquarry.com/wp-content/uploads/2018/05/white-paper-comal-exposure-aggregate-pollution.pdf

Randolph, R.K. (2018). Health risks associated with exposure to airborne pollutants arising from quarrying and aggregate processing. Retrieved from https://www.stop3009vulcanquarry.com/wp-content/.../06/white-paper-randolph.pdf

Shelly, A. (2018). *The Texas Aggregate Industry is Crushing Hill Country Dreams.* Retrieved July 24, 2019, from http://www.texasvox.org/texas-aggregate-industry-crushing-hill-country-dreams/

Stop Vulcan Quarry 3009 (n.d.) *Vulcan - not a good neighbor*. Retrieved October 24, 2018, from https://www.stop3009vulcanquarry.com/myths/

Texas Commission on Environmental Quality (TCEQ). *Current air permitting policy memos, guidance memos, and implementation guidance.* (n.d.). Retrieved July 17, 2019, from TCEQ website: https://www.tceq.texas.gov/permitting/air/nav/air_memos_all.html

US EPA (2013). *Regulatory information by topic: air* Retrieved October 24, 2018, from https://www.epa.gov/regulatory-information-topic/regulatory-information-topic-air

Vodonos, A., Awad, Y. A., & Schwartz, J. (2018). The concentration-response between long-term $PM_{2.5}$ exposure and mortality; A meta-regression approach. *Environmental Research*, *166*, 677–689. https://doi.org/10.1016/j.envres.2018.06.021

World Health Organization (n.d.) Air quality guidelines - global update 2005. Retrieved June 9, 2019, from WHO website: https://www.who.int/phe/health_topics/outdoorair/outdoorair_aqg/en/

Appendices

Appendix A

Core Components of Herman's (2013) Policy Analysis Structure Using Heuristics
1. Define the problem or issue. 2. Analysis the data
3. Summarize Findings 4. State Recommendations 5. Generate Criteria for Evaluating Data
6. Tradeoffs and Feasibility 7. Next Steps and Recommendations 8. Conclusion