Harsimrat Singh Wadhawan

GGR124

Final Essay

Air and Posterity

This essay aims to examine the issue of urban pollution in two cities in vastly different parts of the world. The central theme for this essay is urban air pollution and its menace on human health, environmental health, and quality of life. This document aims to analyze the effect and sources of air pollution in different regions. It will provide an interesting overview of the effects of urban pollution in term of urbanization, both planned and unplanned, land use policy, governance decisions, and the lives of the people who have acclimatised to their environment. The City of Sarnia and New Delhi are strikingly different regions with a different geography, population, population density, operating budgets, and environments. However, their citizens deal with a central issue of air pollutions and numerous health effects that stem from them.

New Delhi and Sarnia are the cities chosen for the basis of this comparative essay. In terms of population New Delhi is the capital of India and is a bustling city with over 18 million inhabitants in a metropolitan region that spans 1484km^2 and has a population density of 19,994 people per square kilometre. On the other hand, Sarnia, Ontario is a relatively small city in Ontario's "chemical valley", named after the largest concentration of petrochemical plants in Canada in that area, and at an area of 52 km^2 it has a population density of 1376.5 people per square kilometre.

The problems in both cities can be associated to multiple sources such as the heavily industrialized region in Sarnia that includes over 63 petrochemical plants and the constant problem of smog and pollution in New Delhi during the winter months that results from stubble burning and agricultural

residue from neighbouring regions. Cities are the meeting place for millions of people around the world, and it is in their citizens' best interests to grow and thrive in places that are not harmful to their health, wellbeing, and quality of life. The problem of urban air pollution is rampant in many parts of the world and it is especially problematic in developing countries due to their heavily populated metropolitan areas. Urban pollution stems from either point source or non-point sources such as agricultural runoff, rainwater runoff etc. The problems of air pollution in Sarnia and New Delhi can be attributed mostly to point source pollution such as crop residue burning, automobile exhaust, and factories.

However, for the case of New Delhi it would be inaccurate to pinpoint all causes to just stubble burning and factories. Delhi's pollution is a multivariable problem that is affected by seasons, time of the year, infrastructure, its geography, and settlement patterns in the city. On the other hand, Sarnia's pollution problem can be associated primarily to industrial exhausts in the "chemical valley" area of Ontario and the United States. Governmental legislation and enforcement are also causing for severe pollution issues in and around New Delhi and Sarnia. The air quality index in the Delhi region frequently tops the "severe" or "hazardous" level and it is deemed the most polluted city in India. Principal causes of air pollution in Delhi result from the city's large fleet of automobiles, and unfavorable metrological conditions, stubble burning and household and industrial waste burning. Similarly, Sarnia has faced significant air pollution issues over the years due to industrial exhaust created by the number of chemical factories in its area [MacDonald and Rang].

The plight of Delhi's citizens can be accorded to rapid urban growth in recent years. It is estimated that the city's population is growing by 100 people per hour, or at an annual rate of 3% per year. The city's population is projected to surpass that of Tokyo (38 million). Indian cities have grown rapidly in the past 2 decades both in geographic size and population. Delhi's urban area has almost doubled in the last 20 years and with it the average trip size has increased from 9.5 kilometres to 10.4 kilometres. This has

effects on the region's traffic congestion, and residents' health due to the increased pollution caused by older and less efficient vehicles that are used on the city's roads.

But what does urbanisation have to do with air pollution?

As a city's population grows so does the demand for physical space and essential resources such as water and fuel for transpiration. Bigger cities around the world face the problem of rising commute times, and aging transportation infrastructure. However, in places where infrastructure does exist, we transit corporations may be using inefficient and polluting vehicles. To counter this issue, municipalities are investing in cleaner and renewable technologies for covering their needs. Longer commute times may also encourage residents to use personal transportation vehicles such as scooters or cars. Another problem associated with using these vehicles is due to many being older and not using more efficient technologies.

Delhi's population influx is an important factor for urbanisation. Although air pollution is only one problem that is associated with informal or unplanned urbanisation that stems from this influx. The share of its migrants reached 33% in 2016 and this makes it the most popular destination for migration in India. Such migration puts a strain on land usage where some of the most marginalized communities settle on un-serviced land that is environmentally vulnerable such as dumping grounds, rivers, unexploited plots, or abandoned land, among others. Like many cities around the world, Delhi showcases the concept of urban dualism or "divisive cities" that exhibit social and economic inequality. It is important to keep in mind that "informal" should not be equated to "poor", "illegal", or "inferior" because increasingly large number of middle-class families find their residence in these sites [Martínez-Bravo].

Delhi's migrant boom amplifies the effects of air pollution, and environmental degradation. The increased use of cars, motorcycles and scooters contributes to Delhi's choking smog and pollution.

Another important contribution is done by rural regions lying north of Delhi where stubble burning by farmers to clear fields and release nutrients back into the soil. The geography of Delhi traps these pollutants during the winter months and makes it difficult for pollutants to disperse, thus locking the pollutant matter into the atmosphere.

The situation in Sarnia, however less severe, cannot be ignored either. For a city with a declining and at best stable population, Sarnia's residents must cope with high levels of air pollution and 62 large industrial facilities right in their backyards. The so called "chemical valley" region of Southern Ontario accounts for over 40% of Canada's petrochemical industry. The Sarnia region emitted over 16.5 million tonnes of carbon dioxide equivalents and it constitutes for 1/5th of Ontario's total greenhouse gas emissions. With a population of 74,293, most of the city's working age population is employed in the petrochemical facilities scattered around the city [MacDonald et. al]. While Delhi is facing the challenge of large inward migration, Sarnia is facing a problem of a lack of inward migration. The challenge in this community is of retention of the workforce and sustenance of the city rather than adapting to a growing population. Air pollution in Sarnia can be primarily attributed to effluents from the city's factories. The effects of marginalization and to some extent the concept of divisiveness can also be observed at the Aamjiwnaang First Nation community at the south end of the city. Although not technically a part of the city of Sarnia, the community has been affected by the pollutants released by the industrial facilities dotting the city. The difference between the municipal government of Sarnia and the governmental system of First Nation bands creates accessibility problems for community members to receive healthcare, drinking water and other services.

The effect of pollution on human health is considerable in both Delhi and Sarnia. Delhi with its population of 18 million people regularly experiences one of the worst air quality indices in the world. Sarnia's residents also face health concerns and ailments due to air pollution. A study was conducted which linked an increase in cerebral palsy hospitalizations in the Great Lakes Area with the Sarnia region.

Furthermore, workers in the Sarnia-Lambton area are commonly diagnosed with asbestos related disease such as mesothelioma and asbestosis in record numbers. Similarly, studies conducted by the Central Pollution Control Board of India showed that the city had 1.7 higher the prevalence of respiratory symptoms compared with controls. Prevalence of non-respiratory symptoms were also associated with air pollution which include hypertension and skin irritation [Rizwan et al.].

So far from a wholistic perspective, the causes of urban air pollution have been attributed to migration and urban sprawl. However, it is also important to answer the question whether land use planning plays a factor in the menace of urban air pollution. Land use planning refers to the regulation of land to include environmental conservation, limit urban sprawl, reduction in exposure to pollutants, and reduce land use conflicts. In a large city like Delhi, land use planning in Delhi is characterized by residential, industrial, commercial, recreational, and other land uses. The various components of Delhi include planned areas, special areas, unplanned components of the urban area, and urban extensions. The growth of the city over the years has been on a ring and a radial pattern. The Master Plan for Development (MPD) for the years 1961 - 1981 proposed to increase residential land use to 44% in 1981 from 18% in 1961. Some of the issues in land use planning that stem are haphazard development, overcrowding in unplanned areas, and non-conforming land uses. There has also been little emphasis on recreational land use planning and for the allocation of natural areas to absorb pollution and to provide leisure activities for the population [Puri]. Although there are plans for the allocation of parks and open spaces as per the MPD, many of these guidelines have not been implemented. One of the major issues in planning for growth management is the lack of financial planning in face of the economic realities and a plan that is not supported by data about the surrounding environment [Srinivasan].

Contrastingly, Sarnia has explicit provisions for not just recreational areas but also natural and natural heritage areas. There is a clear emphasis on protecting the natural environment and the official plan for the city has provision for supporting the ongoing monitoring and management of the natural heritage

system to ensure its long-term health. As for parks and recreation spaces the city's plan aims to ensure that active recreational uses and passive conservation activities are in balance with the natural environment [Sarnia].

It is important to understand the need for a vision to achieve a specific goal and land use planning aims to meet this need. By providing a set of guidelines for development and environmentally sound regulations, land use planning in cities can make them more habitable, economically prosperous and improve the quality of life for its citizens. There is a link between failure to properly account for land use and urban pollution that can be seen in Delhi's case. In Sarnia, however; the existence of land use plan that emphasizes the natural environment helps make the city more livable despite the existence of various factories in its vicinity to some extent.

What are the effects of large-scale shutdowns on urban air pollution?

Due to the COVID-19 pandemic, many heavily populated areas around the world had to implement lockdown procedures to contain the spread of the coronavirus disease. The widespread lock-down naturally transpired a slow-down in global economic output and caused financial recessions. For the case of the industry this meant that many factories and manufacturing facilities around the world had to be closed and a sever limitation was imposed on the number of vehicles active on city roads around the world. From the perspective of Delhi and Sarnia it is an interesting question to research the effects of lockdowns on the urban air quality.

Research and analysis on the data gathered by air quality monitors during the initial stages of the pandemic indicates reduction in particulate matter content and greenhouse gas emissions in some urban areas in different parts of the world. For example, Nitrogen dioxide and nitrogen dioxides showed a reduction across Ontario over a five-week period starting in March 2020 [Adams]. Although lockdowns do not necessarily mean a stark reduction in of pollutants of all forms, in some cases they can be

associated with better air quality. For example, the air quality indices of Delhi and surrounding areas significantly dropped indicating a transition from severe air quality levels to satisfactory air quality [Gautam]. This meant a jump from routine levels in the range of 137 to 210 before the lockdown and onto the range of 31.07 to 75.50 after the lockdown. The stark reduction of air pollutant levels across the globe demonstrates how close cities are to achieving better urban pollution levels and that it is in fact not impossible to remove pollutants from the environment.

Government policy plays an important role in setting environmental regulations and if properly enforced it can be quite helpful in deterring polluters. Sarnia's factories have on several occasions flouted Ontario's emission regulations and in Delhi, not unlike many other Indian cities, experiences deadly pollution levels during some festival seasons. The use of fireworks is a major source of pollution and can leave the city choked for days after the festivities. Urban air pollution is a rampant issue around the world, and it is not a problem just in developing parts of the world. Recently an asthmatic child feel victim to air pollution London, United Kingdom and it shows that air pollution is a genuine problem for people all over the planet [Merali].

Sarnia and Delhi may be two different cities on opposite ends of the spectrum based on population density, geography, governance, and demographics, however; both cities are united by their struggle for a better environment to live in and marginalization of some community members. In Sarnia's case that would the population of the Aamjiwnaang First Nation as they lack the healthcare resources and the attention from government at the Federal level. In Delhi's case, the plight of the millions of migrants flocking the city is unheard by the government at the state and central level. Urban pollution is a challenge that is amplified by failure to plan for a growing population. As the population increases, the distance for commutes increases and a city may start expanding beyond its urban-rural fringe. This is notable in Delhi's case where the geographic size of the city almost doubled between 1991 and 2011 with the number of rural houses declined by half.

Failure to create a well-developed plan for land use can cost dearly as a city grows this is evident through Delhi's various master plans which have little regard for environmental conservation. Air pollution is just one of the challenges that the world faces as more people migrate into urban areas. For all cities to prosper financially and ecologically it is of the utmost importance to reduce income disparity or access to infrastructure at the least. In a generalized case, haphazard development occurs when people in the lowest income organise and settle on unserviced land because they lack the resources or documentation to procure housing. This process evolves as settlements are destroyed by developers and reused. Rising inequality is quite frequent in metropolises and it goes beyond visible infrastructure. For example, having access to better ranked and funded schools in some parts of Toronto when compared to others. This maybe considered an exclusive approach to public education based on where a family resides since they may not be able to afford living in a certain neighbourhood or they may have been misled due to ethnic preferences of the area's residents.

Some of the hurdles to enforcement of bylaws and zoning criteria set out by Delhi government are bureaucratic challenges such as corruption. Other issues impinging Delhi's master plans for development include a failure to plan for the economic realities of the time. Although having a vision plan is commendable it is not practical to achieve those results if there are financial resources available for that transition. However, in Sarnia's case this has not been a very significant issue due to its relatively small population and virtually negative migration rate.

In conclusion, this essay compared the state of urban air pollution in Sarnia, Ontario and New Delhi, India. Different factors were explored that are principle causes of air pollution. These include growing pains caused by rapid urbanisation in a city like Delhi. Heavy inwards migration was explored as an amplifier of urban sprawl and consequently air pollution. It was also observed that marginalisation of communities may lead to unplanned development and inequality in terms of access to infrastructure such as healthcare facilities and housing. This is problem because it reduces the quality of life of a city's

residents and creates barriers to their growth. Furthermore, it was observed that it is possible to achieve a stark reduction in particulate matter given enough governmental pressure as in the case of COVID-19 lockdowns around the world however this process may not be as simple due to conflicting interests between different parties. By the end of the century the global population is expected to surpass 10 billion people and much of this growth is expected to be in urban areas. Pollution cannot be ignored, and it poses a threat to humanity's health and well-being as it can reverse decades of growth in life expectancies. Cities must emphasize solutions to urban air pollution and strive to reduce inequality for a better future.

References

Adams, Matthew D. "Air Pollution In Ontario, Canada During The COVID-19 State Of Emergency". Science Of The Total Environment, vol 742, 2020, p. 140516. Elsevier BV, doi:10.1016/j.scitotenv.2020.140516. Accessed 17 Nov 2020.

Srinivasan, S. Linking land use and transportation in a rapidly urbanizing context: A study in Delhi, India. Transportation 32, 87–104 (2005). https://doi.org/10.1007/s11116-004-2216-y

Gautam, Alok Sagar et al. "Temporary Reduction In Air Pollution Due To Anthropogenic Activity Switch-Off During COVID-19 Lockdown In Northern Parts Of India". Environment, Development And Sustainability, 2020. Springer Science And Business Media LLC, doi:10.1007/s10668-020-00994-6. Accessed 17 Nov 2020.

MacDonald, Elaine, and Sarah Rang. Exposing Canada's Chemical Valley. Ecojustice Canada, 2007.

Martínez-Bravo, M., & Martínez-del-Río, J. (2019). Urban Pollution and Emission Reduction. *Encyclopedia Of The UN Sustainable Development Goals*, 1-11. https://doi.org/10.1007/978-3-319-71061-7_30-1

Merali, F. (2020). *In landmark decision, coroner rules air pollution contributed to nine-year-old girl's death in the U.K. | CBC News*. CBC. Retrieved 19 December 2020, from https://www.cbc.ca/news/world/coroner-rules-air-pollution-contributed-to-young-girls-death-1.5845117.

Puri, P. (2012). *Delhi s master plans: 1962, 2001 and 2021:a critical analysis* (Ph.D.). Delhi University.

Sarnia, C. (2020). Official Plan Document. City of Sarnia. Retrieved 19 December 2020, from https://www.sarnia.ca/official-plan-document/.