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Does air pollution cause residents of New Delhi, India to migrate internationally?

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Image source: Friend of the author (@Chetan)

Does air pollution cause residents of New Delhi, India to migrate internationally?

By

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ABSTRACT

Delhi, India, and the surrounding cities of Noida, Gurugram, Faridabad, and Ghaziabad consistently rank among the world's most polluted cities. For many parts of the year, air pollution levels are so high as to cause significant harm to human health, economy and the environment. Despite overwhelming evidence of the severity and consequences of air pollution, institutional measures to control it remain insufficient.

There is growing evidence that environmental degradation has the potential to generate migration of people out of affected areas. However, the links between environmental factors and migration are complex, with migration often being a result of interactions between economic, social and political factors with changing environmental conditions (Mcleman et al., 2021). This raises the question of whether air quality in the Delhi region is having an influence on out-migration.

This paper describes findings of my exploratory research to see if there is potentially evidence of links between air quality and people's intentions to migrate from Delhi to international destinations. The evidence gathered for this study included:

- A review of the available scholarly studies, government and media reports
- Interviews conducted remotely with five individuals based in Delhi who work directly with migrants and in the environmental field. These include scientists, education advisors and counsellors, physicians, immigration consultants and environmentalists.
- Monitoring of social media posts in Facebook groups dedicated to people considering migration out of Delhi, between the dates November 1- 15, 2019.
- A Twitter poll that was conducted from March 7- 8, 2022 in which 78 people responded to identify the most pressing environmental issue in Delhi.

Collectively this evidence suggests that air pollution is a significant and growing factor that influences migration decisions, alongside other economic, social and/or political factors. Findings are described in detail, with recommendations made for future research.

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Storytelling in the service of truth and facts.

INTRODUCTION

Delhi is notorious for having some of the poorest air quality of any urbanized area on Earth. In 2020, the city ranked as the 10th most polluted city in the world and the most polluted capital (IQAir, 2020; WHO, 2018). The extent of the problem was revealed during lockdowns imposed by the government in 2020 to slow the spread of COVID-19, during which period skies cleared and turned blue, carbon monoxide and nitrogen dioxide levels plummeted (Mahato et al., 2020) and the iconic India Gate was suddenly viewable at a great distance.

Pollution has since rebounded to pre COVID-19 levels as lockdown limitations have progressively been relaxed, driven by a combination of vehicular emissions, brick kilns and stubble burning (DownToEarth, 2020). These high levels of pollution are compounded by Delhi's geographical location and climate. Slow wind speeds and the Himalayan range forms a barrier, preventing pollutants from being dispersed (Kumar et al., 2015).

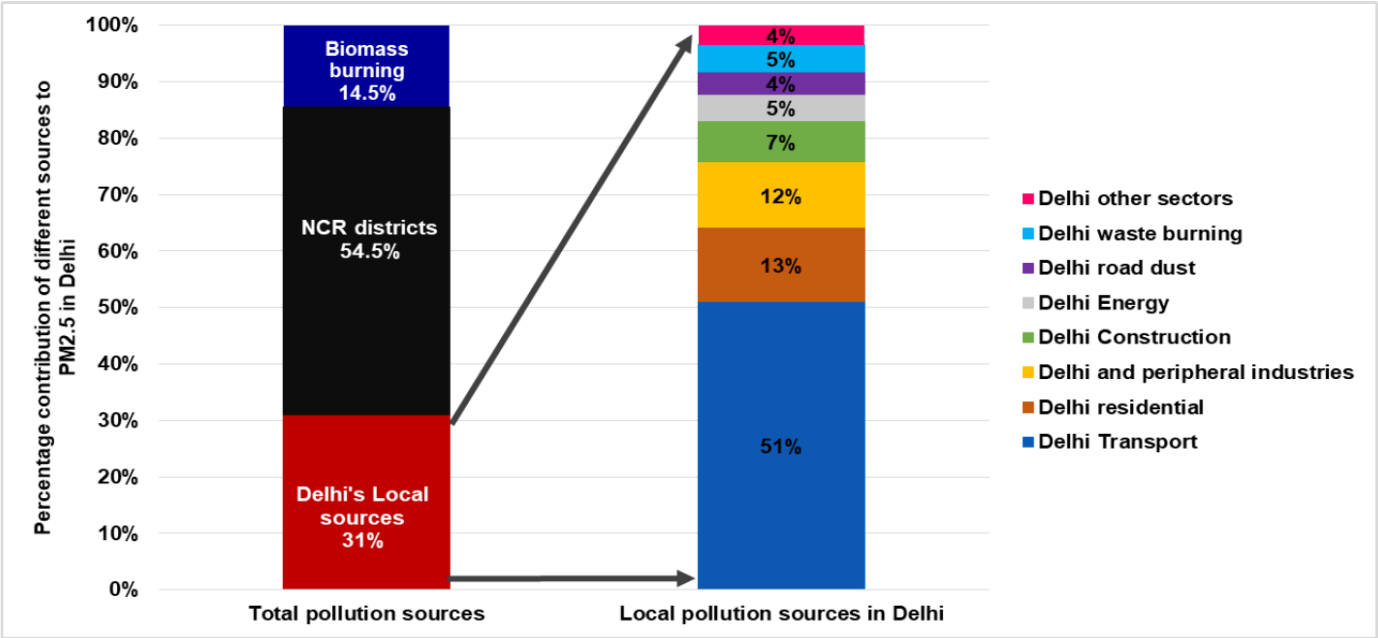
Air pollution is defined as contamination of the indoor or outdoor environment by any chemical, physical, or biological agent that alters the natural properties of the atmosphere (WHO, 2021). It remains a major environmental challenge across India, especially in megacities such as Delhi. In 2019, an estimated 1.7 million people died in India as a result of air pollution, with the mortality rate from outdoor ambient air pollution increasing by 115% between 1990 and 2019. (Pandey et al., 2021).

Faridabad, Ghaziabad, Gurugram, Noida, Greater Noida, and Delhi which collectively comprise the National Capital Region (Delhi NCR) – are among the top 10 most polluted cities worldwide, with air pollution levels often reaching ten times the World Health Organization's threshold for unsafe air quality (IQAir, 2019).

'Stay indoors, shut your windows and doors to harmful air, and wear a mask,' may sound like COVID-19 public health warnings, but were in fact common pre-pandemic health advisories issued to residents by the Delhi government when the air quality dipped. Delhi has been plagued by persistent pollution for nearly two decades. It is a year-round problem, though winters are particularly bad, with residents and even the Chief Minister of Delhi declaring the national capital to be a “gas chamber” (@ArvindKejriwal, 2019).

The air quality index rises dramatically after Diwali, which occurs in late October or early November. Air pollution levels cross the 'hazardous' and' very dangerous' limits rapidly because Diwali celebrations are typically marked by the lighting of fireworks and celebratory fires. This is a major source of air pollution. While Delhi government has banned firecrackers, residents continue to flout the rules. This causes the toxic fumes and debris from the fireworks to exacerbate the city's already poor air quality. This toxic mixture envelops the city in haze and sends the air quality index soaring to dangerous levels (Hindu, 2020).

Figure 1: Average fractional contribution of sources of pollution to PM2.5 in Delhi



Source: CSE's analysis based on Decision Support System for Air Quality Management in Delhi of IITM

The sources of Delhi's air pollution are numerous, with different sources predominating at different times of the year — crop burning in October, dust in the summer, and transportation year around — but all are significant on an annual basis (Dubash, 2018). There are several factors that contribute to the altered composition of the ambient air in Delhi, which can be divided into two categories: natural causes (dust, wild fires) and anthropogenic causes which include emissions from industries, power plants, vehicles, landfill burning and open fires. The most common sources of air pollution in Delhi have been identified as vehicular emissions, industrial pollution, stubble burning where crop

residue is burnt to prepare the fields for the next season and fuel combustion (Guttikunda, 2017). Among the local sources of pollution, vehicular emissions account for more than half of Delhi's PM 2.5 levels. This is followed by household pollution (13%), industrial (12%), construction (7%), waste burning (5%) and road dust (4%) ("Roychowdhury et Al. 2021," 2021) (Figure 1).

How is Air Quality monitored?

In India, air quality is a major concern. As a result, understanding real-time air quality has become a societal requirement. This is made possible by the National Ambient Air Quality System (NAAQS), which monitors pollutants. The system measures pollutants such as Particulate Matter (PM10 and PM2.5), Sulphur dioxide, nitrogen dioxide, ammonia, carbon monoxide, ozone, and benzene at 49 monitoring stations throughout the Delhi NCR (CPCB, 2019).

This data from the real-time monitors allows authorities to ascertain long-term trends, displays data in minutes, issue warnings during critical periods (CPCB, 2019) and developing action plans to meet standards.

The chemical composition of Air pollution and its health impact

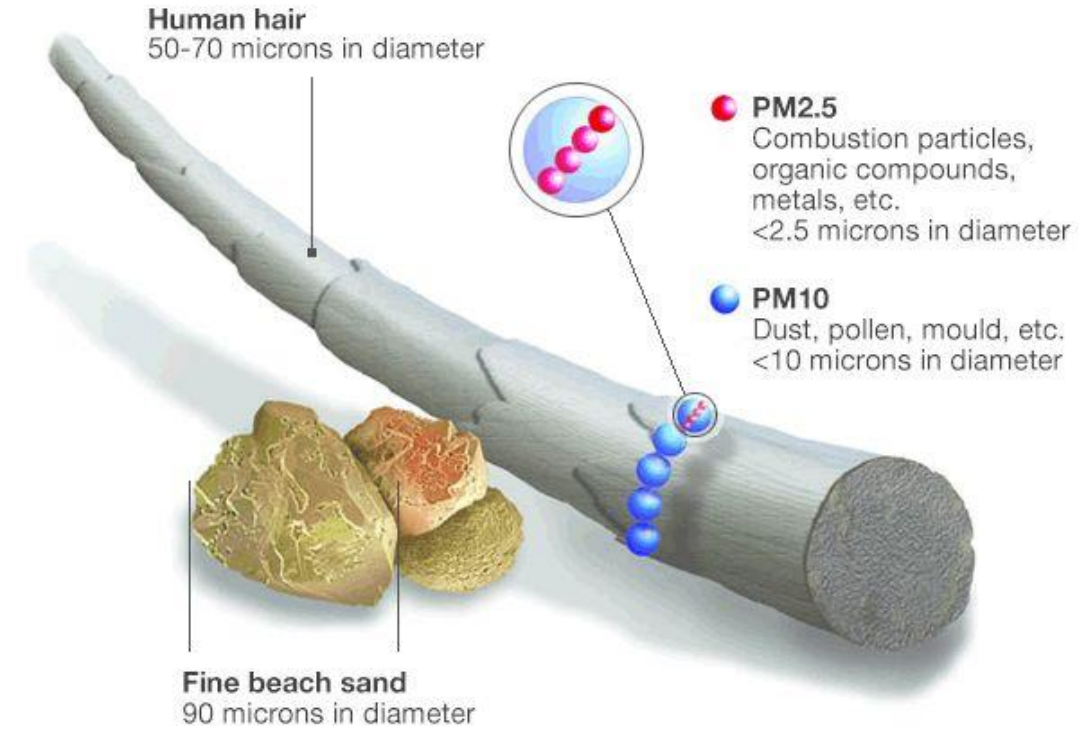
Air pollution is caused by a complex mix of thousands of pollutants. The WHO Global Air Quality Guidelines provide global guidance on key air pollutants that pose health risks. These include particulate matter (PM), ozone (O3), nitrogen dioxide (NO2), and sulphur dioxide (SO2) (WHO, 2021). WHO guidelines originally established in 2005, were recently updated in 2021 to reflect how even low levels of pollutants can have far-reaching health consequences.

According to the World Health Organization, air pollution is the single greatest threat to human health, causing an estimated 7 million premature deaths worldwide each year (WHO, 2021). Particulate Matter (PM) is a commonly used air pollution indicator. It affects a larger number of people than other pollutants, and even at very low levels, it has lasting health consequences.

PM is made up of a complex mixture of organic, inorganic, solid, and liquid particles suspended in the air. Because of their size, PM can linger in the air, causing pollutant particles to enter the body through the bloodstream. While particles with a diameter of 10 microns or less (PM10) can penetrate and lodge deep inside the lungs and can contribute to conditions such as asthma, particles with a diameter of 2.5 microns or less (PM2.5) pose the maximum risk of causing serious health problems. Measuring only 1/30th the diameter of a

human hair, PM2.5 can enter the bloodstream through the lungs and cause cardiovascular, respiratory, and cancer diseases. (US EPA, 2021) (Figure 2).

Figure 2: Size comparison for PM particles



Source: US EPA

The WHO guidelines state that annual average concentrations of PM2.5 should not exceed 5 µg/m3 (micrograms per cubic meter of air volume), while 24-hour average exposures should not exceed 15 µg/m3 more than 3 - 4 days per year.

Delhi's average PM2.5 concentration for the year 2019 was 98.6 micrograms per cubic meter (BBC, 2019).

For PM10, the guideline recommends the concentrations should follow 15 µg/m3 (micrograms per cubic meter of air volume) annual mean and 45 µg/m3 24-hour mean.

Average air pollution levels in Delhi during peak season

Table 1 summarizes average daily air quality measures for Delhi between 2017 and 2021, as measured by Central Pollution Control Board (CPCB). As can be seen, pollution levels greatly exceed the WHO's satisfactory air quality levels in general in Delhi, but especially in the period after Diwali.

Table 1: Average air pollution levels in Delhi, 2017-2021

	2021	2020	2019	2018	2017
Air quality after Diwali celebrations	462	435	368	390	403
Air quality before Diwali celebrations	382	414	337	281	319

Satisfactory Air quality index as per WHO	100	100	100	100	100

Source: Central pollution control board (CPCB)

Apart from being an environmental issue, air pollution is also a major political issue in India, with political parties trading barbs and finger pointing. This leads to contradictory official data on air quality being published.

According to the 2020 CPCB report, 2019 was the worst year since 2015 in terms of Particulate Matter 2.5 (PM2.5) levels in Delhi. However, just a few months after its release in February 2021, the Ministry of Environment, Forest, and Climate Change (MOEFCC) filed an affidavit with the Supreme Court of India claiming that PM2.5 levels in Delhi have been steadily declining since 2016. It claimed that 2019 was 19% cleaner than 2016. Within a month, the Delhi Government backed up the MOEFCC's claim that Delhi's air quality is steadily improving (Somvanshi, 2021). While lowering air pollution figures is in the political interest, it creates mistrust among residents who are given misleading and contradictory air quality values.

Government measures to respond to air pollution

Numerous policies and programs have been put in place to address the air pollution issue in India. The efficacy of these policies is dependent on collaboration and coordination among various stakeholders. From October to January each year, Indian television channels question representatives of the various political parties that govern the Delhi national capital region about rising pollution. These debates, as well as the persistent levels of pollution, reveal a glaring lack of cooperation in addressing the air pollution problem cohesively.

This deterioration in Delhi's air happens despite legal legislations on pollution control since the 1980s that include the Air Act 1981 and the Environment Act 1986. Regulatory bodies like the CPCB and state pollution control board have been constituted to collect, collate and disseminate technical and statistical data with an aim to generate knowledge for developing preventive and corrective measures. In addition, in 1998, the Environment Pollution (Prevention and Control) Authority (EPCA), which implements measures when air quality falls below acceptable levels, was established specifically for Delhi NCR.

The National Clean Air Plan (NCAP), which was implemented in 2019, aims to reduce PM10 and PM2.5 levels by 20-30% by 2024, with 2017 serving as a baseline year, making the policy a 5-year policy. The policy, on the other hand,

has a flaw in that the targets are not legally binding, making it ineffective. The parliamentary committee directed the Ministry of Environment to resolve data-related implementation challenges and increase NCAP budgetary allocation, citing rising air pollution in Delhi (ThePrint, 2022).

One of the most well-coordinated responses to rising air pollution came in the form of the Graded Response Action Plan (GRAP) in Delhi NCR in 2017 (Chatterjee, 2020). GRAP contains actions under four different categories- 'moderate to poor', 'very poor', 'severe' and 'emergency'. They include measures to reduce the addition of new emissions during high-pollution episodes, with the severity of action increasing as AQI levels rise.

If the AQI value falls into the severe+ category, for example, the state-level implementation agency would be required to: stop trucks from entering Delhi and construction activity; introduce an odd-even private car number plate scheme; and close schools. The Delhi government announced a ten-point "winter action plan" in 2021, with a focus on dust pollution reduction.

In August 2021, the Delhi government installed India's first 'smog tower' (Figure 3), a 24-metre structure with 5,000 high-efficiency particulate air (HEPA) filters through which air is filtered in. It is designed to process 1,000 cubic meters of air

per second. The structure sucks in air from the top, runs it through the filters, and then pushes it out from the bottom with the help of 40 large fans. Designed by the University of Minnesota, the tower was modified by IIT-Bombay and IIT-Delhi to fit the Indian weather and tracks pollution levels at the inlet and outlet. However, despite the measures taken by the Delhi State Government to reduce air pollution, the AQI remains dangerously high.

Figure 3: Components of a Smog Tower

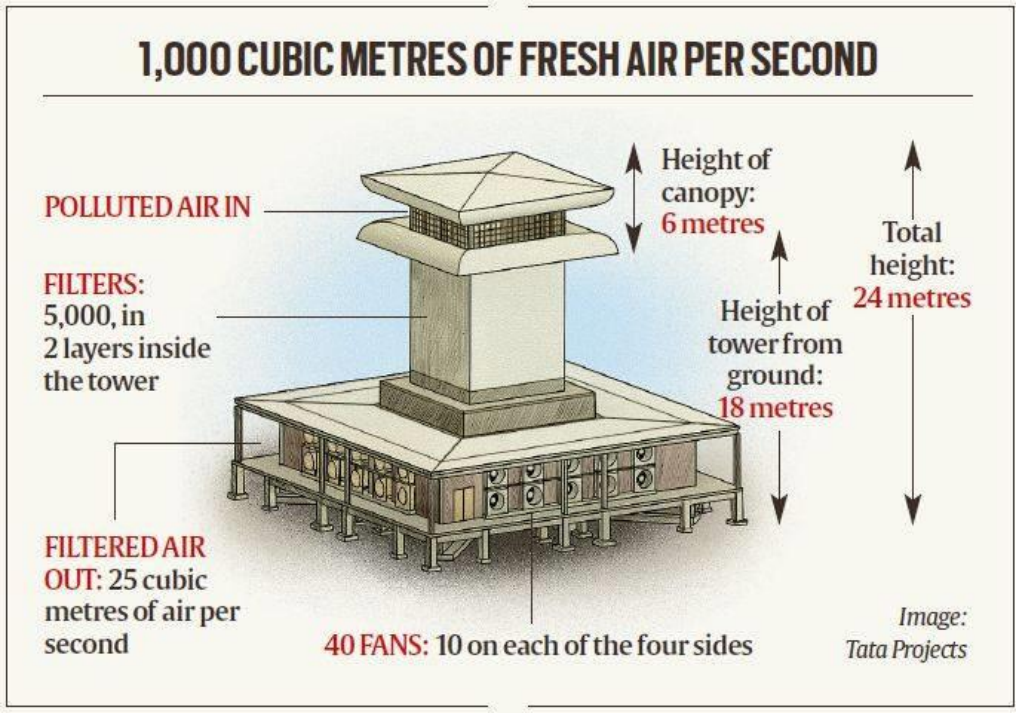


Image source: Tata Projects

Is migration a response to air pollution?

When the AQI hits emergency levels, those who can stay indoors and, assuming they can afford it, purchase air purifiers for their homes. Businesses and restaurants see a decline in revenue. Households with sufficient resources escape to the Himalayan hill retreats or the coasts in Goa- a luxury most people don't have. Some Delhi NCR malls have capitalized on the bad conditions by installing air purifiers and drawing in crowds, not for shopping but for clean air.

Nonetheless, despite these limits and coping methods, young urban residents of Delhi NCR are increasingly desiring to leave the city owing to the severity of air pollution. As a TV journalist in India, I have covered issues of environment and air pollution. During my reportage, I have interacted with young working professionals and families with children who relocated from Delhi NCR owing to rising pollution levels. It is understandable if people find the need to migrate away from these polluted hotspots in search of cleaner air to safeguard their health.

1. Based on my professional experience, for this major research paper, I established to following research questions: How is air pollution affecting families with children in Delhi NCR?

2. Is there a threshold at which young families and others decide that enough is enough- it is time to move elsewhere?
3. How does air pollution interact with other factors that may influence the decision to migrate, and does it lead people to consider migration to international destinations?

The remainder of this report begins by reviewing existing, relevant studies of air pollution and migration, followed by a description of my methodology and data sources, my data findings and a discussion of lessons and potential next steps for research.

2. LITERATURE REVIEW

According to the International Organization of Migration (IOM), migration is a type of human movement in which people have more agency and make decisions and choices about their move. IOM also predicts that the number of people migrating due to the negative effects of climate change and environmental degradation on their livelihoods, daily lives, and health will increase.

The idea that environmental degradation influences migration is not new. Many scholars, including the Intergovernmental Panel on Climate Change (IPCC, 2014), have argued that climate change is likely to cause mass population migration as a result of extreme weather events as well as gradual environmental problems (Gemenne, 2011).

More recently, migration literature has focused on climatic and environmental factors, discovering that these factors have a significant impact on migration (Piguet et al., 2011). One of the environmental factors that likely affects people's migration decisions is air pollution. It impacts especially those who live in highly polluted areas. Life in big, polluted cities with tons of vehicular traffic and industries have a negative impact on its residents' health. As an important component of quality of life, air quality may affect migration decisions (Qin & Zhu, 2018).

Even though air pollution has been declared a public health emergency in Delhi, there has been little research linking air pollution in India and migration. However, in China (Liu & Yu, 2020), find an increase in air pollution levels leads to a decrease in migrant interest in settling in that city. They conclude that air pollution has a significant and negative impact on a person's desire to live in a

polluted city. While air pollution may cause people to be discouraged about living in a city, a decline in air quality increases people's interest in migrating out of a country (Qin & Zhu, 2018). It is also noted that on days when air quality levels are "very poor" or "severe," an indication of people's threshold, this interest in migration increases. Even though migration to another country is a long-term decision, high levels of air pollution pique people's interest and influence their migration decisions (Qin & Zhu, 2018).

Air pollution can influence a person's migration decision in three ways: physical health, mental health, and job satisfaction. People would not want to live in a city that makes them physically or mentally ill, nor would they want to live in a city where they do not enjoy working due to the toxic levels of air pollution (Liu & Yu, 2020). Apart from negative impacts on physical health, air pollution also has significant negative impact on mental health causing quality of life to deteriorate. This may motivate young adults to move away from places where they may feel mentally unhealthy (Chen et al., 2019).

Italy's north often has air pollution levels that are considered unsafe by WHO standards and often represent some of Europe's most dangerous. Findings by authors like (Germani et al., 2021) show that air pollution does affect population

movement and appears to agree with the other studies that suggest that air pollution as a contributing factor in migration decisions. In Italy's case, the authors find that a large proportion of population could relocate to areas with better air quality. With air pollution levels at a high, residents seek out destinations with better air quality, implying that they monitor pollution levels not only in their home city but also in destination cities (Chen et al., 2019).

India has nine of the top ten cities with the highest annual PM2.5 concentrations in the world (IQAir, 2021), with over one million deaths attributable to PM2.5 each year (Pandey et al., 2021). The high levels of PM2.5 contribute to the poor air quality which is exacerbated after Diwali fireworks (Li et al., 2020). In 2017, air pollution is estimated to have caused 1.24 million deaths in India, with Delhi having one of the highest levels of particulate matter air pollution in the country (Pandey et al., 2021).

Although air pollution is commonly associated with lung disease, the Lancet report authored by (Pandey et al., 2021) highlights that cardiovascular disease and diabetes account for a significant 38 percent of the disease burden caused by air pollution in India. In children too, air pollution has lasting impacts. Air pollution exposure during a child's critical growth periods is linked to poorer child health

outcomes. It affects their height and weight for their age and is a major cause of stunting (Singh et al., 2019). A study conducted by the CPCB in 2008, found that prevalence of respiratory symptoms was 1.7 times higher in Delhi, and the prevalence of asthma was significantly higher than in the rest of the country (Rizwan et al., 2013).

The capital city of India, New Delhi, is experiencing an increase in air pollution. While there have been media reports in recent years documenting stories of people fleeing the city due to air pollution, there aren't many scholarly works on the subject. However, the number of people leaving Delhi due to air pollution is limited to a select few, a trickle when compared to the number of people who arrive in Delhi each year in search of economic opportunities (Slater, 2018). According to (Chao et al., 2015), a possible reason for that could be that in heavily polluted areas, for people with a certain level of income, the desire to avoid pollution may have a greater influence on where they choose to live rather than their income.

However, leaving is not always an easy decision, and it is often a last resort when they have had enough. Stater (2018) describes it as a tough decision made by people to leave well-paying jobs and abandon their social circle of family and

friends in search of cleaner air. Working professionals with small children are frequently seen looking for alternative places to visit during Diwali. It's because, while Delhi has poor air quality all year, it's especially bad after fireworks, which prompts families to decide it's time to leave permanently (Rahman, 2019).

My review of literature identified a number of limitations within the existing literature. While there have been studies on climate change and migration and a couple on internal migration within parts of China and Iran, my search did not reveal any studies that have addressed migration influenced by air- pollution in India. As a result, in my research, I attempted to determine whether air pollution influences migration decisions.

3. METHODOLOGY

3.1 Methodological Framework

To achieve my research goal, I used a mix of qualitative methods to understand the role air pollution plays in the decision-making process to migrate. The literature reviewed above provided me an understanding of existing research and debates relevant to the topic of air pollution, its impact on humans and migration, and provided me the context to build my questionnaire for the semi-structured interviews and contextualize the findings of the data collected.

Social media offered an opportunity to harvest a massive range of content without the need for intrusive data collection procedures. These platforms also provide a large untapped source of user preference data (Ngai et al., 2015). Twitter was used to conduct a poll to gather information on what was the most pressing environmental issue for Delhi residents.

The study also looked at user comments about air pollution and migration in Delhi, on Facebook. It was chosen as the social media platform because being a dominant player in the social media landscape, it is a rich source of qualitative data for researchers (Franz et al., 2019) with more than 1.2 billion users.

Individuals' Facebook profiles contain a mix of public and private information. These individuals, or users as they are more commonly known, create videos, images, reactions, and texts on Facebook. The approach used in this study is limited to content analysis of user-generated text on Facebook about air pollution in Delhi NCR.

The method allowed examining the content of user interactions, taking into account the temporal and social context of their opinions (Veltri & Atanasova, 2017). It provided me access to diverse and unconstrained voices that may not be accessible through more traditional approaches like semi-structured interviews.

Though social media provides qualitative researchers access to a massive range of data, it also presents them with challenges like blurring of boundaries on key determinants (Andreotta et al., 2019). Comments on Facebook include interactions among users and with external material such as websites, news articles and pollution monitoring data, often making them lengthy and without well-defined boundaries (Parker et al., 2011).

As a result, in addition to social media posts, I conducted semi-structured interviews to learn how Delhi residents feel about air pollution and whether it is becoming a driver of migration. Semi-structured interviews refer to an interview technique that does not follow a specific pattern. Rather than asking specific worded questions, a general list of questions form a reference point to guide the conversation. The open-ended nature of semi-structured interview methodologies allow for a wide range of data that is rooted in a participant's lived experiences and supported by data (Galletta & Cross, 2016).

Semi-structured interviews encouraged two-way communication, allowing me to ask more open-ended and conversational questions. It enabled me to delve deeper into the reasoning behind the answers. It also allowed me to become acquainted with interviewees who were frequently critical of their employer's or

government's policies (Galletta & Cross, 2016). Following the semi-structured interviews, an in-depth analysis of the information gathered from the participants was conducted.

The aim of including the four data sets: available literature, Twitter poll, Facebook comments and semi- structured interviews was to cover what has been written about international migration influenced by air pollution, to highlight the voices of the residents of Delhi NCR, and to include expert opinions and observations who are representatives of the community. This methodological framework was used to approach the study in a way that was attendant to the study's local meanings and its broader global sphere of influence.

3.2 Conducting a Twitter poll

On my behalf, a Twitter poll was posted on the "Warrior Moms" Twitter handle. With 1,633 followers and growing, the group is a people's movement for climate justice and environmental issues in Delhi. While there are no geographical restrictions on followers, the majority of Warrior Mom members are based in India. This is a popular handle that is followed by prominent environmentalist and

policy makers, with about 40 tweets posted each week that are frequently retweeted.

The multiple-choice poll, with four options, was open for 24 hours, asking respondents what they thought was the most pressing environmental issue in Delhi NCR.

3.3 Review of Facebook posts

There are three primary types of user-generated textual data on Facebook (Franz et al., 2019):

1. Posts: A post is a status update written by a Facebook user that appears on an individual's timeline.
2. Comments: A comment is a response or a reaction to a Facebook post
3. Messages: A message is privately sent by one user to another. It does not appear on timelines and is not publicly visible.

Facebook pages and public Facebook groups are topical forums where individuals can post content in the form of videos, images or text. Facebook Groups are a

space for small group communication and for people to share their common interests and express opinions (Facebook Notes, 2010). Groups allow people to come together for common causes, issues or activities. Due to its public nature, groups are easily accessible and present data, in the form of comments and posts without any restrictions.

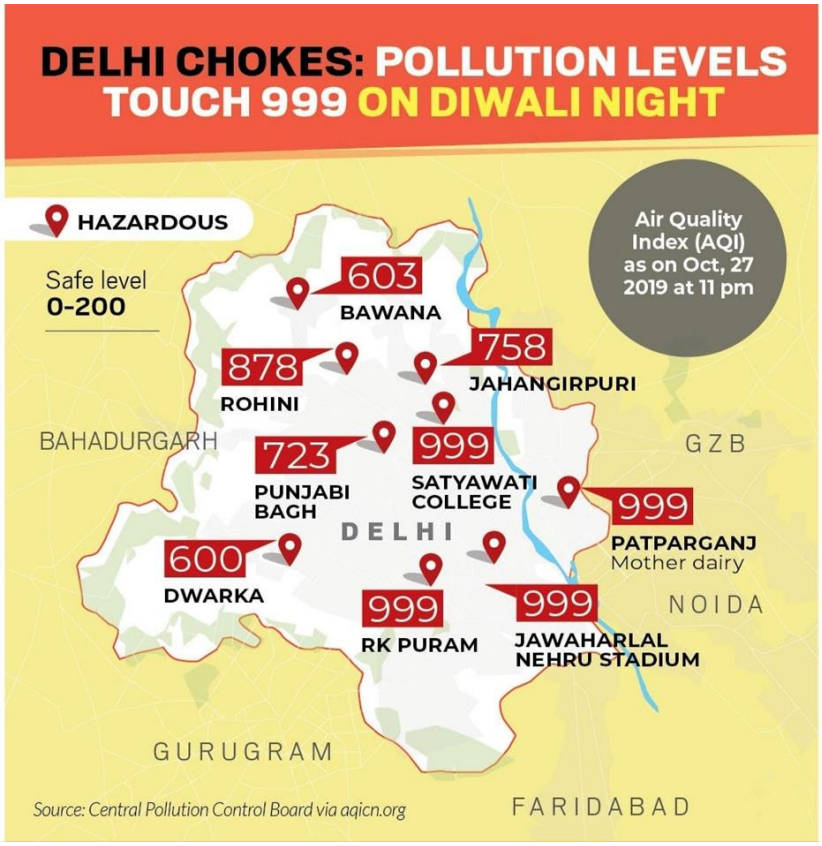
For my second data set, Facebook filter feature was used to search for groups and pages about Delhi NCR air pollution using a combination of the following key words:

Air pollution, Delhi NCR, Poisonous, Gas Chamber, Leave and Escape.

The Pages and Groups with more than 1000 "likes" were selected from the resulting list. “Likes” represented by a thumbs-up emoji  , are a show of support and represent engagement (Facebook Notes, 2010). Top three Pages and Groups became the field for sourcing comments that would later become Facebook data for analysis.

To keep the data relevant, comments published between November 1 and 15, 2019 were chosen because air pollution levels in Delhi were at their highest during this period and the week preceding it (Rai, 2019; Ellis, 2019) (Figure 4).

Figure 4: Graphic showing extreme air pollution levels in November 2019



Shortly before that two week-period, the Air Quality Index (AQI) reached 999 on Diwali night, October 27, 2019. A few days later, during the first week of November 2019, air quality measured 999 in most areas and reached levels almost 400 times the amount deemed healthy.

Schools were shut, planes were diverted, questions were raised on governmental complacency and high-level meetings were held (Ellis, 2019). This prompted the Delhi government to issue an anti-pollution notification ordering curbs on construction work, demolition projects and asking educational institutions to shut down. Additionally, Delhi Chief Minister Arvind Kejriwal turned to Twitter to describe the city as a “gas chamber” and distributed N95 masks to students (Figure 5).

It should be noted that when air pollution levels are high, public discourse and media coverage on the subject increase. This prompted me to select November 1-15 as the study's data collection period on Facebook. While similar levels of pollution were observed in the winter of 2020, this was excluded from the study because the COVID lockdown could have influenced air quality and migration-related decision-making processes.

Figure 5: Tweet from Delhi Chief Minister Arvind Kejriwal

The following three criteria were used to select comments from the pages and groups for this study's Facebook data corpus:

1. All comments and posts must be related to the Delhi National Capital Region.

2. The entry must be made between November 1 and November 15, 2019.

3. The topic of the comment/post must be related to air pollution and relocation in the Delhi NCR.

To select the relevant comments for this study, they had to have included one or more of the following terms related to air- pollution and migration:

Air- Pollution, Smog, Unlivable, Unhealthy, Move, Leave, Migrate, Relocate, as well as names of countries and cities.

Furthermore, only English-language content was chosen to allow for more accurate analysis and to ensure that nothing was lost in translation. I used manual extraction (Franz et al., 2019) methods of copying and pasting the relevant comments from each page to an Excel spreadsheet. An advantage of using publicly available data on Facebook was that it presented a wide range of expressions, and informed consent by participants was not required.

Approximately 150 posts were reviewed and after being filtered twice against the key terms and the above-mentioned criteria, 70 Facebook posts were relevant.

Facebook data analysis

The first step was to categorize the data collected from Facebook comments. A content analysis method was used, in which each post was analyzed to

determine major content themes. (Franz et al., 2019). I chose to manually analyze the 70 posts. The posts and comments were copied into an Excel spreadsheet, where they were analyzed for indicators (Figure 6).

Figure 6: Facebook sample posts

Sample posts
Delhi's air is poisonous. Let’s see where I find a suitable place to settle. It won’t be easy but I cannot punish my kids with a gas chamber
I’m seriously pondering leaving Delhi for good. I still don’t have the heart to leave the country - but this city is not worth living anymore.
Delhi is the worst place to live knowing the pollution levels. Short periods out of Delhi don’t help anymore. Have to make a permanent move and out of the country
Air Pollution level of all cities is at hazardous level. Time to accept that Govt of India has totally failed to give a solution on pollution. The only solution is to move to another country for better air.
Children are constantly sick. Jaipur and the other nearby cities also have AQI problems.Unless I move my family across oceans to another country
Unhealthy air quality levels but my wife and I have jobs here. Can't move but do do I keep my children safe?

To maintain topicality and focus solely on the meaning of each post, emojis and links to external websites were removed. Posts and comments were captured verbatim to ensure that the emotion associated with what was said was recorded, for example: did the message mention moving, or did the user express frustration with the impending pollution threat?

Comments were coded based on whether the user expressed a desire to relocate away from the Delhi NCR due to the increase in air pollution. The goal was to derive meaningful interpretations and themes from the data, within the context of the research study.

3.4 Semi-structured interviews

The third and final data set in this project is derived from semi-structured interviews with experts in the field of air pollution in New Delhi. My knowledge about this topic was influenced by my experience of working as a journalist in Delhi- including my interactions with experts on the impacts of air – pollution and reporting the experiences of other residents who are exposed to the toxic air in addition to my own.

The nature of my research question guided my decisions about the method. Ideally, I would have incorporated the lived experiences and views of residents of Delhi NCR through semi- structured interviews. While practical issues, such as limitations in terms of time, cost and access to participants entered into consideration, the second wave of COVID-19 pandemic played a dominant role.

This research was conducted near the conclusion of India's second wave, which left many families distraught, making it tough to speak with someone about air pollution, especially when you didn't know what the person on the other end of the phone was going through.

According to a report by United Nations, the deadly wave of infection with the Delta variant stole at least 240,000 lives between April and June 2021 in India, however, experts believed a serious undercount (PTI, 2022). Buckling under the pandemic pressure, the heath system collapsed with hospitals running out of oxygen.

Social media feeds, phone calls and messages were full of calls for help and mutual aid. Families, friends, neighbors and colleagues stayed up all night trying to cold call hospitals to organize beds and medical supplies. In times of bereavement, efforts united to gather firewood for performing last rites. The images broadcast on news channels around the world depicted a grim reality unfolding in my community and India's capital city.

Given the circumstances and emotional trauma that engulfed India during the pandemic, reaching out to people for their opinion and views on air – pollution seemed insensitive. Therefore, I chose to interview five experts- an educator,

environmentalist, doctor, scientist and immigration consultant to gain perspective about what the residents of Delhi felt about this issue. This method offered insight into individual experiences enabling me to explore not just the participant's narratives but also provided me a window into their interactions with community members.

Interview questionnaires were created using the principles outlined in Anne Galletta's book, Mastering the Semi-Structured Interview and Beyond. In order to qualify for this study, the participant must:

1. Be above the age of 18
2. Be a resident of Delhi National Capital Region
3. Hold credibility and expertise in their respective professional fields
4. Work in the field of air- pollution mitigation or adaptation
5. Work in the field of international migration

Initially six participants were chosen for the purpose of this study. Because of time and human resource constraints caused by pandemic restrictions, the Canadian High Commission in New Delhi declined my invitation to participate, leaving five participants as the final target.

The recruitment process began with the delivery of the statement of interest via E-mail to the participants. This statement included a brief note on the purpose of the study, length of study, details about where the findings will be published along with the time needed for the interview and where it would be conducted. Due to COVID-19 restrictions in place, the interviews were conducted telephonically and on Zoom.

Experts known to have substantial engagement with city residents on all topics related to air pollution were chosen for interviews. These included a prominent pulmonologist who could elaborate on the health impacts that his patients are most concerned about, a school principal and Indian school board certified counsellor, an immigration consultant, a parent and environmental activist, and a scientist in charge of research, advocacy, and policy were among the candidates. To avoid over representation of a specific group in addition to the scope of the study, only one expert per field was targeted.

After agreeing to participate in the study, participants were sent a brief outline of the study, a copy of the Research Ethics Board approval, and the informed consent form. The participants were informed in the consent form's

confidentiality section that, with their permission, quotations from their responses could be used in future write-ups without revealing their identities.

Participants were asked to sign a consent form and specify a time that was convenient for them to be interviewed, as well as whether they preferred to be interviewed over the phone or via Zoom. Three of the five preferred phone interviews, while the other two preferred to meet over coffee. The meetings took place in an outdoor set cafeteria, with all COVID-19 precautions, masks, and social distancing in place.

The REB- approved questionnaire containing twelve questions were administered to the participants (Table 2). Each interview took approximately 30 minutes. The opening segment of the interview comprised of questions to set the stage, allowing participants to speak from their experiences, although the focus very deliberate and carefully tied to my research topic. During this stage, the focus was to listen carefully to the unfolding story, probing to ensure the portions of the narrative are clear, and noting particular details, insights, emotions and behavioral observations that were relevant to the study. The aim was to create space for data that is about the participant and their experiences.

As the interview progressed, the questions became more specific to ensure the research topic is adequately explored. This was accomplished by following the questionnaire and asking probing questions to further elaborate. The discussions were recorded and transcribed in order to extract themes from what was said. Afterwards I found that Question 11 garnered no substantial responses because participants partially answered it in the previous question.

Table 2: Interview Questions

1. What is your role in this organization?
2. What type of people does your organization typically work with, for example, the elderly or children?
3. In what capacity do you work with people affected by air pollution?
4. How important has health and well-being become in the context of air pollution, to the people you interact with?
5. What is the most pressing environmental issue for Delhi's young urbanites?

6. Based on the people you work with, who are the most vulnerable to the effects of air pollution?
7. What is their primary air-pollution concern?
8. Do any of the people you interact with express a desire to relocate away from the Delhi NCR due to the air-pollution problem?
9. Where are those who are thinking about migrating going or seeking to go? Do they have any plans to relocate internationally?
10. Do they emphasize air pollution as a major concern that influences their decision to relocate?
11. Do you think more people will consider leaving if pollution levels in Delhi NCR continue to worsen?
12. Is pollution-induced migration a growing concern in discussions with government officials during meetings and panels?

Analysis of Semi-structured interview data

The researcher's ability to know when and when not to interrupt is critical to effective interviewing. Contributing to this was the depth with which I had explored and experienced life in polluted Delhi NCR, as well as my journalistic

experience, which taught me to accurately capture the meaning a participant gives to a study topic. According to (Galletta & Cross, 2016), data analysis in qualitative research can often occur while data is being collected, where the researcher notes thematic patterns emerging in the data. Keeping with my promise of security, the data was stored in my personal phone and external hard drive. I used the data analysis practices recommended (Galletta & Cross, 2016) in the following steps:

1. Data from semi-structured interviews were audio-taped using a phone
2. Data was transcribed and stored on a phone and an external hard drive
3. Each transcription was double-checked for accuracy
4. Locate meaningful text (label with codes, key terms and patterns)
5. Identify critical themes across interviews (and across other data sources)
6. Categorize the data as per the common themes
7. Defining, documenting and analyzing the themes
8. Writing the summary/results

To get started, I read through the transcriptions a few times and took some notes to familiarize myself with the data. Following that, I highlighted sections—usually phrases and key words—in different colors. I used this technique to label data,

using terms that reflected the meaning generated by them. Different colors for different codes where each code represented an idea, opinion, or experience regarding air pollution.

To be thorough, I read through each transcript several times, highlighting anything that stood out as relevant or potentially relevant to my research question. Going through the data kept generating more codes. Following that, I categorized the data based on the codes to gain an overview of the main points and common meanings that appeared throughout the data set.

Identifying a code, where it came from, what ideas it promoted, and how it is related to other codes was critical to the analysis. Each code offered an insight that was grounded in lived experiences of the participant.

Next, I began turning codes into themes by identifying common patterns. Sometimes, this required combining a few codes under one theme. I did encounter some outlier codes at this stage and though they did not fit under any single theme, I kept them aside for a later review or a possible lead for further research.

Some questions that I asked myself while doing the analysis:

- What meaning does a participant's experience convey in relation to my research?
- Are there connections between different parts of the interview response?
- Or are there differences/ contradictions?
- How does the data address my research question?
- In what ways are data from different interviews related? Is the interview data related to the data collected from Facebook?

Then came the difficult part of the analysis: defining each theme and recording this information on an Excel sheet. This was accomplished by defining exactly what I meant by each theme and how it would aid in understanding the data. Going through the transcriptions and codes provided a better understanding of whether they are willing to relocate in search of cleaner air, and what motivates them to make that decision. While a single word or phrase was insufficient to tell the entire story and capture all of the data's dimensions, it did provide clues to important ideas related to the research topic.

3.5 Limitation and challenges

One of the primary benefits of using Facebook as a source was its openness. However, this benefit came with a significant drawback. In public, people are not always open and expressive. Public pages miss out on a subset of data that can be derived from user engagement. So, while there were comments that represent data, the real story is often found in the nuances of an elaborated response.

Another problem I encountered while analyzing Facebook data was that, while some comments mentioned how dangerous the air was and how it made Delhi unlivable, they did not elaborate on whether this was a compelling reason to relocate. Furthermore, while a user's concerns about rising air pollution and desire to seek a way out of the polluted environment were evident in the posts, it did not specify whether they wanted to relocate to any specific country.

Semi-structured interviews bridged the above gap, but they also presented the most difficult challenge. Given that this study was conducted on the heels of the Delta wave of the COVID-19 pandemic, one of the most difficult aspects was reaching out to participants, unaware of the challenges they must be dealing with. One instance occurred when I called an environmentalist, who answered the phone but sounded panicked. 'I’m helping a neighbor to get her grandmother

admitted,' she replied. 'The hospital claims that they are out of oxygen. Can you assist as a former journalist? Do you have any connections here, and can you pull some strings?', she added.

While asking participants to share their experiences, all precautions were taken to ensure their anonymity. This was done to address the participants' fear of repercussions and guilt, which arose as a result of their dissatisfaction with the way their local councilor or state government handled the issue of air pollution.

Given the current coronavirus pandemic and how it has affected gatherings, researchers are prone to rely on technology for semi-structured interviews. In my case, three of the five interviews were conducted over the phone, while the other two were conducted in person in accordance with COVID-19 guidelines of Delhi.

A major disadvantage of not having a face-to-face interview is the inability to read body language. When you see someone, you can observe their expressions, pauses, and inquire further when they frown or laugh. Under the circumstances of the pandemic, a Zoom or telephonic call is convenient, but it is no match for a face-to-face engagement.

The results of this study may be limited by the following factors:

1. *Limited to residents of Delhi NCR*: Air pollution is a major problem in India. Three of the world's ten most polluted cities are in India (IQAir, 2022), including Delhi, Kolkata, and Mumbai. However, for the purposes of this study, my research is limited to the Delhi NCR and does not take into account possible migrations caused by air pollution in other cities. The study excludes a large geographical area where the findings will be relevant.
2. *Role of environmental-factors alone*: The international dimension of migration, complicates the question of whether environmental factors alone can cause migration. The intervening factors and roadblocks that influence such a decision cannot be quantified in this study. Political and legal frameworks, moving costs, social networks, diasporic ties, and job satisfaction are among these factors.
3. *Uncertain destinations*: During data collection, general themes of frustration and the need to relocate internationally due to rising air pollution emerged, but it was impossible to determine where the participants were moving or considering moving.
4. *Limited government participation*: The current instruments and government authorities did not participate in this study. To determine

whether residents of Delhi NCR are migrating to Canada due to air-pollution concerns, a perspective from Immigration, Refugees, and Citizenship Canada was required. It should be noted that India is one of the top sources of immigrants to Canada facilitated by formal international migration programs (IRCC, 2021). It would have been useful to learn whether there are tools in place to determine whether applicants cite environmental reasons for their migration (based on my own experience in immigrating to Canada, I suspect there are not). Despite my request to the Canadian High Commission in New Delhi to participate in this study, they declined, citing a lack of human resources as a result of the pandemic's increasing work pressure.

5. *Facebook and Twitter data limitations*: Information gathered from Facebook and Twitter posts may not cover people from low-income families who do not have access to social media platforms or internet coverage.

4. RESULTS AND FINDINGS

4.1 Twitter poll results

Seventy-eight responses were received on Twitter to the poll that was posted by the group “Warrior moms” (Figure 7). A multiple-choice poll with four options to choose from was conducted by the group that has members across India and focuses on air pollution and its impacts. The poll that was open for 24-hours asked respondents what they thought was the most pressing environmental issue in Delhi NCR.

A total of 74.4 percent of respondents selected air pollution as the most serious environmental concern in Delhi NCR, followed by waste management (12.8 percent), tree-felling (11.5 percent), and water pollution (1.3 percent). In addition to the poll, two respondents commented on waste management and tree-felling as sources of air pollution in Delhi.

Figure 7: Screen shot of the Twitter poll

4.2 Facebook comments

I analyzed Facebook posts about Delhi NCR air pollution to gain insights into residents' unprompted feelings and opinions regarding this issue. To analyze a manageable set of data, I extract a subset of the data from the most relevant

Facebook posts and performed a qualitative analysis. Using the method described above in **3.3,** I reviewed one hundred and fifty posts that were made between November 1- 15, 2019 to the Facebook pages of: Stop Air pollution (India), Help Delhi breathe and Prana Air and identified seventy that mentioned air pollution and migration intentions.

For the analysis of this data set, the 70 posts were coded according to four themes.

1. A post belonged to the group who want to move but don't know where to

2. A post belonged to the group who are tired of air pollution in Delhi NCR and want to move nationally

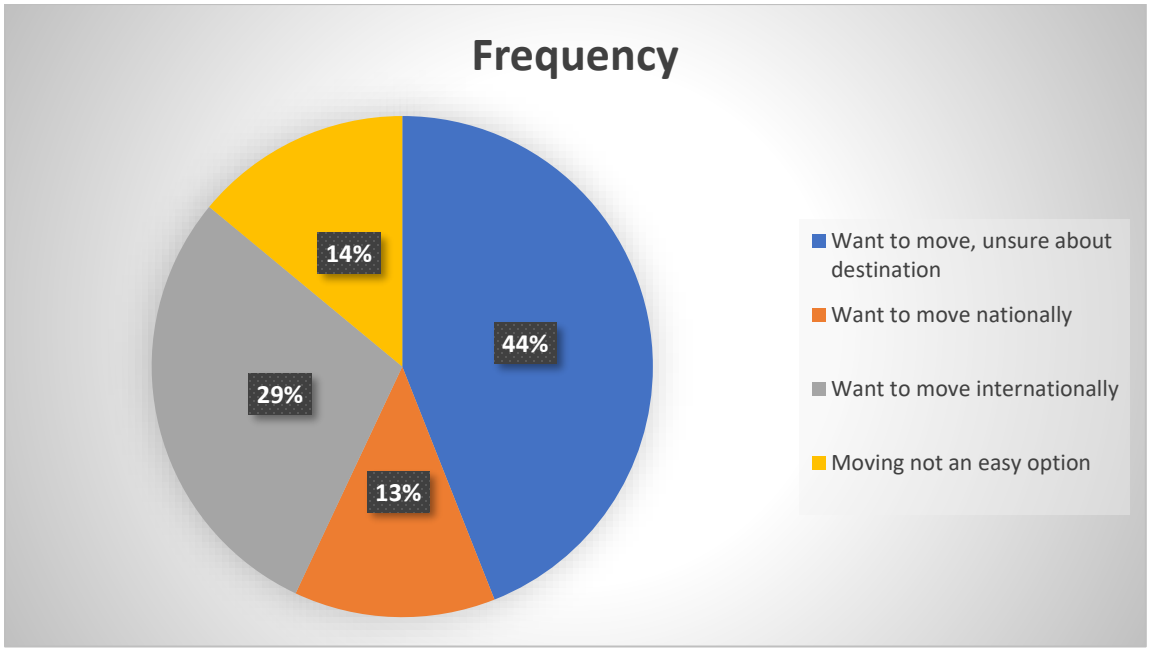
3. A post belonged to the group who are tired of air pollution in Delhi NCR and wants to move internationally

4. A post belonged to the group who want to move but moving not an easy option

The most commonly occurring theme (44.3% posts) was that the person posting was concerned with the health impacts of air pollution in Delhi NCR and wanted to move out of the city but was unsure or did not specify the destination (Figure 8) Tired of Delhi's poor air quality, several posts referred to the city's pollution

period as "the apocalypse" and included comments such as, "It was pitch black and I could hardly breathe."

Figure 8: Results of Facebook analysis



The next most common them (29% posts) was that users were frustrated with the air pollution issue in Delhi NCR and wished to moved overseas. These posts cited a variety of different countries and cities of the world, including Canada and New Zealand. This theme encapsulated commentary where users were critical of the action or inaction towards air pollution in Delhi NCR, criticized approaches by politicians and ineffective policies and expressed a sense of frustration about incessant pollution year after year, with comments such as, ""AAP and BJP infighting will never fix the impending issue, things will only get worse. Time to

leave the country". Several comments expressed a willingness to compromise on their living conditions and careers in return for a healthier life for their children. Additionally, users talked about more green spaces, blue skies, and cleaner air in other countries in this theme.

Third most common theme (14.3%) was posts from people who wanted to move to another city within India. Cities in the northern Himalayan region and coastal cities in southern India and Goa were included in this commentary. When Delhi experiences high air pollution levels, there have been comments about taking short-term holidays during school breaks outside of Delhi. Unlike other themes, content under this theme contained information about other Indian cities performing poorly on Air Quality Index. These comments had links to news articles and press releases which showed that many Indian metropolis cities are among the top 20 most polluted cities. One commenter noted, "what is the use of going to other cities in India, their future will be the same".

4.3 Semi-structured interviews

I also conducted semi-structure interviews with five experts about their experiences and interactions with residents of Delhi NCR and air pollution. They were interviewed in the Delhi NCR during the month of August 2021, with

questions being drawn from the attached interview questionnaire guide, which can be found in Appendix A. Adhering to the ethics committee guidelines and communication to the participants, names of participants and their workplaces are not revealed. They are referred to simply as Interviewees 1, 2…5. For the discussion section though, I refer to them by their professions (Doctor, educator etc.) in order to signify the varied aspects of the air pollution impacts. The interview results are organized into groups based on the order of questions asked.

Q 1 & 2. What is your role in this organization? What type of people does your organization typically work with, for example, the elderly or children?

The respondents included:

A chest surgeon at a private care facility in Delhi, treating patients of all ages and genders of middle- and upper-income.

An environmental activist who works with residential welfare associations and lawmakers on environmental issues; this interviewee is also a parent of young adolescent students.

A Delhi-based educator and school counsellor who works with students, parents, and the school education board.

A scientist who collaborates with policymakers and government officials to develop key policies relating to sustainable transportation and waste management in terms of air pollution.

An immigration consultant who assists clients, including young salaried residents of Delhi NCR, in exploring further education and job opportunities for resettlement purposes.

Q 3. In what capacity do you work with individuals impacted by air pollution?

The doctor treated patients with chest ailments and communicated scientific research to community members about the links between air pollution exposure and health effects. Between students, parents, residents, and government officials, the environmentalist and educator served as liaison officers. While the environmentalist worked with residents and local government officials to raise awareness about sources of pollution at the ground level, the educator dealt with worried parents and students who had suffered both mentally and physically as a result of air pollution and school closures due to rising levels of pollution each year. The scientist collaborates with a diverse group of stakeholders, including community leaders, policymakers, and government officials, to develop sustainable systems to reduce air pollution, and the immigration consultant

advises clients on destination choices based on their concerns. A growing number of prospective migrants are looking for immigration routes to clean-environment destinations.

Q 4. How important has health and well-being become in the context of air pollution, to the people you interact with?

In response to this question, all five interviewees stated that everyone they interact with in their fields of work or socially is acutely aware of and concerned about the impact Delhi's air has on the health of their families (Table 3). Residents with young children or young couples starting new families and building homes were unanimously identified as the most concerned about its health impacts.

Table 3: Frequency of responses to Question 4

Responses	Frequency
Better quality of life includes clean air	5
Very important, it has direct impact on health	5
Worried about direct and indirect impacts of air pollution	5
Big stress factor for parents of young children	5
Impacts mental health, well-being and productivity	4

According to the immigration consultant, it has become critical because people want to save more for their families and the priority has now shifted from chasing dollars to finding a place with better air quality because health is most important.

All interviewees agree that residents closely monitor air pollution levels in their neighborhoods, as well as in schools and workplaces. They take actions to protect their children and other members of the community and widely share studies linking air pollution to health.

Interviewees elaborated on why health has taken centerstage, stating that a sick family member causes concern for the entire family and leads to higher hospital bills. Children's symptoms from air pollution range from mild headaches to constant coughing, wheezing, breathing problems, and asthma. Most families have installed air purifiers in their homes to provide some relief, but when pollution levels are at their highest, doctor visits increase. During peak pollution periods, the children are reliant on nebulizers and find it difficult to perform.

All interviewees also agree that while high pollution in Delhi has everyone concerned about its health impacts, it also has them worried about the impact it has on mental well-being and productivity. Among children, concentration levels fall, their enthusiasm for schoolwork and other activities drastically falls. Not only

physically but children also become very irritable and cranky when exposed to peak pollution because of the multiple restrictions.

The educator notices that parents are concerned about their children being a little fuzzy, forgetful, and that air pollution appears to be affecting their memory.

Air pollution reduces productivity among young adults and adults too. The toxic air exhausts them. Being exposed to the polluted air, or even spending a few hours travelling from one location to another, all have a negative impact on people's ability to focus and be creative.

All interviewees emphasize that life in Delhi is a comfort zone for the residents because they have either lived there their entire lives or worked hard to build a life in the competitive city, but they have a very low quality of life. It's unhealthy and stressful because someone in the family is always sick as a result of air pollution.

It should also be noted that one interviewee stated that many Indians living abroad who have returned to Delhi regret their decision because the city provides an unhealthy environment for its residents.

Q 5. What is the most pressing environmental issue for Delhi's young urbanites?

All five interviewees agree that air pollution is by far the most concerning environmental issue for residents of Delhi NCR, especially because its effects are personal and visible (Table 4). No family is immune to the effects of the toxic air that Delhi residents breathe.

Table 4: Frequency of responses to Question 5

Responses	Frequency
Air pollution	5
Reduction of green spaces	2
Air pollution linked to other concerns	3

They emphasize that the pandemic has made health a top priority for families, and as a result, even those who were previously dismissive of the effects of air pollution have begun to take it very seriously. Residents are especially concerned about the long-term effects on their children's health, as well as the fact that the air pollution continues to rise year after year.

Residents also believe that air pollution is linked to other types of environmental concerns that are prevalent in Delhi NCR dialogues, such as waste burning. They

believe that open waste burning causes serious air pollutants and is to blame for the visible smog.

In addition to air pollution, many residents are concerned about the city's shrinking green spaces as a result of massive tree felling. People of all ages are concerned about the removal of trees for development purposes. Thousands of children and adults came out in protest at any tree-cutting site, demonstrating this.

Q 6. Based on the people you work with, who are the most vulnerable to the effects of air pollution?

While all of the responses to this question stated that air pollution is harmful to people of all ages, there was a unanimous agreement that the effects were even more severe and far-reaching for children and young people (Table 5). Because children's bodies are still developing, the effects of air pollution on younger people, such as stunted growth and growth function, are irreversible, according to the doctor.

Table 5: Vulnerable population

Responses	Frequency

Infants and young children	5
Elderly above 65 years	2
Adults (25-35 years) with lifestyle diseases	2
People who work outdoors	5

The doctor adds that lung x-rays performed on patients who complain of respiratory problems reveal that even non-smokers' lungs are damaged as a result of the toxic air that the residents are breathing.

The educator said that because of the amount of time they spend outside, they are more exposed and thus develop breathing problems. While junior section students experience the visible effects of air pollution, seniors experience anxiety as a result of missing out on school and sporting activities, which play an important role in college admissions. She also stated that many students become ill with respiratory illnesses during school hours in the winter months, requiring parents to take them home or to a doctor's appointment. As a result, school nurseries now stock medications and equipment to help with respiratory issues.

All respondents agreed that parents and residents of the Delhi NCR are looking for ways to protect their children from ongoing air pollution.

Two respondents, a doctor and a scientist, stated that the elderly, those above the age of 65 are a high-risk group due to preexisting health conditions and age, but residents between the ages of 25 and 35 are also at a growing risk due to an inactive lifestyle, an imbalanced diet, and lifestyle habits such as alcohol and tobacco consumption.

There was an overwhelming agreement that many residents in Delhi NCR work in occupations that require them to spend extended periods outdoors, such as sales, marketing, paramedics, logistics. With no respite from rising air pollution levels, this group is increasingly becoming vulnerable to the effects of air pollution in the Delhi NCR metropolis region.

Q 7. What is their primary air-pollution concern?

Considering that the most vulnerable group are children, parents are most concerned about permanent damage to children's health and the exacerbation of pre-existing conditions due to exposure. They believe the more time children spend commuting and being outdoors, the worse their respiratory issues become.

However, they also acknowledge the perils of being restricted to the confines of a house.

Question 7 received a 100% response with non-communicable diseases such as hypertension, diabetes, heart ailments and air pollution resulting in an unsustainable lifestyle emerging as the most common answer from all five respondents (Table 6). The other responses were long term irreversible damage to health as well as lack of concentration and discomfort caused by pollutants with four respondents highlighting these as common concerns among Delhi NCR residents.

Table 6: Primary air pollution concern

Responses	Frequency
Irreversible health damage	4
Non- communicable diseases (hypertension, cardiovascular diseases)	5
Short- term health concerns (lack of concentration, productivity, well-being)	4

Unsustainable quality of life	5

All respondents agreed that, in addition to children, young people mostly between the ages of 25-35 years are concerned about air pollution adding to the escalating burden of lifestyle diseases or non-communicable diseases such as hypertension, cardiovascular diseases and diabetes. Another response that drew consensus was that exposure, as well as the restrictions imposed as a result of rising air pollution, has an impact on a child's physical and mental development. They emphasize that while the middle class spends money on masks and purifiers for their families, they question whether a future reliant on them is a viable option.

Residents are extremely concerned about long-term harm to the health and well-being of children and young adults due to the numerous organs impacted by toxic levels of pollutants in the air, according to four out of five respondents. These concerns range from fear of worsening respiratory conditions like asthma to heart problems and stroke.

Similar consensus with four out of the five respondents agreeing was established about children developing attention deficit hyperactivity disorder which renders them unable to regulate attention and emotions due to the toxic air that they are

exposed to. The lack of green spaces around homes and schools in combination with air pollution increases anxiety that makes children irritable and they tend to show tendencies of depression.

The doctor who answered this question elaborated on the concerns shared by his patients by saying that Delhi NCR does not meet the WHO's air quality guidelines, thus making the city's air unhealthy. Residents and doctors share the concern that this could worsen asthma in children or increase chronic obstructive pulmonary disease in adults.

The educator says that, on days of poor air quality, more students complain of breathlessness, carry asthma pumps, request to stay indoors to avoid sports activities, and have difficulty concentrating. According to an attendance review that the educators monitor, more students call in sick on days when air quality is poor.

Q 8. Do any of the people you interact with express a desire to relocate away from the Delhi NCR due to the air-pollution problem?

In Question 8, respondents were asked if anyone they interacted with expressed a desire to relocate away from the Delhi NCR due to rising air pollution. The answer

was a resounding 'yes' from all five respondents (Table 7). All respondents agreed that people are already leaving Delhi NCR and others are strongly considering the move due to the persistent air pollution problem. Most families, they add, experience discomfort during peak pollution periods and relocate to hill stations or coastal areas throughout India.

Table 7: Frequency of people expressing desire to leave Delhi

Responses	Frequency
Frustrated and want to leave for clean air	5

The educator points out that school transfer certificates, which are documents issued by the institution for the purpose of moving to a new school, increasingly cite "air pollution" as the reason for transferring. Additionally, when further probed during exit interviews, she found that families are relocating to cities with better air quality because their children have been suffering due to Delhi's rising pollution levels.

According to the doctor, Delhi's air is making residents sick by inflaming their airways. He noticed that the COVID-19 pandemic has made health a top priority for the majority of people. Most of his patients are concerned that air pollution

will make the virus more lethal, making them more vulnerable to other infections. As a result, many young families in Delhi NCR are simply waiting for the right opportunities to escape the health burden brought on by air pollution.

People move to other countries to save money, get a better education, and get better health care, according to the immigration consultant. Unwilling to build a future in Delhi's polluted environment, most applicants are eager to restart their lives in foreign countries that can offer a higher quality of life, including clean air.

While the scientist agrees that people want to leave Delhi NCR because they believe it is the only solution, she notes that these people are willing to leave the problem but are hesitant to make sacrifices to combat rising pollution levels. She is referring to those who complain when the government implements odd-even vehicular schemes or bans diesel fuel and advises them to take public transportation instead.

Q 9. Where are those who are thinking about migrating going or seeking to go? Do they have any plans to relocate internationally?

After questioning the interviewees further to learn about the destinations that residents are either moving to or are interested in, Canada emerged as the top

destination (Table 8). There was some overlap in responses, with New Zealand being the second most popular destination.

Table 8: Where are people expressing interest in moving to, due to air pollution

Destination	**Frequency**
Canada	4
New Zealand	2
UK	1
National	1
Inconclusive	1

While only one response indicated a national migration, it was discovered that Delhi residents believe that with more and more cities appearing on the most polluted list, no big city in India will be a healthy place to live in the future.

Question 9 asked respondents to further elaborate on whether the residents of Delhi NCR are considering international destinations or are relocating nationally? The question received a 100% response but with a caveat that the destination cannot be ascertained for all the residents leaving thus this question resulted in more than one response. The top response recorded was Canada with four

respondents agreeing that the country's open immigration policy and a sizeable Indian diaspora makes it a top favorite. This was followed by New Zealand with two respondents agreeing it's natural beauty and good work-life balance makes it a destination of choice for families escaping Delhi's air pollution and looking for green spaces. National destinations including other metropolis cities came next with one respondent saying national migration is still the most common among parents of school-going children. However, with more Indian cities consistently appearing among the most polluted cities of the world, the trend is fast moving towards international destinations for a more permanent solution.

Q 10. Do they emphasize air pollution as a major concern that influences their decision to relocate?

The most common response to the above question was that, air pollution is now a significant driver of migration. Three respondents agreed that families with young children are increasingly citing the unhealthy environment caused by rising pollution levels as a reason to relocate. This is emphasized by responses indicating that people are dissatisfied with the reduction of air pollution levels and thus believe the situation has reached a point of no return. They add that families are

willing to make big sacrifices and take a step back in their professions for a healthier environment for their families.

According to the immigration consultant, about a decade ago, Indians considering migrating overseas were only interested in making money, but that has evolved to air quality becoming a top parameter when discussing quality of life in destination countries. The educator and the doctor echo similar sentiments in their responses, stating that even middle-income families prioritize the health effects of air pollution over income because they do not want to be burdened with frequent doctor visits. They add that discussions about pollution in Delhi always end with 'leaving the city' as the difficult but only solution—for those who can afford it—and that the declining air quality year after year is no reassurance to anyone. The doctor said that some of his patients who are Indians working overseas have received good employment opportunities in their home countries, but aren't considering returning due to the pollution. The city of Delhi may offer more comfort to some, but they do not wish to be exposed to harmful levels of pollution.

Despite the fact that two respondents agree that air pollution is rapidly becoming an important factor, they argue that it is not the only factor driving people to

migrate because migration is also influenced by other factors. Residents do not want their families to be exposed to such high levels of pollution, but this concern cannot drive migration on its own. Other important factors include job opportunities in destination countries, better work-life balance, distance from grandparents, family members, and a social and professional network.

Q 11. Do you think more people will consider leaving if pollution levels in Delhi NCR continue to worsen?

In this question, respondents were asked whether pollution levels continuing to rise would cause more people to leave the city. It received a 100% response with three respondents agreeing that if air pollution continues to rise, more residents of Delhi NCR will consider leaving. Although, the other two respondents agree that residents may leave during peak pollution periods, permanent migration is not an option for all, regardless of the severity of the impacts of pollution.

To support their views, the doctor and educator suggest that many people move to the hills and to coastal areas during peak pollution. Apart from that period, pollutant levels during the summer months in Delhi NCR are also above the WHO guidelines, putting families at risk of health impacts. Temporary migration is

therefore only a short-term solution and with global opportunities on the rise, permanent migration will continue to grow.

In addition, the educator mentioned that many high school students are applying to Canadian universities because they want quality education in an environment that is free of pollution. To avoid the pollution, many families are encouraging their children to study abroad to get away from pollution since moving a family requires more planning and often stable employment for both parents.

The immigration consultant said that a growing number of applicants express concerns about the health impacts of air pollution in Delhi NCR on their families and want to escape the polluted city. According to him, a lot of Canadian cities and educational institutes market themselves as locations with good air quality and blue skies to potential applicants.

All respondents agreed that moving away from Delhi NCR because of its high pollution levels was the best way to deal with it given that there has been no respite, but two respondents, the environmental activist and scientist diverged on the point that moving away was not a viable option for everyone. Their responses went on to elaborate that money can buy masks, purifiers and safe spaces from polluted air. Well- fitted doors, windows and expensive purifiers can scrub the air

of toxic pollutants but only to a certain extent. There is no escape from the world's most polluted city, where the poor, who are more likely to rely on wood-burning stoves, and the middle class, who have more pressing issues, share the burden unequally. One of the diverging views by the scientist mentioned, “the rich can have the best air purifiers and relocation destination, the poor can’t so where will the majority go?”

Q 12. Is pollution- induced migration a growing concern in discussions with government officials during meetings and panels?

This question asked the respondents whether in meetings and panel discussions with government officials, migration due to pollution becoming a growing concern. All respondents unanimously agreed that this was not a talking point in either formal or informal talks with authorities.

Doctors, educators, scientists, and environmentalists who regularly attend meetings organized by the Ministry of Environment and Climate Change say that air quality management is an ongoing process that needs to be integrated into the government's capabilities and incorporated into the behavior and practices of businesses and citizens. However, Delhi's policy measures to combat pollution

have not yet brought about a measurable improvement. For a long-term solution to be effective, the government needs to respond immediately and consider this a health emergency. In addition, they say government efforts have been aimed at mitigation, while people are finding various ways to adapt to the problem.

6. DISCUSSION

My research reveals that there is a shift in immigration decision making in Delhi. It is moving away from economic motivations and access to better education and towards cleaner air and a cleaner environment. Residents are willing to face new challenges in order to fight their way out of the city's toxic pollution for the sake of their children and themselves. This is also fueled by their belief that there is no hope of reducing air pollution in the future due to the disorganized manner in which government policies are implemented, leading to despondency.

My findings indicate that there are three major factors that influence the decision-making process to leave Delhi. These are:

- When residents feel that air pollution in Delhi has a direct impact on their children

- When air pollution has a direct impact on them
- Other environmental factors like tree felling and waste management that creates a sense of despondency.

In this section, I draw from the results to discuss the reasons that answer my research questions. Awareness and concern about air pollution is rising in Delhi. Air quality in the city is rapidly deteriorating. According to data from Delhi's CPCB (Central pollution control board), particulate matter levels exceed WHO standards almost all year.

Families with young children are particularly concerned about Delhi's high levels of air pollution. My analysis of Twitter poll results, Facebook posts, and semi-structured interviews reveals that air pollution is a pressing environmental concern for Delhi residents. According to 74.4 percent of Twitter poll respondents, air pollution, followed by unregulated waste burning and tree felling, has a negative impact on their and their children's health (Figure 7). This is supported by Facebook comments (Figure 8), where 86 percent of the posts I examined expressed a desire to leave the city due to the various effects of air pollution on their families. Interviews I conducted further confirmed that Delhi

residents are very concerned about air pollution’s adverse impacts to them directly and indirectly (Table 3). These impacts range from shortness of breath to long term impairments and from mental health to productivity.

Given the importance of trees in mitigating Delhi's noxious air pollution, the environmentalist and scientist emphasized that tree-felling in Delhi has been a major source of concern. For instance, as Delhi's green spaces shrink, so does its poor air quality, demonstrating that residents are attributing other factors to the city's rising pollution levels (Table 4).

The high levels of pollution in Delhi endanger the health of those who are exposed. My findings (Table 5) indicate that air pollution is causing people to become ill, with children and those with preexisting respiratory illnesses bearing the brunt of the burden.

During peak pollution, there is an increase in patients with respiratory conditions such as asthma, respiratory infections, heart attacks, and stroke, according to the doctor. The majority of these patients are children. He adds that chest X-rays of young nonsmokers resemble those of smokers' lungs. This is supported by

Facebook posts and educator comments demonstrating that an increasing number of children are suffering from respiratory issues, requiring them to visit the school infirmary or their parents to rush them to clinics (Table 5). Many Facebook comments highlight instances where parents are concerned about their children's quality of life as a result of their constant use of nebulizers and air purifiers.

Air pollution has a negative impact on children's mental health and well-being, as evidenced by comments made by the educator and the environmental activist who interacts with other parents (Table 6). Senior students who are concerned about academics and university applications become more anxious as restrictions to stay indoors and cancellations of outdoor sports are imposed.

Residents are most concerned about the impact on their children's health, but they are also concerned about their own health (Table 6 & 7). According to the environmentalist, immigration consultant, and doctor I interviewed, no one, young or old, is immune to Delhi's air pollution. They all describe how adults and parents are dealing with high blood pressure, lung disease, and the exacerbation of lifestyle diseases as a result of the air they breathe.

Moreover, the immigration consultant points out that residents attribute their low work productivity to pollution. According to his interviews with prospective immigrants, exposure to toxic pollutants is exhausting and is a significant barrier to their ability to be creative and advance in their careers (Table 3).

The health effects of air pollution are of primary concern to residents, but the financial costs are also significant. According to the doctor and immigration consultant, residents complain about increased hospital bills (Table 3) as a result of family members becoming ill. Residents on Facebook express similar sentiments, claiming that purchasing an air purifier is costly and that having one in every room of the house is impractical. The scientist agrees partly, says air purifiers can only protect to a certain extent, “one cannot escape the air.”

Based on my analysis of Twitter, Facebook posts, and interviews, I have found that air pollution is becoming a major health threat due to the direct and indirect effects it has on Delhi residents. Delhi's pollution problems have become a major issue for the city's residents and is a significant factor behind people considering moving away.

In addition to the negative impact on the health of children and the well-being of families, Delhi's pollution is weighing down families' confidence in living there, so they are planning to leave the city. Doctors' advice to residents to stay indoors or avoid Delhi entirely during pollution periods has resulted in a noticeable increase in residents looking to relocate to other cities with better air quality.

In my findings from Facebook posts (Figure 6 & 8), I discovered people are despondent about Delhi's air quality, saying things like "air pollution is increasing year after year, and if there is no real change, the city's future will be unhealthy." Many residents mention taking short vacations to other parts of the country to escape the pollution in Delhi. As the doctor advises parents not to expose young children to outdoor activities, parents flee to nearby hill stations and coastal areas for relief when the government declares smog days off. They notice a change in their health during this time, according to the doctor, as they breathe easier and feel better.

My interviewees all state that the fact that pollution has not decreased while suffering has increased has led to a sense of "enough is enough," among residents. According to the doctor, immigration consultant, and educator, the

severe effects on residents' health have reached a tipping point where residents feel they can no longer take it. They go on to say that the long-term effects of air pollution on health are what concerns them the most (Table 6 & 7). During the interview, the educator adds that an increasing number of school transfer certificates show that families are relocating due to air pollution.

'Just leave,' is a common theme that emerges from the study's diverse voices. According to an analysis of Facebook posts and interviews, residents claim that air pollution is increasing their health burden and presenting an unsustainable and unhealthy quality of life. Placing human health at risk of permanent harm has proven to be a tipping point in their decision to leave the city. A Facebook comment put it in these words, “what is the point of earning money. It can’t buy me clean air.”

The scientist claims that while residents of Delhi are willing to relocate to escape the city's pollution, many are unwilling to stay back and make sacrifices such as using public transportation or ride-sharing programs that would help to reduce air pollution.

Focus on relocation: thinking long term

When deciding where to live permanently, Delhi residents look for areas where the air is much cleaner and promises to be cleaner in the long run. My interviews reveal that residents are not forced to move out of the city but are put in a situation where they do so due to the unfavorable air pollution condition at the current location (Table 8 & 10).

All of the interviews and Facebook posts I reviewed revealed that most of residents are educated, have stable jobs, attractive pay packages, a support system of family and friends, and a comfortable life in Delhi, but they are willing to relocate because the air in Delhi is awful. However, the air pollution migration nexus is not based on a single factor.

Several factors contribute to a Delhi resident's decision to relocate, including the desire to live in a cleaner environment, be healthier, and have better employment opportunities, according to the doctor, educator, and immigration consultant. The immigration consultant points out that whereas in the past economic opportunities would have been the primary and only reason residents relocated, today they are willing to put their career growth on hold just to breathe clean air. He adds that this is true even for middle-income families, for whom financial

stability is paramount, but the impact of air pollution on their lives has shifted the focus to health.

The doctor points out that many of his overseas patients that get jobs in Delhi decline them since the air is so polluted (Table 3). This is despite the fact that they may be more comfortable moving back home to be surrounded by their extended families and grandparents.

Many families are also waiting for job opportunities to relocate. Pollution is a major factor in their decision to relocate, but moving a family also necessitates a source of income. It came up in my discussions with the doctor, environmentalist, and the immigration consultant who add that discussions about pollution with Delhi residents always end with 'leaving the city' as the difficult but only solution—for those who can afford it—and that the declining air quality year after year is no reassurance to anyone.

To summarize, pollution in Delhi is not the only factor influencing migration; economic opportunities and a higher standard of living are also important. But I found that air pollution definitely contributes to migration decisions, even though it comes at a high cost. According to all of the interviewees, cleaner air is one of

the most important factors affecting a higher quality of life (Table 7 & 8). This demonstrates the shift in focus from economic to environmental health.

This brings us to our next section on, so where are Delhi residents moving to?

Only a small number of families relocate across the country or to other cities in India. This is evident from the analysis of the Facebook posts (Figure 6 & 8) where twenty-nine percent respondents want to move internationally versus thirteen percent who express interest in moving to other destinations within India.

In support of Delhi residents' tendency to move to international destinations, the doctor and scientist note that more and more Tier 1 cities, which offer quality education and good employment opportunities, are among the most polluted in the country, not offering a long-term solution (Table 8).

Furthermore, the doctor points out that moving to another city in India will not be beneficial in the long run because most Indian cities have poor air quality. Because of the widespread awareness of the pollution problem, citizens weigh their options before making these major decisions and leads them to discount national destinations.

Thus, while national destinations are popular for short-term vacations to escape the toxic pollution in Delhi, they are not a popular long-term solution to the pollution problem.

According to my findings, Canada emerged as the top destination for residents seeking to relocate away from the pollution of Delhi. A trend that emerged early in the research through Facebook comments revealed that residents consider moving internationally to be a difficult choice.

However, a doctor, an environmentalist, and an immigration consultant weigh in, emphasizing that moving abroad is difficult. There are jobs to be found, a new home to find, a social network to rely on, an education system to which their children must adapt, and a life to rebuild. Despite the challenges, residents with children, health concerns, and limited financial resources, see this as an urgent decision. A decision that offers them freedom from a life reliant on an inhaler, nebulizer and illnesses that residents develop due to Delhi's air.

One of the primary reasons that Canada is a top destination is that the country offers a diverse range of immigration programs when compared to neighboring United States with comparable living conditions. According to the immigration

consultant, the biggest draw factor is that immigration rules in general are less stringent than in other countries.

Second, Delhi residents seek a destination with clean air, better education, and health care, all of which Canada provides. It is a country that provides social services, and the doctor notes that those with preexisting health conditions prefer Canada because of its funded healthcare program.

According to the immigration consultant, many Canadian universities, colleges, and provinces promote themselves as destinations that offer a clean, green environment and healthy air quality. A sign that Canadian institutes have identified a key migration driver and are using it to attract more students.

This is supported by an educator who has noticed an increase in high school students applying to Canadian colleges and universities, citing quality education in a quality environment as a reason.

As per the environmentalist and educator, if a family is unable to relocate due to their circumstances, they are increasingly encouraging their high school children and young adults to look for better career opportunities in Canada. An indication that residents are willing to go to any length to provide a clean environment for their children.

Thirdly, Canada is also seen as a country with strong diasporic ties, which appeals to Indians. According to the immigration consultant and environmentalist, knowing someone in Canada often lowers the initial migration cost because they may help you settle in and provide a social network to rely on. It also allows residents from Delhi to integrate into Canadian society while maintaining close cultural ties to India in the long run.

Countries that accept Indian immigrants, such as Canada, do not recognize environmental reasons for migration. They do not ask immigrants if environmental degradation is a reason they want to move to Canada.

The findings I present show the cost of air pollution now outweighs the economic benefits of living in a big city like Delhi. Despite the numerous challenges that migration poses, air pollution is driving people out of the city. I hope that these effects of air pollution are considered in India's policy plans to reduce air pollution in a timely manner. As concluding remarks during the interviews, I conducted (Question 12), all experts note that it is important for governments in India to identify priority areas for action for addressing environmental migration, and developing confidence among the residents of Delhi.

These findings can help destination countries like Canada develop comprehensive immigration policies that might respond to environmental concerns. This information may be useful for public health officials in receiving countries such as Canada in monitoring pollution-related health challenges among people moving from polluted cities such as Delhi. Perhaps most importantly, affected Indian communities and those who have moved to Canada due to environmental reasons should be actively involved in policy planning and implementation to address challenges and capitalize on environmental-induced migration.

OPPURTUNITIES FOR FUTURE RESEARCH

My study is the first of its kind to investigate the impact of air pollution on residents' decisions to leave the Delhi NCR. Every resident and their family have their own thresholds for dealing with air pollution and its consequences, after which they decide "enough is enough" and decide to leave the city in search of a cleaner and healthier environment. The ongoing air pollution problem will inevitably affect more and more families in the near future.

Although air pollution influences migration decisions, it is not the only factor that motivates an individual or a family to relocate. Other factors such as job security,

home, a support system, and education are all important. However, air quality has become an important component of quality of life because it affects health, mental well-being, and productivity. It is no longer just economic factors that drive migration; quality of life, including clean air, has emerged as a key motivator for families who have achieved a certain level of economic stability.

There has been little research on the effects of air pollution on migration, particularly in Delhi. With several Indian cities ranking among the most polluted in the world, this gap needs to be filled. Even if air pollution is not the only factor driving migration, the fact that people are fleeing in search of something as simple as clean air should be thoroughly investigated in the future. Despite the fact that the World Health Organization has identified air pollution as a major environmental and public health concern in India, political gridlock and blame games prevent governments from making concerted and consistent efforts to reduce pollution.

This study is a good case study for studying migration behavior. It can be an excellent starting point for PhD-level research into people's decisions to stay or to move. It will enable us to understand how human aspirations and capabilities

(Haas, 2021) manifest themselves in the context of environmental degradation caused by economic development.

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Appendix 1. Informed consent/ participant form

WILFRID LAURIER UNIVERSITY INFORMED CONSENT STATEMENT

Does air pollution influence the international migration of young urbanites from Delhi, India?

Principal Investigator: Snigdha Basu, MES Candidate

Advisor: Dr Robert McLeman

You are invited to participate in a research study. The purpose of this study is to investigate whether Air-pollution influences young urban residents of Delhi to migrate. The researcher is a Laurier graduate student in the Department of Geography, in the Masters in Environment Studies program working under the supervision of Dr Robert McLeman.

Information

Participants will be asked to reflect upon their experiences of working with people in the field of air-pollution and answer twelve questions. The interview will take approximately 40 minutes to complete. Data from five participants who are involved in the field of air- pollution and migration will be collected for this study.

- As a part of this study, you will be audio-recorded for research purposes. You have the right to refuse being taped. Only I, the researcher, Snigdha Basu will have access to these recordings and all information that may identify you will be kept confidential. My supervisor, Dr Robert McLeman will have access to transcriptions of these audio recordings. You will be able to preview these recordings and transcriptions should you want to. The recordings will be transcribed by July 15, 2021
- The recordings will not be used for any additional purposes without your permission.
- In order to participate in the study, you will be interviewed by the student researcher either electronically over software applications like Zoom/MS Teams or telephonically.

Risks

When speaking about the persistent issue of air pollution, participants might have critiques to local governments that can threaten their status in society. The research findings, analysis and publication will keep your responses anonymous to safeguard your privacy. The goal of this research is to understand if the persistent high levels of air-pollution is influencing migration.

You are free to discontinue the study at any time and to choose not to respond to any question.

Benefits

Participants may benefit from the participation in this research project by playing a key role in informing studies at the intersection of air-pollution and migration. The research will contribute to the body of literature on environmentally induced migration.

Confidentiality

The data will be stored on a password protected computer and on a password-protected Android recording device located in Delhi, India.

- Identifying information will be stored separately from the data and will be permanently deleted by the principal investigator by December 2021.
- The anonymous data will be stored indefinitely and may be reanalyzed in the future as part of a separate project or for further studies.
- Only aggregate results will be published/presented.
- If you consent, quotations will be used in write-ups and will not contain information that allows you to be identified. You will be able to vet your quotations by reviewing the interview transcript, which will be shared with you after the interview, should you want to.

Compensation

For participating in this study, you will not receive any compensation.

Contact

If you have questions at any time about the study or the procedures or you experience adverse effects as a result of participating in this study you may contact the researcher, Snigdha Basu, at basu2480@mylaurier.ca Or +91-8373993489

This project has been reviewed and approved by the University Research Ethics Board (REB 10011727), which receives funding from the Research Support Fund. If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Jayne Kalmar, PhD, Chair, University Research Ethics Board, Wilfrid Laurier University, (519) 884-1970, extension 3131 or REBChair@wlu.ca.

Participation

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty. You have the right to refuse to answer any question or participate in any activity you choose.

If you withdraw from the study, you can request to have your data removed within a week from the date of interview.

Feedback and Publication

The results of this research might be presented in a Masters Research Paper and a news article.

- Only aggregate findings and no individual responses will be reported.

- The results of this research may be made available through Open Access resources.
- An executive summary of the findings from this study will be available by October 15, 2021.
- You can request the executive summary by e-mailing basu2480@mylaurier.ca. OR If you choose to provide your e-mail address for this purpose at the end of the study, the executive summary will be e-mailed to you by October 15, 2021.

Consent

I have read and understand the above information. I have received a copy of this form. I agree to participate in this study.

Participant's signature _____ Date _____

Investigator's signature _____ Date _____

I understand that my comments will be audio recorded and anonymized quotations may be used in publications. I will be able to review a copy of my interview transcript.

Participant's signature _____ *Date* _____

Investigator's signature _____ *Date* _____

It is advised that you print or save this consent form and the researcher contact information in the case that you have any questions or concerns.

Appendix 2. Twitter poll results


Warrior Moms
@Warriormomsin
Which of the following is the most concerning environmental issue to you as a resident of Delhi NCR?
Air Pollution 74.4%
Waste Management 12.8%
Tree Felling 11.5%
Water Pollution 1.3%
78 votes · Final results
8:33 PM · Mar 8, 2022 · Twitter for iPhone
8 Retweets 3 Quote Tweets 9 Likes
Tweet your reply
Reply
Asees&Asheer (#di... @Asees... · Mar 8
Replying to @Warriormomsin
Waste Management & Tree Felling causes of Air Pollution; ideally all 3!

Appendix 3. Facebook data coding sheet

Frequencies of emotions and key words from Facebook posts				
Elements	**Underlying emotion**	**n/70**	**Percentage**	**Sample posts**
Expresses urge to move but unsure about destination	Helpless	31	44%	Delhi's air is poisonous. Let's see where I find a suitable place to settle. It won't be easy but I cannot punish my kids with a gas chamber
Frustrated and wants to move within India	Frustrated and disheartened	20	29%	I'm seriously pondering leaving Delhi for good. I still don't have the heart to leave the country - but this city is not worth living anymore.
Frustrated but Indian cities not an option, international move	Aware and keen to move international	9	13%	Delhi is the worst place to live knowing the pollution levels. Short periods out of Delhi don't help anymore. Have to make a permanent move and out of the country
	Despondent, hopeless			Air Pollution level of all cities is at hazardous level. Time to accept that Govt of India has totally failed to give a solution on pollution. The only solution is to move to another country for better air.
	Enough is enough. Indian city have unhealthy future			Children are constantly sick. Jaipur and the other nearby cities also have AQI problems.Unless I move my family across oceans to another country
Delhi unlivable but moving is a hard decision	Helpless. Must adapt	10	14%	Unhealthy air quality levels but my wife and I have jobs here. Can't move but do do I keep my children safe?

Appendix 4. Semi- structured interviews response sheet

uestion 8	Question 9	Question 10	Question 11	Question 12
o they express esire to relocate vay due to ollution?	**Where are they moving to? Are they relocating internationally?**	**Is air pollution a major concern that influences their decision to relocate?**	**If air pollution continues, will more people consider moving?**	**Is pollution-induced migration a growing concern for the government?**
ES.Many couples ave moved out, any waiting for b oppurtunities nd want to leave r better air for ild	Local migration doesn't provide long term respite from air pollution. New Zealand and Canada	Not the ONLY reason but a significant one. High on quality lifestyle parameters. Those toying with the idea to return, don't due to pollution	Yes, because unless it reduces people's health declines. People move to hills/Goa from Sept-Feb. Int relocation is permanent.	No effort to rectify. It is a health emergency, cannot wait for 10 year policy plans. Residents have no confidence on ability to reduce AP
ES. School lendar has a nog week, arents head out Delhi. Tired of ebulizers, pumps, arents are leaving	Healthcare driving people to Canada due to **ability to manage the damage Delhi air** does	There are cofactors but it is a main one nowdays. Concerns about breathing issues and also that there is no turn around	Not affordable solution for all. Life here is compromising due to toxic air. Daughters lost out on senior nationals due to AP	Migrations happen in hopelessness, when govt fail people yet don't talk about consequences of worsening AP
ES. Transfer rtificates state aving city due to elhi's air. If one arent can get job verseas, they efer abroad, say elhi becoming nlivable	National migration to better Air quality cities common but lot of metro cities now among top polluted cities so Canada and UK most spoken about	Yes, even middle income families are leaving becasue they don't want to be saddled with frequent doctor visits	Gradual uptick in air pollution reason to study overseas. If parents can't move, children consider Canada for higher ed to get away from pollution	No focus on AP induced migration yet
ES. Those with oney leave, ther buy masks, urifiers. Escaping e problem but luctant to make crifices	People leave yes, where is inconclusive	For people with young children, this is a main reason coupled with better work life balance overseas	AP is now associated with quality of life. Other cities in India very poor too. Not an option for all	No
ES. Clients save r better health nd now AP is a ctor hindering at. Willing to ruggle again in areers for better mily health	Canada because it is most welcoming	15- 10 years ago, we would never discuss pollution as a concern. Now, better quality of life is dominantly driven by the air . Don't want emotional and financial toll of AP. Miss blue skies	undoubtedly especially if I go by the number of applicants who express concerns about what pollution is doing to their families or fear what it may do in the future	Not from immigration authorities but some Canadian unis and cities promote themselves as green/good AQ