

State of Delhi's Air

2020

Full Report

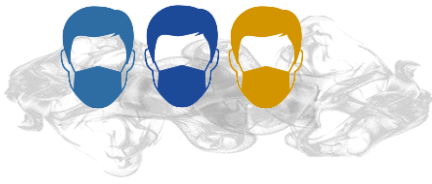


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Purpose: State of Delhi's Air 2019 is purely a primary research (survey) based study. The purpose is to educate government, organisations working in the field of curbing air pollution and researchers on how people – the largest stakeholder group, perceives various dimensions of air pollution problem in Delhi in the context of their preparedness and involvement in dealing with the crisis.

Partners: Envecologic was supported by TERI School of Advanced Studies as Knowledge Partner, UN Sustainable Development Solutions Network (SDSN) Youth – South Asia as the Sustainability Partner, United Residents Joint Action for Delhi (URJA) as the Citizens Partner, and 180 Degrees Consulting as our Outreach Partner.

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About Us & Our Partners

***Envecologic** is a new age sustainability think tank and capacity building firm which works towards understanding and proposing solutions to the challenges of global warming, climate change and fast depleting natural resources. To achieve this, we rely on our Thought Leadership, Research & Advisory and Workshop & Training capabilities. In a short span of time, we have built the reputation of delivering in-depth and applicable intelligence in spheres of energy and sustainability. What sets us apart is the combination of our research approach, subject matter expertise, and effective application of principles of environmental economics. Domain expertise, coupled with highly skilled consultants, an extensive network of subject matter experts, and proprietary KARE framework (Knowledge, Analytics, Research & Economics) make us unique and value driven.*

***TERI School of Advanced Studies (TERI SAS)** was set up as a Trust by TERI (The Energy and Resources Institute) – a globally non-profit known for its contribution to scientific and policy research in energy, environment, and sustainable development. The objective of the TERI SAS is to build capacity around various themes of sustainable development adopting an interdisciplinary approach and incorporating the most contemporary, research-based evidence into the curriculum.*

In 2012, the UN Secretary-General Ban Ki-moon launched the UN Sustainable Development Solutions Network (SDSN) to mobilise global scientific and technological expertise to promote practical problem solving for sustainable development. SDSN Youth educates young people about the Sustainable Development Goals and provides opportunities for them to pioneer innovative solutions to address the world's biggest challenges. The South-Asia network of the SDSN is hosted by TERI, New Delhi.

***United Residents Joint Action of Delhi (URJA)** is the apex body of RWAs in Delhi. It gathers, analyzes, disseminates information & aggregates public opinion to demand efficient delivery of civic amenities, health services, security, clean air and water to residents of Delhi through an accountable, efficient and responsive Government.*

***180 Degrees Consulting** provides socially conscious organizations around the world with high quality research and consulting services. 180DC operates with a mission to ensure that social enterprises committed to environment, education, health, and poverty alleviation can reach their full potential by meeting their demand for high-quality strategic and operational assistance, and in so doing developing the next generation of social impact leaders.*



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State of Delhi's Air 2019 has been an ambitious project, which set out to uncover unexplored dimensions playing a role in efforts to deal with the air pollution crisis Delhi is grappling with.

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Preface

The State of Delhi's Air 2019 report is a public perception study analyzing the impact of air pollution on the lives of people living in Delhi and how they are dealing with it, besides capturing the factors driving their involvement. The study is based on insights drawn from a survey of 5,000 respondents conducted across all nine districts of Delhi (as per 2011 census) covering youth, middle and old age demographics. This is the largest public perception survey till date on the topic in the National Capital Territory.

The state of air pollution in Delhi has resulted in a public health emergency. It won't be wrong to say that air pollution is a great leveller, because it is sparing no one. Doctors acknowledge that Delhiites, especially children, are increasingly falling prey to lung related ailments due to exposure to poor air quality. A Delhi based environmental think tank has noted that, on average, Delhi loses 80 lives everyday to air pollution prematurely. Gravity of the current situation merits a mass movement involving government and citizens alike. In reality however, there is still a major disconnect between policies that exist and the people they ought to benefit. There's a basic lack of understanding in terms of ease of implementation, or even awareness amongst masses. For a policy or regulation to succeed, active public participation is a must, as they form the largest and the most critical stakeholder group. Therefore, analysing public's understanding of the situation and preparedness is essentially the motivation behind the study.

This survey-based study aims to capture insights on people's perception of level of urgency attached to air pollution, their preparedness to deal with it, their awareness of existing policies, and factors limiting people's active involvement. While the problem cannot be tackled overnight, the study also captures how people are adapting to the crisis to safeguard their health. By understanding factors driving people perception towards air pollution, the efforts can be further streamline and reprioritized.



Allegiance to SDGs

Here's how air pollution bears strong relationship with Sustainable Development Goals.



Ensure healthy lives and promote well-being for all at all ages

Air pollution is fast becoming the leading cause of pulmonary ailments, including lung cancer. Children are growing up with acute asthma. Outdoor activities in Delhi such as jogging have ironically become hazardous to health. Good health and well-being of Delhi's people is at stake because of Air Pollution and there is an imminent need to address the issue to get closer to achieving SDG # 3.



Ensure access to affordable, reliable, sustainable and modern energy for all

Major causes of Air Pollution include dirty hydrocarbons being used for a wide range of activities including commercial and non-commercial vehicles using petrol and diesel, diesel gen-sets, industrial use of pet-coke and furnace oil, and use of biomass/coal for cooking. Replacing all these usage with affordable, cleaner and renewable source of energy will help us achieve Goal # 7.



Make cities and human settlements inclusive, safe, resilient, and sustainable

Delhi supports the livelihood of over 19 million people, making it one of the most populated cities in the world. Unfortunately, the Air Pollution crisis is making the city's environment extremely unsustainable for all those people. Money spent on dealing air pollution and health crisis is an economic loss. Poor health is taking away economic productivity. Pregnant women, new-borns, school going children all suffer.



Ensure sustainable consumption and production patterns

In the context of Air Pollution, responsible consumption and production refers to all the activities mentioned in Goal 7's explanation above. Consuming clean sources of energy as well as efficient consumption of existing sources, production processes leading to lesser pollution from factories' chimneys', cleaner cooking stoves, etc. will all lead to efforts towards Goal # 12, consequently resulting in improved air quality.



Take urgent action to combat climate change by regulating emissions and promoting developments in renewable energy

Emissions from vehicles, power plants, waste burning, and fumes from factories are all adding up to the GHG emissions responsible for climate change. Efforts to tackle these factors in the pursuit to reduce Air Pollution, by default, contribute to action to combat global warming and climate change, a step closer to achieving Goal # 13.



Executive Summary

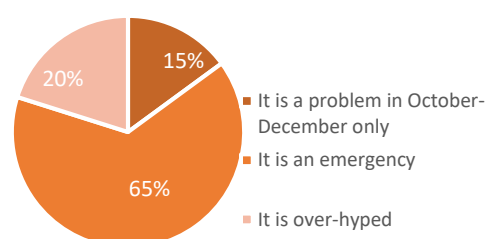
State of Delhi's Air 2020 aims to determine public perception of Delhi's air pollution crisis, and build an understanding of the current state of preparedness of the largest stakeholder – the people. In 2019, Delhi experienced only 2 days with good air quality and 57 days with satisfactory air quality, with pollution levels distributed between moderate, poor, very poor and severe in the remaining year, as defined by the Central Pollution Control Board (CPCB). Over the years, air pollution problem has taken the shape of a public health crisis, and requires intervention akin to a mass movement or revolution. Even though a wide array of regulations and policies have been initiated, including the emergency action plan (Graded Response Action Plan), the outcome in terms of AQI improvement has been far from satisfactory, where it has been observed that people's participation has been passive. This, coupled with lack of strict enforcement, has resulted in progress at a snail's pace.

The other important aspect is the health deterioration due to constant exposure to poor air quality. In order to minimize this impact, as mitigation measures take their own course, adaptation by people for their own sake becomes necessary. For this, public awareness is imperative.

This report captures the factors that impact people's involvement such as their awareness, urgency attached by them to the air pollution problem, existing pattern of adaptation to the problem, their willingness to comply with existing policies, and so on.

The study is based on a survey of 5,000 respondents representing population across the 9 districts of Delhi (as per 2011 census), covering youth (15-29 years), middle aged (30-49 years) and old (50 years and above) people.

Figure 1: Level of Urgency



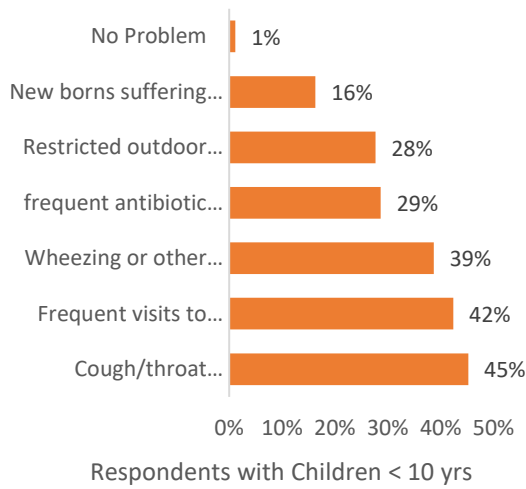
Initial question of the survey analyzes the seriousness that public attaches to the air pollution crisis. Results show that 65% respondents agreed that Delhi's air quality has reached a state of emergency. 70% of which comprise the youth. 15% of the population is convinced that deteriorating air quality only poses a problem during the October to December period, while 20% consider the whole air pollution issue to be overhyped.

The next few questions focus on understanding how many Delhi residents have suffered from ailments which are either caused by or aggravated by air pollution, and whether they are able to attribute it to poor air quality. Of the results received, frequent coughing, wheezing, sore throats and itchy/watery eyes are common ailments frequently seen, and around 70% respondents suffering from these consider air



pollution to be the cause, while 30% don't see the correlation.

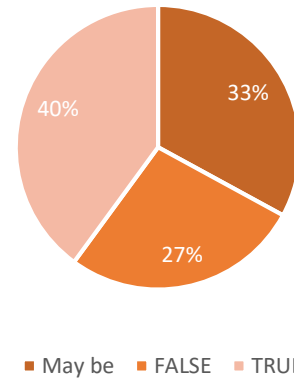
Figure 2: Impact on Children



Succeeding questions examine parents' understanding of the connection between deteriorating air quality and health, specifically those under 10 years of age, the most vulnerable section. 99% of these respondents claim their children have suffered from throat congestion, wheezing or breathing problems for long periods, and have to frequently consume antibiotics. However, only 15% of these think air pollution in Delhi qualifies as a health emergency.

Health advisories during peak pollution period recommend staying indoors and avoiding exhausting outdoor physical activities and to stay indoors. That makes it important to ascertain the safety of indoor environment. When asked if indoor air pollution is as bad as

Figure 3: Is Indoor Air Pollution A Concern?



outdoor air pollution, 60% respondents believed it was not.

A big reason for why some of the implemented policies don't work in the face of this crisis is people's unawareness of their existence. Out of those surveyed, a significant number were unaware of the policies in place to fight air pollution. In fact, least popular policy measure has been Graded Response Action Plan (GRAP), the emergency response plan during peak pollution period. The most popular policy, i.e. banning of diesel cars older than 10 years, is itself not known to about 40% of the respondents.

While ascertaining people's expenditure on preventive or adaptive measures, increased medical expenses on account of increased number of ailments were recorded. These results are a clear indication of the gap that exists in the public perception and the actual scenario. It calls for more streamlined efforts for deeper dissemination of information among the public.

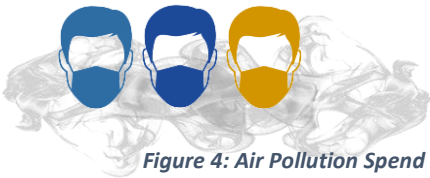
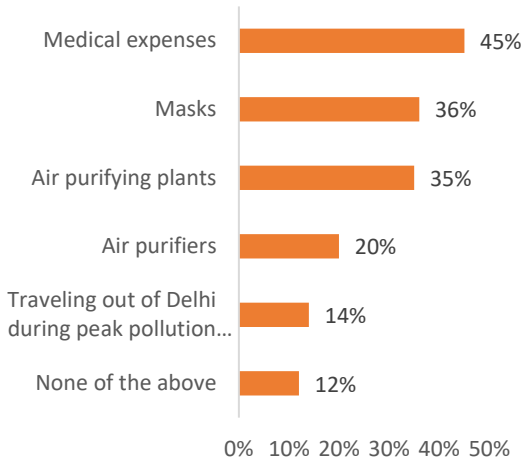


Figure 4: Air Pollution Spend Items



To summarize, the report captured the level of priority people place on air pollution, and how prepared they are to protect themselves from its compromising impacts on their lives. These insights can aid the government and other agencies working on ground build the roadmap to effectively design solutions, resulting in more streamlined efforts to effectively curb the air quality crisis in the city.



Introduction

Air Pollution is the fifth largest reason for premature deaths in the Indian subcontinent, and the main culprit for this are the PM 2.5 & PM 10 pollutants which are known to be a major cause for respiratory and heart related issues. This number is particularly significant in Delhi's context, where approximately 10,000 to 30,000 lives are lost annually, indicating that over 80 people die every single day in the city due to PM 2.5 emissions. These deaths have occurred due to heart attacks, strokes, pulmonary, & respiratory problems – all of which are either directly affected by or exacerbated by air pollution. These pollutants are released into the environment through vehicular emissions, construction activities, and other periodic emissions such as those by firecrackers during Diwali season, etc.

In fact, in December 2014, Centre for Science & Environment (a Delhi based environmental think tank), declared 65% days in the year operating at 'severely polluted' levels, which translated into serious health and financial implications for the citizens of Delhi.

Around 45% of premature deaths, caused due to air pollution, could be avoided if the city undertook preventive measures to control pollution levels and met its National Ambient Air Quality Standards. (India Environment Portal, 2015)

According to World Bank, India's losses from air pollution have increased more than four times between 1990 to 2013, to 560 billion dollars, contributing directly

to the economic burden of our country. Workforce disruption and severe healthcare crisis are the collateral damage of this air pollution problem. (Beniwal, 2019)

Given the number of people suffering everyday, and dying due to increasingly worsening air quality, it stands to reason that this is one of the biggest health crises faced by the city in recent times.

According to a study conducted by Indian Institute of Technology, Bombay, the impact of air pollution can not only be calculated by accounting for the people suffering from ailments which are a by-product of the increasing pollution levels, but also by accounting for the sick workforce in the country. Air pollution is responsible for around 29 million cases of Restrictive Activity Days (RAD), which means either less productive days or days off from work for individuals in Delhi. The severely increasing levels of pollution in the city have also led to an estimated 0.12 million visits to the emergency room for respiratory problems in 2015 alone. (Borwankar, 2017)

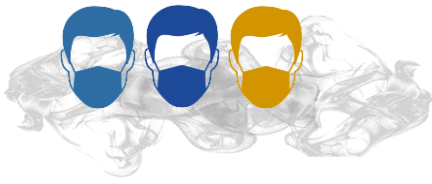
The severity of the air crisis is such that Delhi is now being increasingly looked upon as a hardship posting. For those who come from outside Delhi, the severity of this crisis is a big drawback. Foreign nationals residing in Delhi, including senior employees and members of bureaucratic missions are avoiding postings in the capital city, despite being offered a hardship allowance. This allowance is offered to



make employment opportunities in the city, often being referred to as a 'gas chamber' in the peak periods, more lucrative. Given the recent increasing levels, these people are moving out of the city to safer environs around India to protect themselves and their families.

This paints a very bleak picture for the future of the city, and the respective investment opportunities as well. On these same lines, pollution in the national capital could push local talent to work in other cities in India or abroad, according to industry group the Associated Chambers of Commerce & Industry of India. (Beniwal, 2019)

This narrative should be enough to conclude that people living in Delhi have to regularly accommodate their lives around this pollution crisis. Schools are shut regularly, warnings to stay indoors and avoid physical activity outdoors are issued by the government on regular basis, construction activity is brought to a halt to control the pollutant levels, and policies like the odd-even rule curtailing traffic movement is implemented twice a year. All these pose serious inconveniences for the people of the city who don't always understand the reasons behind these restrictions, nor able to really judge how these help them.



Background

Given the current state of Delhi's air, nearly 20 million people living in Delhi are staring at incalculable health risks, impacting their overall wellbeing. While there are many external and internal factors that play a role in this scenario, current scale of efforts made by the stakeholders does not match the scale of problems, as evident by the air quality which continues to be unbreathable.

While stubble burning is often considered as the most critical pain point, fact is that it is relevant only during a certain period. The air quality levels in Delhi are far from recommended limits for most part of the year, and this translates into serious health and financial implications for the citizens.

In the recent years, efforts have been made towards tackling the air pollution issue by various stakeholders, especially the government. However, they have been unable to create a dent thus far because the scale of efforts is extremely small vis-à-vis the need, and usually correlated with events such as a spike in the air quality index.

Though it's difficult to attribute this crisis to one factor, a number of reasons are at play that have rendered the policies and measures put in place, ineffective. Lack of awareness of existing policies is a big factor behind ineffective policy execution. The public needs to be made aware of the risks of pollution, and what measures the government has put in place to battle the same. If people are unaware of the policies, there are slim chances of their implementation. For

example, there's a fine of INR 5,000/- on waste burning. However, most people are unaware of this, and where there are those who know of its existence, don't know the reporting authority.

It is imperative to capture the preparedness of the people towards dealing with the current air pollution crisis, and understand the level of urgency they attach to the problem, the extent to which they are impacted by the problem, what are the factors holding them back from adhering to the existing policies and rules.

By understanding the relevance of the questions addressed to the public, the study aims to research the level of priority and importance the public places on air pollution, and whether they look upon it as an imminent health threat, or a factor impeding their quality of life. The study aims to understand the level of involvement of the people of Delhi in tackling this crisis.



Review of People's Role

Air pollution levels in Delhi-NCR have deteriorated significantly over the last few years. According to a study of 61 capital cities conducted by IQ AirVisual and Greenpeace, Delhi was the most polluted capital in the world in 2018.

Every year, 2.5 million people die prematurely due to unhealthy air quality across the country. This number is significant for a city like Delhi where 50% of all children, roughly accounting for 2.2 million children, are exposed to unhealthy air quality, leading to irreversible lung damage. (The Times of India, 2019). The book, 'The Great Smog of India', noted that more people in India die due to air pollution in a week than total casualties in India-Pakistan wars since independence (Singh, 2018).

India's air pollution crisis is taking an incalculable toll on public health and economic growth, and will likely exhibit much worse manifestations in times to come. Though efforts have been made to tackle the issue in recent years, their impact has been insignificant due to a lack of parity in the scale of efforts vis-à-vis the need (Gupta, 2019).

One common factor contributing to unchecked and alarmingly high levels of pollution is people, the largest stakeholder, not playing an active participatory role in these efforts. In Delhi, people are known to have played a passive role in tackling air pollution as a challenge despite the severity of the situation. This gap between their understanding of the situation and their

response needs to be bridged in order to bring change.

The study 'Public Understanding of Air Pollution: the 'localization' of environmental risk' stresses on the importance of understanding and studying public perception with special emphasis on air pollution as 'air pollution represents a thoroughly social problem' (Bickerstaff & Walker, 2001). In simpler terms, if there needs to be brought about proper change in the environment, it is important to address the mindset and adapting capabilities of the people. It is only when people are sensitized towards the implications of such changes in the environment and perceive this to be severe will they be pushed to take up initiatives to bring about change. Thus, an understanding of people's perception is critical for reformatory change to be brought around.

Understanding the involvement of people and the role they play in air pollution has become an important area to study in the recent times, and a number of studies have been conducted towards this in order to understand people's perception of the problem better.

Centre for Science and Environment conducted a study in 2013 to understand how people perceive the link between air pollution and their health (CSE, 2013). Results concluded that majority believe the two to be heavily correlated, and that respiratory health is very significantly dependent on-air pollution. Another



such survey was conducted by Clean Air Asia in 2017 as a youth initiative to document public understanding around common air pollution centric terminology, and the correlation between air and health. The results deduced that there's general awareness among the people, but it's primarily with respect to vehicular emissions. They also were able to correlate symptoms like itchy eyes and cough with worsening air quality. While many were inclined towards taking required action, they were unaware of what needs to be done (Clean Air Asia, 2017). These studies show that at some level, people do attribute deteriorating health to severe air pollution levels.

In order to tackle the air pollution menace in India, there's a need for the government to assess public's understanding of the existing problem, impact on health and general well-being; b) Take initiatives to consider public's response to a potential regulation, and understand factors driving those responses; c) step up efforts to educate people about the existing regulations and their rationale. There's a need to scale up communication channels multi-fold and ensure that campaigns around air pollution become as popular as those around certain public campaigns like polio eradication and *Swachh Bharat Abhiyaan*. (Gupta, 2019)

The current level of discourse around air pollution, while encouraging, is still closely correlated with events such as a spike in the air quality index and fluctuates with seasonal cycles.

While people's involvement is still at a nascent stage, small steps towards building the discourse are visible to fight air pollution. In recent years, social

media and news channels have helped increase the level of awareness, besides providing a platform to bring a number of social awareness campaigns to come into the limelight. Participation of youth, including school students, in various campaigns has helped spread awareness among young people.

To summarize, it can be said that while public is largely aware of the air pollution crisis, there's a need for more active participation in dealing with it. There may be many factors for passive public participation, such as lack of awareness, or difficulty in complying with certain regulations. These are the factors that this study delves into – understanding people's preparedness to deal with the air pollution crisis and analyse what factors determine their involvement.



Research Methodology

Research Questions

The study, through the aforementioned objective, addresses the following research questions:

- ✚ What is the level of seriousness and urgency which people associate with Air Pollution?
- ✚ In the midst of narrative around outdoor air pollution, are people aware of hazards of Indoor Air Pollution?
- ✚ What is the level of preparedness to deal with Air Pollution?
- ✚ What is the level of awareness of policies and solutions, and associated willingness to comply with them.
- ✚ What is people's willingness to pay (WTP) to fight air pollution?

Methodology

Primary data collection through public survey is the backbone of this study, designed to represent the population of Delhi. The survey sample selection relies on the outcomes of Government of India population Census of 2011.

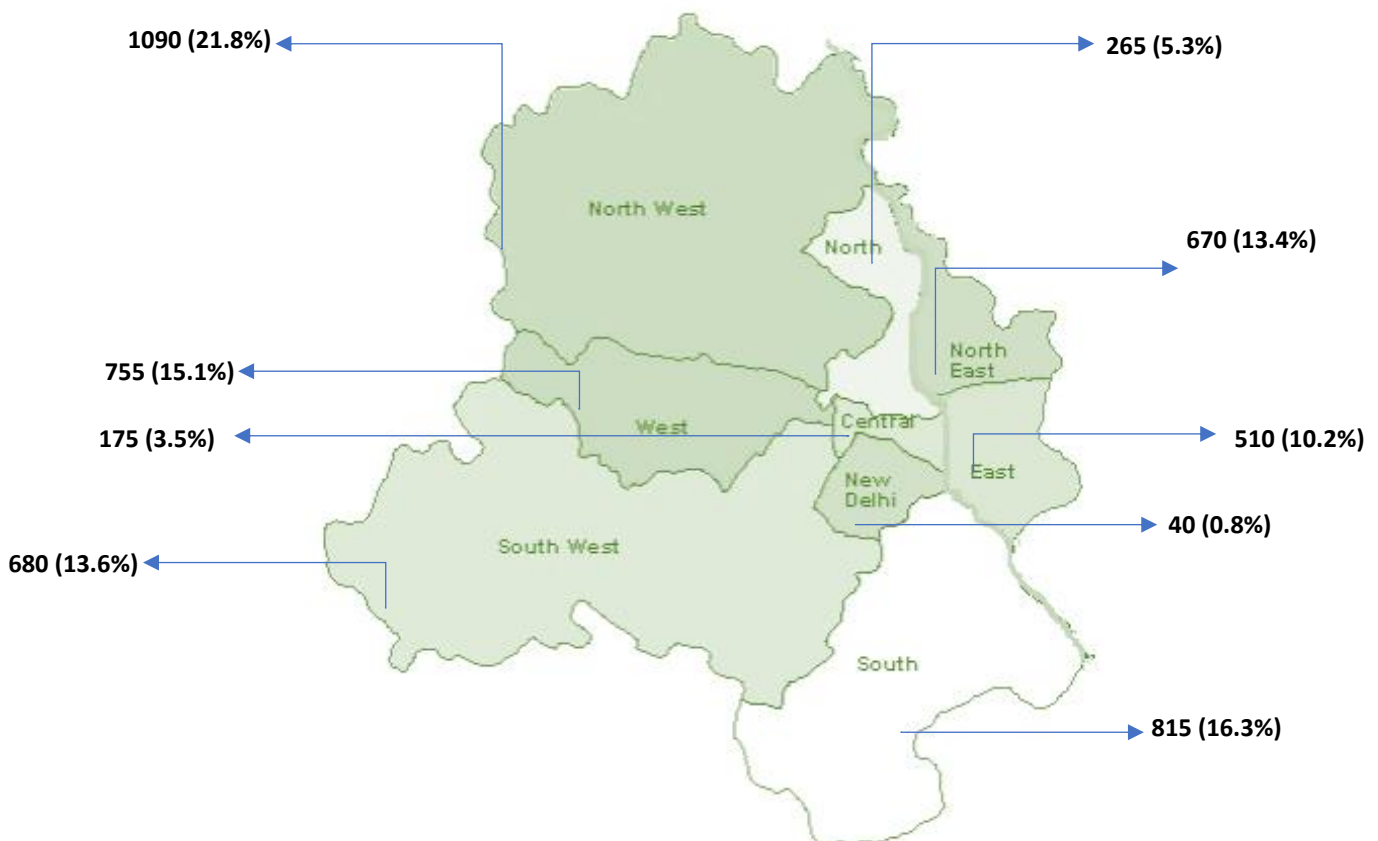


Figure 5: Sample Distribution in Delhi, India



Survey Sample

Sample Size:

The study analyses **sample size of 5,000** respondents, representing the population of Delhi on the basis of **area of residence, gender, and age group**.

Sample Selection

The sample represents population from 9 zones or districts of the National Capital Territory, namely:

Table 1: Population Distribution Across 9 Districts of Delhi

DISTRICTS OF NCT	POPULATION SHARE	REGION-WISE SAMPLE SIZE
CENTRAL DELHI (06)	3.50%	175
East Delhi (04)	10.20%	510
New Delhi (05)	0.80%	40
North Delhi (02)	5.30%	265
North East Delhi (03)	13.40%	670
North West Delhi (01)	21.80%	1090
South Delhi (09)	16.30%	815
South West Delhi (08)	13.60%	680
West Delhi (07)	15.10%	755
Total	100%	5000

Within each district, two other factors were considered, viz. the age group and sex ratio. In order to understand people's preparedness to deal with Air Pollution crisis comprehensively, the survey selected respondents from three major categories:

- Youth: 15 to 29 years
- Middle Aged: 30 to 49 years
- Old: 50 years and above

Based on the census data, age distribution was calculated from the census data for all three age brackets:

Table 2: Population Distribution According to Age Groups

	YOUNG	MIDDLE AGED	OLD
Central Delhi	40%	38%	21%
East Delhi	40%	39%	21%
New Delhi	41%	40%	20%
North Delhi	41%	39%	19%
North East Delhi	46%	37%	17%
North West Delhi	42%	39%	19%
South Delhi	42%	40%	18%
South West Delhi	41%	40%	18%
West Delhi	40%	39%	22%



Furthermore, sex ratio within each age group was calculated so that the sample captures truest possible representation of how men and women look at the problem separately. Accordingly, we got the following male-female distribution for the nine districts across all three age groups:

Table 3: Gender Distribution Within Age Groups Across Districts

	YOUNG		MIDDLE AGED		OLD	
	Male	Female	Male	Female	Male	Female
Central Delhi	53%	47%	53%	47%	51%	49%
East Delhi	53%	47%	53%	47%	51%	49%
New Delhi	56%	44%	54%	46%	57%	43%
North Delhi	54%	46%	54%	46%	52%	48%
North East Delhi	53%	47%	53%	47%	52%	48%
North West Delhi	54%	46%	53%	47%	52%	48%
South Delhi	54%	46%	54%	46%	53%	47%
South West Delhi	55%	45%	54%	46%	53%	47%
West Delhi	54%	46%	53%	47%	51%	49%

Finally, combining results from Table 1, Table 2, and Table 3, sample selection can be determined as described in Table 4.

Table 4: Final 5k Sample Selection

	DISTRICT SAMPLE SIZE	YOUNG			M-AGED			OLD		
		MALE	FEMALE		MALE	FEMALE		MALE	FEMALE	
Central Delhi	175	71	38	33	67	36	31	37	19	18
East Delhi	510	205	110	95	199	105	94	105	54	51
New Delhi	40	16	9	7	16	9	7	7	4	3
North Delhi	265	110	59	51	104	56	48	51	27	24
North East Delhi	670	306	162	144	251	133	118	115	60	55
North West Delhi	1090	460	250	210	421	223	198	209	109	100
South Delhi	815	344	186	158	324	175	149	146	77	69
South West Delhi	680	281	154	127	275	149	126	124	66	58
West Delhi	755	299	162	137	293	155	138	164	84	80

Additional points noted during the survey

- All survey responses collected were offline, face to face interactions. Responses were written down on survey forms.
- Nearly 80% responses are collected by approaching respondent door to door from households from the target area.
- About 20% responses were collected from public places in the target area and were recorded only if the respondent resided in the target area.
- Survey forms were also available in *hindi* for those not able to understand English.
- Survey was conducted between 24th January, 2019 and 15th March, 2019, avoiding days with good breeze, drizzle, rains to avoid bias in responses.



Demographics at a glance

Figure 7: Age Distribution

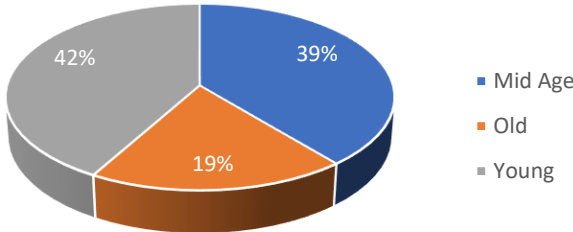


Figure 6: Gender distribution

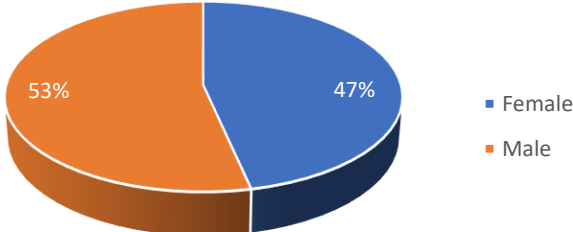


Figure 8: Occupation Distribution

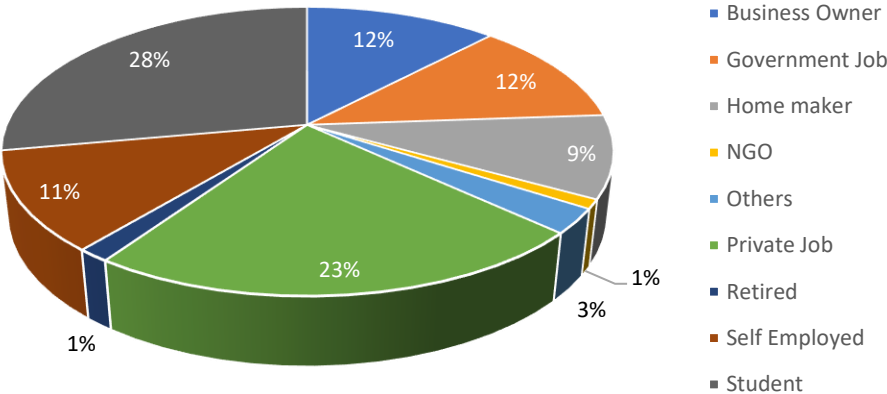
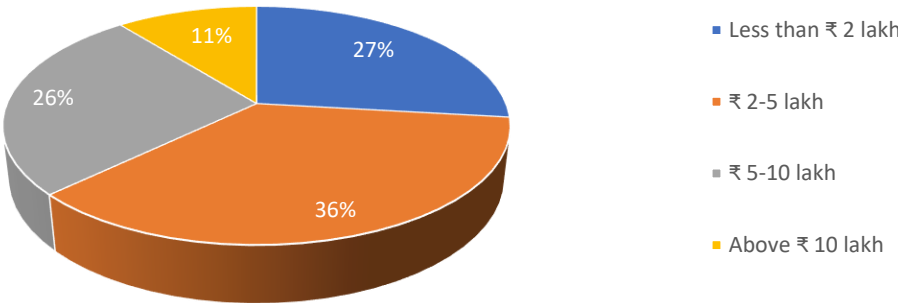
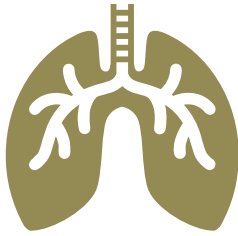


Figure 9: Income Distribution





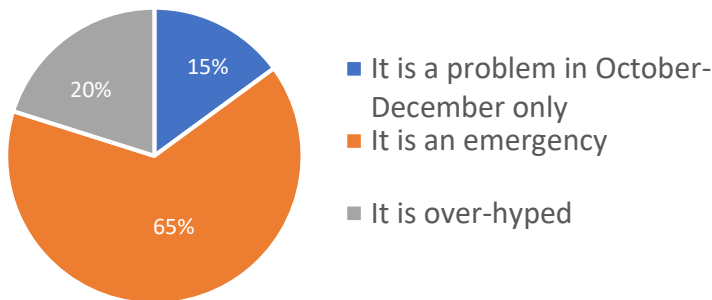
Results & Discussions



Level of urgency Delhiites attach to Air Pollution crisis

In context of Air Pollution, which of the following do you agree with?

- It is an emergency
- It is over-hyped
- It is a problem in October-December only



65% of respondents reckon that Delhi's air quality has reached a state of health emergency. About three-quarters of these people comprise of the youth that understands what is at stake and what this means for their future.

Figure 10: Level of Urgency

According to the survey, 65% of respondents accepted that Delhi's air quality has reached a state of health emergency. 70% of these people, comprise of the youth that understands what is at stake and what this means for their future. The flip side of this scenario is that despite being well-informed on the impact this crisis is having on the people and identifying with it, we still see limited public discourse, let alone complying with non-polluting practices.

Furthermore, 15% of the population is convinced that the deteriorating levels of poor air quality only pose a problem during October-December period. This section first needs to be better informed on the health crisis

and severe levels of pollution which are rampant all year around. Once they understand the severity of the situation, not only will they be easier to encourage to actively participate in battling air pollution but in the meantime, they will be better equipped to protect themselves and their loved ones from the harmful effects all year around.

Lastly, it can be seen that 20% of the population consider the whole air pollution crisis to be overhyped and blown out of proportion. This section is the most vulnerable to the effects of air pollution as they are least likely to take any kind of precautionary measures for the same while in denial mode.



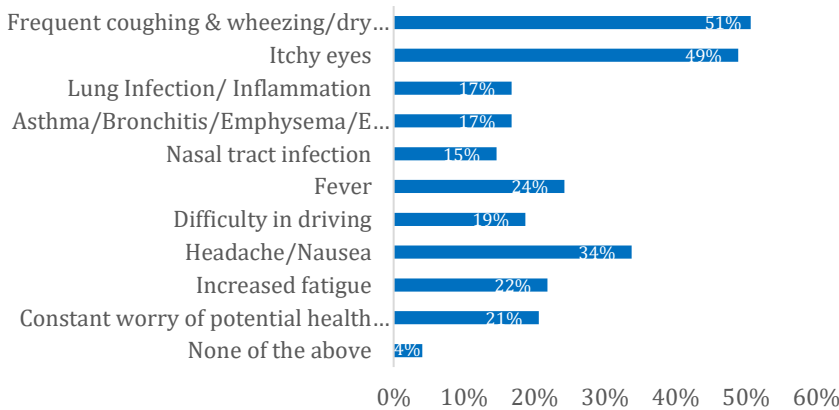
Correlating ailments with Air Pollution

Which of the following ailments have you suffered from in the last 1 year?

Frequent coughing & wheezing/dry throat | Itchy eyes | Lung Infection/ Inflammation | Asthma/Bronchitis/Emphysema/Eosinophilia | Nasal tract infection | Headache/Nausea | Increased fatigue | Constant worry of potential health impact | None of the above

Do you believe one or more symptoms mentioned above were caused due to air pollution?

- Yes
- No
- Can't say



94% of respondents have suffered from at least one ailment in the past one year which is either known to be caused or aggravated by Air Pollution. One out of every two respondents experienced frequent coughing & wheezing or dry throat and itchy eyes.

Figure 11: Air Pollution Symptoms

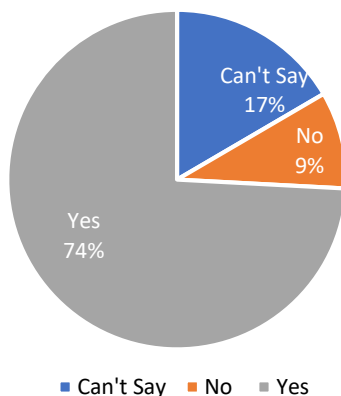


Figure 12: Correlating Ailment with Air Pollution

The set of ailments included in the questionnaire are either caused or aggravated by air pollution.

The aim of the set of two questions is to capture whether people are able to identify the health impact of air pollution.

The result shows that around 95% of the respondents acknowledged that they have suffered from at least one



of the listed ailments in the last one year. 51% respondents complained of having experienced frequent coughing, wheezing or dry throat, when especially when outdoors and in peak pollution seasons. Nearly the same number (49%) of respondents experienced itchy eyes. This translates into one out of every two people from the survey sample experiencing one of the aforementioned difficulties.

74% of the respondents were able to establish a connection between the two. Some responses also acknowledged that a common cold or throat infection took much longer to cure than it would a few years ago. 17% of the responses were 'can't say' as they were not sure whether to attribute the deteriorating health to air quality and 7% of the population were convinced about no correlation between bad air quality and falling sick.

The 'Constant worry of potential health impacts' option makes for an interesting study analysis as this also accounts for the level of stress caused by the air pollution problem. More than 20% of the population has recorded this response, this shows the level of concern amongst the people. People who know enough about the health crisis situation in Delhi are very clearly concerned about their well-being. Living in the constant fear and anxiety of contracting some infection which could lead to temporary or permanent damage is also very taxing for these individuals, and is known as eco-anxiety.



What about the most vulnerable stakeholder - our children?

Do you have children less than 10 years of age?

- Yes
- No

If your answer to the above is 'yes', then which of the following apply to your children?

- Cough/throat congestion for long period
- Wheezing or other breathing problems
- frequent antibiotic courses
- Frequent visits to doctors
- Restricted outdoor activities
- New borns suffering from breathing problem/eye irritation/cough/fever/skin rashes
- No problem

Respondents with Children less than 10 yrs

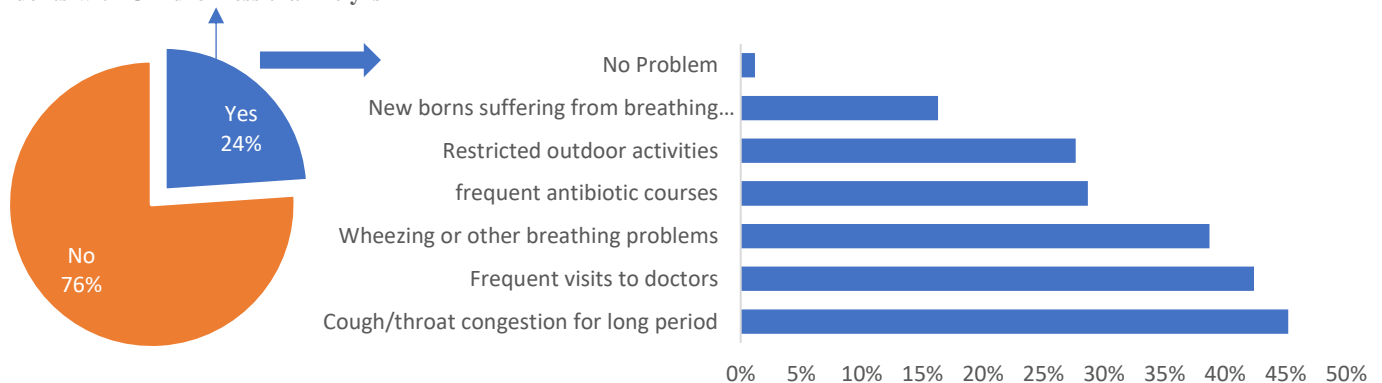


Figure 13: Impact of Air Pollution on Children

Almost 95% of those respondents with child/ren less than 10 years of age have suffered from lung related issues such as throat congestion for long periods, wheezing or breathing problems, and end up consuming frequent doses of antibiotics. Only 15% of these think air pollution in Delhi has led to a state of health emergency.



This question was addressed to parents living in Delhi who have children under 10 years of age, and captures health impact on them due to air pollution. This age bracket is the most vulnerable section in terms of health damages.

According to the survey, 24% of all 5,000 respondents have children less than 10 years of age. 99% of respondents had their children suffer from one ailment or the other. 45% of these respondents noted that their children suffered from coughing and throat congestion for long durations. 39% of the sample sub-set had their children suffer from wheezing and breathing issues. 16% of these parents confirmed that their young ones suffered from breathing issues, eye irritation, coughing, fever or skin rashes, especially during high pollution seasons.

These results are aligned with the observations made by medical practitioners and experts. For example, according to Dr. Anil

Sachdev, Director of the Paediatric Intensive Care at Sir Ganga Ram Hospital, infants and children suffer more than adults, further noting that there has been a consistent rise in the use of inhalation therapies like nebulisers, metered dose inhalation and dry powder inhalation in the last five years. More and more children are prescribed inhalation therapy due to recurrent cough and respiratory symptoms.

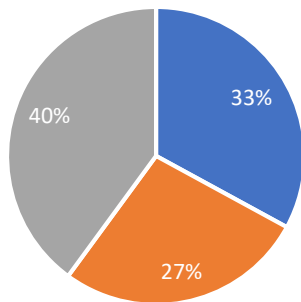
When these responses were mapped against the question on perception of urgency level in the context of air pollution, only 15% parents acknowledged that it is indeed a state of health emergency, and expressed worry for their children's health. It is a concern that nearly 60% of these respondents feel that air pollution is only an October-December problem, which may impact the level of preventive care extended to their children. Worse still is the response of over quarter people who, in their earlier response, noted that air pollution problem is over-hyped.



Are you pollution-proof indoors?

Indoor air pollution can be as harmful as outdoor Air Pollution, if not more.

- True
- False
- May be



■ May be ■ FALSE ■ TRUE

Figure 14: Is Indoor Air Pollution a Concern?

Many studies have established that indoor air pollution is as bad as outdoor air pollution, if not worse. This survey question is rooted in the general perception that one is exposed to air pollution only when outdoors. As a matter of fact, air quality in indoor spaces have been found to be very poor, owing to poor ventilation and various other factors not related to cooking fuel. According to the State of Global Air Report 2019, an estimated 846 million people in India were exposed to indoor air pollution in 2017, almost 60% of the country's population.

People spend more than 80% of the day indoors, whether office, home, schools or colleges. Level of awareness in this case is crucial to determine corrective actions to limit

60% respondents are not convinced that indoor air pollution can be as bad as outdoor air pollution, even though most spend more than 80% of their day indoors. Majority of these are, however, convinced that outdoor air quality is a major concern.

exposure. 40% of the respondents subscribe to the fact that indoor air pollution can be as bad as outdoor air pollution. However, nearly 60% people are not convinced that it could be the case. While considerable number of indoor air pollution sceptics were across all income groups pointing towards lack of awareness, majority respondents earning in the lowest income bracket (earning Rs 2 lakh or less annually) did not agree to indoor air pollution being a problem. This can be correlated with the fact that air quality does not feature in the top subsistence-based priorities for them. Interestingly, almost 60% of indoor air pollution sceptics happen to attach high level of urgency to outdoor air pollution.



First line of defense for people: Masks & Air Purifiers

What prevents you from using masks and air purifiers regularly?

- I use them regularly
- Not sure about their benefits
- It may actually lower the immunity
- Expensive
- Not a priority
- Not feasible to use them all the time

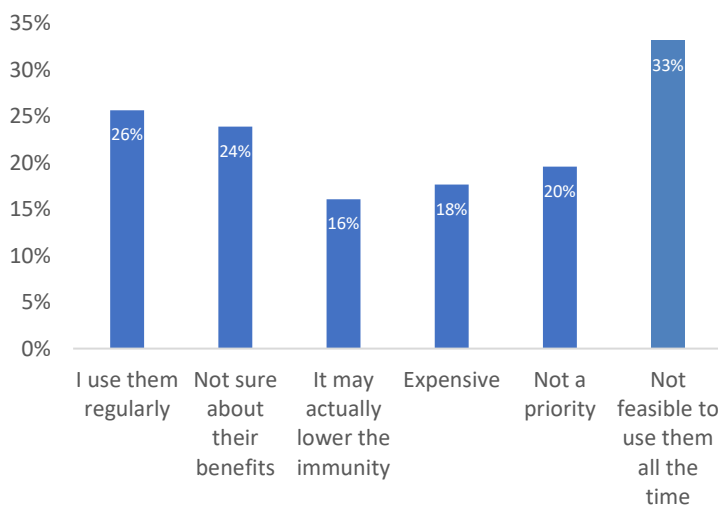


Figure 15: Reliance on Masks & Air Purifiers

Only 26% use pollution prevention aids like masks or air purifiers actively. For the remaining three quarters respondents, infeasibility to use them all the time and being unsure about benefits emerged as top deterrents.

In the absence of any other technique, air purifiers and masks may offer immediate protection against the increasing levels of pollution in Delhi as the first line of defence. Thus, the question singles them out to understand what people perceive of masks and air purifiers.

The survey question is intelligently designed to capture whether the respondents use these aids as well as reasons if they don't. The question addresses how prepared the people

are in these times of crisis and whether their inability to adapt stems from behavioural or economic reasons.

As established from the responses of the first question, most Delhiites perceive air pollution in the city to be at emergency levels. Even then, the survey records only 26% respondents indicating that they use masks or air purifiers regularly.

Nearly three quarters of all respondents don't depend on these



preventive aids. 33% of the respondents, belonging to this lot, do not find it feasible to use while believing that exposure to bad air is inevitable.

About a quarter of all respondents confessed that they are not sure of benefits or effectiveness of these products. Most of these people feel that these alternatives are marketing gimmick and that the problem is either too severe or too trivial to pay heed to these aids.

20% of these respondents believe that using pollution aids is not a priority. This is a mix of people belonging to the section of sceptics,

those who cannot afford and those who have not seriously considered using them yet.

18% of the population thinks that these are too expensive to indulge in. This section may recognize the importance of these measures but is unable to do anything about it due to monetary concerns.

16% of the respondents are convinced that using these alternatives will actually lower their immunity in the longer run. This would result them in falling sick far more frequently than before causing more of an issue.



Policy-people disconnect?

Which of the following government initiatives on air pollution are you aware of?

- Garbage/Waste/Leaves burning attracts penalty up to Rs 5000
- Banning of construction activities during severe pollution days
- Graded Response Action Plan (GRAP) to be applicable during severe pollution days
- Diesel cars older than 10 years and petrol cars older than 15 years are now banned in Delhi region
- Coal, kerosene, furnace oil and pet coke banned
- None of the above

Three out five respondents were not aware of the most important policies in place to address air pollution in Delhi. Most popular policy, i.e. diesel and petrol vehicle to be de-registered after 10 & 15 years, itself is not known to 40% of all respondents. One in every two respondents was not aware of penalty on waste burning.

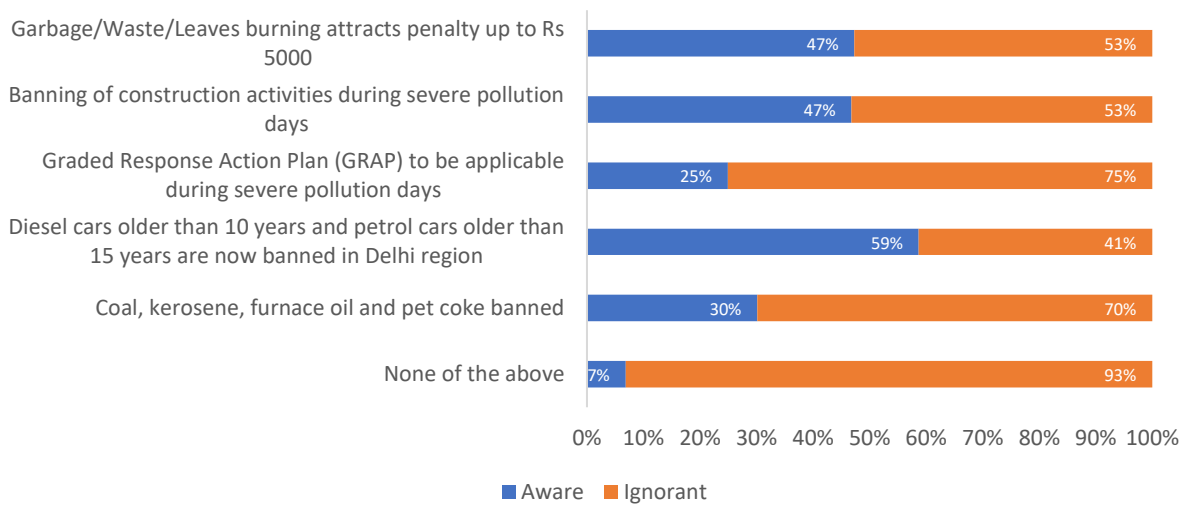


Figure 16: Policy-People Disconnect

Government policies or initiatives are only successful if people are aware of them at the very least. This question analyses the level of awareness amongst the people about prominent policies which are centred around tackling air pollution in the capital. Inability to identify with them is a very big gap this study captures.

The success of reforms or regulations are based on how well they are enforced as well as the extent of cooperation from those supposed to comply.

The awareness is likely to result in greater collaborative government-



people force in efforts towards curbing air pollution.

This question helps understand the problem at the grass root level and plausibly address the inability to bring change despite many efforts by the government.

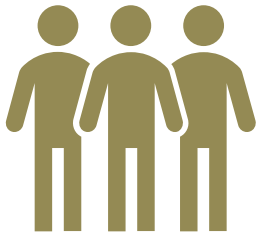
The survey results show that out of the five most popular policy measures, 3 out of 5 people, on an average, do not even know that policy measures exist to tackle air pollution.

The fact that use of coal, kerosene, pet coke etc. are banned in Delhi and graded response action plan (GRAP), Delhi's emergency response plan, is not known to 70% and 75% respondents, respectively.

There is a ban on construction activities during the health emergency and garbage burning has a penalty of Rs. 5000 are also not known to over 50% of the respondents.

The most popular policy, i.e. banning of diesel cars older than 10 years, itself is not known to about 40% of the respondents.

The results clearly indicate that these people need to be made aware of the policies and measures in place. The failure or success of any government initiative is solely dependent on the public's response to it. Due to lack of awareness if the public doesn't cooperate with authorities, no effort to manage the crisis is going lead to expected outcome.



Gauging people's willingness to participate in making Delhi pollution-free

What is the willingness with which you can comply with the following:

- *Use public transport*
- *Comply with odd-even policy (when applicable)*
- *Use car pools/shared cabs*
- *Use bi-cycle and walk where I can*
- *Neither indulge nor allow open construction in my neighborhood*
- *Plant shrubs/grass where there is loose soil/sand*
- *Switch off engine of my car at red lights*
- *Install solar rooftop*
- *Not use diesel cars*
- *Plant and maintain trees*

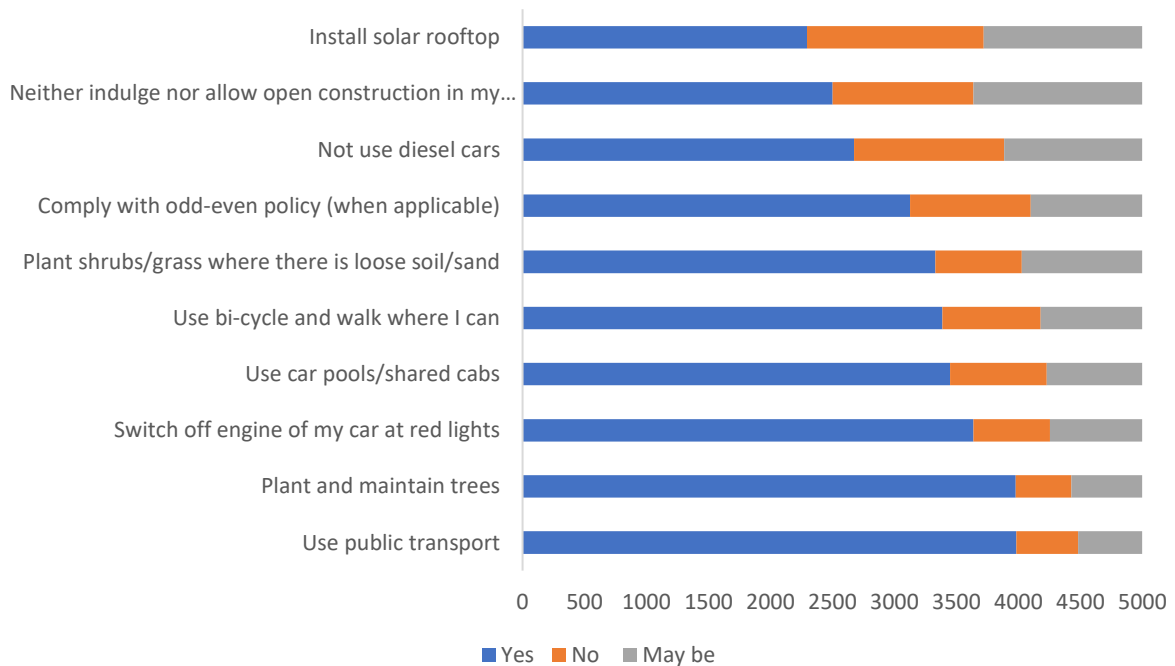


Figure 17: People's Preference to Contribute to Air Quality Improvement



Nearly 40% respondents confessed their unwillingness to abide by the odd-even policy and over 24% respondents expressed unwillingness to switch from diesel cars to more eco-friendly options. Installation of solar rooftops was the least appealing idea amongst respondents as a means to reduce dependency on thermal power plants. Using public transport emerged as the most preferred option by 80% respondents.

The survey question gives an exhaustive set of solutions to the respondents to express their preference or willingness to abide by or adopt. This is done to gauge which of these options are most feasible and desirable for the public in order to tackle air pollution in Delhi. It captures initiatives the area where people are willing to take up in order to curb air pollution.

Use of public transport and planting (and maintaining trees) emerged as the top two ways preferred by almost 80% of respondents, in which they can contribute to reduce air pollution. Next in the rank are switching off engines at the red light, using car pools, using bi-cycles for short distances, which 65-70% people expressed preference for.

The least popular solution is solar installation amongst Delhiites as indicated by the fact that only 46% of

all respondents expressed their preference, lowest in the order.

Almost 20% respondents expressed that they don't want to comply with odd-even policy.

Following is the order of preference in which respondents expressed their willingness to adopt solutions to contribute in cleaning Delhi's Air:

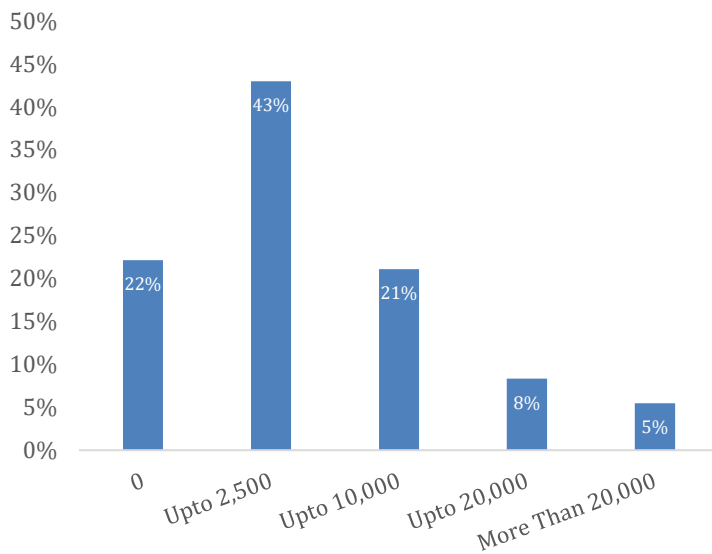
1. Use public transport
2. Plant and maintain trees
3. Switch off engine of my car at red lights
4. Use car pools/shared cabs
5. Use bi-cycle and walk where I can
6. Plant shrubs/grass where there is loose soil/sand
7. Comply with odd-even policy (when applicable)
8. Not use diesel cars
9. Neither indulge nor allow open construction in my neighborhood
10. Install solar rooftop



How much is clean air worth?

How much are you willing to spend annually to breathe clean air?

- ₹0
- upto ₹2,500
- upto ₹10,000
- upto ₹20,000
- More than ₹20,000



Nearly a fifth of all respondents expressed that they would not pay anything for cleaner air, most of who believed that it is government's responsibility to provide it. The average per capita willingness to pay to access cleaner air was Rs 5,822, about 1/4th of the estimate economic burden on every Delhiite.

Figure 18: Willingness to Pay for Clean Air

This question aims to quantify people's willingness to pay to improve air quality or how much is clean air worth to them. This is a unique attempt and another way to capture the importance people attach to clean air. The survey tries to determine the whether paying for clean air has become a necessity for the consumers yet. This could be by spending in purifiers, masks or even planting trees.

22% respondents' willingness to pay was recorded as zero. This means that they don't want to pay anything for air pollution and possibly think that it is the government's responsibility to ensure that the air

they breathe is safe and clean, and that it's a fundamental right. This section could also include those who are air pollution sceptics and don't perceive it as a real problem.

43% respondents are willing to spend up to Rs 2,500 per annum to limit exposure to unbreathable air. Fewer number of respondents indicated greater willingness to pay. 21%, 8% and 5% respondents subscribed to the willingness to pay up to Rs 10,000, Rs 20,000 and more than Rs 20,000 respectively.

Upon analysis, people's willingness to pay is estimated to be Rs 5,822 per capita. As explained earlier,



willingness to pay reflects how much worth people attach to clean air. This can be put in an interesting comparative perspective when analysed against the backdrop of economic burden of air pollution. It can be estimated from an IIT Bombay study that every Delhiite bears Rs 21,894 in terms of economic burden due to air pollution. Evidently, the burden is nearly 4 times (3.7 times to be precise) more than people perceive it to be. People are severely

undervaluing their health or simply do not have the economic means to be able to pay such a large sum, even if they care, due to economic constraints.

The per capita willingness to be pay also indicates the average amount respondents may be spending already in dealing with air pollution, which may be reflected in the analysis of the next set of responses.



Adapting to the Air Pollution Crisis. Are efforts preventive or reactive?

Did you have to spend on any of the following to deal with air pollution?

- Air purifiers
- Masks
- Air purifying plants
- Medical expenses
- Traveling out of Delhi during peak pollution period
- None of the above

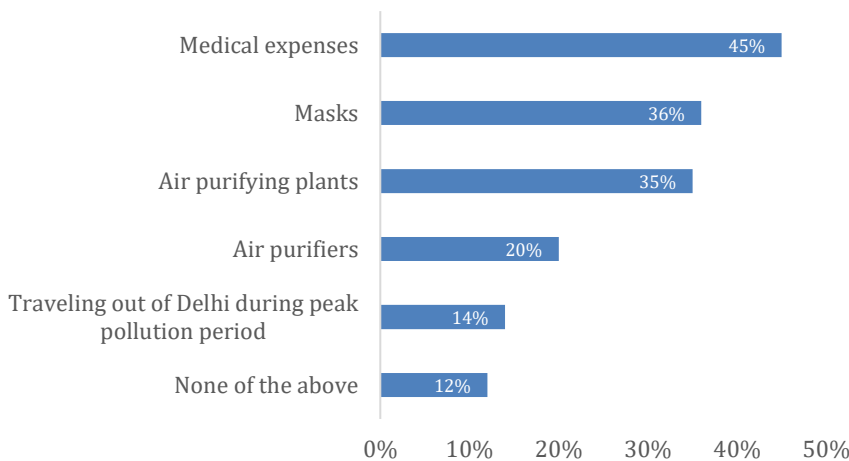


Figure 19: Air Pollution Spend Items

45% respondents spent on medical treatment for ailments typically caused by air pollution, which is reactive spending. Masks and air purifying plants are the next most purchased items to deal with air pollution. Interestingly, 14% respondents acknowledged that they spent on traveling out of Delhi during peak pollution period.

In a developing country where people are already struggling to make both ends meet, it becomes important to capture the economic burden air pollution is slowing levying on the people. This question is in tandem with the previous one. After understanding what kind of money people are willing to spend in order to breathe cleaner air, we now look at the means of doing so.

Investing in masks, purifiers, medical expenses, travel to avoid air pollution are all additional expenses incurred by the common man.

This question highlights the most desired alternatives available to the people and aims to draw out insights on how people are divided between reactive and preventive measure with respect to air pollution.

Almost 45% of the respondents have spent on medical expenses to deal with ailments typically caused by or aggravated by air pollution. The question worth asking here is how much of this money could be diverted towards more productive activities if cheaper preventive measure were taken.

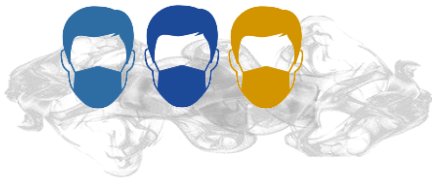


36% of the respondents did indeed spend on masks and 20% spent on air purifiers, preventive aids to limit exposure polluted air. These results are interesting as they can be correlated with 26% of those who indicated that they used aids such as air purifiers and masks. In this case, it is likely that a section of respondents uses both aforementioned aids.

A large section of respondents (35%) spend on indoor air purifying plants. It is likely that many of these people

consider this to be cheaper alternatives to air purifiers. Many of these decisions are driven by notions rather than facts as many who laid confidence on plants are also sceptical about indoor air pollution.

Even though only 14% respondents formed this class but indicating an interesting emerging trend where Delhiites are also choosing to travel outside Delhi during peak pollution periods.



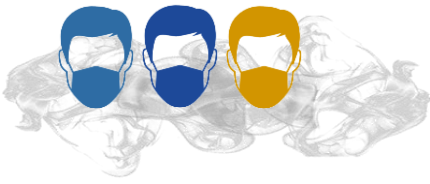
Implications & Way Forward

- *The youth of the city is perhaps the biggest stakeholder in the air pollution crisis in Delhi and naturally is heavily invested in it. In the face of this adversity, a sense of helplessness enfolds these youngsters as a majority of them feel ill-equipped to deal with the health crisis at hand. There is an opportunity to leverage the youth's concerns and energy towards a paradigm shift in turning the city more sustainable and steering the goal towards lowering pollution levels.*
- *The crisis has painted a bleak future for Delhiites, especially the children living in the city, that are left vulnerable to the harmful effects of air pollution. 95% of the respondents that have children under 10 years of age and on average one in every two people living in the city suffers from ailments caused or aggravated due to air pollution. In a country where medical services anyway shortfall the need, we are staring at an exponential increase in need for medical services due air pollution caused ailments. While focusing on mitigation activities, public healthcare services will have to be strengthened.*
- *According to the results of the survey, 45% of the respondents are paying medical bills incurred due to air pollution. Thus, these efforts need to be turned into preventive measures in order to minimize exposure and health risk. This can potentially lead to a significant economic burden. Measures must be taken to turn this reactive measure into preventive one.*
- *Despite the hype surrounding the air pollution crisis which has shed considerable light on the current scenario in the capital, there isn't much awareness around indoor air pollution. This is a very big oversight on behalf of the people living in Delhi. The average Delhiite spends 80% of their time indoors, a false sense of security which stems from limited knowledge on indoor air pollution can have life altering implications for*



these individuals. A more thorough awareness program is needed to educate people on this.

- *While mitigation in the air pollution crisis is critical, it is not very realistic to see results overnight. In the meantime, one should also focus on adaptation measures seriously to minimize health impacts. The government should also encourage the use of preventive aids like masks, purifiers etc., and provide subsidies wherever possible to facilitate reach and affordability for all.*
- *The government has put a number of policies in place in order to fight air pollution in Delhi. People's inability to identify with these policies is setting them up for failure. One in every two respondents is unaware that burning waste is penalized by the government. This shows the lack of awareness amongst the masses. Simply put, they cannot follow a policy they do not know about. Awareness campaigns on educating people on existing policies is imperative. An aggressive approach, like that seen for polio, malaria and dengue campaigns need to take place in order to warrant the same level of attention from the people.*
- *Insights based on people's willingness to comply with certain policies help the authorities identify these points and scale them up for quicker results by strategizing better.*
- *The insights derived from willingness to pay show that the average citizen of Delhi undervalues clean air and the impact air pollution would have on their health. Thus, further highlighting the need to educate and create awareness for the people.*



Annexure

Copy of Actual Questionnaire used during the survey

State of Delhi's Air: 2019 Survey

You are the voice of change. You are taking part in the largest Air Pollution Survey in Delhi. Your inputs will help us form recommendations on what will work effectively to tackle air pollution crisis. Take this survey only if you live in Delhi.

* Required

1. Full Name *

2. Age (years) *

3. Gender *

Mark only one oval.

- Male
 Female
 Other

4. Education *

Mark only one oval.

- School
 Graduate
 Post Graduate & above

5. Email Address

6. Phone Number

7. Annual Income *

Mark only one oval.

- Less than ₹ 2 lakh
 ₹ 2-5 lakh
 ₹ 5-10 lakh
 Above ₹ 10 lakh
 Don't wish to disclose



8. Occupation *

Mark only one oval.

- Student
- Private Job
- Government Job
- Business Owner
- Home maker
- Self Employed
- Retired
- NGO
- Others

9. Area *

Mark only one oval.

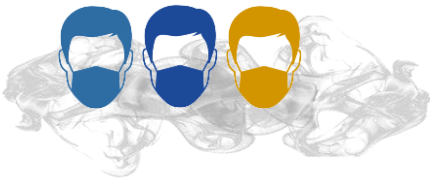
- North Delhi (Near: Model Town, Narela, Alipur, Sadar bazar, Kotwali)
- South Delhi (Near: Kalkaji, Defence Colony, Sarita Vihar, Hauz Khas, Saket, Mehrauli, GK)
- East Delhi (Near: Mayur Vihar, Preet Vihar, Gandhi Nagar, Laxmi Nagar, Vivek Vihar, Patparganj, Karkardooma)
- West Delhi (Near: Patel Nagar, Punjabi Bagh, Rajouri Garden, Moti Nagar, Tilak Nagar, Vikas Puri, Janakpuri)
- North East Delhi (Near: Yamuna Vihar, Shahdara, Mandoli, Dilshad Garden, Seelampur, Rohtash Nagar)
- North West Delhi (Near: Saraswati Vihar, Narela, Model Town, Kanjhawala, Rohini, Pitampura, Shalimar Bagh, Rithala)
- South West Delhi (Near: Vasant Kunj, Palam, Vasant Vihar, Dwarka, Kapashera, Dhaura Kuan, R.K. Puram, Moti Bagh, Narayana)
- Central Delhi (Near: Daryaganj, Paharganj, Kotwali, Karol Bagh, Civil Lines, Sadar Bazar, Jhandewala, Rajinder Nagar)
- New Delhi (Near: CP, Barakhamba Road, Chanakyapuri, Gol Market, Golf Links, INA Colony, Lodi Colony, Jor Bagh)

Survey

10. 1. In context of Air Pollution, which of the following do you agree with? *

Mark only one oval.

- It is an emergency
- It is over-hyped
- It is a problem in October-December only



11. 2. Which of the following ailments have you suffered from in the last 1 year? *

Check all that apply.

- Frequent coughing & wheezing/dry throat
- Itchy eyes
- Lung Infection/ Inflammation
- Asthma/Bronchitis/Emphysema/Eosinophilia
- Nasal tract infection
- Fever
- Difficulty in driving
- Headache/Nausea
- Increased fatigue
- Constant worry of potential health impact
- None of the above

12. 3. Do you believe one or more symptoms mentioned above were caused due to air pollution? *

Mark only one oval.

- Yes
- No
- Can't say

13. 4. Do you have children less than 10 years of age? *

Mark only one oval.

- Yes
- No

14. 4(a). If your answer to the above is 'yes', then which of the following apply to you?

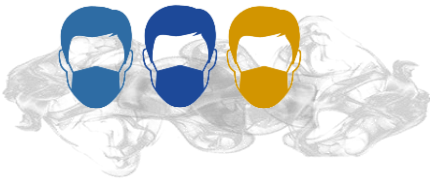
Check all that apply.

- Cough/throat congestion for long period
- Wheezing or other breathing problems
- frequent antibiotic courses
- Frequent visits to doctors
- Restricted outdoor activities
- New borns suffering from breathing problem/eye irritation/cough/fever/skin rashes
- Other: _____

15. 5. Indoor Air Pollution can be as harmful as Outdoor Air Pollution. *

Mark only one oval.

- True
- False
- May be



16. 6. What prevents you from using masks and air purifiers regularly? *

Check all that apply.

- I use them regularly
- Not sure about their benefits
- It may actually lower the immunity
- Expensive
- Not a priority
- Not feasible to use them all the time
- Other: _____

17. 7. Which of the following government initiatives on air pollution are you aware of? *

Check all that apply.

- Garbage/Waste/Leaves burning attracts penalty up to Rs 5000
- Banning of construction activities during severe pollution days
- Graded Response Action Plan (GRAP) to be applicable during severe pollution days
- Diesel cars older than 10 years and petrol cars older than 15 years are now banned in Delhi region
- Coal, kerosene, furnace oil and pet coke banned
- None of the above

18. 8. What is the willingness with which you can comply with the following: *

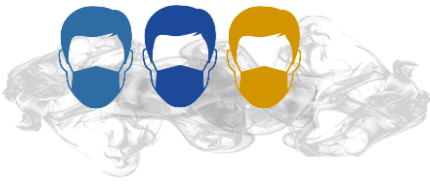
Mark only one oval per row.

	Yes	No	May be
Use public transport	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comply with odd-even policy (when applicable)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use car pools/shared cabs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use bi-cycle and walk where I can	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Neither indulge nor allow open construction in my neighborhood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plant shrubs/grass where there is loose soil/sand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Switch off engine of my car at red lights	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Install solar rooftop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not use diesel cars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plant and maintain trees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. 9. How much are you willing to spend annually to breathe clean air? *

Mark only one oval.

- ₹0
- upto ₹2,500
- upto ₹10,000
- upto ₹20,000
- More than ₹20,000




20. 10. Did you have to spend on any of the following to deal with air pollution in the last 1 year? *


Check all that apply.

- Air purifiers
- Masks
- Air purifying plants
- Medical expenses
- Traveling out of Delhi during peak pollution period
- None of the above

21. 11. Any message for the government?

22. Surveyor ID (for internal purpose only)

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Questionnaire

1. In context of Air Pollution, which of the following do you agree with?
 - It is an emergency
 - It is over-hyped
 - It is a problem in October-December only
2. Which of the following ailments have you suffered from in the last 1 year?
 - Frequent coughing & wheezing/dry throat
 - Itchy eyes
 - Lung Infection/ Inflammation
 - Asthma/Bronchitis/Emphysema/Eosinophilia
 - Nasal tract infection
 - Headache/Nausea
 - Increased fatigue
 - Constant worry of potential health impact
 - None of the above
3. Do you believe one or more symptoms mentioned above were caused due to air pollution?
 - Yes
 - No
 - Can't say
4. Do you have children less than 10 years of age?
 - Yes
 - No
- 4(a). If your answer to the above is 'yes', then which of the following apply to you?
 - Cough/throat congestion for long period
 - Wheezing or other breathing problems
 - frequent antibiotic courses
 - Frequent visits to doctors
 - Restricted outdoor activities
 - New borns suffering from breathing problem/eye irritation/cough/fever/skin rashes
 - Other:
5. Indoor Air Pollution can be more harmful than Outdoor Air Pollution.
 - True
 - False
 - May be
6. What prevents you from using masks and air purifiers regularly?
 - I use them regularly
 - Not sure about their benefits
 - It may actually lower the immunity
 - Expensive
 - Not a priority
 - Not feasible to use them all the time
 - Other:



7. Which of the following government initiatives on air pollution are you aware of?

- Garbage/Waste/Leaves burning attracts penalty up to Rs 5000
- Banning of construction activities during severe pollution days
- Graded Response Action Plan (GRAP) to be applicable during severe pollution days
- Diesel cars older than 10 years and petrol cars older than 15 years are now banned in Delhi region
- Coal, kerosene, furnace oil and pet coke banned¹
- None of the above

8. What is the willingness with which you can comply with the following: *

- Use public transport
- Comply with odd-even policy (when applicable)
- Use car pools/shared cabs
- Use bi-cycle and walk where I can
- Neither indulge nor allow open construction in my neighborhood
- Plant shrubs/grass where there is loose soil/sand
- Switch off engine of my car at red lights
- Install solar rooftop
- Not use diesel cars
- Plant and maintain trees

9. How much are you willing to spend annually to breathe clean air?

- ₹0
- upto ₹2,500
- upto ₹10,000
- upto ₹20,000
- More than ₹20,000

10. Did you have to spend on any of the following to deal with air pollution in the last 1 year?

- Air purifiers
- Masks
- Air purifying plants
- Medical expenses
- Traveling out of Delhi during peak pollution period
- None of the above

¹ https://www.dpcc.delhigovt.nic.in/Approved_Fuel_List_29.06.18.pdf



Rationale of Questionnaire

The Questionnaire has been specifically designed in order to conduct research on Air Pollution in Delhi. In order to eliminate maximum bias, data was collected by primary research. Door-to Door survey was done across the length and breadth of the city. The questionnaire was available in both English and Hindi in order to facilitate the needs of the public. Volunteers were provided to provide clarity on any question and further help filling the questionnaire. The research has been used as a primary resource for the study, supported by secondary research conducted in the form of peer reviewed papers, books, other publications and news journals in order to validate the results of the study.

Question 1: In the context of Air Pollution, which of the following do you agree with?

The citizens of Delhi are constantly exposed to unhealthy air pollution. The frenzy around which picks up drastically over the October-December period. This does not negate the fact that in recent years, Delhi has been exposed to high levels of air pollution all year around. The public is the biggest stakeholder of the problem as they are directly affected. Thus, it is important to understand how severe they perceive the problem of air pollution to be.

This question aims to analyze the awareness amongst the masses in regard to air pollution. It delves deeper into the minds of the people to understand if they perceive air pollution to be detrimental to health only during peak Diwali season or all year around. Further, the study aims to identify the gap between the awareness levels amongst the citizens of Delhi and their involvement in battling air pollution. If the public perceive the problem to be an all year around affair, then recommendations can be made to tackle this at the individual level. However, if most people think this issue is 'Over Hyped' or 'It is a problem in October- December only', then they need to be educated on the problem. This needs to be done not only to inspire action to curb air pollution from individuals but also educate them so they can safeguard their health better all year around.

Only if the person is educated on the subject and readily understands the implications of which will they be able to contribute towards the solution. After attaching numerical value to these responses, they study can further analyze plausible solutions and make recommendations.

Question 2: Which of the following ailments have you suffered from in the last 1 year?

This question has been incorporated after heavy research through specialist doctors, practitioners, general physicians, papers and so on. The options available to the respondents have been carefully formulated. This is done because most of these ailments are known to have been caused directly because of air pollution or been aggravated by it.

This question aims to allocate numbers to the amount of people falling sick in the capital city. This will serve as raw data that helps the study understand how many people living in the city are either directly affected by air pollution or worsen in condition due to it. Identifying that the public is continuously suffering from ailments paints a very serious picture regarding the issue. The authorities are also more inclined to take up reformatory measures if they can quantify the number of people affected by the same. Insights generated would provide the number of citizens affected by the basic fundamentals of life- breathing.



Question 3: Do you believe one or more symptoms mentioned above were caused due to air pollution?

The question aims to understand if the people have been able to make the correlation between severely harmful air quality to continuous episodes of falling sick. Lung related and pulmonary ailments listed are fairly common amongst the masses and also a direct result of air pollution. Failure to make this correlation is misleading for the public and thus maybe one of the reasons air pollution isn't taken up so seriously. The ailments are fairly common in nature which has led many people confuse it with something normal as opposed to attributing this to the excessive level of pollution.

This question helps quantify the level of impact for analysis. These numbers are integral for the study as recommendations in order to safeguard their health.

Both the above questions give insight into why people are still so indifferent towards the air pollution crisis and which people suffering from these ailments would be easily encouraged to take up initiatives to do their bit in order to curb air pollution.

The question plays an important role in capturing the acceptance and understanding factor of the people.

Question 4: Do you have children less than 10 years of age? If yes, then which of the following apply to you?

Children are the most vulnerable age group and thus very critical for the study. Due to their low immunity and under developed lungs, they are the most affected group. This question is addressed to the respondents to find out whether those who have children under the age of 10 years are able to identify that their children are falling sick due to the exposure to bad air quality. The response helps quantify the number of kids impacted by bad air pollution. The number of children falling prey to air pollution are important to the study in order to understand how many children living in the Delhi area are exposed to irreversible lung damage. The options presented to the respondents range from 'Wheezing or other breathing problems' to 'Frequent visits to the doctors' and so on. Given the extreme levels of air pollution in the capital, a day spent in the city is equivalent to smoking around 8-10 cigarettes on average.

This question helps the respondent make the correlation between air pollution and their kids falling sick and helps them understand whether air pollution is responsible for their kids' ailments or at the very least has exacerbated the ailment. From the pollution study point of view, the relevance of this question for the author is to help place numbers and quantify the research in order to produce sound and precise results.

Question 5: Indoor Air Pollution can be as harmful as Outdoor Air Pollution?

Statistics and numerous studies have known to prove Indoor Air Pollution to be as bad as Outdoor Air Pollution. A fact, people tend to overlook either due to limited knowledge on the subject or due to lack of alternatives. This question is relevant to the research as it helps the author analyse the level awareness amongst the citizens of Delhi.

The common misconception amongst people stems from the fact that people tend to associate Air Pollution with smoke, haze and smog in the city seen outdoors. While true, this fact overlooks the detrimental effects of Indoor Air Pollution. Precautionary measures on average suggest minimal exposure which is interpreted as one should spend maximum time indoors. Thus, people's limited understanding of the subject doesn't urge them to take precautionary measures inside like installing air purifiers and such.



The responses are categorized under 'True', 'False' and 'Maybe'. The responses help the author determine the level of awareness amongst people and accordingly make suggestion for policy reforms, awareness initiatives and best ways to educate the people. If they know that Indoor pollution is as harmful as outdoor pollution and still do not take precautionary measures, this study shall help acquaint them with the alternatives they could use to battle air pollution at their level. If they don't know, this study shall serve to first educate then provide alternatives.

Question 6: What prevents you from using masks and air purifiers regularly?

Air purifiers and masks serve as immediate protection against the increasing levels of pollution in the city. They would be the first line of defense, thus, the question singles them out to help understand that failure to incorporate these in one's lifestyle determines how seriously the situation is being handled at the ground level.

The research questions allow the author to delve deeper into the psychology of the people and make recommendations for policy reforms accordingly. The underlying assumption this research question operates on is that the people do not use air purifiers or masks and helps understand what reasoning stops people from investing in these products given the high levels of pollution.

Research shows that the severe levels of air pollution cannot be brought down overnight. It is going to take considerable time to put policies in place which allow the city to drastically reduce pollution levels and come up with a systematic approach to the same. In the meantime, adaptation is the only alternative available to the people. The question addresses how prepared the people are in these times of crisis and whether their inability to adapt stems from behavioral or economic reasons.

In order to provide recommendations in the study, the author must first understand the reasons. For example, If the public consensus lies with the option of 'Not a priority' or 'Not sure about it's benefits' then the solution would be to increase awareness amongst the people.

Question 7: Which of the following government initiatives on air pollution are you aware of?

Government policies or initiatives are only successful if people are aware about them. This question analyses the level of awareness amongst the people about prominent policies which are centered around tackling air pollution in the capital. Inability to identify with them is a very big gap for the study. The problem of air pollution can only be tackled at such a large scale if proper reforms and policies which are applicable to everyone are generated. If most people do not identify with the policies already in place due to lack of knowledge, it is very difficult to manage the crisis. Those respondents who do know of these reforms are the target section of people who would be most likely to accept the policies and thus help tackle Air pollution. This question helps understand the problem at the grass root level and plausibly address the inability to bring change despite many efforts by the government.

Question 8: What is the willingness with which you can comply with the following?

The research questions gives a wide range of options to the respondents, this is done to gauge which of these options are most feasible and desirable for the public in order to tackle air pollution in Delhi. It captures initiatives the area where people are willing to take up in order to curb air pollution. The opinions of the people will serve to quantify data and allocate numbers which initiative policy reform. Even if the masses take up one of the initiatives presented, a significant difference can be made in the city. If constant efforts for policy reform and a wide range of initiatives are taken up by regulatory bodies to improve the crisis situation but willingness of people does not comply with the idea, the initiative is bound to fail. Thus, for people



to be able to contribute and do their part in curbing air pollution, a more popular and feasible option needs to be considered. This research question also helps the respondents understand the alternatives available to them. These can be easily incorporated in their lives without difficulty and simultaneously help reduce their carbon footprint.

Question 9: How much are you willing to spend annually to provide clean air to your family?

This question aims to analyze and quantify the economic impact of Air pollution on the people living in the city. While every individual values their health, the monetary value they are willing to associate to that health varies considerably across the different strata of society. The author wants to determine the whether paying for clean air has become a necessity for the consumers yet. This could be by investing in purifiers, masks and so on. The question helps understand the psychological workings of the average individual in a city like Delhi. If the masses realize how important it is to invest economically in order to stay healthy and are still not willing or able to spend, then initiatives need to be introduced to either educate or make these products more affordable. If they are willing to pay for these products, how much value are they willing to associate to these products and how important do they deem them to be. By attaching numbers to this analysis, the author is able to quantify the results more accurately providing sound and reliable results.

Question 10: Did you have to spend on any of the following to deal with air pollution?

In a developing country where people are already struggling to make both ends meet, it becomes important to capture the economic burden air pollution is slowing levying on the people. This question is in tandem with the previous one. After understanding what kind of money people are willing to spend in order to breathe cleaner air, we now look at the means of doing so. Investing in masks, purifiers, medical expenses, travel to avoid air pollution are all additional expenses incurred by the common man. This question highlights the most desired alternatives available to the people and aims to draw out insights as to what else can be done without pressurizing people to heavily invest in these products.

Mapping Questionnaire with the research questions²

Table 5: Research Questions - QQuestionnaire Mapping

RESEARCH QUESTION	QUESTIONS ADDRESSING THE RESEARCH QUESTION
What is the level of seriousness and urgency which people associate with Air Pollution?	1, 2, 3, 4
In the midst of narrative around outdoor air pollution, are people aware of hazards of indoor air pollution?	5, 6
What is the level of preparedness to deal with air pollution?	6, 8, 9
What is the level of awareness of policies and solutions, and associated ease/challenges to comply with them.	7, 8
What is people's willingness to pay (WTP) to fight air pollution?	10

² Actual Survey Instruments attached in the appendix.



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