CLEAN AIR ASIA

# CLEARING THE AIR

## ENGAGING YOUTH IN HOT SPOT ACTION

TOOLKIT

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# CLEARING THE AIR

## Engaging Youth in Hot Spot Action

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# FOREWORD

*Clearing the Air* is a toolkit for engaging youth to understand air pollution in hot spots and work towards clean air in these areas. It has been developed by Clean Air Asia India with the objective of encouraging sector specific micro level activity driven by public engagement to reduce air pollution in hot spots. The toolkit uses simple language to explain scientific concepts to guide youth in identifying hot spots, generating data, and finding solutions. The guidelines, and suggested strategies discussed here are designed to be simple, yet logical and effective. Communication strategies to engage communities living in the hot spots are also proposed here and can be modified to adapt to the local context.

City action for air pollution requires a multi stakeholder, and integrated approach to successfully reduce air pollution levels. While policy and regulation can provide the guidelines and directives to generate standards there is a need to engage with public so that policy can be successfully enforced by the government with implementation of preventive and corrective measures that people accept.

This is where the hot spot strategy becomes important as a scientific method for addressing air pollution. Hot spots are areas with higher levels of the pollutants that rise beyond a threshold (safe) level for consecutive days at the same time. Continuous exposure can cause long-term health problems for those living in that area. Exposure to pollutants in air can be a threat to the health of everyone, but it especially affects the young people.

Following from our solution-oriented approach to improve air quality, we hope this toolkit will encourage youth to develop local solutions for air pollution based on scientific ways of generating data and driving innovation. We hope that this simple toolkit will also generate a thought process on integrating the hot spot approach in the larger air quality management process taking place within the city. Most of all, we hope that youth engagement can drive clean air action locally so that it can be scaled up and helps to solve the air pollution issues in cities.

**Prarthana Borah**
India Director, Clean Air Asia

# GLOSSARY

**Aerosols –** A liquid or solid that is finely dispersed in a gas, usually air, and is in a stable state is an aerosol.

**Anthropogenic –** It refers to environmental change caused or influenced by people, either directly or indirectly.

**Cardiovascular –** The term cardiovascular refers to the heart (cardio) and the blood vessels (vascular). The cardiovascular system includes: Arteries, Arterioles, & Capillaries.

**Epidemiology –** Epidemiology is the study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems.

**Metallurgy –** Art and science of extracting metals from their ores and modifying the metals for use.

**Nitrous Oxide –** Nitrous oxide, commonly known as laughing gas or happy gas, is a colourless, non-flammable gas. This gas is used in medical and dental procedures as a sedative. It helps to relieve anxiety before the procedure and allows the patient to relax.

**Particulate Matter –** This is the complex mixture of solid and liquid particles that are suspended in the air. Particles up to 10 µm in diameter ($PM_{10}$) can enter our airways and settle in the lungs, where they can cause serious illnesses. Particles of 2.5 µm in diameter ($PM_{2.5}$) are considered the most harmful because their size means they can enter our bloodstream and can even reach the brain.

**Sulphur Dioxide –** A heavy pungent toxic gas $SO_2$ that is easily condensed to a colourless liquid, is used especially in making sulfuric acid, in bleaching, as a preservative, and as a refrigerant, and is a major air pollutant especially in industrial areas.

**VOCs –** Volatile organic compounds (VOCs) are chemicals that evaporate from a solid or liquid form at room temperature. Some VOCs exist naturally in the environment. Others are manufactured (made by people) and put into things that we use every day.



# TOOLKIT OVERVIEW

Air pollution is increasingly acknowledged as a major threat to human health causing an estimated 7 million deaths annually: in other words, one in eight deaths globally can be linked to air pollution[1].

The emergence of air pollution hotspots has drawn significant attention in the urban regions of the country. These hotspots have increased in number in recent years linked to a growing population, consumption and polluting activities. In particular, the emergence of hotspots may be due to the increased contribution of local pollution sources and/or favourable meteorological conditions which aide in the accumulation of pollutants at ground level. As a young person who is concerned about air pollution in your area, you will identify with the shared problem and want to consider the ways in which you can make an active contribution towards improving air quality.

This toolkit focusses specifically on youth aged between 15 to 24 years of age. It can be used by youth to design an engagement strategy and support the creation of a clean air action plan around a local hot spot. It provides directions on generating local data and conceptualizing local action in and around hot spots.

The content of this toolkit is not only useful for college students/youth, but for working professionals as well, especially for those working or wanting to work in the field of planning and policy development, air pollution research and community engagement. Most of all, if you are concerned about air pollution in your area, you will find that this toolkit develops your understanding of sources of pollution and helps drive a prevention/ mitigation strategy where you live, go to school/ college or work.

With this toolkit you will understand the following about air pollution in a hotspot. The guidelines, suggestions and strategies discussed here are designed to be simple, yet effective and can be easily adopted as part of your daily lives.

This toolkit provides basic information on the following in the context of Air Pollution Hotspot management:

- How do we identify an air pollution Hotspot?
- How do we identify the sources of air pollution in that Hotspot?
- Possible ways to reduce air pollution in that area.

You can use the resources of this toolkit in micro level planning to address air pollution from local pollution sources and for mitigation of air pollution emissions. You can also design communication strategies for public engagement which are interactive and effective at the same time.

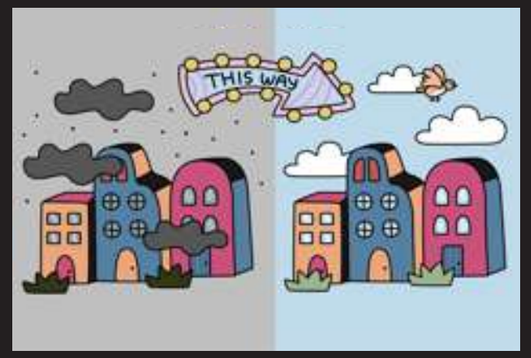



Image Credit: V. Dhianisya, Let's talk pollution

1 World Health Organisation (2021) New WHO Global Air Quality Guidelines aim to save millions of lives from air pollution, accessed on 20th October 2021

# 1. WHAT IS AIR POLLUTION?

The earth is surrounded by a gaseous layer called the atmosphere, which is composed almost entirely of nitrogen and oxygen, along with a number of trace gases such as argon, helium and the greenhouse gases (GHGs). The gaseous criteria air pollutants of primary concern in urban settings include sulfur dioxide, nitrogen dioxide, and carbon monoxide; these are emitted directly into the air from fossil fuels such as fuel oil, gasoline, and natural gas that are burned in power plants, automobiles, and other combustion sources.

**WHAT WE CALL "AIR" IS THE MIXTURE OF GASES THAT MAKE UP THE ATMOSPHERE.**

In addition, the atmosphere contains water vapour, clouds and aerosols. Greenhouse gases are the gaseous component of the atmosphere; they may be natural or anthropogenic (i.e. originating in human activity).

GHGs absorb and emit radiation, which causes the greenhouse effect. The primary GHGs are water vapour, carbon dioxide ($CO_2$), nitrous oxide ($N_2O$), methane ($CH_4$) and ozone ($O_3$). There are also other anthropogenic GHGs, such as halocarbons[2].

Aerosols are tiny particles, suspended in the atmosphere, that come from a variety of natural and anthropogenic sources. In the atmosphere, gaseous water vapour attaches itself to these tiny aerosol particles and result in the formation of cloud droplets.

## DID YOU KNOW?

**THE WORLD HEALTH ORGANISATON HIGHLIGHTS THE LINKS BETWEEN AIR POLLUTION AND THE EPIDEMIC OF NON-COMMUNICABLE DISEASES (NCDS). HEART DISEASE, STROKE, LUNG DISEASES AND CANCER, ARE AMONG THE TOP FIVE CAUSES OF DEATH TODAY, AND ONE-QUARTER TO ONE-THIRD OF DEATHS FROM THESE DISEASES ARE DUE TO AIR POLLUTION.**

Now that we know the basic facts about air pollution, let's take a closer look at the main pollutants, their origins and the effect they have on our health. This information will allow us to reflect on the main pollutants in our community. Identifying these pollutants will be key for guiding citizen mobilization actions.

**AIR POLLUTION REFERS TO THE PRESENCE OF PARTICLES, GASES OR MATTER IN THE AIR THAT CAN REDUCE THE AIR QUALITY AND GENERATE RISKS OR CAUSE DAMAGE OR SERIOUS NUISANCE/HEALTH CONCERNS/ HEALTH RISKS/PROBLEMS TO PEOPLE AND OTHER LIVING BEINGS.**

Particulate Matter (PM) is the complex mixture of solid and liquid particles that are suspended in the air[3]. Particles up to 10 µm in diameter ($PM_{10}$) can enter our airways and settle in the lungs, where they can cause serious illnesses. Particles of 2.5 µm in diameter ($PM_{2.5}$) are considered the most harmful because their size means they can enter our bloodstream and can even reach the brain. The main source of $PM_{10}$ and $PM_{2.5}$ emissions is combustion processes, in particular the combustion of coal and other fossil fuels.[4] This occurs, for example, in automobile engines, power plants and in the industrial sector.

**SECTION QUIZ**

- WHAT ARE AEROSOLS?
- WHAT DOES THE ABBREVIATION PM STAND FOR?
- WHAT ARE THE MAIN SOURCES OF PM?

# COMMUNITY ENGAGEMENT

In its broadest framing, community engagement refers to involvement and participation in an organisation, intervention or project for the welfare of the community. It has emerged as an essential component of policy design, implementation, project governance, delivery, monitoring and evaluation (Institute of Health and Human Development, 2015; CREW, 2015; Gaventa & Barrett, 2010). The Centre for Disease Control (1997) defines community engagement as:

- The process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the well-being of those people.
- It is a powerful vehicle for bringing about environmental and behavioral change.
- It often involves partnerships and coalitions that help mobilize resources and influence systems, change relationships among

2 Babiker, M., et al. (2018), 'Annex I: Glossary', in: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways', Intergovernmental Panel on Climate Change, accessed on 18th October 2021

3 U.S. Environmental Protection Agency, 'Particulate Matter (PM) Basics', EPA, accessed on 20th October 2021

4 C.Penard -Morand and I. Annesi – Maesano (2004), 'Air Pollution: from sources of emission to health effects', Breathe, Volume I Issue No. 2, ERS Journal

partners, and serve as catalysts for changing policies, programs, and practices.

Examples of community engagement practices can be found in health service provision, education strategies, housing services, local economic development, planning policy and review, digital innovation and is often a requirement for area regeneration strategies (Institute of Health and Human Development, 2015).

Community engagement can allow a focus (in terms of goals, activities and budgets) on mobilising communities, where the issues to be addressed are self-identified. It is also an instrumental or integrated approach, whereby engagement or mobilisation methodologies are incorporated to accomplish a program in a participatory and empowering manner (UNICEF, 2020). Four levels of community engagement are typically identified, these include informing, consulting, collaborating and empowering:

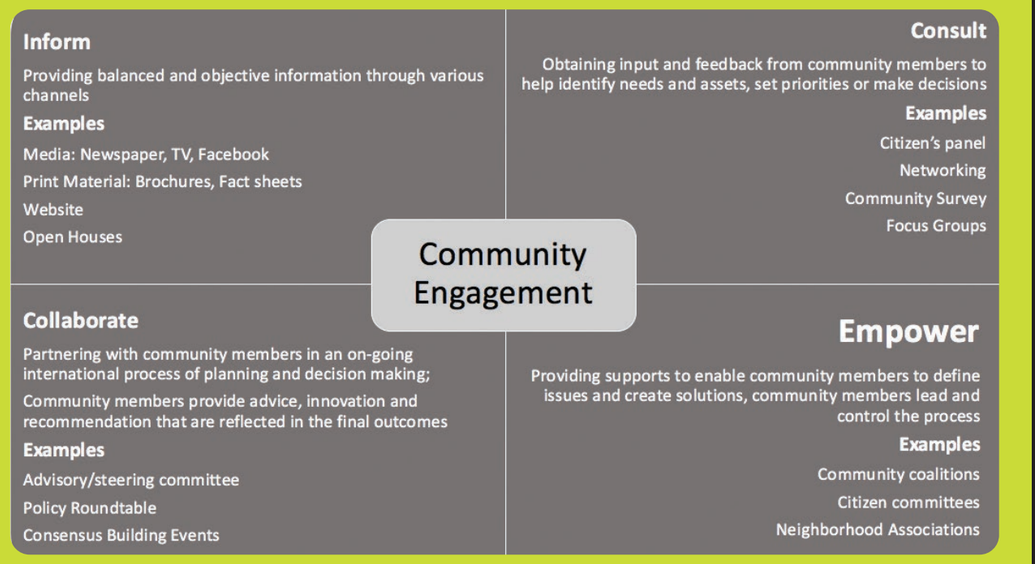



Figure 1: Community Engagement Methods Based on Varied Levels of Participation

There exists a broad consensus that community engagement is a necessary means of achieving long-term and sustainable outcomes, processes, relationships, discourses, decision-making and implementation grounded in community needs.

# What is an Air Quality Index?

According to Central Pollution Control Board (CPCB), an Air Quality Index is an overall scheme that transforms weighted values of individual air pollution related parameters ($SO_2$, CO, visibility, etc.) into a single number or set of numbers. Specifically, it establishes the relationship between human exposure, health effects, and air quality.

PM is a good indicator of air quality, as it is the air pollutant with the greatest capacity to affect human health. It is therefore one of the most widely used indicators of air pollution in the world. Particles can be of different sizes and are measured in microns (um) in diameter. The most harmful to humans are $PM_{10}$ (with a diameter of less than 10 um) and $PM_{2.5}$ (with a diameter of less than 2.5 um).

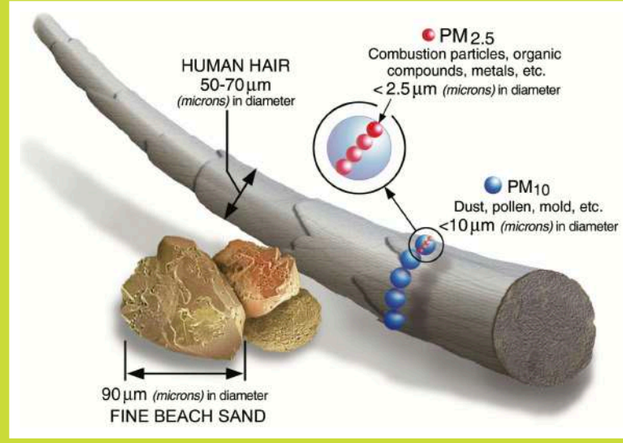



Figure 2: Particulate Matter
Source: Particulate Matter Basics. United States Environmental Protection Agency

An Air Quality Index (AQI) is used by government agencies to communicate to the public, the current air pollution levels or the forecast for air pollution. Public health risks increase as the AQI rises. Different countries have their own air quality indices, corresponding to different national air quality standards.[5] It is also important to note that the AQI range differs from country to country, depending upon the various pollutants and time frames (annual or 24 hours).

The higher the AQI value, the greater the level of air pollution and the greater the health concern.

# HOW IS AQI COMPUTED ?

Computation of the AQI requires an air pollutant concentration over a specified averaging period, obtained from an air monitor or model. Concentration and time are the two deciding factors that indicate the level of air pollution. Health effects corresponding to a given level are established by epidemiological research. Air pollutants vary in potency, and the function/formulae/ calculations used to convert air pollutant concentration levels to AQI varies by pollutant.

| AQI Range | Category | Associated Health Impact |
|---|---|---|
| 0 - 50 | Good | Minimal Impact |
| 51 - 100 | Satisfactory | Minor breathing discomfort to sensitive people |
| 101 - 200 | Moderately Polluted | May cause breathing discomfort to people with lung diseases such as asthma and discomfort to people with heart diseases |
| 201 - 300 | Poor | May cause breathing discomfort to people on prolonged exposure and discomfort to people with heart diseases |
| 301 - 400 | Very Poor | May cause respiratory illness to the people on prolonged exposure. Effect may be pronounced in people with lung and heart diseases |
| 401 - 500 | Severe | May cause respiratory effects even on healthy people and serious health impacts on people with lung/ heart diseases. The health impacts can be experienced even during light physical activity |

Figure 3 Air Quality Index: India CPCB

5 American Lung Association (2020), what is the Air Quality Index? accessed on 20th October 2021



**Here's where and how you can check the Air Quality in your city.**

There are various websites through which you can check the Air Quality in your city and your area.

To understand this better, you can visit the Central Pollution Control Board (CPCB) website at: **https://app.cpcbccr.com/AQI_India/** or

- Visit the CPCB website by using this link: **https://cpcb.nic.in/**
- Click on the Environmental Data tab followed by the Air Quality Data tab and then by the Automatic Monitoring Data tab.
- On this page, you will be able to see the active monitoring stations blinking in green color in your cities map.
- Click on advance search and download the data from your nearest monitoring station.

You can also download the SAFAR or VAYU apps or any other AQI apps that may provide air quality data for your area. One can also search for air quality levels in their cities by looking for city specific air quality data.


Figure 4: VAYU Application

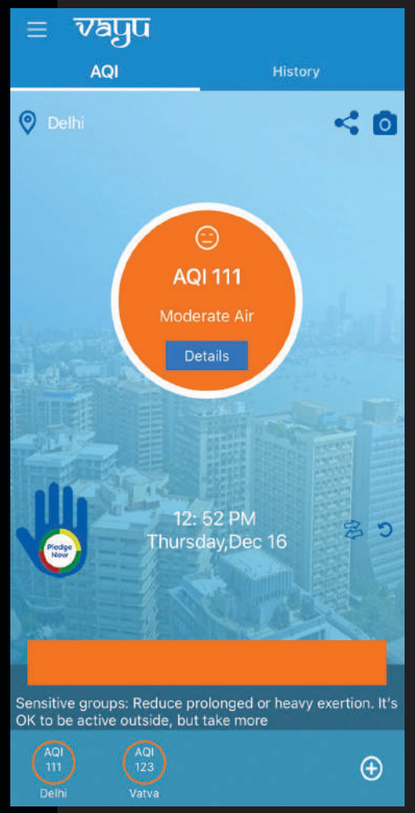




Figure 5: SAFAR Application

**THE MOBILE APPLICATION FOR VAYU CAN BE DOWNLOADED:**

**PLAY STORE: HTTPS://PLAY.GOOGLE.COM/STORE/APPS/DETAILS?ID=COM.CLEANAIRASIAINDIA**

**APP STORE (IPHONE): HTTPS://APPS.APPLE.COM/US/APP/VAYU/ID1508112358?LS=1**

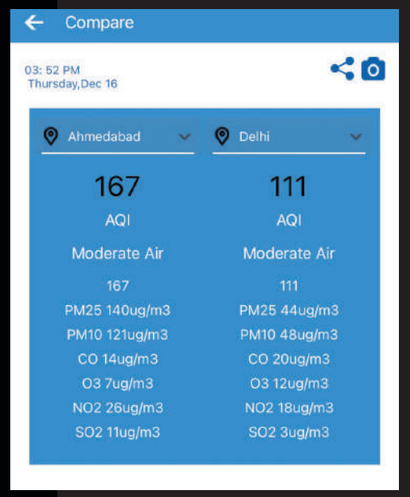



Figure 6: Vayu App Interface



**SECTION QUIZ**

- WHAT DOES AQI STAND FOR?
- WHAT RELATIONSHIPS DO AQI EXPLORE?
- WHAT ARE THE COMMON CATEGORIES LISTED BY AN AQI?

| **Activity 1.1: How to observe your area's AQI?** | |
|---|---|
| **Time:** 1 Month | **No. of people:** Individual |
| **Learning Objective:** You will have an understanding of the Air Quality levels variations in your area as well as adjoining areas according to the Air Quality Index (AQI). | |
| **Material needed**: Pen, Internet Access, Notebook | |
| **Method:** You can either create a calendar or use a readymade calendar to mark the daily AQI level as per the colour coding of the index. Note down the Air Quality of your area for a month. This will help you to understand whether the Air Quality in your area is good or poor. Based on this information you can make modifications in your home/lifestyle which will help you improve the air quality inside your home and in your area. | |

# 2. WHAT ARE THE SOURCES OF POLLUTION?

We are all aware that almost all major sources of emissions are anthropogenic in nature. A number of studies have analysed air pollutant concentration data for major metropolitan cities like Delhi and major pollutants highlighted are PM, nitrogen dioxides ($NO_x$) and sulphur dioxides ($SO_x$) with other pollutants showing peaks at different times of the year. In many urban areas, air pollutant concentration routinely exceed National Ambient Air Quality Standards (NAAQS) set by India's Central Pollution Control Board (CPCB). Emission Inventory Assessments (EIA) of major cities reveal that vehicular and industrial sources are the principal emitters, followed by domestic sources. The quality of the air depends on the amount of pollutants, the rate at which they are released from various sources and how quickly the pollutants are deposited or dispersed.

Transport, road side re-suspended dust, unpaved road dust, construction activity and industrial emissions are the major contributors of air pollution at a hotspot. For residential hotspots, biomass burning should also be taken into account.

Vehicle exhaust produces many air pollutants including un-burnt hydrocarbons, carbon monoxide (CO), nitrogen oxide ($NO_x$) and lead oxides. Vehicular emission is the major culprit behind smog (smoke + fog) in cities during winters.

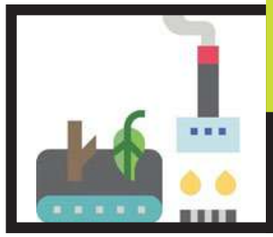
A number of industries cause air pollution due to unplanned growth, use of outdated technologies and lack of policies to control pollution. From mineral, metallurgy, oil refining, cement, brick kilns, electricity to waste management and several manufacturing/producing plants are responsible for emitting huge amounts of harmful substances including air pollutants.

Construction work emits airborne pollutants. The most common impacts are dust soiling and increased ambient $PM_{10}$ concentrations due to dust arising from on-site activities.

Dust is the most common pollutant generated by different activities. Vehicular emission, industrial pollution and construction activities are responsible for generating dust which settles down as unpaved road dust and dust particles are known to play a major role in air pollution issues.

Biomass burning is the burning of living and dead vegetation. It includes the human-initiated burning of vegetation for land clearing and land-use change as well as natural, lightning-induced fires.

Waste or garbage burning produces a lot of smoke and toxic substances. All these pollutants are released into air that is close to ground level, where they are easily inhaled.



## DID YOU KNOW?

**SCIENTISTS ESTIMATE THAT HUMANS ARE RESPONSIBLE FOR ABOUT 90% OF BIOMASS BURNING**

# 3. WHO IS VULNERABLE TO AIR POLLUTION?

The effects of air pollution on human health are well documented in a range of epidemiological studies; exposure may increase the risk of lung cancer, heart disease, bronchitis and other cardiorespiratory conditions (Kelly & Fussell, 2015). The economic cost of this health loss is also significant, the World Bank estimates that globally in 2013 air pollution led to an estimated $5.11 trillion in welfare losses, and $225 billion in lost labour income (World Bank & IHME, 2016). The World Bank concludes that air pollution "is not just a health risk but also a drag on development by causing illness and premature death, air pollution reduces the quality of life. By causing a loss of productive labour, it also reduces incomes" (IBID: 2).

**YOUNG CHILDREN, PREGNANT WOMEN, OLDER ADULTS AND PEOPLE WITH ASTHMA OR OTHER RESPIRATORY AILMENTS ARE ESPECIALLY SENSITIVE TO ITS EFFECTS.**

## WHO IS MOST IMPACTED BY THE ENVIRONMENT

Environmental impacts on health are uneven across age and mostly affect the poor.

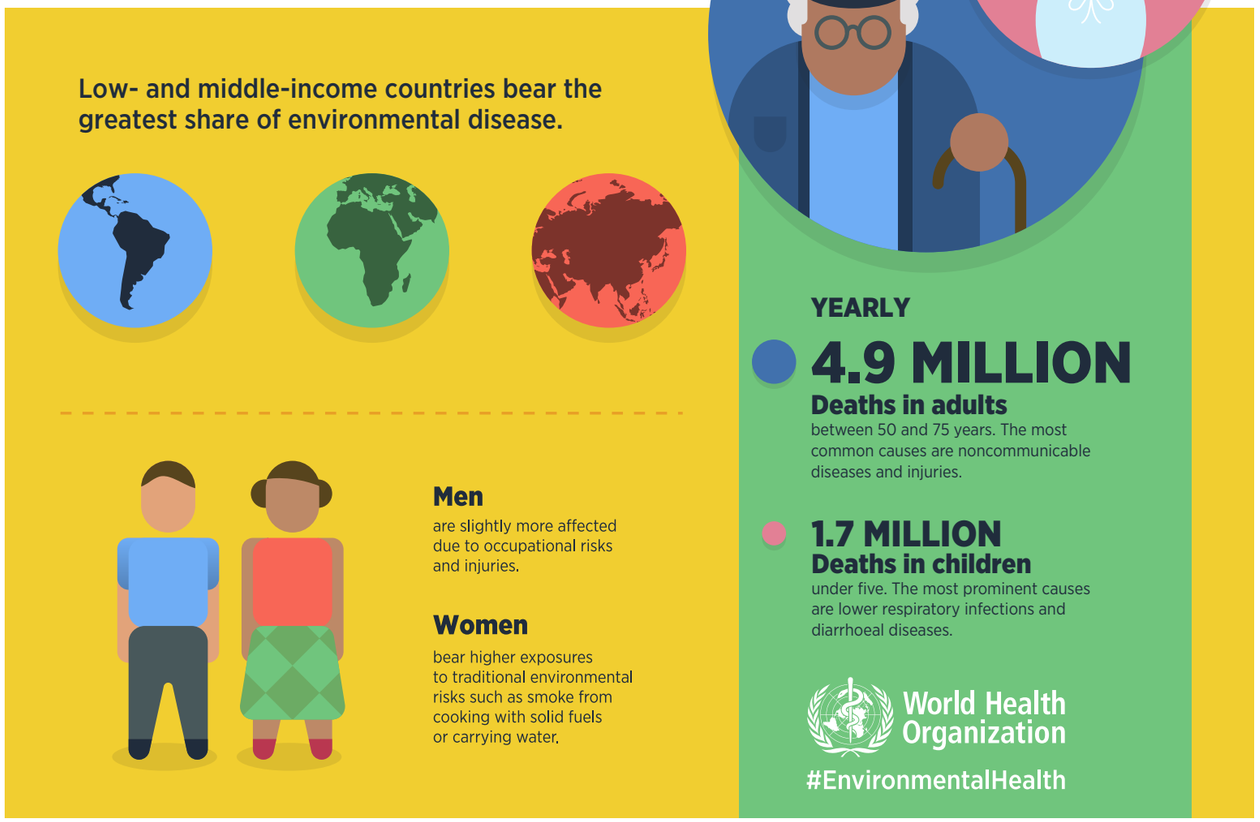



Figure 7: Most Impacted by the Environment
Source : World Health Organisation

Whilst these headline figures are alarming, they tend to gloss over the disproportionate impact of poor air quality on certain populations, locations and occupations. Common approaches to assessing the impact of air pollution have tended to assume an equal vulnerability, sensitivity or susceptibility to air pollution (Stilianakis, 2015). This assumption masks differences in exposure and risk across populations, locations and occupations with air quality in cities varying both spatially and temporally (Kathuria & Khan, 2007). Although average changes in risk associated with exposure to air pollution are considered small, some individuals or groups can be considered more vulnerable or susceptible than others.

**POPULATION:** Air pollution is considered to impact on all groups especially when exposed over prolonged periods of time. However, some groups are considered to be more susceptible than others when considering exposure. Further to this, different pollutants may affect groups in different ways. WHO considers as vulnerable groups; young children, the elderly, persons with certain underlying diseases, foetuses, groups exposed to other toxicants that interact with air pollutants and those with low socio-economic status (WHO, 2004).

**LOCATION:** There are a number of factors that may increase an individual's exposure to air pollution including time-activity patterns, modes of transport, recreational activities and pivotally, proximity to sources of air pollution whether major roads or polluting industries etc. Despite this acknowledgment, risk assessment studies often ignore within city variations of air pollutants. Low-income populations often reside in areas likely to

increase exposure to air pollutants – notably in locations of high pollution and low quality housing e.g. proximity to high traffic areas or factories. Studies that have included socio-economic factors have identified poor and less affluent population groups as most exposed to environmental risk in their place of residence (WHO, 2010).

**OCCUPATION:** Despite a growing body of evidence of the health impacts of exposure to air pollution, particularly on the cardiovascular system, relatively little attention has been given to the effects of occupational exposures (Fang et al., 2010). Exposure to air pollution can also result from occupational factors (e.g. outdoor work) and exposure to high concentrations of certain air pollutants. Certain types of work (e.g. in transport or construction) may lead to higher exposure (Rotko et al., 2000). Further examples of hazardous work can include those who live on waste dumps and make a living from sorting and selling waste products. The presence of hazardous waste and the smoke from burning of waste is considered to pose serious health risks (SIDA, N.D).

### SECTION QUIZ

- WHAT ARE KEY SOURCES OF AIR POLLUTION?
- WHAT IS SMOG?
- WHAT IS BIOMASS BURNING AND HOW MUCH ARE HUMANS RESPONSIBLE FOR THIS?

# 4. WHAT IS AN AIR POLLUTION HOTSPOT?

Air pollution hotspots are defined as places or localized areas with high concentrations of a pollutant or number of pollutants much higher than background concentration in particular region (Kumar, 2017) leading to increased negative health effects.

An air pollution hotspot can be a local, regional or continental phenomenon. They are also source specific, time specific and pollutant specific. When we observe high levels of air pollution in a particular area, it comes under the local category, whereas severely polluted regions are categorized as regional hotspots. But when we see it at country level, this becomes continental. In India, many metropolitan cities have been shown to have high levels of pollution and can thus be categorised as air pollution hotspots.

**CPCB AND DPCC HAD IDENTIFIED 13 AIR POLLUTION HOTSPOTS IN DELHI IN 2019. AS OF 2020 – 2021, DELHI GOVT. IDENTIFIED 150 AIR POLLUTION HOTSPOTS IN DELHI!!**

Pollutant dynamics differ and are extremely complex in areas with distinct geographical conditions. Emissions from various sources react through atmospheric transport processes and chemical transformations that involve a wide range of spatial and temporal variations. (Borge et al., 2014). Air pollution in Indian metropolitan cities is caused mainly by industry, vehicular traffic, secondary aerosols along with garbage burning, dust pollution from construction which contribute significantly. As these activities don't take place uniformly throughout the area, local hotspot regions are created.

### THE GREAT SMOG OF DELHI

In November 2017, the levels of Particulate matters $PM_{2.5}$ and $PM_{10}$ particulate matter hit 999 micrograms per cubic meter spiking air pollution in Delhi beyond acceptable levels.
The government was compelled to issue a health advisory as Delhi reached its worst air quality level since 1999 and several immediate strict measures were taken by the government.

Respiratory and Cardiovascular cases spiked at the time as health complications were aggravated in the residents of Delhi. The whole city became a hotspot at that time.

### SECTION QUIZ

- WHAT IS AN AIR POLLUTION HOTSPOT?
- HOW MANY AIR POLLUTION HOTSPOTS WERE IDENTIFIED BY THE CPCB AND DPCC IN 2020/21?
- WHEN WAS THE GREAT SMOG OF DELHI?

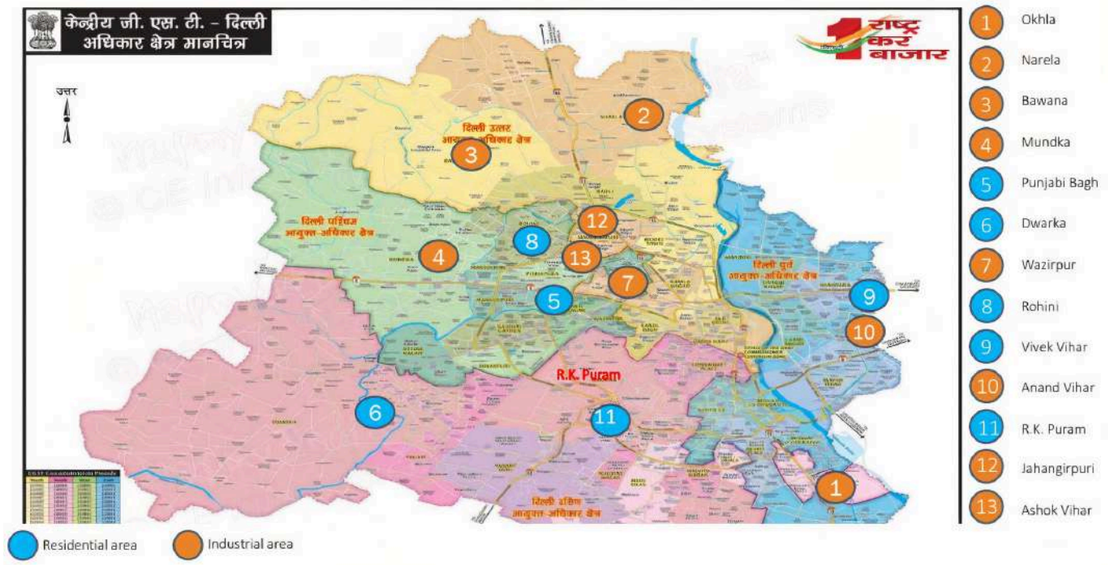



Figure 8: Hot spots in Delhi – DPCC, 2018
source: https://www.dpcc.delhigovt.nic.in/uploads/sitedata/hotspot.pdf



## Activity 4.1: Is your neighbourhood an Air Pollution hot spot?

**Time:** 1 Month (30 -31 days) | **No. of people:** Individual/Group (4 to 5 students per group)

**Learning Objective:** This activity will help you determine whether your residential locality is an Air Pollution Hotspot

**Material needed**: Pen, Internet Access, Notebook

**Method:** You will do this by comparing your location's air quality data to the prescribed standard values of air pollutants. This exercise will be done by collecting air quality data for a period of 1 month before analysing the collected data.

To obtain the air pollutants data for your locality, download the hour wise average data for $PM_{10}$ and $PM_{2.5}$ daily for 1 month from the CPCB website. You can use the following data download link for this purpose.

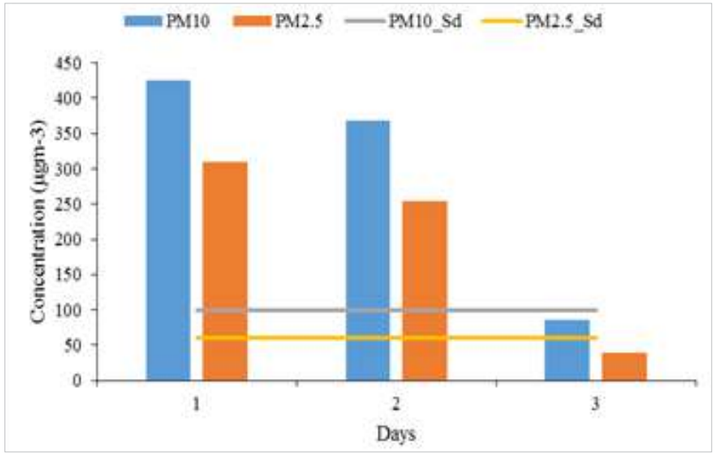
https://app.cpcbccr.com/ccr/#/caaqm-dashboard/caaqm-landing/data.

**Procedure:** After downloading the data follow these stepwise instructions:

1. Take daily average of AQI by using this formula

$$\text{Month Average} = \frac{(t_1+t_2+t_3+\ldots t_n)}{(30/31)}$$

2. Once you have completed recording the data, you will have 30 or 31 readings for a month
3. Compare your average data value with the standard value. If your data value is higher than the standard value for about 15 days out of 30 days, you can consider the area as an Air Pollution Hotspot. For example, in Figure you can see that the pollutant concentration on the 3rd day is low compared to the standard pollutant values. You can plot your collected data in a similar manner on a graph and count the number of days which show low concentration when compared with the standard pollutant value.



# 5. HOW TO IDENTIFY AN AIR POLLUTION HOTSPOT?

The challenge of identifying air pollution hot spots relates to defining the area where you will be conducting your study. In general, air pollution hotspots are identified by monitoring the air quality of that area over a period of time i.e., by real time screening of air quality and comparing the data with reference data or the permissible limits of pollutants set by the Pollution Control Board (or PCB). This approach identifies the hotspot depending on whether or not the standards are met, and what is the shortfall. Studies have been conducted where researchers have analysed data ranging from two months to a year to identify air pollution hotspots. Scientifically, it is challenging and expensive to identify exact pinpoint sources and areas where air quality is worst.

**STATUS OF INSTALLED CAAQMS**
**TOTAL NUMBER OF STATIONS INSTALLED - 309***

**STATUS OF MAAQMS UNDER NAMP**
**TOTAL NUMBER OF STATIONS INSTALLED - 793**

Source: Central Pollution Control Board

* As of August 2021

## DO YOU KNOW?

**BEING EXPOSED TO AIR POLLUTION OVER A LONG PERIOD OF TIME CAN CHANGE OUR STRUCTURE AND LOWER OUR ABILITY TO DO WELL IN SCHOOL AND FOCUS DURING EXAMS**

Ambient air concentration of pollution is currently monitored by Continuous Ambient Air Quality Monitoring Stations (CAAQMS). In Delhi, these stationary monitoring stations are operated and maintained by the Delhi Pollution Control Committee (DPCC) and Central Pollution Control Board (CPCB).

**A STATIONARY MONITORING SYSTEM IS A FIXED TYPE OF MONITORING STATION, WHICH BASICALLY MEANS THAT IT CANNOT BE MOVED FREQUENTLY FROM ONE AREA TO ANOTHER.**



# HOW TO MONITOR AIR QUALITY?

Monitoring air quality plays an important role, and allows stakeholders to analyse the various aspects of air quality data that provide an insight into indoor and outdoor air pollution.

There are various websites, mobile applications and methods through which information about Air Quality Indices (AQI) can be noted, measured and monitored. We have mentioned a few monitoring Applications in Section 1.1. There are other applications and websites such as AirVisual, Breezo, Plume, etc. which can be downloaded to mobile phones through Play Store (Android) and Apple App Store (iOS).


Figure 9: World's Air Pollution

Source: https://waqi.info/


Figure 10: Plume Air Quality

Figure 11: AirVisual Application

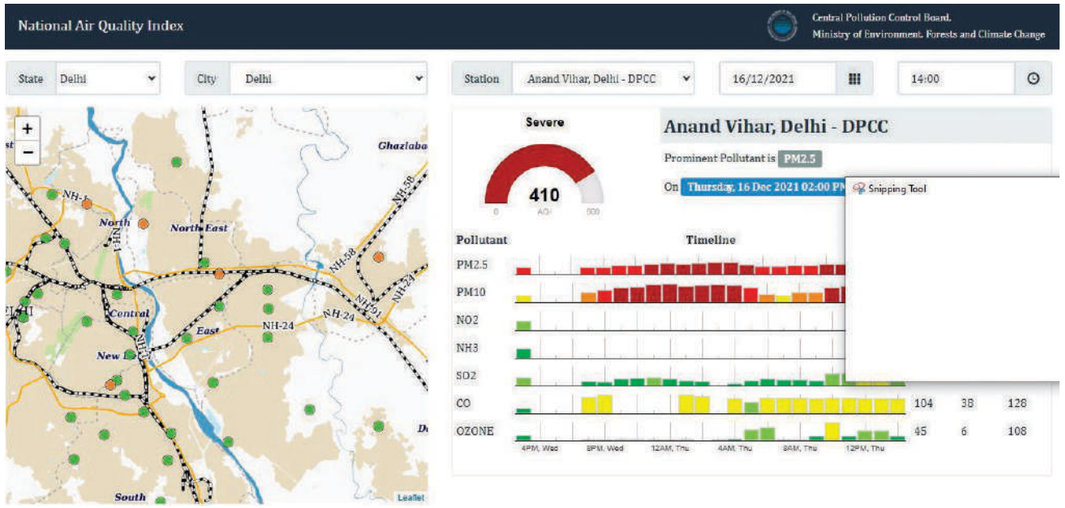



Figure 12: CPCB - National Air Quality Index

Source: https://app.cpcbccr.com/AQI_India/

| **Activity 5.1: How to monitor Air Quality on your own?** | |
|---|---|
| **Time:** Fortnightly or Monthly | **No. of people:** Individual/Group (4 to 5 students per group) |
| **Learning Objective:** Youth will have a better understanding of the major air pollutants ($PM_{2.5}$ or $PM_{10}$, $NO_X$, $SO_X$, $SO_2$, CO etc.). This activity will also help them to understand how to use an Air Quality Index. | |
| **Material needed**: Smartphone, Laptop/Computer, Pen and Notebook | |
| **Method:**<br>• Record the Air Quality for a period of 15 days or one month as illustrated below – or one month using website/app.<br>• Once you have noted down all these details, you will be able to identify the location which is polluted the most and the peak time of pollution.<br>• After the location is identified the next step is to identify the primary source of pollution which is contributing the most to AQI. | |

Format for recording the data:

| **Name:** XYZ | | | |
|---|---|---|---|
| **Date** | **Time** | **Location** | **Air Quality Index** |
| 05/10/2021 | 10:00am | Colony Gate | 103 µg/m$^3$ |
| 06/10/2021 | 1:00 pm | Market Place | 230 µg/m$^3$ |



# HOW CAN YOU IDENTIFY A POLLUTION SOURCE?

Monitoring air pollution aids in the identification of the major pollutant in a given area. Once we have identified the major pollutants, we also need to identify the sources of these pollutants. The following provide a few activities which will help you in identifying pollutant sources.

| **Activity 5.2: Idling Survey** | |
|---|---|
| **Time:** 10 Days | **No. of people:** Individual/Group (4 to 5 students per group) |
| **Learning Objective:** This exercise will tell you the contribution of your personal vehicle to emissions as compared to the chosen public transport. | |
| **Material needed**: Hardcopy of the survey sheet, a watch/timer, pen | |
| **Method:**<br>1. Assign the following roles in your groups:<br>• **Observer** – Spots and Identifies vehicles<br>• **Time Keeper** – Checks how long the vehicles are left idling<br>• **Record Keeper** – Records the number of idling and non-idling vehicles<br>2. Fill the survey sheet below based on the data collected.<br>3. This activity should be repeated twice (morning and afternoon) total of 30-minutes, which should be divided into 2 observation sessions of 15 minutes each.<br>4. Ideally, the survey should be carried out 15 minutes at the start of the day and at the end of the day. | |

| **Sessions** | **Start Time** | **End Time** | **Number of vehicles idling** | **Approximate time of idling** | **Total number of vehicles** |
|---|---|---|---|---|---|
| Morning | | | | | |
| Afternoon | | | | | |

"IDLING" REFERS TO RUNNING A VEHICLE'S ENGINE WHEN IT'S NOT MOVING, SUCH AS WHEN YOU'RE AT A RED LIGHT OR STUCK IN TRAFFIC. IDLING IS PART OF THE PROCESS OF DRIVING A CAR AND IS A FAIRLY COMMON OCCURRENCE FOR MOST DRIVERS. HOWEVER, IDLING MAY NOT BE THE BEST THING FOR YOUR CAR, FUEL CONSUMPTION, OR THE ENVIRONMENT.

**Activity 5.3: Monitoring ambient temperatures of vehicle free zone road network areas and roads which have high vehicular flow**

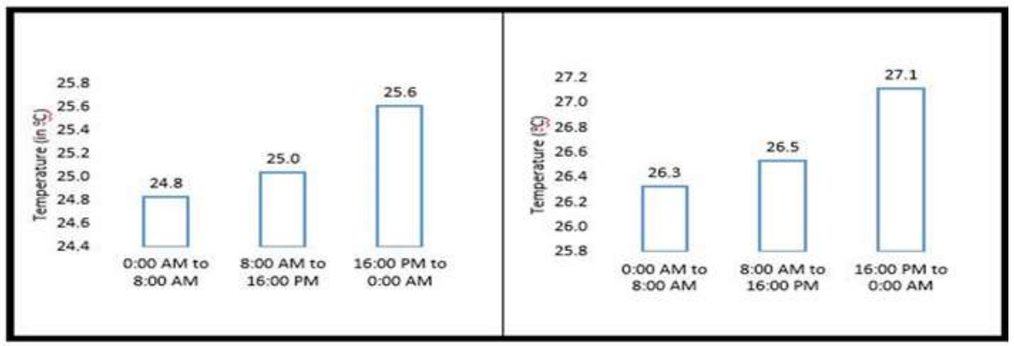
| | |
|---|---|
| **Time:** 10 Days | **No. of people:** Individual/Group (4 to 5 students per group) |

**Learning Objective:** This is a practical technique to promote the idea of using alternate modes of transport and persuade people around you to utilize bicycles/ e-vehicles as a green mode of transportation.

**Material needed**: Laptop, Internet

**Method:** In this exercise, you will monitor ambient temperatures of vehicle free zone road network areas and roads which have high vehicular flow. You can download the data from the nearest real time air pollution monitoring station of the CPCB. You can use the following link to download the required data: https://app.cpcbccr.com/ccr/#/caaqm-dashboard/caaqm-landing/data.

You can exhibit your data by plotting it in a graph as shown below. (The information in this diagram is provided just as an illustration to show the differences between two zones.)




**Activity 5.4: How you can identify the hotspot for activities related to emission source in your locations**

| | |
|---|---|
| **Time:** 10 Days | **No. of people:** Individual/Group (4 to 5 students per group) |

**Learning Objective:** Youth will understand the different kind of sources which contribute to the air pollution in their location.

**Material needed**: Pen, Notebook



**Method:**

**Home location**

1. Frequent traffic congestion
   - Choose a busy road around your home location.
   - Choose any time of the day e.g., morning (8-10 AM), afternoon (12-2 PM) or evening (4-6 PM) for monitoring this busy road.
   - Observe and note down the time when one side of the road is completely occupied with vehicles and they are moving slowly. Make a note of how many times there is congestion on this road and what is the duration of these congestions in the observing 2-hour period.
2. Visible plume (black color of plume) of chimney, Diesel Generator sets
   Select a 1 km stretch of the road or mark the 1km×1km square location in your area. Once you have selected the area, visit all the buildings within this area and count the total number of DG sets present in them. Simultaneously, note down the place information. – this line is unclear
3. Frequent garbage dumping or biomass burning activities
   Select an area of 1km×1km taking your home as the center point. Conduct a field visit in the morning or evening time in your selected area grid. Count the visible number of open garbage dumping sites around the residential blocks and near the major and minor road. Write down the latitude and longitude of major garbage dumping locations.


**Travel location**

1. Identify and mark locations having high vehicle congestions in your daily travel road.
   - Choose the route that you take most frequently to travel to work/ school/ college/ study center on a daily basis.
   - Count the number and duration of vehicular congestions on this route, while you are doing your daily commute. You can use google maps along with the screen recorder to count the number of vehicular congestions and their durations.
   - Make a note of these and mark the locations of these roadblocks on your map.

**Work location**

You can follow the same activities presented for identifying air pollution around your home location. The same can be applied for a, b and c points below.

a. Frequently traffic congestion occurred
b. Within 1 kilometer radius, visible plume of chimney, DG sets
c. Frequent garbage dumping and waste burning activities near your work location.

# Community Mapping

Community mapping by youth is the process where by a community collectively map an area in support of a particular objective. It is about mapping by the community for the community often using relatively informal processes.

Youth Community mapping is often undertaken to support assessment of how to make communities safer. The process facilitates an assessment of the unique needs, assets, and perspectives within each community. Youth community mapping is also an important step which ensures that local youth perspectives and ideas are at the centre of these initiatives.

Along with creating a clear picture of the physical landscape of communities, community mapping combines this with an understanding of the social, economic, and security landscape in communities. At the heart of these processes is a form of collaboration with younger members of the community to answer questions like "What sources of air pollution originate in my community?", "Are there specific groups that may be more vulnerable than others to exposure?" and "Are there specific factors that impede air pollution action?"

**Lessons from past experiences of community mapping include:**

### Every community is unique.

While many of them face similar challenges, no two communities are the same. Each community faces unique challenges and have their unique assets that can be leveraged to reduce their vulnerability. By getting to know a community, its members, and its situation, we can collectively work more effectively to address a range of challenges.

### It's important to identify community needs with communities.

Community members know their community best. It's important to ensure that community members, lead community mapping processes. Through Community Mapping, local leaders' can be empowered with tools to address challenges.

### Collaboration is key to success.

Community mapping provides an opportunity to collaborate with communities, and to draw on peoples understanding of their community and to unite around a shared goal. This helps reinforce the importance of working together, across differences and helps ensure that the voices of communities are heard.



**Activity 5.5: Is your area and its population vulnerable to air pollution?**

| | |
|---|---|
| **Time:** 1 Day | **No. of people:** Individual/Group (4 to 5 students per group) |

**Learning Objective:** This activity will draw on data collected previously and combine it with an assessment of your area specific vulnerabilities. This activity is intended to provide an indicative sense of the relative impact of sources of air pollution on your area, the pollutants that are a particular concern and the presence of vulnerable groups in your community who may be particularly adversely affected.

**Material needed**: Data collected previously, Google Maps

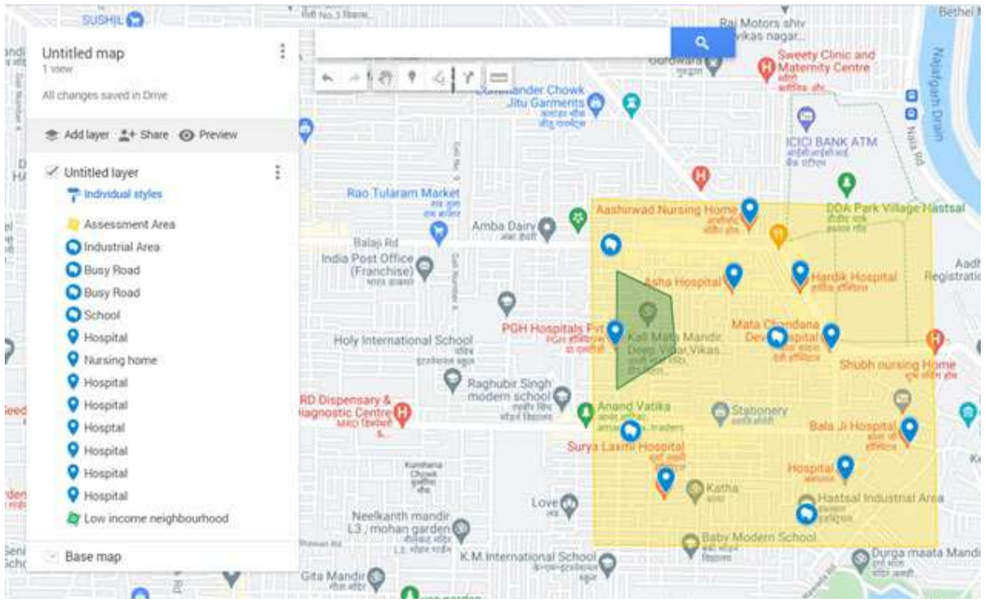
**Method:**

1. Access Google Maps (https://www.google.com/maps/d/u/0/edit?hl=en&mid=1rEru_qB774z5DlB-wgnjo9nugsaeC3R2&ll=28.635009584373044%2C77.05238354999999&z=16)
2. Mark out your area using the **'draw a line'** function
3. Mark locations of industry, congested road junctions, agricultural activities, and areas where household fuel use is an issue using the **'add marker'** function. You can add photos and notes in the pop - up box.
4. Mark locations where particularly vulnerable groups may spend significant periods of time i.e. educational establishments, hospitals, nursing homes, low income areas. Use the **'add marker'** function. You can add photos and notes in the pop - up box.

Now that you have a generated an overview of the sources of air pollution in your local area as well as the presence of vulnerable groups, you can answer the following questions. Draw on past activities where appropriate.

| | | |
|---|---|---|
| Air pollution Sources<br><br>Are the following Major/ Moderate/Minor/Not at all sources of air pollution in your area?<br><br>You can indicate on the map, locations of sources of air pollution and upload pictures. | Industry (are industrial units present) | Major/Moderate/ Minor/Not at all |
| | Vehicle (are congested roads present) | Major/Moderate/ Minor/Not at all |
| | Agriculture (are agricultural activities undertaken) | Major/Moderate/ Minor/Not at all |
| | Domestic Energy Use (are polluting fuels used in houses) | Major/Moderate/ Minor/Not at all |

| | | |
|---|---|---|
| Presence of Vulnerable Groups<br><br>Are the following present in your area<br><br>You can indicate on the map, industry, congested road junctions, agricultural activities, and areas where household fuel use is an issue | Younger People (presence of schools) | Yes/No |
| | Older People (presence of retirement homes) | Yes/No |
| | Disadvantaged Groups / Poorer Groups (presence of low income neighbourhoods / informal settlements) | Yes/No |
| | Those with health issues (presence of hospitals) | Yes/No |
| Ambient air pollution levels<br><br>Does the collected data indicate exceedances of daily limits | $PM_{10}$ (24hr limit 100) | Yes/No |
| | $PM_{2.5}$ (24hr limit 60) | Yes/No |
| | Pb (24hr limit 1) | Yes/No |
| | $SO_2$ (24hr limit 80) | Yes/No |
| | $NO_2$ (24hr limit 80) | Yes/No |




# Reporting

Through the above activities we have learned how to monitor air quality, identify the main source of pollution and highlight major pollutants in your area. Now that we have this information, the next step is to report these findings.

**Reporting is one of the ways to make the authorities aware of any violation which is taking place in your area which is leading to air pollution.**

Importantly, if you notice any violation of clean air legislation e.g. the open burning of leaves or garbage, etc. you should immediately report it to the relevant authorities e.g. Residential Welfare Association, Municipal Department, Ward Management etc. Further to this, there are many social media applications which can be downloaded where citizens can register grievances. One such mobile application is the Government of Delhi's **Green Delhi App**.

'**Green Delhi**' is a mobile application for residents to help control air pollution activities in the city. The app lets people register complaints against activities such as waste burning, dust emissions from construction work, polluting vehicles and industrial pollution etc.

How to use this App:

1. Download the Green Delhi App from Google Play Store
2. Enter your Mobile Number – You will receive an OTP.
3. Once you enter the OTP you will be redirected to the landing page where you will be able to see the status of your complaints (resolved or pending).
4. To register a new complaint, you can choose the "Register Complaints" option and you will be taken to a form page where you can upload a photo/video of any violation and register the complaint.

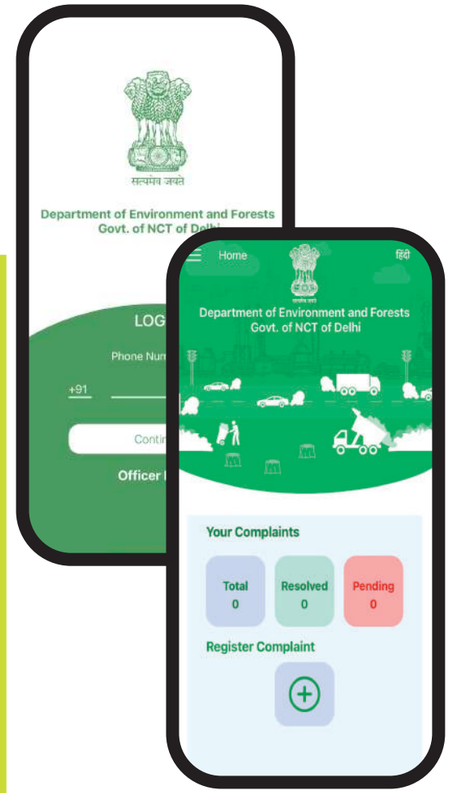



Figure 13: Green Delhi App

# 6. HOW WILL YOU ENGAGE OTHERS?

Your juniors always look upto you as role models and flag bearers of change. They tend to find a leader and idol in you. This will be a good opportunity for you to engage with your younger generation and help them understand what is air pollution, identifying the various pollutants and how will it affect/impact them.

You are aware that children are one of the groups that is worst affected by poor air quality, but they are also our hope for a cleaner, better future. Awareness raising programs inform children about the harmful effects of pollution. They also strengthen the popular demand for positive change. Awareness also plays a key factor in motivating children to drive action.  Youth can help the children through activity based learning to help understand what is air pollution and in what ways can it affect them.

| **Activity 6.1: Clean the Dirt** | |
|---|---|
| **Time:** 15 Minutes | **No. of people:** Group of 3 to 4 Students |
| **Learning Objective:** Understanding the impact of air pollution. Students will realize that the dirt they see around them and the dust they feel on their faces while they are in the playground or in the parking lot waiting for their buses is nothing but a result of air pollution. | |
| **Material needed**: Wet wipes/Damp Cloth | |
| **Method:**<br>1. Go outside on a field trip around the playground, parking lot and roadside area.<br>2. Take a damp cloth or wet wipe to wipe one surface. Each student should wipe a different surface.<br>3. On your return to the classroom, share your experiences with the group. Show your classmates the cloth and tell them what object/ surface you wiped.<br>4. Understand that dirt in the air makes objects and surfaces dirty. It can also make it difficult to breathe.<br>5. This activity can also be carried out inside the classroom. | |

**DISCUSSION POINTS:**
- **WHAT DID YOU OBSERVE?**
- **WHICH IS THE PLACE THAT HAD MOST DIRT?**
- **HOW DO YOU FEEL ABOUT THE AIR AROUND YOU?**
- **WHAT ARE THE POSSIBLE SOURCES OF POLLUTION IN THE AREAS YOU VISITED?**



| **Activity 6.2: Catch the Pollutant** | |
|---|---|
| **Time:** 30 Minutes | **No. of people:** 25 to 30 (5 students in each group) |
| **Learning Objective:** Understanding the sources of air pollution in everyday lives. Students will be able to relate the sources of air pollution better by attempting to capture the dirt and dust in their surroundings. | |
| **Material needed**: White disposable plate, colour pencils, petroleum jelly, hole punch/ punching machine and shoe lace. | |
| **Method:**<br>1. Take the white plate and draw a picture representing your idea of a 'clean earth' on one side.<br>2. Make two holes on one side of the plate using a hole puncher/punching machine and insert the shoe lace in the holes you created.<br>3. Apply a generous amount of petroleum jelly all over on the other side.<br>4. Hang it on trees or pillars in places like playgrounds and areas facing towards the road in the school campus.<br>5. Take care of it – make sure it is protected from rain or storm for one month.<br>6. Bring it back to the classroom after a month or so and discuss the observations. | |

| **Activity 6.3: Air Colours** | |
|---|---|
| **Time:** 15 Minutes | **No. of people:** 25 to 30 |
| **Learning Objective:** Relating everyday activities to air pollution. We are often unaware of how our everyday activities contribute to air pollution. The purpose of this activity is to make students aware of air pollution that we possibly create in our daily lives. | |
| **Material needed**: A cup of clean water, water colours and paint brush | |

**Method:**
1. Take the cup of water to represent clean air.
2. Add drops of colours to the cup to represent different types of air pollutants caused by the everyday activities based on the table below:

| | |
|---|---|
| | Pollutants from power plants and industrial processes ($CO$, $NO_2$, $PM_{10}$, $PM_{2.5}$, $SO_2$, VOCs) |
| | Pollutants from household activities ($CO$, $NO_2$, $PM_{10}$, $PM_{2.5}$, $SO_2$) |
| | Pollutants from cars, motorcycles, buses, auto rickshaws, and trucks ($CO$, $NO_2$, $PM_{10}$, $PM_{2.5}$, $SO_2$, VOCs) |
| | Pollutants from construction activities ($CO$, $NO_2$, $PM_{10}$, $PM_{2.5}$, $SO_2$, VOCs) |

**DISCUSSION POINTS:**

**LOOK INSIDE THE CUP AND DISCUSS THE FOLLOWING QUESTIONS:**

- **IF AIR POLLUTION AROUND YOU WAS THIS APPARENT, WOULD YOU WANT TO BREATHE THE AIR?**
- **WHAT ARE THE SOURCES OF AIR POLLUTION, BEYOND THOSE MENTIONED IN THE ACTIVITY BEING PRODUCED IN A SINGLE DAY?**
- **WHAT COULD YOU DO TO REDUCE THE NUMBER OF POLLUTANTS RELEASED EACH DAY?**

# 7. DO YOUR BIT. KNOW YOUR ROLE

Nowadays, the importance of air quality monitoring has been recognised. Many of you are either living in metro cities or tier II[6] or III cities. Every city needs clean air to sustain the healthy life of inhabitants. Your elders may have complained about asthma, burning of eyes, and other respiratory diseases. You might have felt these symptoms as well, especially while travelling during peak travel hours, spending time in particularly polluted areas and during festivals like Diwali. Air pollution is also influenced by the time of year, for example the winter season brings new and increased episodes of air pollution. We need to have good quality air not just for our health, but also to support the economic development of our cities and regions as well as to meet national climate change goals.

As mentioned earlier, air pollution can be overcome and controlled and you can help.

6 See Annexure I

**SIMPLY FIND ANSWERS TO THESE 2 QUESTIONS FOR YOUR CITY:**

- **DOES YOUR CITY FALL UNDER THE MONITORING OF THE NATIONAL CLEAN AIR PROGRAM (NCAP)?**
- **DOES YOUR CITY HAVE CLEAN AIR ACTION PLANS (CAAP) FOR MITIGATION OF POLLUTION LEVELS?**

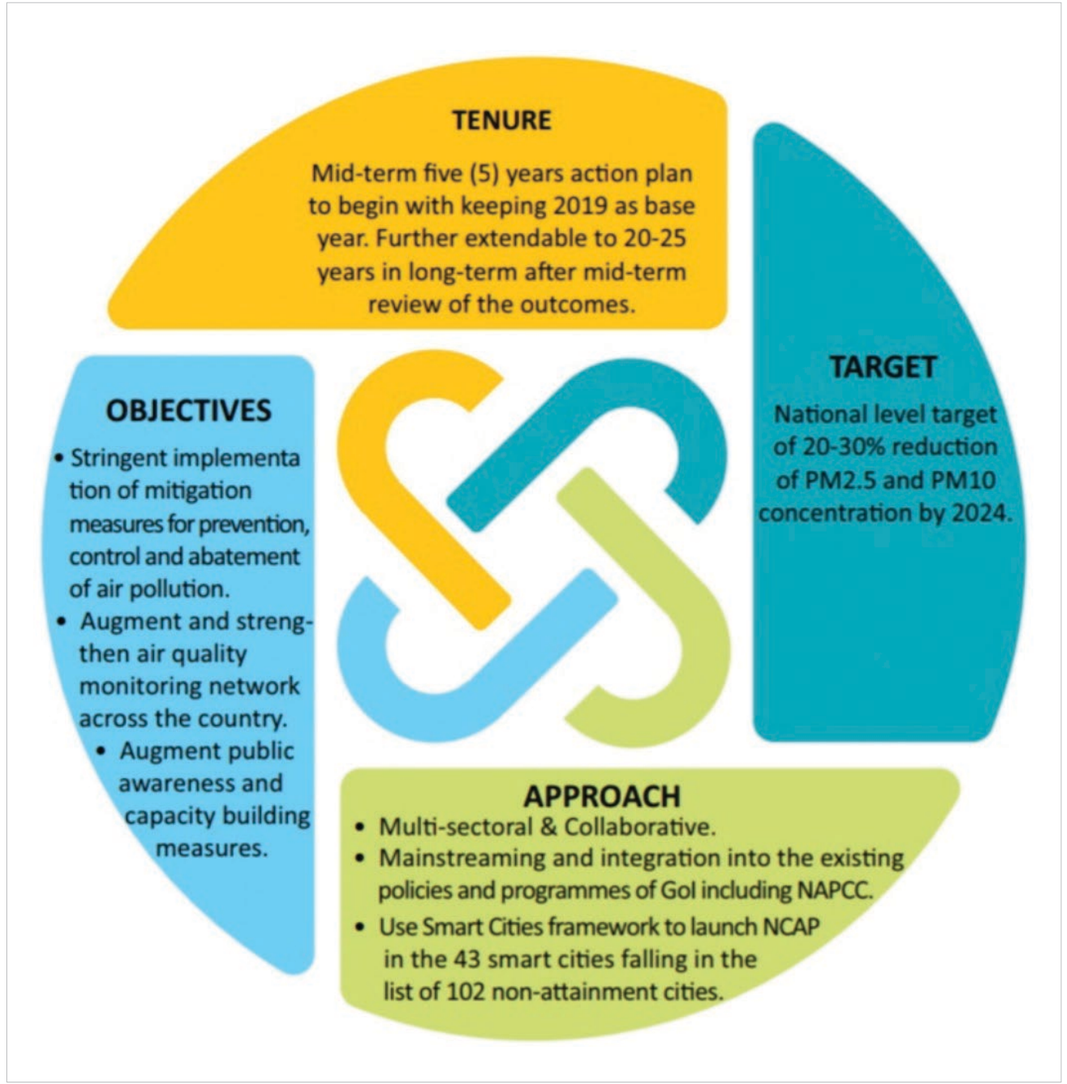



Figure 14: National Clean Air Programme Overview

You will be surprised by your findings and the policies and initiatives in place to combat air pollution. Another thing that you can do is become more observant about those activities that you and your peers are responsible for or can influence that may contribute to air pollution. Those activities may be in your home or outside. It is important to be aware of these activities and devise ways in which these can be checked or curbed to reduce air pollution. Try to correlate air pollution trends with the change of fuel in your community. Once you have identified the primary sources, relating that to the secondary sources will help provide a substantial amount of data with limited resources and a short available time-frame.

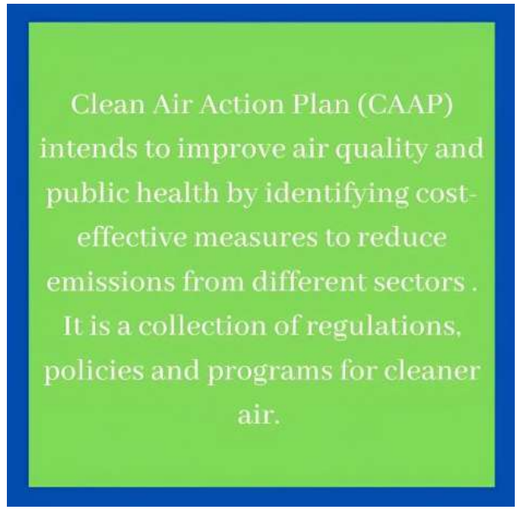



Figure 15: Clean Air Action Plan

# 8. EXPERIENCES FROM AROUND THE GLOBE

## Case Study 1: Air Pollution Youth Mappers Programme in Mongolia

Adolescents from two selected districts of the capital, Ulaanbaatar, are actively involved in addressing air pollution through data collection that aims to document the adverse effects of air pollution levels in the city.[7] In 2019, 75 adolescents from 25 high schools volunteered as community researchers.

The programme was a collective effort where the Scout Association of Mongolia managed implementation; the school administrators oversaw activities and supported logistics; high school staff (mainly teachers and social workers) facilitated and supported the youth mappers teams; and youth volunteers and Scout rovers led the teams after receiving training on how to do so.

In the programme, the information and skills the youth mappers learned included:

- Sources of air pollution for their community comes from and its harmful effects on health, cognitive development, education, etc.;
- What are the global guidelines and plans to reduce air pollution, and how this is applied in Mongolia;
- How to protect themselves, their peers, and families from adverse effects of air pollution;
- How to measure air pollution levels in their communities using simple air quality monitors provided by UNICEF Mongolia to note pollution indexes and log results in and outside of school premises (monitors include the Laser Egg and IQair pollution monitors);
- How to develop team strategy plans that respond to their ideas for reducing air pollution, including how to set goals and objectives, identify possible obstacles, and share their ideas; and
- How to do digital mapping, photography, and blogging for enhanced communication to raise awareness and advocacy influence.

More than 1,000 adolescents learned about air pollution at the Mongolian National Scouts Jamboree in mid-2019.

7 UNICEF (2020), Adolescents take action to mitigate and alleviate the harmful effects of air pollution in Mongolia and Vietnam, UNICEF Adolescent Development and Participation, accessed on 20th October 2021

CASE STUDY 2

**Case Study 2: Youth offer innovative ideas to achieve clean air in Vietnam**

One of the adolescent consultations towards developing the school action plan took place through UNICEF Viet Nam's collaboration with the NGO Clean Air Asia and the Saigon Innovation Hub (SIHUB), which led to the establishment of the New Solutions to Air Pollution innovation initiative.



CASE STUDY 2

Through idea- and solution-generating activities, 110 adolescents from the six innovation hubs first learned about the adverse effects of air pollution at community and school levels. They then shared their learnings with an estimated 4,500 peers and community members through various awareness raising activities and channels, including social media.[8] The six innovation hub teams also spent two months developing and testing solutions and prototypes to address concerns related to air pollution. They pitched these at a Clean Air Day event that was attended by more than 100 participants, including representatives from UNICEF, academia, educational institutes, artists, private sector, government agencies, and children and adolescents. The purpose of the pitches was to receive feedback on the solutions and potential implementation of them, and to discuss how all the various stakeholders participating in the event could commit and contribute to addressing the adverse effects of air pollution in their communities.

The solutions and prototypes pitched by the adolescents included developing a filter to clean the smoke discharged from chimneys at restaurants and street vendors around the school; promoting the installation of air quality monitoring devices in and around schools; and advocating for clean energy public transportation and traffic behaviour change (i.e., using bicycles or walking instead of scooters and cars), and air quality warning systems. The six innovation hub teams received hands-on trainings, coaching and mentorships during the co-creation, testing, and piloting phases of their ideas.

8 UNICEF (2020), Adolescents take action to mitigate and alleviate the harmful effects of air pollution in Mongolia and Vietnam, UNICEF Adolescent Development and Participation, accessed on 20th October 2021

CASE STUDY 3

Clean Air Asia India's Youth for Clean Air Network (YCAN) volunteers in Nagpur started a 'Turn it off campaign' in collaboration with Fridays for Future. They created awareness against idling at traffic signals and vehicular pollution. They campaigned at prominent traffic spots in Nagpur as there is heavy traffic during peak hours. From 6PM to 7PM, volunteers promotes information about air pollution awareness by holding up posters on idling vehicular pollution and wearing pollution masks. The visible impact was seen as many people turned their engines off (especially 2- Wheelers) after seeing this at the red light signals.

**CASE STUDY 3: TURN IT OFF CAMPAIGN IN NAGPUR, INDIA**



# 9. ADDITIONAL ACTIVITIES

**Activity 9.1: Challenges and opportunities in increasing public transport usage (Survey)**

| | |
|---|---|
| **Time:** 3 hrs | **No. of people:** 10 |

**Learning Objective:** To understand the challenges and opportunities regarding usage of public transport.

**Material needed**: Pen, Survey form

**Method:**

1. Divide yourselves into groups of 2.
2. Divide areas based on number of teams and size of area.
3. While conducting survey make sure that demographic scenario is considered for the survey justifies the output.
4. Fill the survey sheet below based on the data collected.
5. Once survey is complete, data can be added to an excel file for further analysis.

In this exercise, youth will carry out an extensive survey in their respective areas to identify challenges and opportunities for increasing public transport usage. This survey will provide detailed insights into how to increase usage of public transport. Using public transport like the metro train and city buses is a good alternatives to using private vehicles and help reduce vehicular traffic and air pollution.

**Survey Demography**

1. Age:
2. Gender:
3. Occupation:
4. What is the approximate annual income of your household?
   - Less the Rs. 50,000
   - Rs. 50,000 to Rs. 2,00,000
   - Rs. 2,00,000 to Rs. 5,00,000
   - More than 5,00,000
5. How frequently you use public transport:
   - Once in a month
   - Once in a week
   - More than once in a week
   - Everyday
6. Challenges/hindrance to using public transport?
7. Opportunity/suggestions to improve public transport?

## Activity 9.2: Reducing Vehicle Idling through communication strategy (Flyer)

**Time:** 90 minutes | **No. of people:** 15

**Learning Objective:** Eliminating/reducing vehicle idling

Areas where major vehicle idling was observed can be visited by youth teams to spread positive messaging using flyers/posters. Youth efforts to give positive messages will create a huge impact in reducing air pollution.

**Material needed**: Watch, Pen

**Method:**

1. Divide yourself into groups of 4 -5 people.
2. Create posters/flyers with positive message related to vehicle idling.
3. Based on assessment of previous activity teams, identify places where vehicle idling is prominent.
4. Show/convey positive message regarding vehicle idling by using the posters/flyers.
5. This activity should be conducted for a 30-minute session in the morning, afternoon and evening at an interval (During red traffic signal) (preferably during peak hours) – give more time specific periods.


Figure 16: No Idling - Stock Photos, www.istockphoto.com



## Activity 9.3: Pledge for Clean Fuel

**Time:** 60 minutes | **No. of people:** 20 to 25

**Learning Objective:** Promoting clean fuel in neighbourhood area

To promote clean fuel in neighbourhood area, taking a pledge in that direction can create a sense of responsibility towards the environment. Youth team can engage people through the use of pledge cards for sensitising them to use clean fuel wherever possible to create a clean neighbourhood.

**Material needed**: Pledge card, Note, Pen

**Method:**

1. Divide yourself into groups of 4 – 5 people
2. Create pledge card for clean neighbourhood.
3. Engage neighbourhood citizens through pledge cards about use of clean fuel.
4. Take pictures and upload them on social media with #cleanfuelforclleanneighbourhood.
5. This activity should be conducted for a 30 minutes session in the morning, and evening - more time specific details to be given

You can also take a Pledge on the VAYU App (Section 1.1) or Youth for Clean Air Website (www.youthforcleanair.com). You can share it with others around you and share it on social media and encourage them to take steps towards clean air.

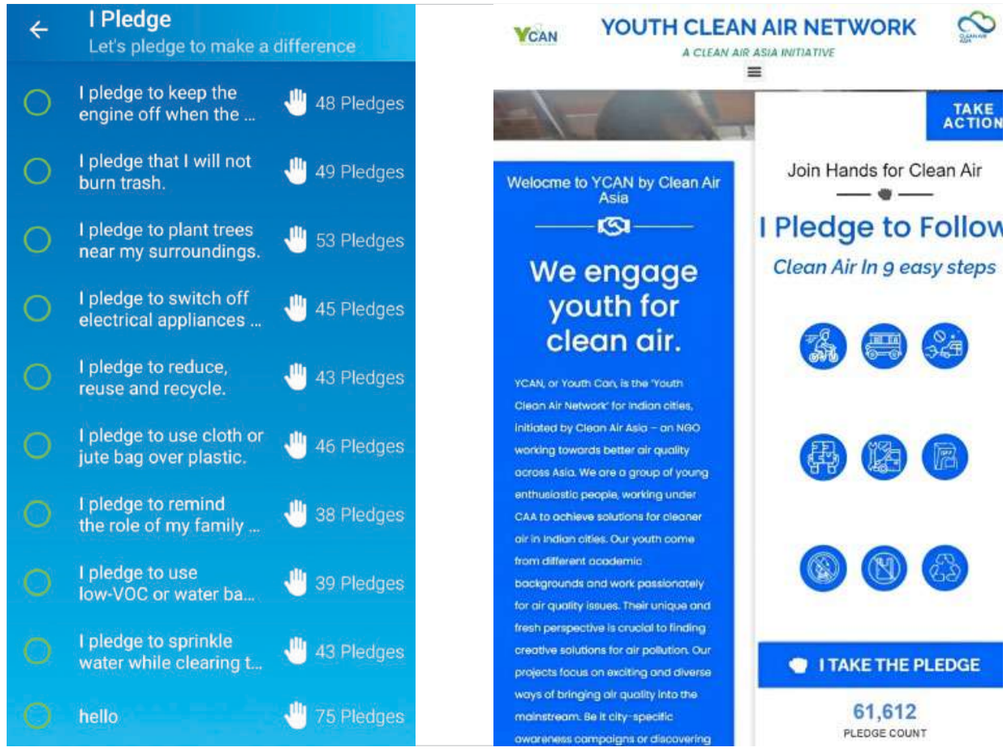



Figure 17: VAYU App Pledge

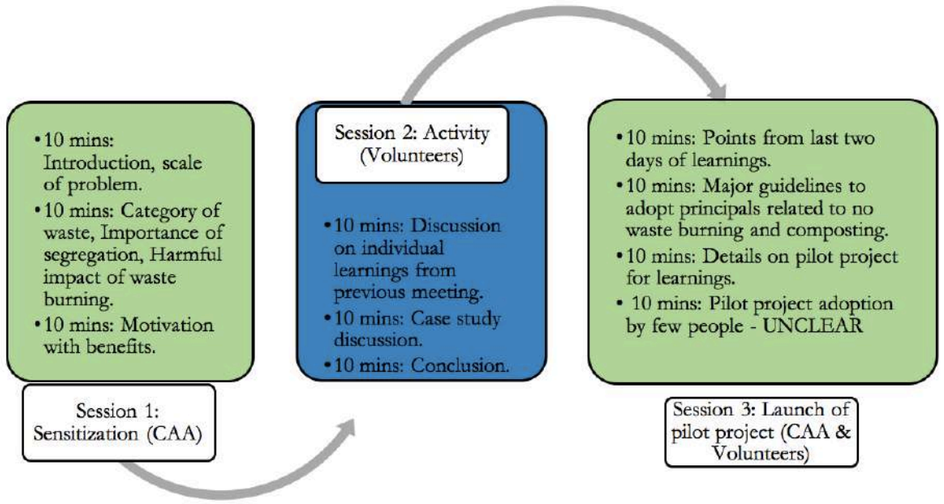
**INFORMATION, EDUCATION AND COMMUNICATION, ABBREVIATED AS IEC, IS A STRATEGY TO SPREAD AWARENESS THROUGH COMMUNICATION CHANNELS TO A TARGET AUDIENCE TO ACHIEVE A DESIRED POSITIVE RESULT.**

Figure 18: Information, Education and Communication
Role of IEC in Rural Development, https://www.thevisualhouse.in/blog/role-of-information-education-communication/

| **Activity 9.4: Information, Education & Communication (IEC) campaign to eliminate waste burning in neighbourhood area** | |
|---|---|
| **Time:** 90 minutes | **No. of people:** 15 |
| **Learning Objective:** IEC on eliminating waste burning, segregation and waste composting | |
| **Material needed**: Booklet/Powerpoint, 2 Dustbins, Chairs, Resource Material | |

**Method:**

1. Planning of IEC component: i) Training ii) Posters iii) Activities
2. Sensitize neighbourhood citizens for upcoming discussion/training programme by CAA and simultaneously start creating posters for the same.
3. Send in personal invitation for training program with circulation material.
4. Procure material required for training day.
5. Start awareness building activities at least 5 days in advance through the use of posters.
6. Training schedule to be prepared.
7. Monitoring: Once the IEC campaign is over, weekly assessment by volunteers and monthly assessment by representative from the CAA.
8. Over the period of time responsibility will be given to "Local Clean Air Champion" to conduct trainings and monitor the activities.






# 10. Reading Resources


What is Air Pollution?
World Health Organization. Air Pollution. https://www.who.int/health-topics/air-pollution#tab=tab_1

World Health Organization (2021). Household air pollution and health. WHO. https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health

World Health Organization (2021). Ambient (outdoor) air pollution. WHO. https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health

British Lung Foundation (nd). Types of air pollution. BLF. https://www.blf.org.uk/support-for-you/air-pollution/types

What is an Air Quality Index?
Central Pollution Control Board (??) National Air Quality Index. CPCB. https://app.cpcbccr.com/ccr_docs/FINAL-REPORT_AQI_.pdf

Central Pollution Control Board (2019). National Ambient Air Quality Status and Trends 2019. CPCB.

What are the sources of pollution?
WHO (nd.). Infographic: What are the sources of air pollution? WHO. https://www.euro.who.int/en/health-topics/environment-and-health/air-quality/news/news/2018/5/over-half-a-million-premature-deaths-annually-in-the-european-region-attributable-to-household-and-ambient-air-pollution/infographic-what-are-the-sources-of-air-pollution

Guttikunda, S. (2017). Air pollution in Indian cities:
Understanding the causes and the knowledge gaps. Centre for Policy Research. https://www.cprindia.org/news/air-pollution-indian-cities-understanding-causes-and-knowledge-gaps

Gurjar, B. (2021). Air Pollution in India: Major Issues and Challenges. The Energy and Resources Institute. https://www.teriin.org/article/air-pollution-india-major-issues-and-challenges

Who is vulnerable to air pollution?
Adger, W.N. (2006). Vulnerability. Global Environmental Change, 16(3), 268-281. https://www.geos.ed.ac.uk/~nabo/meetings/glthec/materials/simpson/GEC_sdarticle2.pdf

Avis, W. & Khaemba, W. (2018). Vulnerability and air pollution. ASAP-East Africa Rapid Literature Review. Birmingham, UK: University of Birmingham.
https://static1.squarespace.com/static/5a6b5aad12abd97ed4679071/t/5b0fe3cb2b6a282944ee1a22/1527768016134/ASAP+-+East+Africa+-+Vulnerability+and+air+pollution+Rapid+Lit+Review+Final.pdf

Fussell, H. (2007). Vulnerability: A generally applicable conceptual framework for CC research. Global Environmental Change 17(2): 155–167.
http://www.riesgoycambioclimatico.org/biblioteca/archivos/DC1089.pdf

Makri, A. & Stilianakis, N. (2008). Vulnerability to air pollution health effects. International journal of hygiene and environmental health, 211(3). 326-336.
https://ac.els-cdn.com/S1438463907000971/1-s2.0-S1438463907000971-main.pdf?_tid=2a5dbe26-c827-46b1-a4ca-aebad3e0d22e&acdnat=1524586130_5b887769b39e10e898c6b843daa8f98a

Stilianakis, N. (2015). Susceptibility and vulnerability to health effects of air pollution: The case of nitrogen dioxide. EU.
http://publications.jrc.ec.europa.eu/repository/bitstream/JRC98587/lb-na-27634-en-n%20.pdf

What is an Air Pollution Hotspot?
Avis, W. Weldetinsae, A. Getaneh, Z. and Singh, A. (2018). Air Pollution Exposure and Public Transport in Addis Ababa. ASAP-East Africa Vulnerability Scoping Study no. 4. Birmingham, UK: University of Birmingham.
https://static1.squarespace.com/static/5a6b5aad12abd97ed4679071/t/5e56a9810e338c4b7961ace4/1582737800552/ASAP+-+East+Africa+-+Vulnerability+Scoping+Study+-+Addis+Ababa+Public+Transport.pdf

Environmental Defense Fund (2019). Making the invisible visible: A guide for mapping hyperlocal air pollution to drive clean air action. EDF.
https://www.edf.org/sites/default/files/content/making-the-invisible-visible.pdf

How to Monitor Air Quality?
Avis, W. & Bartington, S. (2020). Monitoring Air Quality in Low Income and Lower Middle-Income Countries. K4D Helpdesk Report. Brighton, UK: Institute of Development Studies.
https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/15694/776_Monitoring_Air_Quality_in_Low_Income_and_Lower_Middle_Income_Countries.pdf?sequence=7&isAllowed=y



# ANNEXURE – I

## LIST OF TIER I AND TIER II CITIES

| Tier I | | | |
|---|---|---|---|
| Mumbai | Delhi | Kolkata | Chennai |
| Bengaluru | Hyderabad | Ahmedabad | Pune |

| Tier II & III | | | |
|---|---|---|---|
| Agra | Faridabad | Kolhapur | Salem |
| Ajmer | Firozabad | Kollam | Sangli |
| Aligarh | Ghaziabad | Kozhikode | Shimla |
| Amravati | Gorakhpur | Kurnool | Siliguri |
| Asansol | Gulbarga | Ludhiana | Solapur |
| Aurangabad | Guntur | Lucknow | Srinagar |
| Bareilly | Gwalior | Madurai | Surat |
| Belgaum | Gurugram | Malapurram | Thanjavur |
| Bhavnagar | Guwahati | Mathura | Thiruvananthapuram |
| Bhiwandi | Hamirpur | Mangalore | Thrissur |
| Bhopal | Hubli-Dharwad | Meerut | Tiruchirappalli |
| Bhubaneshwar | Indore | Moradabad | Tirunelveli |
| Bikaner | Jabalpur | Mysore | Tiruvannamalai |
| Bilaspur | Jaipur | Nagpur | Ujjain |
| Bokaro Steel City | Jalandhar | Nanded | Vijaypura |
| Chandigarh | Jalgaon | Nashik | Vadodara |
| Coimbatore | Jammu | Nellore | Varanasi |
| Cuttack | Jamnagar | Noida | Vasai Virar City |
| Dehradun | Jamshedpur | Patna | Vijayawada |
| Dhanbad | Jhansi | Puducherry | Visakhapatnam |
| Bhilai | Jodhpur | Purulia | Vellore |
| Durgapur | Kakinada | Prayagraj | Warangal |
| Erode | Kannur | Raipur | Rourkela |
| Karnal | Kanpur | Rajkot | Ratlam |
| Kochi | Ranchi | Rajamahendravaram | |

# ANNEXURE – I I

## LIST OF 132 NON-ATTAINMENT/ MILLION PLUS CITIES IN INDIA UNDER NCAP

| State | S.No. | City |
|---|---|---|
| Andhra Pradesh (13) | 1 | Guntur |
| | 2 | Kurnool |
| | 3 | Nellore |
| | 4 | Vijayawada |
| | 5 | Vishakhapatnam |
| | 6 | Anantapur |
| | 7 | Chitoor |
| | 8 | Eluru |
| | 9 | Kadapa |
| | 10 | Ongole |
| | 11 | Rajahmundry |
| | 12 | Srikakulam |
| | 13 | Vizianagaram |
| Assam (05) | 14 | Guwahati |
| | 15 | Nagaon |
| | 16 | Nalbari |
| | 17 | Sibsagar |
| | 18 | Silchar |
| Bihar (03) | 19 | Patna |
| | 20 | Gaya |
| | 21 | Muzaffarpur |
| Chandigarh (01) | 22 | Chandigarh |
| Chhattisgarh (03) | 23 | Bhilai |
| | 24 | Korba |
| | 25 | Raipur |
| Delhi (01) | 26 | Delhi |
| Gujarat (04) | 27 | Surat |
| | 28 | Ahmedabad |
| | 29 | Vadodara |
| | 30 | Rajkot* |
| Himachal Pradesh (7) | 31 | Baddi |
| | 32 | Damtal |
| | 33 | Kala Amb |
| | 34 | Nalagarh |
| | 35 | Paonta Sahib |
| | 36 | Parwanoo |
| | 37 | Sunder Nagar |
| Jammu & Kashmir (2) | 38 | Jammu |
| | 39 | Srinagar |
| Jharkhand (03) | 40 | Dhanbad |
| | 41 | Jamshedpur* |
| | 42 | Ranchi* |
| Karnataka (04) | 43 | Bangalore |
| | 44 | Devanagere |
| | 45 | Gulburga |
| | 46 | Hubli-Dharwad |
| Madhya Pradesh (07) | 47 | Bhopal |
| | 48 | Dewas |
| | 49 | Indore |
| | 50 | Sagar |
| | 51 | Ujjain |
| | 52 | Gwalior |
| | 53 | Jabalpur* |
| Maharashtra (19) | 54 | Akola |
| | 55 | Amravati |
| | 56 | Aurangabad |
| | 57 | Badlapur |
| | 58 | Chandrapur |
| | 59 | Jalgaon |
| | 60 | Jalna |
| | 61 | Kolhapur |
| | 62 | Latur |
| | 63 | Mumbai |
| | 64 | Nagpur |
| | 65 | Nashik |
| | 66 | Navi Mumbai |

| State | S.No. | City |
|---|---|---|
| Maharashtra (19) | 67 | Pune |
| | 68 | Sangli |
| | 69 | Solapur |
| | 70 | Ulhasnagar |
| | 71 | Thane |
| | 72 | Vasai-Virar* |
| Meghalaya (01) | 73 | Byrnihat |
| Nagaland (02) | 74 | Dimapur |
| | 75 | Kohima |
| Orissa (07) | 76 | Angul |
| | 77 | Balasore |
| | 78 | Bhubaneswar |
| | 79 | Cuttack |
| | 80 | Rourkela |
| | 81 | Talcher |
| | 82 | Kalinga Nagar |
| Punjab (09) | 83 | Dera Bassi |
| | 84 | Gobindgarh |
| | 85 | Jalandhar |
| | 86 | Khanna |
| | 87 | Ludhiana |
| | 88 | Naya Nangal |
| | 89 | Pathankot/Dera Baba |
| | 90 | Patiala |
| | 91 | Amritsar |
| Rajasthan (05) | 92 | Alwar |
| | 93 | Jaipur |
| | 94 | Jodhpur |
| | 95 | Kota |
| | 96 | Udaipur |
| Tamilnadu (04) | 97 | Thoothukudi |
| | 98 | Trichy |
| | 99 | Madurai |
| | 100 | Chennai* |
| Telangana (04) | 101 | Hyderabad |
| | 102 | Nalgonda |
| | 103 | Patancheruvu |
| | 104 | Sangareddy |



| State | S.No. | City |
|---|---|---|
| Uttar Pradesh (17) | 105 | Agra |
| | 106 | Allahabad |
| | 107 | Anpara |
| | 108 | Bareily |
| | 109 | Firozabad |
| | 110 | Gajraula |
| | 111 | Ghaziabad |
| | 112 | Jhansi |
| | 113 | Kanpur |
| | 114 | Khurja |
| | 115 | Lucknow |
| | 116 | Moradabad |
| Uttar Pradesh (17) | 117 | Noida |
| | 118 | Raebareli |
| | 119 | Varanasi |
| | 120 | Gorakhpur |
| | 121 | Meerut* |
| Uttarakhand (03) | 122 | Kashipur |
| | 123 | Rishikesh |
| | 124 | Dehradun |
| West Bengal (07) | 125 | Kolkata |
| | 126 | Asansol |
| | 127 | Barrackpore |
| | 128 | Durgapur |
| | 129 | Haldia |
| | 130 | Howrah |
| | 131 | Raniganj |
| Haryana (1) | 132 | Faridabad* |
| *Million plus cities but not part of non-attainment cities | | |

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# CLEARING THE AIR

## Engaging Youth in Hot Spot Action