

Effective Air Quality Communication For Indian Cities

Training Manual

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Train4CleanAir (T4CA)

Effective Air Quality Communication For Indian Cities

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INTRODUCTION

National Clean Air Programme (NCAP), launched in 2019, is India's flagship program for better air quality. NCAP designated 122 cities as non-attainment from 21 states and 2 union territories (Chandigarh and Delhi) based on the ambient monitoring data from the network operated by Central Pollution Control Board (CPCB). As of August 2021, the number of non-attainment cities has increased to 132. NCAP in its first round of activities aims to increase the capacity of the Pollution Control Boards both CPCB and SPCBs to measure, evaluate and manage air pollution. This includes improving capacity in preparation of an information baseline for emissions and assessment of source contributions, communication strategies to maintain and disseminate information, clean technology assessments and review, management development on inspection monitoring, awareness generation and designing strategies for air pollution mitigation.

Train for Clean Air (T4CA) is a regional training approach that aims to assist cities to create and implement Clean Air Plans (CAPs) and make informed policies and decisions. It includes standardized modular training courses customized for different stakeholders – decision-makers, technical staff, researchers, NGOs, and the media. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) in partnership with Clean Air Asia in 2008 developed T4CA modules for an international audience. Clean Air Asia has used these modules to conduct several trainings to build the capacity of officials and strengthening implementation and monitoring of clean air action plans of different cities of Asia.

Support to the National Clean Air Programme, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH under the Indo-German Development Cooperation and Bloomberg Philanthropies supported Clean Air Asia to develop five training manuals based on the T4CA manuals. Since the implementation of CAPs lies with the city, officials involved in the mitigation of air pollution need capacity development and could benefit through these manuals.

This manual titled Effective Air Quality Communication for Indian Cities is designed for a specific group of decision and policymakers whose functions encompass implementation of clean air strategies with specific focus on formulating an effective communication strategy to gain public support for improving air quality in a targeted area to create positive public opinion and participation in air quality management (AQM) program, clean air action implementation, championing air quality improvement and mitigation of climate change impacts and gaining support from national government agencies and development organizations for AQM.

The training manual shall support the decision-makers and strengthen their knowledge on air quality management and be able to make decisions on city development and help better air quality in India.

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Table of Abbreviations

AQ	Air Quality
AQI	Air Quality Index
AQS	Air Quality Standard
AQM	Air Quality Management
CAP	Comprehensive Action Plan
CO	Carbon Monoxide
CPCB	Central Pollution Control Board
EPCA	Environmental Pollution Control Authority
GRAP	Graded Response Action Plan
NCAP	National Clean Air Programme
NCR	National Capital Region
NGO	Non Governmental organisation
NH ₃	Ammonia
MoEF&CC	Ministry of Environment, Forest and Climate Change
O ₃	Ozone
Pb	Lead
PM	Particulate Matter
SO ₂	Sulphur dioxide
UNECE	United Nations Economic Commission for Europe
US	United States

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Effective Air Quality Communication For Indian Cities



Learning Objectives

Goal

This manual enables participants to formulate an effective communication strategy to gain public support for improving air quality in a targeted area and to create positive public opinion and participation in air quality management (AQM) programs. Key interventions required to improve public participation in implementing clean air action plans with the help of an effective communication strategy is highlighted in this manual.

Target Audience

This manual is aimed at officials whose functions encompass establishing a communication framework for effective air quality management (AQM) and improved public engagement for implementation of clean air action plans. It is designed to improve understanding of communication for championing air quality improvement and mitigation of climate change impacts, besides gaining support from various stakeholders for AQM.

Contents of the Manual

In the manual, *Effective Air Quality Communication for Indian Cities*, the participants will learn about the tools of communication, importance of stakeholder involvement and integrating communication strategies within air quality management plans. The manual contents include:

- The importance of communication strategy in air quality management
- Communication tools
- Communication to highlight impact of air pollution on human health
- Strategies for effective communication
- Multi-stakeholder and participatory approaches that drive air pollution management through communication plans

Objectives of the Manual

The manual can be used to support training around *Effective Air Quality Communication for Indian Cities*. With the help of this manual participants can

- Know the benefits of air quality management for improving public health, reducing social costs, and regional economic growth
- Evaluate the air quality and improvement strategies for an area considering various national/international standards and local needs
- Move from awareness to effective communication in AQM
- Formulate an effective communication strategy for public and major stakeholder engagement to improve air quality

1. Air Quality Management



Better air quality can only be achieved if all stakeholders are committed to reducing polluting air emissions. Raising awareness is therefore a key factor in air quality management as different stakeholder groups (e.g. citizens, medical professionals, industry and policy makers, etc.) can be both victims of air pollution and contributors to the problem.

Air quality (AQ) communication involves understanding the status of air quality, its sources and impact on human health. It actively uses data to raise awareness about air pollution issues, engaging people in dialogue, changing attitudes, and influencing behaviour.

Local government's management of the main sources of polluting emissions (e.g. industry, business and domestic, transport sectors), together with its role in urban planning, contribute to the state of regional and local air quality. The adoption of air pollution prevention and control measures will only be effective if the relevance and impact can be conveyed to those empowered to take action, and to those interested parties likely to be affected by the intervention. However, communicating air pollution prevention and control is complex. Careful consideration should be given to the target audience, the message that is being sent, and the communication channel used to deliver it.

1.1 Air Quality Management Framework

Air quality management (AQM) is the strategic framework within which air pollution can be addressed and air quality improved (Figure 1). It aims to maintain the quality of the air that protects human health and welfare but also provides protection to animals, plants (crops, forests, and natural vegetation), ecosystems, materials and aesthetics, such as natural levels of visibility. AQM is a tool which enables governmental authorities to set objectives to achieve and maintain clean air and reduce the impacts of air pollution on human health and the environment.

Governmental authorities in collaboration with other stakeholders can determine the individual steps of the implementation of this process according to:

- Local circumstances with respect to background concentrations of air pollutants and technological feasibility
- Cultural and social conditions; and
- Financial and human resources available

An effective AQM plan or strategy is dependent on data and information generated through actions in

and information on the status of air quality, air pollution sources and impacts on human health - data and information that are important content for AQ communications aimed at raising awareness of air pollution issues, engaging people in dialogue, changing attitudes, and influencing behaviour.



- Identify all major sources of air pollution caused due to human activities
- Facilitate the monitoring of air quality and effects on human health and environment
- Set appropriate objectives and targets for human and environmental health
- Set priorities for achieving objectives and targets
- Identify and establish appropriate policies, laws and regulations on air quality with climate co-benefits
- Establish an institutional structure and programme to implement policies and achieve objectives and targets
- Ensure compliance with emission and air quality standards
- Generate content for AO communication.

Air quality monitoring data provides valuable content for AQ communication, which aims to raise awareness of air pollution issues, engage people in dialogue, change attitudes, and influence behaviour. Air quality levels that exceed national ambient air quality standards and/or WHO health-based guideline values, help communicate the severity of the problem. One of the main challenges in AQM is to have timely

to: (i) protecting human health; (ii) developing related mitigation action; and (iii) raising awareness to increase political willingness and increase public participation. Air quality monitoring can also be used to calculate population exposure at risk of health impact (total and wide range of population at risk, type of pollutant and its intensity/concentration, etc.), to provide baseline or raw data as input to developing air quality improvement strategy/action plan/management and to define appropriate technology for mitigation.

The main objectives of an air quality monitoring programme are to:

- Determine status and trends of ambient air quality
- Ascertain whether the prescribed ambient air quality standards are exceeded
- Identify Non-Attainment Cities/areas
- Identify the potential sources of pollutants (source apportionment)
- Assess the effectiveness of air quality management strategies
- Obtain the knowledge and understanding necessary for developing preventive; and corrective measures, i.e., review/formulation of the AQM programme

A combination of real time Ambient Air Quality Monitoring Stations (AAQMS) and a large number of diffusive samplers are sufficient to monitor air pollution in a spatial, time-representative and cost-effective way. In addition to the local government air quality monitoring, self-monitoring by the polluters both for stack and ambient air must also be promoted.



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1.1.2 Sources of air pollution - emissions inventory

In order to understand the current state of air quality and to predict air pollution levels under various policy options, certain information is needed. This includes data on current pollutant emissions(emission inventories), atmospheric concentrations at different locations, meteorology and modelling future air pollutants.

Emissions Inventory is a comprehensive listing by air pollutant sources and emissions in a geographic area during a specific time period. An air pollutant emission inventory is a fundamental component of AQM. The aim of an emissions inventory is to :

- Quantify total emission (emission load) for certain pollutant in the city
- Quantify source contributions by sector so that appropriate policies can be developed; and
- Define option for control by developing control scenarios for policy action

In many cities, the transport sector is the main source of emissions of nitrogen oxides (NO_x),particulate matter (PM), carbon monoxide (CO), carbon dioxide (CO₂), sulphur dioxide (SO₂) and non-methane volatile organic compounds (VOCs). Since the transport sector also emits greenhouse gases (GHG), the emissions inventory can also include CO₂ and methane (CH₄). Figure 4 shows the contributions of different types of vehicles to the total emissions in Iloilo City (Philippines).

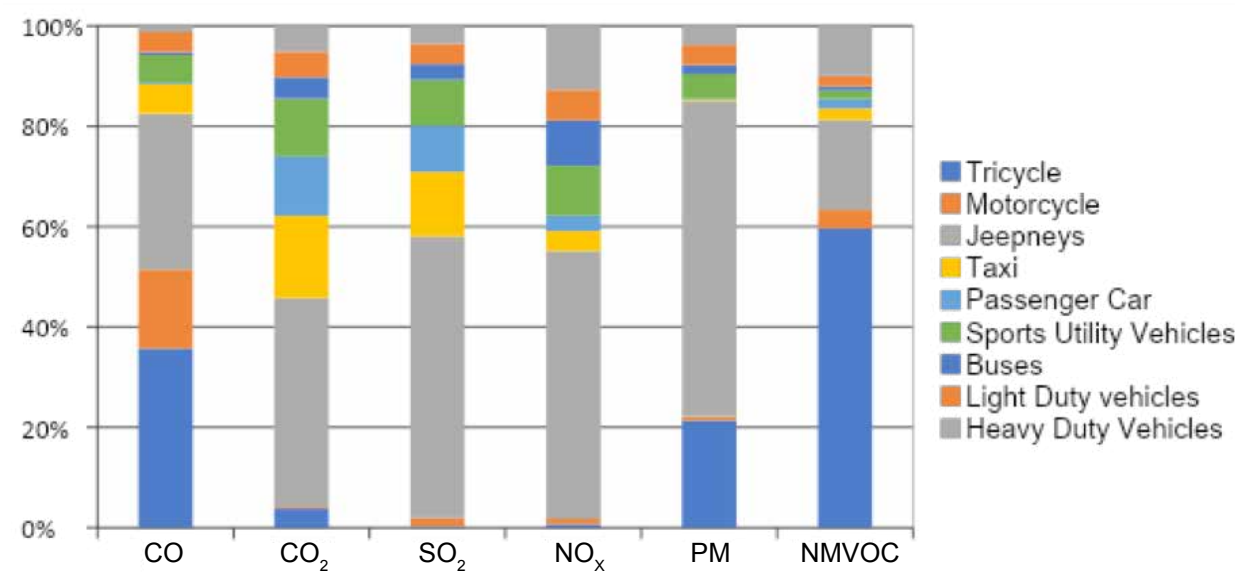


Figure 4: Road Emissions Percentage Breakdown by Vehicle Type in Iloilo City(Source: 2015 Iloilo EI Report of “Clean Air for Smaller Cities in the ASEAN Region”)

Inventories are also indirect indicators of overall air quality changes. Emission trend analysis helps to determine if air quality control programmes are successful. Uncertainty analyses can be used to identify areas for improvement in emission inventories. When regulations are established for facilities, the emission inventories need to be determined:

1. If regulations apply to a facility. The facility can use the emissions inventory to evaluate the expected impact of future actions (e.g. What if emission controls are added? What if operating hours were reduced? What if a different fuel source is substituted? etc.) or scenarios can be developed and tested in the inventory.

- Actual – best estimate of emissions over a time period; based on actual rates of production; assumes that control equipment is properly operating.
- Potential – maximum rate of release over a time period; based on maximum throughput of the equipment capacity.

2. If affected facilities comply with the regulations. Non-compliance with regulations may incur penalties, as specified in the regulations.

Emissions inventory is therefore an important step in AQM, because it identifies the type and concentration of emission from various sources so that appropriate action can be planned.

Compiling an emissions inventory typically includes the following steps:

1) Identify pollutant categories

Based on the air quality data of the city an emission inventory can identify: dominant parameters responsible for the deteriorating air quality; other pollutants (even though data is not available or limited); and secondary pollutants that might be formed in the atmosphere through photochemical reactions.

2) Compile activity data

Collection of information on the type and amount of emissions from all polluters/emitters in the area can be done by identifying:

- Industries (point source group)
- Data on size, and classification of vehicle fleet, total kilometres travelled (line source group)
- Estimate domestic fuel consumption and total organic waste (garbage) that is processed within the area or city
- Others including natural sources

In developing countries, it is difficult to derive the emissions inventory due to lack of complete data. In certain cases, the emissions can be calculated from the input of fuels.

3) Determine emission factors

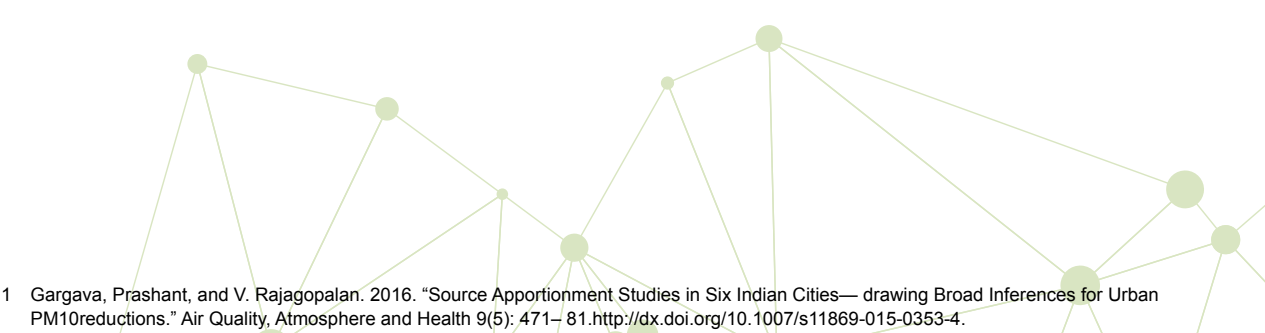
Emission factors help in quantifying pollution loads from various sources. Many countries use the factors developed by international agencies such as the United States Environmental Protection Agency (USEPA)(e.g. <http://www.naei.org.uk/emissions/> or <http://www.epa.gov/ttnchie1/ap42/>)

The sources of air pollutants can be either natural emission sources (e.g. volcanoes, dust storms, forest fires, living vegetation, and sea spray) or anthropogenic sources. Air pollutants are either emitted directly into the atmosphere from the pollution source (primary pollutants) or are produced when primary pollutants interact with other substances in the air (secondary pollutants). Vehicle exhaust, road dust, industries, domestic cooking, waste site emissions, construction activities are some of the major anthropogenic sources of high PM concentration in the ambient air. Brake and tyre wear are also important sources of trace metals in the air, and at heavy traffic locations, can be more toxic and significant than any other emissions.

In 2010, the Indian Central Pollution Control Board (CPCB) conducted a PM₁₀ (10µm or less in size) source apportionment study at six major cities in India. Table 1 presents the major air pollutant sources in Indian cities.

Table 1: Source contribution in % for Indian cities. Source: Gargava and Rajagopalan, 2016¹

Locations	Vehicles	Road dust	Domestic cooking	Industry	Diesel	Commercial genset	Construction fuel use	Other sources
Delhi	6.58	52.49	8.06	21.97	0.36	0.822	8.36	1.33
Kanpur	20.31	14.36	18.72	32.23	0.85	3.19	0.03	10.31
Mumbai	5.75	29.54	2.11	22.86	0	9.04	8.530	22.16
Chennai	14.42	72.68	0.27	1.99	0	0.72	8.89	0.99
Bangalore	41.17	20.03	3.30	14.33	6.61	0.18	14.15	0.18
Pune	18.29	61.14	7.18	1.238	0	3.127	4.427	4.58



¹ Gargava, Prashant, and V. Rajagopalan. 2016. "Source Apportionment Studies in Six Indian Cities— drawing Broad Inferences for Urban PM10reductions." Air Quality, Atmosphere and Health 9(5): 471– 81.<http://dx.doi.org/10.1007/s11869-015-0353-4>.

Table 2 provides examples air pollution prevention and control measures.

Table 2: Major Air Pollutants Management

Pollutant	Source	Prevention and Control
Ozone (O ₃)	Formed when volatile organic compounds (VOCs) and nitrogen oxides (NO _x) react in the presence of sunlight. Sources of VOCs include any source that burns fuels (e.g., gasoline, natural gas, wood, oil);solvents, petroleum processing and storage and pesticides	Reduce motor vehicle Reactive Organic Gas (ROG) and NO _x emission through emission standards, reformulated fuels, inspection program, and reduce vehicle use. Limit ROG emission from commercial operations and consumer products. Limit ROG and NO _x emission from industrial sources such as power plants and refineries. Conserve energy.
Respirable Particulate Matter (PM ₁₀)	Road dust, windblown dust, agriculture and construction, fireplace, also formed from other pollutants (acid rain, NO _x , sulphur oxides (SO _x), vorganics (VOC's)). Incomplete combustion of any fuel	Control dust sources, industrial particulate emissions, wood burning stoves and fireplaces. Reduce secondary pollutants which react to form PM ₁₀ , conserve energy.
Fine Particulate Matter (PM _{2.5})	Fuel combustion in motor vehicles, equipment and industrial sources, residential and agriculture burning. Also former from reaction of other pollutant (acid rain, NO _x , SO _x , organics)	Reduce combustion emissions from motor vehicles, equipment, industries and agricultural and residential burning. Precursor control, like those from O ₃ , reduce fine particle formation in the atmosphere
Carbon Monoxide (CO)	Any source that burns fuel such as automobiles, heavy construction and farming equipment, residential heating	Control motor vehicle and industrial emission. Use oxygenated gasoline during winter months. Conserve energy.
Nitrogen Dioxide (NO ₂)	See Carbon Monoxide	Control motor vehicle and industrial combustion emission. Conserve energy
Lead	Metal smelters, resources recovery, leaded gasoline, deterioration of lead paint	Control metal smelters. No lead in gasoline, replace lead paint with non-lead substitutes
Hydrocarbons (HC)	Incomplete combustion process	Inspection and maintenance of motor vehicles, emission control, conserve energy sources.
Sulphur Dioxide(SO ₂)	Coal or oil burning power plants and industries, refineries, diesel engines	Reduction of high sulphur fuels (e.g., use low sulphur reformulated diesel or natural gas). Conserve energy
Visibility Reducing Particle	See PM _{2.5}	See PM _{2.5}
Sulphate	Produced by reaction in the air of SO ₂ (see SO ₂ sources), a component of acid rain	See SO ₂
Hydrogen Sulphide	Geothermal power plants, petroleum production and refining, sewer gas	Control emission from geothermal power plants, petroleum production and refining, sewage treatment plant.

1.1.3. Impacts of Air Pollution

Health

Air pollution has both acute and chronic effects on health, ranging from short-term allergy and hospital admissions to premature deaths. Economic development of a nation contributes to increased air pollution and the ineffectiveness of implementing air pollution control strategies will lead to higher health risk. WHO has listed ambient air pollution as one of the major causes of morbidity and mortality across the globe. From the various epidemiologic studies done in the field of air pollution, it can be inferred that health impacts due to PM is a function of its chemical characteristics, exposure time, concentration and the particle size distribution. Table 3 shows the deposition potential for particulates based on size range.

Table 3: Deposition Potential for particulates based on size range. Source: Kim et al., (2015)²

Respiratory System	Size Ranges (in µm)
Nasal Passages	11-7
Pharynx	7-4.7
Trachea	4.7-3.3
Primary Bronchi	4.7-3.3
Bronchi Branches	2.1-1.1
Bronchiole	1.1-0.65
Alveoli	0.65-0.43

In India, the majority of the population is exposed to high levels of ambient PM_{2.5} resulting in a negative effect on human health and wellbeing. Heart and lung disease (i.e. Ischemic Heart Disease (IHD), Cerebrovascular Disease (Stroke), Chronic Obstructive Pulmonary Disease (COPD), Lower Respiratory Infection (LRI), and Lung Cancer (LNC)) have been associated with long-term PM_{2.5} exposure resulting in early death.

A study (Saini and Sharma, 2020)³ estimated the premature deaths (2016) in 29 Indian cities with a population of more than a million people. The study found heart disease (IHD) is the leading cause of death accounting for 58% of PM_{2.5} related premature deaths, followed by Stroke (22%), COPD (14%), LRI (4%), and LNC (2%) in these 29 cities. The estimated number of PM_{2.5} related deaths in productive age group (25 – 50 years) is low compared to older people, but the percentage share of these deaths in the cumulative cause-specific baseline deaths is higher for productive age group (see Figure 5).

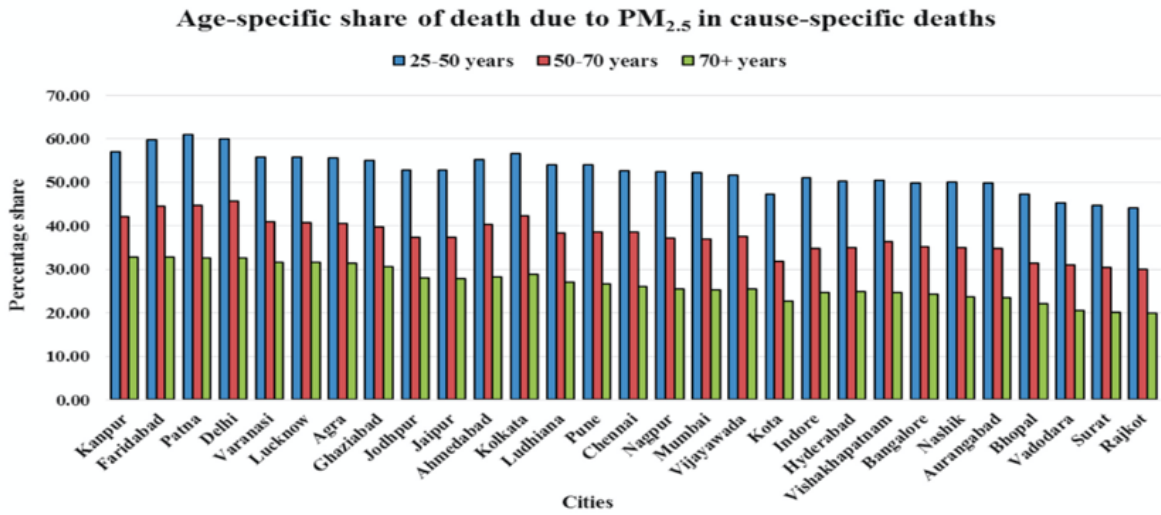


Figure 5: Age-specific share due to PM_{2.5} in cause-specific deaths

2 Kim, Ki Hyun, Ehsanul Kabir, and Shamin Kabir. 2015. "A Review on the Human Health Impact of Airborne Particulate Matter." Environment International 74: 136–43

3 Saini, P. and Sharma, M., 2020. Cause and Age-specific premature mortality attributable to PM2. 5 Exposure: An analysis for Million-Plus Indian cities. Science of The Total Environment, 710, p.135230.

Ecology

Air pollution has a great impact not only on human health, but also on climate, agriculture and the natural ecosystem. Air pollutants such as sulphur may lead to excess amounts of acid in lakes and streams and can damage trees and forest soils. Nitrogen in the atmosphere can harm fish and other aquatic life when deposited on water surfaces. Ozone damages tree leaves and negatively affects scenic vistas in protected natural areas. Mercury and other heavy metal compounds that are emitted into the air from fuel combustion and deposited on land and in water accumulate in plants and animals, some of which are consumed by people. Recent studies have documented the cataclysmic decline of insect populations across the world and reductions in habitat quality due to air pollution.⁴

Economy

Adverse health impacts of air pollution affect the national economy through a reduction in productive days, revenues, and increased medical expenses. When air quality causes hospitalisation or absences from work, there is loss in productivity that entails some loss of revenues and additional medical costs. For example, despite overall improvements in air quality in China, illnesses resulting from O₃ and PM exposure is estimated to have costs 112 billion.⁵

According to the World Bank report- Diagnostic Assessment of Select Environmental Challenges in India, the cost of outdoor and indoor air pollution is the highest annual burden on India's economy. Outdoor air pollution accounts for 29 per cent, followed by indoor air pollution (23 per cent). The cost of serious health consequences is estimated at 3 per cent of India's GDP due to particulate matter exposure.⁶

1.1.4 Clean Air Policies and Programmes in India

Communicating government's responses to air pollution, such as clean air policies, plans and programs, is as important as communicating the air pollution problem itself. Reporting on progress in implementing these policies, plans and programmes is part of AQ communication. Overtime, the Indian Government has adopted a range of policies to address air pollution. These include:

- 1981: the Government of India enacted the Air (Prevention and Control of Pollution) Act to

prevent and control air pollution in India.

- 1984-85: the CPCB initiated the National Ambient Air Quality Monitoring (NAAQM) Network to assess the present and anticipated air pollution impacts through air quality survey/monitoring programmes. Over the years, the number of stations has increased, and the programme was renamed the NAMP.
- 1986: Environment (Protection) Act further emphasized the need to reduce air pollutant emissions.
- Under section 18(1)(b) of Air (Prevention and Control of Pollution) Act, 1986 CPCB directed the implementation of forty-two (42) measures to mitigate air pollution in major cities including Delhi and NCR comprising of action plan to counter air pollution include control and mitigation measures related to vehicular emissions, resuspension of road dust and other fugitive emissions, biomass/municipal solid waste burning, industrial pollution, construction and demolition activities.⁷
- 1988: the motor vehicle act was enacted with road safety standards and pollution control measures, among others.
- 1998: the Ministry of Environment and Forests (MoEF) established the Environmental Pollution (Prevention and Control) Authority (EPCA) for the National Capital Region (NCR) of Delhi. The EPCA was given the authority to control and tackle environmental pollution. This included taking the necessary steps to control vehicle pollution in the NCR. Based on various public interest litigation (PIL) and on the recommendation of EPCA, the Supreme Court on 28 July 1998 directed that all public transport vehicles comprising of taxis, three wheelers, and buses in Delhi were to run only on Compressed Natural Gas (CNG) after April 2001.
- 2000: motor vehicles are a major contributor to air pollution in India. To keep their pollution levels in check, the government introduced the Bharat Stage Emission Standards (BSES). BSES are emission standards instituted by the Government of India to regulate the output of air pollutants from internal combustion engines and spark-ignition engines. The standards and the timeline for implementation are set by the CPCB under MoEF&CC. The standards which are based on European regulations were first

introduced in 2000. Progressively stringent norms have been rolled out since then.

- 2010: Bharat stage III norms have been enforced across the country. In thirteen (13) major cities, Bharat Stage IV emissions have been in place and are enforced for the whole country from April 2017. In 2016, The Indian Government announced that the country would skip the BS-V norms and adopt BS-VI norms by April 2020.
- 2016: the Government of India published Construction and Demolition Waste Management

Rules (C&D rule) to tackle the issues of pollution and waste management.

- 2018: MoEF&CC issued a Dust Mitigation notification making mandatory dust mitigation measures in infrastructure projects and demolition activities in the country.
- 2019: the National Green Tribunal (NGT) directed state pollution control boards to install air quality monitoring stations and to report to the CPCB on the installation of the stations by 1st April 2020.⁸



4 Thimmegowda, G.G., Mullen, S., Sottolare, K., Sharma, A., Mohanta, S.S., Brockmann, A., Dhandapany, P.S. and Olsson, S.B., 2020. A field-based quantitative analysis of sublethal effects of air pollution on pollinators. *Proceedings of the National Academy of Sciences*, 117(34), pp.20653-20661

5 Matus, et.al. (2012) Health damages of air pollution in China. *Global Environmental Change*, 22:1, 55-66

6 <https://www.downtoearth.org.in/news/health-cost-of-air-pollution-in-india-assessed-at-3-per-cent-of-its-gdp-41699>

7 Ministry of Environment, Forest and Climate Change (2019). National Clean Air Programme. http://moef.gov.in/wp-content/uploads/2019/05/NCAP_Report.pdf

8 Times of India. 2019. Air pollution: Get 'assessed' monitoring stations in a year, says NGT. <https://timesofindia.indiatimes.com/city/delhi/air-pollution-get-assessed-monitoring-stations-in-a-year-says-ngt/articleshow/72152635.cms>

1.2 National Clean Air Programme

The National Clean Air Programme (NCAP) is a long-term, time-bound, national level strategy to tackle air pollution across India. It aims to achieve a 20-30% reduction in particulate matter (PM) (PM_{10} and $PM_{2.5}$) concentrations by 2024 compared to 2017. A total 122 non-attainment cities mostly in Indo-Gangetic Plains have been identified based on ambient air quality data for the period 2011 – 2015. These cities have developed city specific action plans to tackle air pollution.⁹

One objective of the NCAP is to augment public awareness and capacity building measures. This encompasses data dissemination and public outreach programmes for inclusive public participation to ensure there is trained personnel and infrastructure to tackle air pollution.

Under NCAP, AQ communication is required at four different levels: enhance understanding; reduce exposure; mitigation actions; and action plan development (see Figure 6).

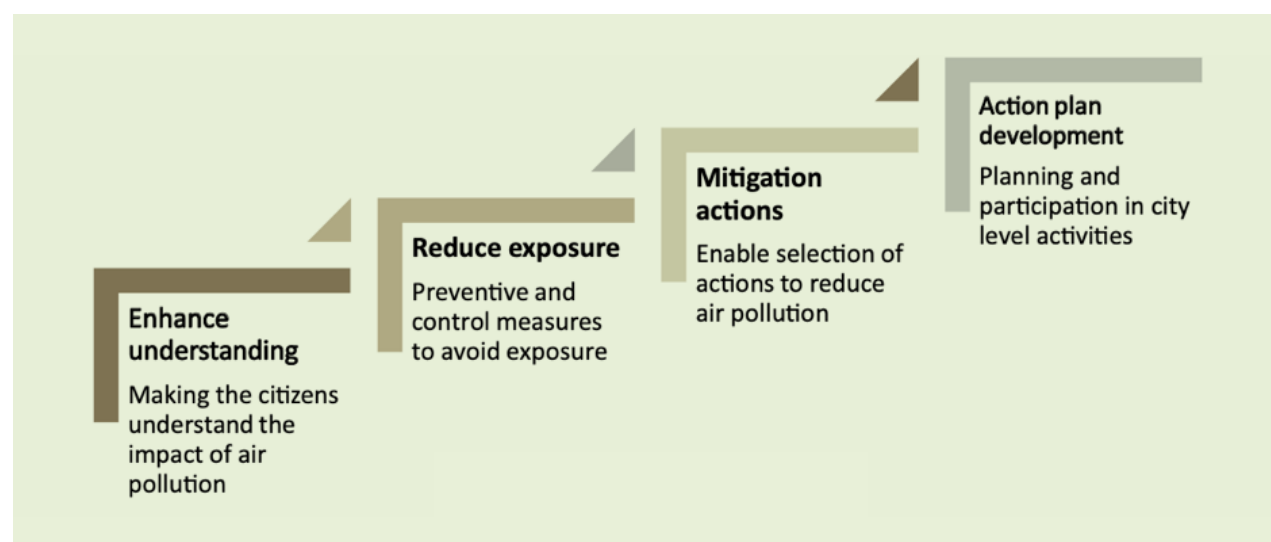


Figure 6: Dimensions of air quality communication¹⁰

Through communication, a city can improve air pollution awareness and understanding, ensure perceptions reflect the reality of the situation, and enable citizens to take action to reduce personal exposure. This will require credible and independent information of the causes and effects of air pollution being made available. Effective AQ communication can also increase the success of individual, community and city-level mitigation actions and enhance participation in the development of city-level action plans.

1.3 Role Of Communication In Air Quality

The communication of AQ issues, particularly to the general public, is normally required as part of national legislation that has provisions for authorities to inform and warn the public when air quality standards (AQS) are exceeded. In addition, numerous policies adopted to reduce urban air pollution can also assist in mitigating climate change.¹¹ Communication of these potential ‘co-benefits’ can encourage stakeholders to support the adoption and implementation of emissions reduction measures.

A rise in environmental awareness over past decades means the public is now more concerned about the quality of the air they breathe. A 2018 survey of public perception of 5,000 people in 17 Indian cities, found that while citizens were aware of air pollution and experience sickness or discomfort due to poor air quality, they lacked knowledge about its causes and solutions.

The survey included highly polluted cities (Delhi-NCR, Kolkata, Patna, Lucknow, Varanasi, Amritsar, Singrauli, Dhanbad, Raipur, Korba, Chandrapur, Angul, Nagpur) and cities becoming rapidly polluted (Bengaluru, Pune, Mumbai and Chennai). Delhi had the highest level of awareness, followed by Chennai, Bangalore, Pune and Kolkata. Although awareness was higher in metro cities, there was limited understanding of the Air Quality Index (AQI), and major pollutants such as particulate matter (PM_{10} and $PM_{2.5}$). The study found that only 54% of the respondents had an understanding of AQI, 30% respondents knew about $PM_{2.5}$ and only 18% respondents knew about PM_{10} .

An earlier 2017 survey of 1,202 citizens across 11 cities (Ahmedabad, Bangalore, Chennai, Delhi, Gwalior, Kanpur, Kolkata, Lucknow, Mumbai, Patna and Varanasi), also found that the majority of respondents claimed to be aware about air pollution but actual understanding and knowledge appeared lower.¹² The survey found a lack of appreciation of the scale of the problem and the effort needed to resolve it. Respondents felt a general unhappiness with current Government efforts and were actively seeking more information, especially about the impact on health.

On Earth Day (22 April) 2017, the Youth for Clean Air Network (YCAN) (see Box 5) undertook a public perception survey of 1,500 Delhi residents.¹³ Air pollution (55%) was the most important cause of public concern when compared to water (18%), waste (26%) and other types of pollution (0%). More than 50% of respondents believed air pollution was having detrimental health effects such as breathlessness and an increase in respiratory disorders. There was a desire to move out of the city due to the general discomfort caused by air pollution. YCAN undertook similar

perception surveys in Gandhinagar¹⁴ and Nagpur City.¹⁵ Air pollution was a main concern in Gandhinagar while for Nagpur City respondents the main concern was garbage/waste followed by air pollution.

Understanding public perception of, and attitudes to, AQ is important to ensure successful citizen involvement in AQM.¹⁶ A number of factors shape public attitudes and behaviour. These include: knowledge (e.g., how individuals interpret information based on existing beliefs); psychological factors (e.g., values, attitudes and emotions that affect behaviour and give a sense of responsibility); habits (e.g., mostly habitual and routine behaviour that contributes to polluting emissions); structural conditions (e.g., infrastructure — or lack of it — that can lead to “lock-in” situations, providing an obstacle to behavioural change); and socio-demographic patterns (e.g., the influence of these factors vary with individual circumstances).¹⁷ Communication is therefore important to raise awareness, change public attitudes, and promote environmentally friendly behaviours, such as the use of public transport and non-motorised transport.

A range of organisations and groups are involved in the communication of AQ information. These include environmental agencies that are monitoring, collating, and reporting on the state of AQ; public health agencies that are providing advice to protect health; non-governmental organisations (NGOs) that are raising awareness and creating political pressure; and the media, which provide the communication channels to reach different stakeholder groups.

1.4 Why Communicate Air Quality Issues?

Public information on the environment is of increasing importance as more people want to understand the risk posed by environmental pollution. In 1998, the United Nations Economic Commission for Europe (UNECE) Aarhus Convention established the public right to have access to environment information and participate in decision-making to ensure environmental justice.¹⁸

9 Ministry of Environment, Forest and Climate Change (2019) Various Initiatives undertaken by Government for mitigation of Air Pollution. Press Information Bureau, Government of India, New Delhi, India.

10 Clean Air Asia/Centre for Environment Education (2019) National Module for Advancing Air Quality, New Delhi, India.

11 Nemet, G. F., Holloway, T., & Meier, P. (2010). Implications of incorporating air-quality co-benefits into climate change policymaking. *Environmental Research Letters*, 5, 1: 014007.

12 Shakti Sustainable Energy Foundation/Edelman (2017) A survey of public awareness, perceptions and attitudes on air quality in urban India. New Delhi, India

13 Banga Swath India (2018) People Know About Air Pollution But Lack Awareness About Cause And Effect: Study.

14 YCAN/CAA (2018) How bad is Gandhinagar's Air? Youth Clean Air Network/Clean Air Asia, New Delhi, India.

15 YCAN/CAA (2018) How Bad is Nagpur City's Air. Youth Clean Air Network/Clean Air Asia, New Delhi, India.

16 Saksena, S. (2007). Public perceptions of urban air pollution with a focus on developing countries (East-West Center Working Papers No 65). Hawaii, U.S.A.: East-West Center.

17 Haq, G., Cambridge, H. and Owen, A. (2013). A targeted social marketing approach for community pro-environmental behavioural change. *Local Environment*, 18: 1134–1152.

18 UNECE Aarhus Convention.



Parties to the Convention are required to make the necessary provisions so that public authorities - at national, regional or local level - implement these rights in practice. Under the Convention, everyone has the right to receive environmental information that is held by public authorities; to participate in environmental decision-making and to review procedures to challenge public decisions that have been made without respecting public rights or environmental law in general.

In addition, a number of international guidelines on the reporting and dissemination of AQ information is currently available. European Directive 2008/50/EC on ambient AQ requires that the public and appropriate organisations (i.e., environmental, consumer, healthcare bodies, industry federations) should be provided with adequate ambient AQ information. This should be freely available and accessible through any media, including the internet or telecommunications. Annual reports for all pollutants stating when limit values, target values, and long-term objectives have been exceeded should also be publicly available. Section 127 of the United States (US) Clean Air Act (1990) also outlines the need to inform the public on the status of AQ. It is mentioned in The Air (Prevention and Control of Pollution) Act, 1981 to collect and disseminate information relating to air pollution. The Environment (Protection) Act, 1986 also include collection and dissemination of information in respect of matter relating to environmental pollution. NCAP aims to increase public awareness and recommends the dissemination of AQ information through the media, public involvement through the

use of social media and mobile apps and creating platforms for people to monitor and report pollution sources.¹⁹

There are three main reasons for informing the public about air quality issues:

1. Legal obligation to warn the public when air quality limits are exceeded
2. Meet public demand for information due to concern about environmental pollution
3. Raise public awareness to change attitudes and behaviours to reduce air pollution.

However, there are differences between *informing*, *reporting* and *communicating* which all involve the production and dissemination of information. *Informing* requires making information and data available in passive (on-request) or active (disseminated freely) way and is a one-way process. The value and credibility of the information is based on its accuracy and objectivity and is related to the legitimacy and neutrality of the information provider.

In contrast, *reporting* involves the formal submission of data to regional/national/local authorities in a specified format and according to a set timetable. *Communicating* is actively using information to inform, engage and influence attitudes and behaviour of individuals in a two-way process. For example, a report can be used to inform the public. However, the well-defined content and target group might make it inaccessible to a wider public. Equally, actively informing the public can be part of a communication campaign that encourages a two-way flow of information.²⁰

Box 1: What makes an effective air pollution campaign

The Clean Air Fund analysed 30 air pollution and public health campaigns and 65 organisations that work on these issues in India.²¹

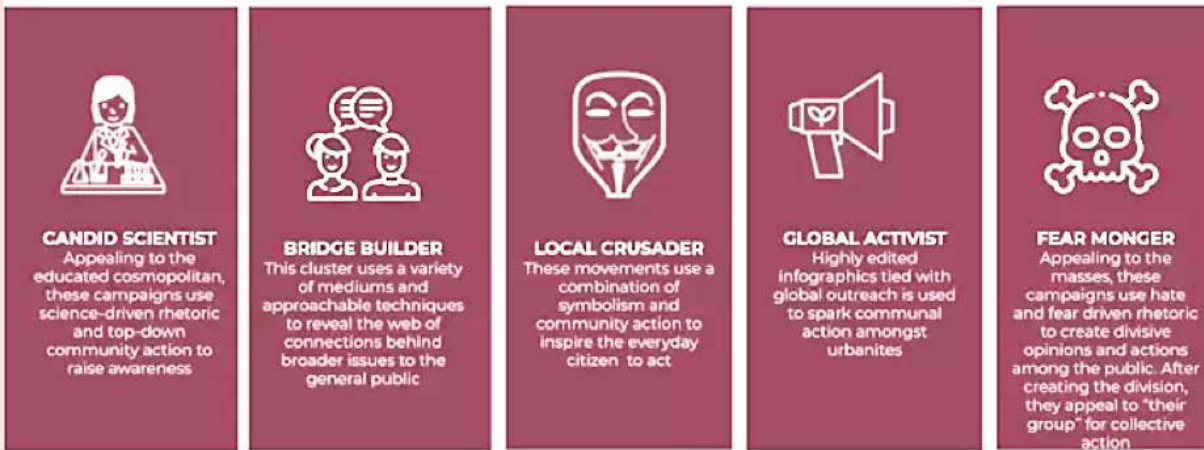
The analysis involved studying 21 million searches and over 10,000 social media posts on air pollution. These were run through artificial intelligence models on linguistic analysis, object detection and culture analysis, and produced insights on what makes an air pollution campaign in India effective. The study found five broad profiles of air pollution campaigners: Candid Scientist, Bridge Builder, Local Crusader, Global Activist, and Fear Monger. Out of these, Bridge Builder, Local Crusader and Fear Monger were found to be most effective in digital campaigns.

1. The Bridge Builder highlights the connections between their issue and popular, mainstream ones in order to bring the spotlight to their own focus area. Flexible in their communication style, they use a spectrum of messaging, aiming to appeal to everyone. Their quest for genuine collaboration comes across in their wide variety of narrative, a balanced mixture of messaging types (for example, logos and posters, formal events, and community activities) and retweeting powerful content on hot-button issues that bring attention to their own cause. To them, air pollution can be solved by having a more informed society with a strong sense of community.

2. The Local Crusader uses simple but emotive messages in local languages with unfiltered pictures of successful community projects to invoke feelings of success and community. They use a combination of symbolism and moving images of community action to stir nationalistic sentiment and urge individuals to act together. We see this reflected in the second most-popular factor, as determined by our AI models: Emotional (12,588 data points). Terms like “rich soil”, “abundant water”, “lungs”, “mother Cauvery”, “beating heart” and “dream” dominate the list of commonly used phrases. To them, air pollution can be solved by galvanizing individuals into communal action.

3. The Fear Monger, to date, is used for political campaign strategies. What works is its two-phased approach: first, the population is divided with hate and fear-filled rhetoric. Second, the supporters of the campaign are pushed towards collective action on key issues. A continuous feeling of inclusion is presented as a reward for group loyalty. Presence on every digital platform is heavy and multiple online and offline behaviour change strategies are used. Some of these include taking over real estate timelines on public platforms and redirecting online search behaviour. To them, air pollution can be solved by waging a war (shaming and using negative rhetoric) against the “polluters”.

Overview of five main profile types



19 MoEFCC (2019) NCAP: National Clean Air Programme. Ministry of Environment, Forests and Climate Change, New Delhi, India.
20 CiteAir. (2007). Communicating air quality: A guidebook on communication with the public about air quality. Schiedam, The Netherlands.

21 Upadhyay, R. and Banerjee, A. (2020) How to run an effective air pollution campaign in the post-COVID area. The Clean Air Fund, London.

Social media reach and engagement influences the effectiveness of digital campaigns. Looking at the Facebook pages of organizations that drive these campaigns – including a calculation of their followers and number of likes for climate content and campaigns, and their tweets and retweets to understand how much original content these organizations create – gave us insight into their social media reach and level of online engagement.

Search behaviour demonstrates that the timing of campaigns are crucial, as are the air pollution-related terms people are searching for. The study found that both the search volume and rate of change for the following air pollution-related words rise significantly between the months of October and January each year (based on a trend analysis from 2015-2019): “air pollution,” “causes of air pollution,” “air purifier,” “effects of pollution,” “PM_{2.5},” “Diwali pollution,” and “anti-pollution mask”.

Further, the majority of campaigns analysed were launched in May – but based on search behaviour, it is more strategic to launch in October and finish by February of the following year.

2. Essentials of AQ Communication



Communication of air pollution issues needs to compete with the growing amount of information available on the internet, which can be of dubious quality. Addressing a target audience in the right tone, at the right moment and in the right way will ensure communication is effective. It is therefore important to understand what message needs to be conveyed and to whom. Once these are known then it is easier to identify the appropriate communication channel and develop the message to reach the intended audience. The sender of the information must adjust

to the intended Receiver who must also be able to react to the message (see Figure 7).

In order to communicate the right message, the Sender must gather information on the target audience (Receiver). For example, what is their background knowledge? (i.e. should the message be technical or simple?), How can the message relate to them? (i.e. what are the concerns, emotions and issues that are important to them). The Sender must adapt the message to fit the Receivers and be open to clarifying

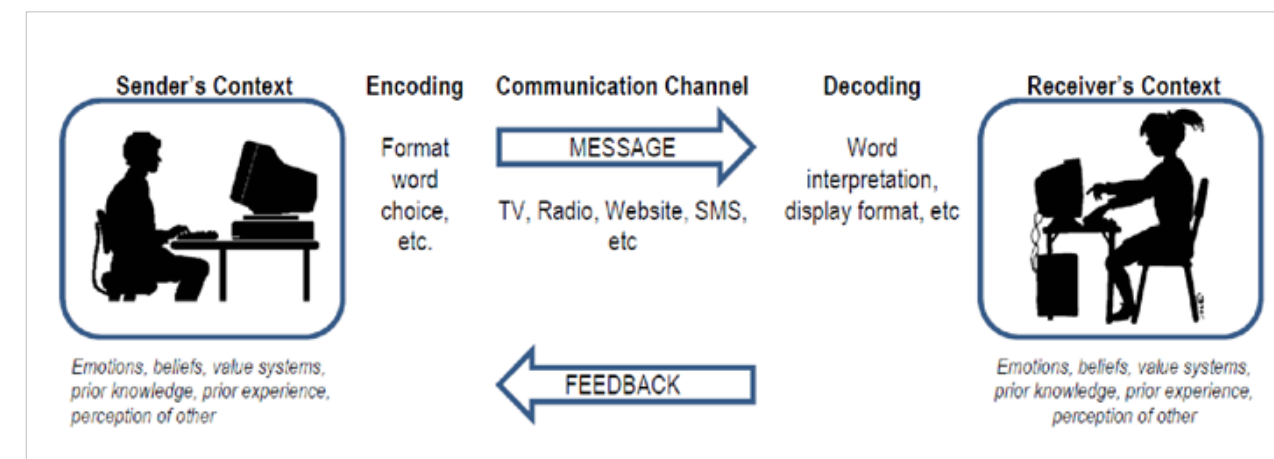


Figure 7: Communication model²²

²² CiteAir. (2007). Communicating air quality: A guidebook on communication with the public about air quality. Schiedam, The Netherlands.

information. For example, the Receivers may not understand the message, or the message may be of no use to them. If this is the case, receivers may begin to ask questions. This feedback is important because it makes clear that the message has been received.

In order to reduce exposure, citizens need to understand their location-specific vulnerabilities in a simplified manner. Communication related to city hotspots (using spatial maps or innovative graphics) would enhance people’s understanding of the risks in terms of locations that are more polluted and also explain to them the sources and related health impacts. Further, communication regarding methods/ways to reduce exposure would help them to select appropriate actions and reduce their vulnerabilities.

2.1 Tools Of Communication

Communication channels are the vehicles that present, deliver and explain messages. Channels can range from face-to-face interactive activities to community-level interventions and mass media. It is important to choose the channels most readily available and acceptable to the target population and also to keep cost-effectiveness in mind.

The channels form the main mechanisms to influence the target groups by taking the messages to them. While the identification of target groups themselves is indicative of how they will be reached, it is important to understand and clarify the main mechanisms to be adopted for reaching each target group.

The choice of communication channels should consider the reach and its reliability. Cost effectiveness of the media is also crucial. At the same time, care should be taken to ensure that local resources are used in developing communication materials to ensure adaptability to local context and cost effectiveness.

Some of the tools for an effective communication include:

2.1.1. One way communication tools

Printed Material: Printed materials are a relatively effective way of communicating a message with government bodies as well as the public. These materials should be:

- **Informative** – highlighting ‘what’ people can do to help Air Quality Management (AQM)
- **Thought-provoking** – explaining how bad air quality can affect their health, environment and economy

- **Encouraging** – appreciating them for their present contributions

Promotional materials such as brochures, pamphlets, bumper stickers and posters can be useful in creating program visibility and awareness. An innovative slogan and/or logo, for example, can create a sense of identity for the program and can be used for mass awareness. This may be used in conjunction with and to complement other tools.

Legal tool: Section 19 of the Indian Air (prevention and control of pollution) Act declares the air pollution control area. It states also that if any fuel used by a control area causes air pollution, the fuel will be prohibited from being used in such an area.

Public campaigns: Direct personal contact with target audiences is typically one of the most persuasive forms of communication, and audio/visual presentations can be used during these events. Presentations can be effectively made before special interest groups and/or schools. At a community level, street plays and/or local entertainment methods can also be used for mass communication.

Awards and Incentives: Another tool that has proven to be effective is through the use of Awards and Incentives. Sometimes the most effective means of gaining the attention of the public is by offering some sort of award or incentive. Such programs can effectively motivate individuals and businesses to participate in activities, reinforce positive actions, and recognize achievements of program participants.

Penalties and Disincentives: As much as possible, penalties should be avoided. However, sometimes penalties/disincentives help in conveying the desired message. For example, imposing penalty fines on smoke-belching vehicles communicate that a city is committed to controlling emissions from mobile vehicles.

School Education: Messages taught to children get informally transferred to their parents and other adults they interact with, thereby helping spread the message.

Community Centres: Community centres can be useful for displaying communication materials regarding air pollution and its effects on health and environment.

TV Network: This is a powerful medium that can be used to inform the citizens about AQM and its importance in their lives. TV commercials of 10-30 seconds on air quality issues can also be produced by

advertisement agencies experienced in development communication and social marketing. However, this may require a big budget and professional expertise. Air quality issues can also be tackled through the news, talk shows or others to generate public concern.

FM Radio: Audio skits and interesting slogans and jingles can be developed on the issues pertaining to AQM and its effect on the population.

Accept and involve the public as your partner

Listen to your audience

Coordinate and collaborate with other credible sources

Be honest, frank, and open

Speak clearly and with compassion

2.1.2. Interactive communication tools
Focused Group Discussions: through Focused Group discussions people can be directly informed, educated and convinced about their role in air quality management. This is an effective tool though it may be time-consuming as such discussions may last for a couple of hours.

Courses in Educational Institutions (Colleges and Schools): Environmental education courses may be included as part of educational curriculums. This approach can be integrated with environment awareness campaigns in educational institutions.

Folk Programmes (Street Plays): Folk programmes are an entertaining and cost-effective way to effectively communicate a message to a large number of people. These programmes are successful for audiences within low and medium income groups.

Media Support for Information and Awareness: Mass media can spread information among the community in a fast and effective manner. Print media as well as electronic media could play a great role in creating awareness and informing the people about the air pollution programme and explain how their support can bring about changes to improving urban air quality.

Rallies, Walkathon and Public Meetings: Activities such as rallies, walkathon and public meetings can be organised to build momentum and mobilise public support for the implementation of projects. These activities can be organised in residential areas, commercial areas and schools with the help of local leaders and NGOs.



2.2 Essentials Of Good Communication

Audience attention is higher at the beginning of the communication process. At the outset, one should explain why and how the information given to them is important or valuable to them. The best way is to connect to audience needs and interests, in this case for example, health. If they think you have the answer to their problem, you will have their attention. Communicate the most important information first. This is a technique called the “inverted pyramid” used by the news media for decades. Keep key messages as the prominent feature of communication.

Establish your credibility. If you have not gained the trust and confidence of your audience, they will not pay attention to what you have to say.

Present your message in a bold, dynamic fashion. Borrow the best communication techniques from the experts. Use design principles from books, newspapers, and magazines. Study how professional speakers and television news professionals draw attention to their messages. Take note of what messages get attention and how they are presented. Put these observations into practice.

Engage your audience personally. Draw them in by relating to them as individuals. Ask questions, invite participation, and show interest. Use a personal, conversational tone. Meet the audience where they are at before then they will join will follow your communication.

Minimise use of technical jargon. Working in a technical field, it is easy to forget that others are not familiar with the content. It is necessary to minimise the use of technical jargon. While using such terms may demonstrate expertise, in fact it takes more skill to describe complex technical concepts in everyday language. words that might be unfamiliar to your audience are used be sure to define them first.

Test your messages with someone outside your area of expertise. Sometimes it is not just the terms used that impede comprehension, but the way sentences are constructed and the order of information. Someone who is not familiar with a technical area is often best suited to point out our confusing messages. Invite feedback from such an individual (or individuals) before taking communication to target audience.

Address issues and concerns that are relevant to your audience. If you are a civil engineer, for example, you might be prone to focus predominantly on the civil engineering issues associated with a project or problem. Unfortunately, an audience’s interests may centre on something else—such as traffic disruption, visual impacts, noise, air quality, historic preservation, etc. To increase comprehension, you need to make engineering issues relevant to their non-engineering concerns. Use knowledge of the target audience to make anecdotes relevant.

Write in a concise, conversational manner. For some reason, technical professionals often struggle to communicate about their specialties in a straightforward, understandable fashion. Their writing is frequently stilted and wordy. For best results, write generally as one would speak. Use short sentences and do not say more than what is necessary. State what data are lacking or conflicting.

Be sure your messages are consistent with actions; for example, do not travel by personal transport while advocating public transport.

Increase retention of what is communicated. An audience cannot act upon what they cannot remember, and studies point out that people typically remember only a fraction of what they read, hear, or see. So, it is necessary to design oral and written communications to increase the likelihood that the most important messages are remembered. Some ideas to increase retention are:

- Target a few key messages. Determine the three most important points to remember from the communication and feature these prominently in a document or presentation.
- Illustrate main points. Visual images are remembered more readily than what is merely written or spoken. Graphs, figures, and photographs should be used to illustrate your key messages. Use knowledge of the target audience to make these relevant.
- Use stories. Stories are a powerful form of communication and are better remembered than mere information. Many technical professionals use case studies, but these should be “humanised” (talk about the people involved and the impacts they experienced) for maximum effectiveness.
- Involve the audience in activities. People remember things they do much better than what they are told or what someone else does. Exercises, hands-on demonstrations, and role playing are excellent ways to increase retention.

- Always provide a concise summary. Whether writing or speaking, it is necessary to offer a summary of your key points. In a document, this should appear first—typically in the form of an executive summary. In a presentation, the summary will occur at the end, accompanied with a request for some kind of commitment from the audience.

2.2.1 Things to avoid in communication

The following practices should be avoided:

- **Evaluation and Judgment:** Avoid including judgements of people in communication materials (e.g., avoid use of words such as ‘do not know’, ‘do not act’, ‘do not contribute’, etc). This can create a barrier in communication. The communication process is intended to deliver a message to the people to raise their awareness resulting in concrete action.
- **Order:** Avoid being authoritative in the communication process. Rather the following steps can be taken in delivering talks or presentations:
 - **Introduction:** Introduce the mission and the issue of the AQM programme, and what is in it for the people if they support the program. Invite them to join the programme.
 - **Sharing process:** In this step, all the participants are invited to share their knowledge, experience, skill, etc., or give input, comment and suggestions. Incorporate suggestions by consensus.
- **Interrogative:** Asking too many questions might make people feel bored or disinterested. We must be interrogative only to the extent that it helps to explore information, inputs or suggestions.
- **Being insensitive to context of the audience:** Many times, the target audience might be from different ethnic backgrounds, religion, dialect, occupation, etc. It is important that their background is known to ensure that the messages do not offend audience members.
- **Criticism:** Most people do not like to be criticised, therefore attention should be given in the phrasing of messages or statements. If something needs to be corrected in terms of ideas or views, soft methods in the dialog process must be used so as to make them understand what needs to be improved and how it could be improved.
- **Messages with multiple interpretations:** Avoid using words that have multiple meanings or that are not clearly defined. Often a delivered message can be interpreted in multiple ways confusing the target audience. Choosing the right words to clearly deliver a message should be considered.

2.2.2 Consequences of bad communication

No communication is better than a wrongly executed one. The consequences of bad communication could be:

- **Failure of Communication process:** The target audience do not respect/appreciate the mission of communication and will leave the communication process.
- **Misunderstanding the meaning of the message:** A misleading interpretation of a message may be delivered to the target audience instead of the originally intended message.
- **Communication management failure:** An important aspect about the communication process is management of the activity itself. Mismanagement may lead to failure in meeting the schedule and budget. Such a situation also may decrease productivity of the team and reduce stakeholder.
- **Decrease brand image:** Misunderstandings can affect reputation and brand image which are important in achieving a good communication process.
- **Decision making process failure:** The goal of communication process is to provide appropriate information as baseline to decision making. Failure to deliver the right message to the related stakeholders can lead to a delay in decision making or worse, for a wrong decision to be made.

2.3 Stakeholders

City authorities play a critical leadership role in ensuring air pollution is a strategic priority. This means ensuring senior local decision makers understand the need to address poor air quality. Communication between key stakeholders is important to ensure a coordinated approach is taken to address poor air quality. This requires engaging with different groups which have a role to play in tackling air pollution (see Table 4). For example:

- Members and offices of the local authority;
- Officers and service providers in the local health sector; and the
- Wider community, including the general public, vulnerable groups and the local media.

The stakeholders identified under this program may be categorised as:

- **Primary Stakeholders:** are the people and groups most affected by the outcome of a program, which may be positive or negative. In this case, people are at the centre stage of all AQM initiatives, as they are directly affected by

good or poor air quality. In air quality research, they are often divided into groups based upon certain demographic factors such as gender, socioeconomic status, age, profession and ethnicity.

- **Secondary Stakeholders:** are individuals or groups who have an important influence/effect

on the project. They often help provide aid to the primary stakeholders. These groups may include government agencies, non-government organizations (NGOs), community-based organizations (CBOs), society heads, religious heads, money-lending institutions or monitoring agencies, etc.

Table 4: The role of different stakeholders in tackling air pollution²³

Stakeholder	Roles
<i>City Authority</i>	
State Environment Department/Municipal Commissioner/ District Magistrate/ State or Regional Pollution Control Officer	To identify sources of air pollution and responsible for preparation and implementation of Clean Air Action Plans. Recognise the importance of air quality and the role that the local authority could play as an employer, through the services it commissions and delivers, its public health role, regulatory powers, community leadership and well-being power
Elected officials	Represent citizens if they raise concerns, find out about local pollution hotspots, raise the issues of concern, encourage overview and scrutiny across the range of city strategies, consider the issues as part of local planning decisions, and ensure the city authority is encouraging others to act and informing the public. Also encourage citizens to comply with the norms and take necessary measures to curb air pollution.
Planning policy and control	Ensure planning applications always consider the health impacts of air pollution Ensure local facilities and services are easily accessible by low-pollution means and promote ways of accessing them without polluting.
Local transport authorities, transport planners	Ensure transport strategies encourage active travel and other low or zero pollution modes. Recognise that reducing congestion also reduces air pollution. Ensure enforcement of duties mentioned under Indian Motor Vehicle Act
Street and urban management	Ensure that public squares and parks are designed and managed in such a way to ensure that those that use them are not exposed to high levels of pollution Provide cyclists and pedestrians with routes that are safe and clearly signed to encourage their use
Environmental health protection	Support the local authority Environmental Protection (EP) or Environmental Health (EH) team(s) in the work they do to reduce air pollution through a local Air Quality Action Plan, clear communication about enforcement of pollution control and regulation of permissible industrial activities.

Stakeholder	Roles
	Work with environment and health experts to research and identify new ways of tackling air pollution and reducing exposure to emissions. Share health outcomes data that will support the justification of the EH team(s) for action(s) that will reduce the harm caused by air pollution
Communication teams	Support the local authority's Air Quality Managers in the EH team(s) and Public Health teams to build understanding of the issues
<i>Wider Community</i>	
Industry	Work together to reduce the impact of air pollution created by economic development
Voluntary and community groups	Get involved in community action to reduce air pollution and help raise awareness of local people and in particular vulnerable groups
Local people	Find out about local air pollution levels and measures to reduce their exposure Let their councillor know about concerns and get involved in community activities to make improvements
Vulnerable groups	Talk to their doctor or health professional about any concerns they may have and understand how they can reduce their exposure on high pollution days Utilise national and localised air pollution forecast services to minimise exposure and manage symptoms
Local media	Report on action being taken to improve air quality and encourage awareness of information

Stakeholders range from citizens, vulnerable groups, health professionals, NGOs, businesses, media and academic institutions to policymakers. Each has a stake in improving air quality and can help or hinder progress in implementing air pollution prevention and control measures. While national and local governments may have the responsibility to monitor the state of air quality and take appropriate action when air quality thresholds are exceeded, other stakeholder groups can also play a role in both

air pollution monitoring and mitigation. This can range from providing data to assisting air quality assessments and identifying air pollution hotspots (e.g. citizen science programmes for air quality monitoring) to leadership to reducing transport emissions (e.g. travel plans adopted by companies to encourage staff to use public transport to reach the workplace). Addressing stakeholder concerns and engaging with them in a proactive and appropriate way can build the necessary support required.

23 DEFRA/PHE (2017) Air Quality: a briefing for directors of public health. Department for Environment, Food and Rural Affairs/Public Health England, London, UK.



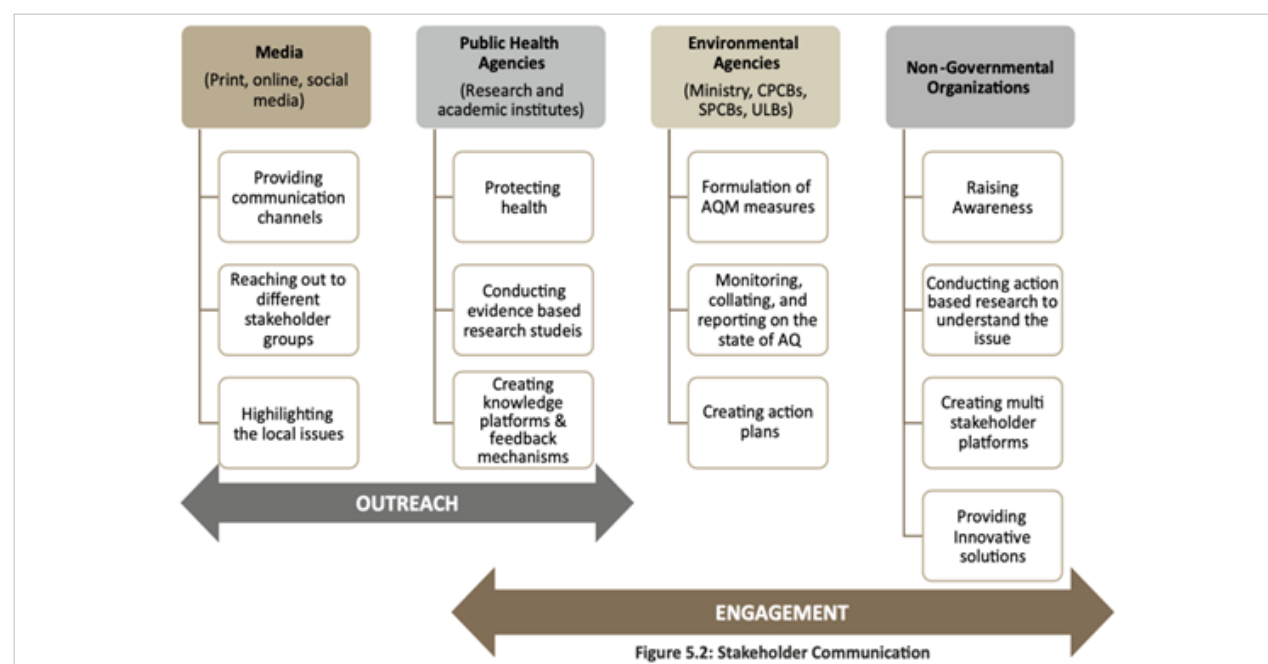


Figure 8: Stakeholder Communication²⁴

2.4 Air Quality Index

In order to reduce exposure, citizens need to understand their location-specific vulnerabilities in a simplified manner. AQ communication related to city hotspots (using spatial maps or innovative graphics) can enhance people's understanding of health risks and air pollution sources. Citizens are potential

casualties of air pollution due to their exposure to poor air quality. At the same time, they contribute to the problem by the choices they make (e.g. travelling by car or open burning waste). Communication is needed to ensure public engagement for air quality improvement actions and to foster behavioural change.

AQI	Associated Health Impacts
Good (0-50)	Minimal Impact
Satisfactory (51-100)	May cause minor breathing discomfort to sensitive people
Moderate (101-200)	May cause breathing discomfort to the people with lung disease such as asthma and discomfort to people with heart disease, children and older adults
Poor (201-300)	May cause breathing discomfort to people on prolonged exposure and discomfort to people with heart disease with short exposure.
Very Poor (301-400)	May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases
Severe (401-500)	May cause respiratory effects even on healthy people and serious health impacts on people with lung/heart diseases. The health impacts may be experienced even during light physical activity

[Source: Control of Urban Pollution series: CUPS/82/ 2014-15, Air Quality Index, CPCB]

Figure 9: Air quality index categories²⁵

²⁴ Clean Air Asia/Centre for Environment Education (2019) National Module for Advancing Air Quality, New Delhi, India.

²⁵ MoEFCC (2019) NCAP: National Clean Air Programme. Ministry of Environment, Forests and Climate Change, New Delhi, India.

In 2015, the Indian government launched the national Air Quality Index (AQI). This is an alert system that aims to protect citizens from air pollution by notifying the public about the air quality status and associated health risks. AQI is described as 'One Number-One Colour-One Description' for the general public to

judge the air quality within their vicinity. It transforms complex air quality data of various pollutants into a single number (index value), category and colour. Many Indian cities have now established AQI to display air pollution levels.

Box 2: Indian National Air Quality Index

The large monitoring data on air quality unless presented in a simple and lucid manner, common citizens cannot appreciate air quality improvements or worsening of air quality. The AQI is developed with the intents: (i) inform the public regarding the overall status of air quality through a summation parameter that is easy to understand; and (ii) inform citizens about associated health impacts of air pollution exposure.

An AQI is defined as an overall scheme that transforms weighted values of individual air pollution-related parameters (SO₂, CO, visibility, etc.) into a single number or set of numbers. The Indian national AQI is based on human exposure and health effects. Primarily two steps are involved in formulating an AQI: (i) formation of sub-indices (for each pollutant) and (ii) aggregation of sub-indices to get an overall AQI. Formation of sub-indices (I₁, I₂, ..., I_n) for n pollutant variables (X₁, X₂, ..., X_n) is carried out using sub-index functions that are based on air quality standards and health effects. Mathematically;

$$I_i = f(X_i), i=1,2,\dots,n \dots\dots\dots [1]$$

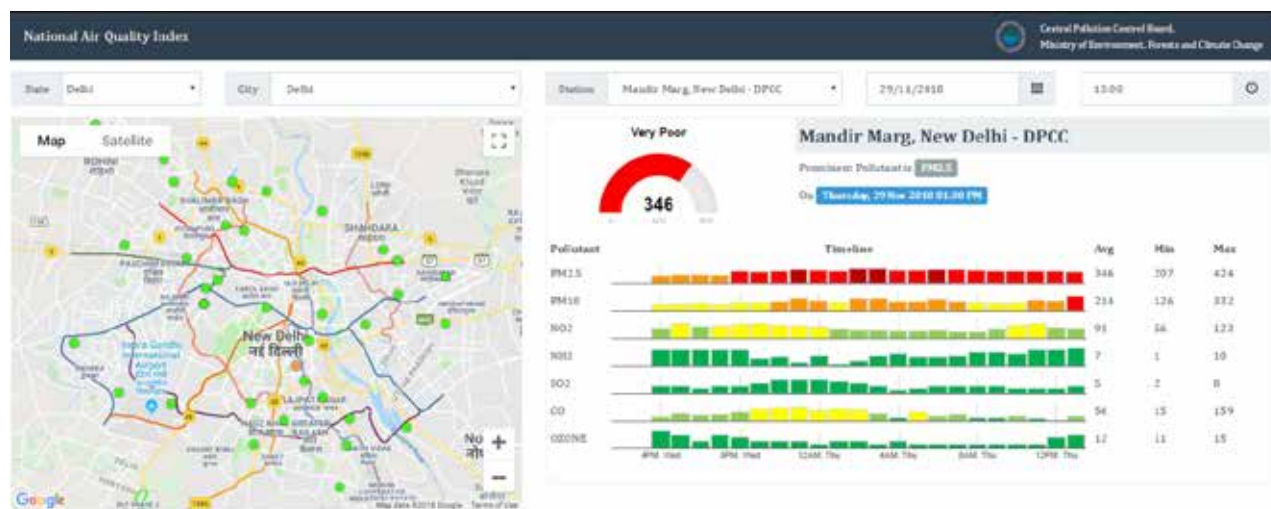
Each sub-index represents a relationship between pollutant concentrations and health effects. Aggregation of sub-indices, I_is carried out with some mathematical function to obtain the overall index (I), referred to as AQI. The AQI uses the maximum operator on all I_i to define the overall AQI. There are six categories of AQI with colour code, numeric number and breakpoints of concentration for different categories (see Table below).

Breakpoints for AQI Scale 0-500 (units: µg/m³ unless mentioned otherwise)

AQI Category (Range)	PM ₁₀ 24-hr	PM _{2.5} 24-hr	NO ₂ 24-hr	O ₃ 8-hr	CO 8-hr (mg/m ³)	SO ₂ 24-hr	NH ₃ 24-hr	Pb 24-hr
Good (0-50)	0-50	0-30	0-40	0-50	0-1.0	0-40	0-200	0-0.5
Satisfactory (51-100)	51-100	31-60	41-80	51-100	1.1-2.0	41-80	201-400	0.6 –1.0
Moderate (101-200)	101-250	61-90	81-180	101-168	2.1- 10	81-380	401-800	1.1-2.0
Poor (201-300)	251-350	91-120	181-280	169-208	10.1-17	381-800	801-1200	2.1-3.0
Very poor (301-400)	351-430	121-250	281-400	209-748	17.1-34	801-1600	1201-1800	3.1-3.5
Severe (401-500)	430 +	250+	400+	748+	34+	1600+	1800+	3.5+

The AQI system is a web-based AQI dissemination which is designed for online calculation and display of nation-wide AQI (Figure 1). The website renders a quick, simple and elegant looking response to an AQI query (<https://app.cpcbcr.com/>)

AQI_India/). The other features of the website include reporting of pollutant responsible for index, pollutants exceeding the standards and health effects.



Web-based AQI Dissemination

2.5 Steps In Stakeholder Engagement

The main steps in stakeholder engagement to achieve better air quality include creating awareness,

understanding, gathering support, commitment, action and advocacy.

Each stage requires different communication objectives, information and communication channels (see Figure 10).

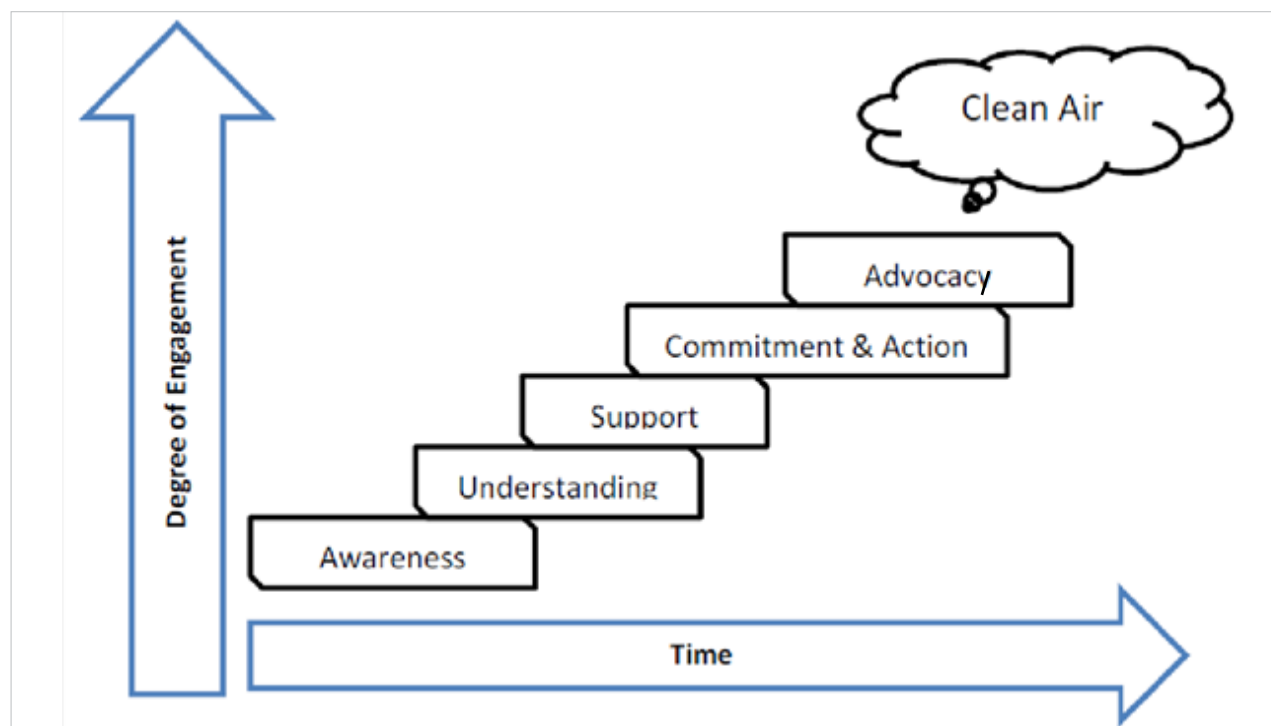


Figure 10: Stakeholder engagement steps for clean air²⁶

Awareness is the most basic air quality communication goal – i.e. awareness-raising is aligned with the stakeholder participation approach of “outreach”, i.e. providing stakeholders with relevant information to increase knowledge of the public on the state of air quality.

Understanding an improved understanding of the causes and impacts of air pollution can encourage and result in action (i.e. to protect against harmful impacts and/or contribute to emission reduction). It is this step that facilitates the transition from simply “being aware” of the state of air quality to engagement for inputs, comments, or action.

Support, Communication and Action, and Advocacy, relate to phased, concrete action of stakeholders towards achieving improved air quality.

These steps exemplify the stakeholder participation approach of engagement, which seeks to engage

particular stakeholder group(s) in action, e.g. formulating policies to address air pollution.

Stakeholder engagement is linked to influencing and changing attitude and serve to inform, engage and mobilise stakeholders to take action (see Table 5).

Table 5: Stakeholder engagement goals

Step	Definition	Communication Objective	Examples of Communication Channel	Evaluation and Impact
Awareness	Awareness that air pollution is problem that affects the stakeholder	Provide appropriate information based on concerns, create awareness of air pollution issues	Printed communications, newsletters, information meetings, emails, social media campaign	Stakeholders know the causes and impact of air pollution
Understanding	Comprehension of the causes of air pollution and intent of change	Broaden awareness and level of understanding of the causes and effects of air pollution	One-to-one communication, public meetings/ policy briefings	Knows the action is necessary, content with possible measures
Support	Positive attitude and perception, willingness to take action	Gain support and personal buy-in to take action to prevent and control air pollution	Focused discussions, workshops, interviews, phone calls, letters from leaders, presentations	Can explain the necessary action required, willing to learn more and mobilise peers.
Commitment and Action	Invest resources and personal time, lead others.	Attain full commitment and encourage action.	Participation in campaigns, adopt measures, change individual behaviour	Advises, communicates and advisor, supports change
Advocacy	Full ownership of the successful implementation adoption of change	Feels, behaves and acts as a self-directed change agent	Round tables, project presentations, discussions	Actively supports change, leads by example, support capability transfer

2.6 Air Quality Communication Platforms

Indian cities can use a range of channels to communicate the status of AQ to the general public and key stakeholders (see Figure 11). Factors such as cost, frequency of reporting and information format all influence the type of communication channel used to disseminate air quality information.

Publishing information online is considered to be significantly cheaper than the cost of using television and print media. In addition, advances in communication technology means it is becoming much easier to share and access data through the use of downloadable mobile applications. For example, the Thailand PCD has established the mobile application Air4Thai, which makes air quality information available to users in Bangkok and other areas in Thailand.²⁷

²⁶ Based on Grosvenor Key to effective engagement.

²⁷ See Air4Thai: <http://air4thai.pcd.go.th/webV2/index.php>

SAFAR APP

In India, the SAFAR air mobile App has been developed by the Indian Institute of Tropical Meteorology (IITM) (Pune) to provide detailed air quality advisory for four metro cities in four languages (English, Hindi, Marathi and Gujarati) (see Figure 12).

IITM, under the Ministry of Earth Sciences (MoES), operates the System of Air Quality and Weather Forecasting and Research (SAFAR). The SAFAR programme forecasts air pollution trends in Delhi,

Mumbai, Pune, and Ahmedabad. For these cities, it generates the likely air quality profile for a day in advance. SAFAR monitors pollutants such as particulate matter PM₁, PM_{2.5}, PM₁₀, nitrogen oxides (NO_x), carbon monoxide (CO), ozone (O₃), sulphur dioxide (SO₂), black carbon (BC), Methane (CH₄), non-methane hydrocarbons (NMHC), benzene, volatile organic compounds (VOCs), and mercury. SAFAR is an integral part of India’s first air quality early warning system operational in Delhi. It monitors all weather parameters such as temperature, rainfall, humidity, wind speed, and wind direction.

Communication platforms	Enhance understanding/ Reduce exposure	Mitigation actions	Action plan development
Research paper	X		
Published (printed) reports – reports, brochures, papers	X	X	X
Print media – newspapers	X	X	X
Broadcast media – television and radio	X	X	X
Website – online databases	X	X	X
Public display screens or booths/ information boards	X	X	
Internal communications/ requests			X
Information upon-request	X	X	X
Print Media	X	X	X
Others: social networking sites, microblogs	X	X	X
Mobile Apps	X	X	X
Policy briefs		X	X
Written reports		X	X
Summary tables		X	X
Visual presentations	X	X	X
Interpretation of information	X	X	X
Pie chart and map	X	X	X
Satellite imagery	X	X	X
Email lists and e-groups	X	X	X
SMS alerts/WhatsApp alerts on request	X		X
Workshops and meetings	X	X	X
Multi-stakeholder Working Groups		X	X

Figure 11: Air quality communication platforms

The effectiveness of these platforms depends on the coordination and facilitation from various departments, organisations and authorities. To be an

effective strategy, city authorities should facilitate this process.

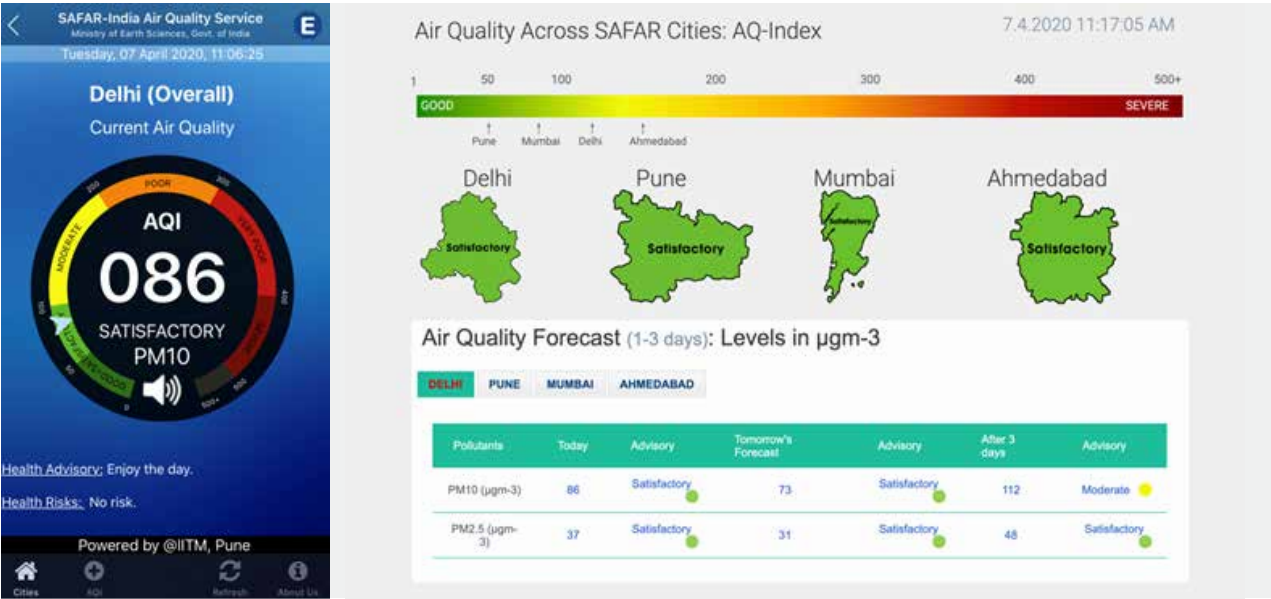


Figure 12: SAFAR Air²⁸

SAMEER Air Quality App

In India, MoEF&CC and CPCB has developed the SAMEER App to provide information on air quality for more than 100 cities. The SAMEER app provides hourly AQI and has been developed as a communication and air pollution mitigation measure. The App presents the listed cities in a colour coded format based on their real time AQI levels.

The App can track complaints related to sources or activities such as waste dumping, road or

construction dust, vehicle emissions or other air pollution issues. To lodge a complaint, it is required to select a pollution category, give a description of the complaint, upload images or videos, and select the region.

The App also provides an ‘Other’ option for a pollution category that is not listed. Once a complaint is filed, the user receives a confirmation mail and message with a complaint ID, the assigned officer’s name and number. The user can also track the status of the complaint within the App.

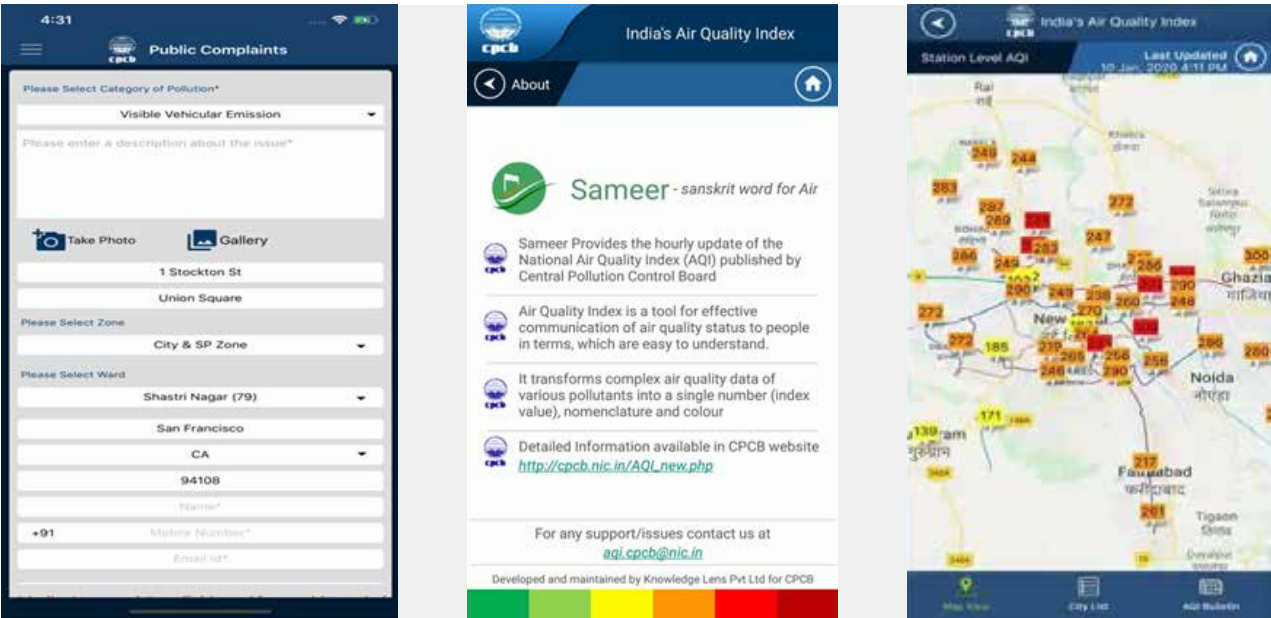


Figure 13: SAMEER App Complaint Filing and Tracking System

28 SAFAR (2020) <http://safar.tropmet.res.in/>

Box 3: Hong Kong Air Pollution Index

Hong Kong has developed an air pollution index (API), which includes health risk categories and provides advice to different vulnerable stakeholder groups on what action to take.²⁹ Since 1995, Hong Kong has implemented an API (or AQI) system that reports an aggregated index based on the pollutant with the highest level of concentration for a given day or hour at a specific station. The index covered four pollutants with indexes based on Hong Kong's Air Quality Objectives. The main limitation of this API approach was that it ignored the joint effects of different air pollutants on the health of the exposed community.

In response to the 2005 WHO Air Quality Guidelines, the Hong Kong government commissioned university teams to review its Air Quality Objectives and consequently review its API system. After studying the different index systems implemented around the world, the team of experts recommended an approach similar to what Canada has adopted. The Air Quality and Health Index (AQHI) of Canada made use of local air pollution and health data, ensuring that the air quality reporting system is based on health outcomes observed locally.

In December 2013, Hong Kong adopted an AQHI system that utilized health risks derived from local hospital admissions data for air pollution-related illnesses. While the Canada AQHI made use of mortality data, Hong Kong revised the approach to use morbidity data instead. The AQHIs are reported on a scale of one to 10 and are grouped into five health risk categories (low, moderate, high, very high, serious) that provide health-risk information and precautionary measures for susceptible groups.

This reporting system, which informs the public of the short-term health risk of air pollution in Hong Kong, is the first of its kind in Asia.

The latest hourly AQHI and forecast is communicated using the following platforms:

- Environmental Protection Department (EPD) website at <http://www.aqhi.gov.hk>, accessible from a personal computer or a mobile device such as a smartphone;
- AQHI application for mobile devices or an AQHI alert wizard for desktop computers; or
- AQHI hotline (2827 8541), which gives verbal updates through an interactive voice recording system, or provides a printed update through the fax-on-demand service.

All of the above methods provide AQHI information 24 hours a day. There are also updates provided at regular intervals via the mass media, on different TV and radio channels.

The adoption of the AQHI system in Hong Kong empowers the public with the information to put pressure on the national government to prioritize air pollution response. If local air pollution and hospital data are available, other Asian cities can adopt this AQHI system using the methodology developed by Hong Kong (Wong et al., 2012.)

2.7 Public Awareness, Education And Capacity Building

Building public awareness is vital to supporting implementation of the NCAP. Awareness and education initiatives towards prevention, control, and

mitigation of air pollution provides communities with the knowledge and tools to take action (see Box 4). This combined with specific information sharing on health advisories can help improve their local air quality. Problem areas can easily be identified and monitored using citizen science methods, empowering communities, and reducing the risks of exposure to air pollution.

29 Wong, T.W., Tam, W.W.S., Lau, A.K.H., Ng, S.K.W., Yu, I.T.S., Wong, A.H.S., & Yeung, D. (2012). A study of the Air Pollution Index Reporting System. Tender Ref. AP 07-085. Hong Kong: The Chinese University of Hong Kong.

Box 4: Schools for Clean Air³⁰

In 2019, Clean Air Asia in collaboration together with the technology company, Phoenix Robotix, monitored air quality data in schools in Delhi, Nagpur and Bhubaneswar. The main focus of the project was to improve awareness about ‘health impacts of air pollution on school-going children’.

Five schools from all three cities were selected strategically to deploy air quality monitors at their campus. Deployed sensors measured ambient air concentrations of particulate matter (PM_{2.5} and PM₁₀). Based on concentrations measured, it generated an ‘Air Quality Index’.

It provided an easy way for the public to determine the level of pollution. Data assimilated and results generated were published on a public portal developed by CAA and Phoenix Robotix. The study provided real time data from monitoring stations, and air quality index which flashes every few seconds. It provided advisories for children based on category of AQI.

Engaging children at an early age can build a foundation in order to ensure clean air for the future generations (see Box 5). With air quality now integrated in public health frameworks and local authority jurisdiction, an ever-increasing number of industries are required to take action and all institutions have a responsibility to reduce air pollution.

Box 5: Youth for Clean Air³¹

YCAN or Youth Can is the Youth Clean Air Network for Indian cities, initiated by Clean Air Asia (CAA). It is a group of young enthusiastic individuals, working under CAA to achieve solutions for better air quality in Indian cities. Members come from different academic backgrounds but they are all passionate about air quality issues, they believe in finding a solution through different and unique perspectives. YCAN projects focus on diverse ways of bringing air quality to the mainstream. Whether it is city specific awareness campaigns or discovering technology solutions, YCAN aims to contribute to cleaner, safer air in Indian cities through discussion, innovation and collaboration.

The young of India represent 50% of the population under the age of 25, and it is important that youth is engaged in making a positive contribution to critical issues such as air pollution. YCAN has members between the age of 15- 32 (according to the definition of youth in Agenda 21) who are passionate to act to clean the air.

The YCAN is currently active in Delhi/NCR, Gandhinagar and Bhubaneshwar. It is envisaged that the network will be expanded to another 10 Indian cities.

The public can become more involved in reducing local air pollution impacts in their communities. Extensive awareness and outreach programmes for various stakeholder groups need to be taken up, especially in the 122 non-attainment cities. This will be achieved through national portals, media engagement, civil society involvement, curricula reform and recognition/awards.

A major challenge to the effective implementation of city AQM plans is the availability of trained staff and infrastructure. This is often lacking, there is a need for formal training on AQM of key stakeholders with the city authority.

The NCAP recommends city-specific awareness programmes targeting key stakeholders to be formulated and taken up for implementation. This could include awareness raising in the general public to prevent the adverse effects of air pollution. In addition, the sensitisation of the media for right interpretation of international reports and data as well as for disseminating information on the governments air pollution control measures.

30 CCA/Phoenix Robotix (2019) Schools for clean air. Clean Air Asia/Phoenix Robotix, New Delhi, India.
31 Youth for Clean Air: <http://www.youthforcleanair.com/>

3. Communication for Clean Air Action Plan And Management In Cities



Under India’s NCAP, City AQM Plans, including Graded Response or Emergency Action Plans, are to be prepared for all non-attainment cities. A city-specific AQM Plan aims to improve air quality and

public health by identifying cost-effective measures to reduce sectoral emissions (e.g. transport, industries and open waste burning) in order to meet National Ambient Air Quality Standards³² (see Figure 14).

Sr. No	Pollutants	Time Weighted Average	Concentration in Ambient Air	
			Industrial, Residential, Rural, and Other Areas	Ecologically Sensitive Area
1	Sulphur dioxide (SO ₂), µg/m ³	Annual* 24 hours**	50 80	20 80
2	Nitrogen dioxide (NO ₂), µg/m ³	Annual* 24 hours**	40 80	30 80
3	Particulate matter (Size <10 µm) or PM ₁₀ , µg/m ³	Annual* 24 hours**	60 100	60 100
4	Particulate matter (Size <2.5 µm) or PM _{2.5} , µg/m ³	Annual* 24 hours**	40 60	40 60
5	Ozone (O ₃), µg/m ³	8 hours** 1 hours **	100 180	100 180
6	Lead (Pb), µg/m ³	Annual* 24 hours**	0.50 1.0	0.50 1.0
7	Carbon monoxide (CO), mg/m ³	8 hours** 1 hours **	02 04	02 04
8	Ammonia (NH ₃), µg/m ³	Annual* 24 hours**	100 400	100 400
9	Benzene (C ₆ H ₆), µg/m ³	Annual*	05	05
10	Benzo(a) pyrene (BaP)-particulate phase only, ng/m ³	Annual*	01	01
11	Arsenic (As), ng/m ³	Annual*	06	06
12	Nickel (Ni), ng/m ³	Annual*	20	20

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable shall be complied with 98% of the time in a year. 2 % of the time may exceed the limits but not on two consecutive days of monitoring.

Figure 14: National Ambient Air Quality Standards (Source: NCAP)]

The city AQM Plan enables the government as well as the wider stakeholder groups to recognise the vision and goals for air quality improvement, set objectives mobilise resources and collaborate effectively and

efficiently to improve air quality. Figure 15 presents a participatory approach that it require the involvement of both civil society and the private sector to develop an integrated AQM plan.

32 National Ambient Air Quality Standards (India 2009)

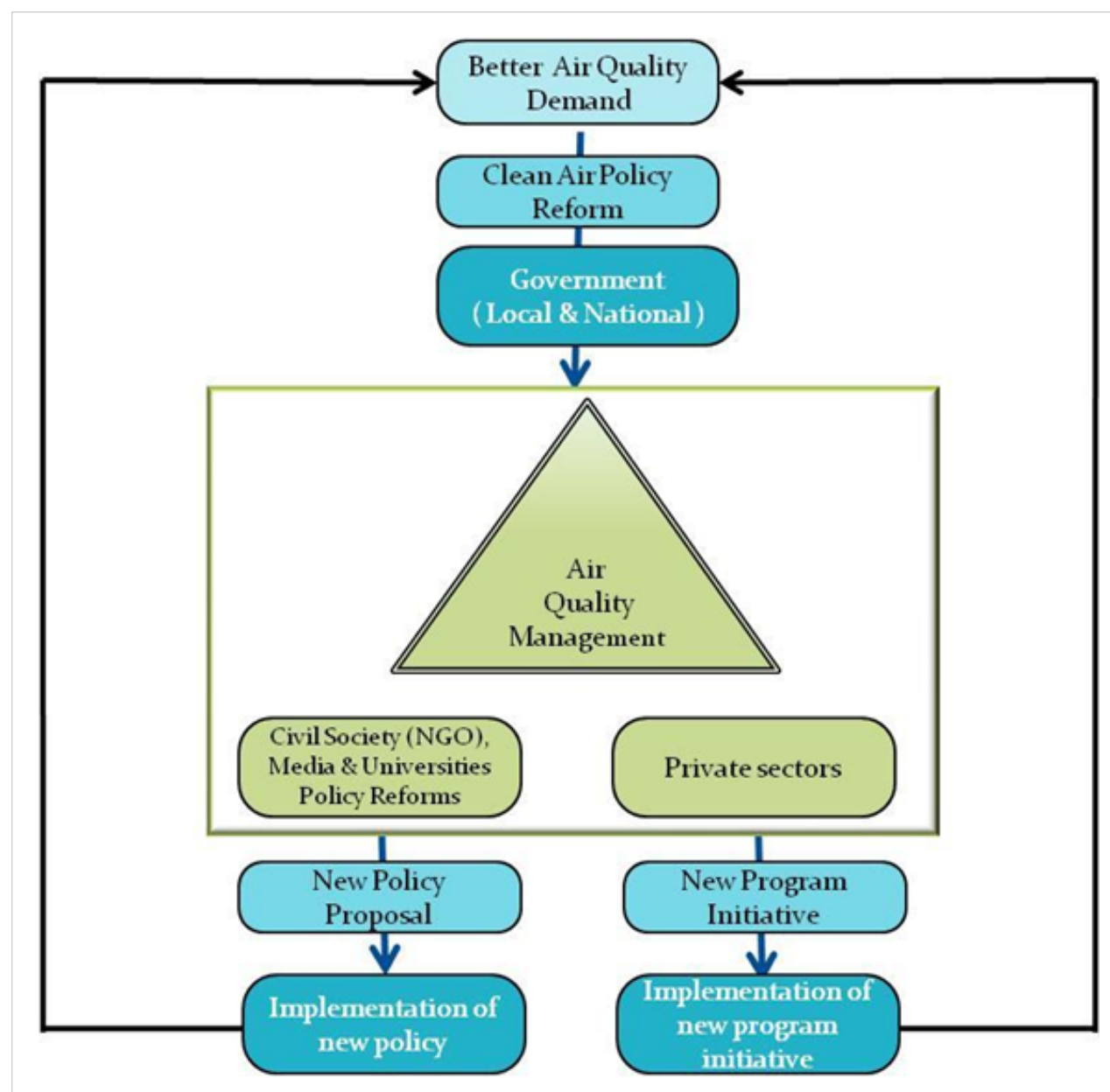


Figure 15: Participatory process of integrated AQM

Communication is therefore an important tool for enabling public engagement in the development of a city action plan (see Figure 15). Communication is also required to strengthen air pollution prevention and control systems, manage processes and build capacities of stakeholders. City level strategies are also required to:

- Build/enhance capacity for communication of AQM to policymakers and the public in a more systematic way.
- Build capacity to issue ad hoc press releases on the state of AQ and advisories during pollution episodes.
- Start building capacity for information technology to ensure online accessibility of

general AQ information and relevant control measures to reduce exposure to the public.

- Effective multiple communication channels for collaborative, multi-scale and cross- sectoral coordination between the relevant departments/ ministries, state governments and local bodies.
- Set up systems for the display of AQ, advance public warnings and forecast systems to advise subsequent action.
- Strengthen capacity to measure, collate, process and update AQ monitoring data from ad hoc or project-based monitoring activities, and gather general information on pollution sources for use in more regular communication activities.

5.7.2 Public engagement strategy for City Action Plan

Communication is an important tool for enabling public engagement in the city action plan as discussed in Module 4. Following are the stages of development of the city AQM plan where communication can be integrated:

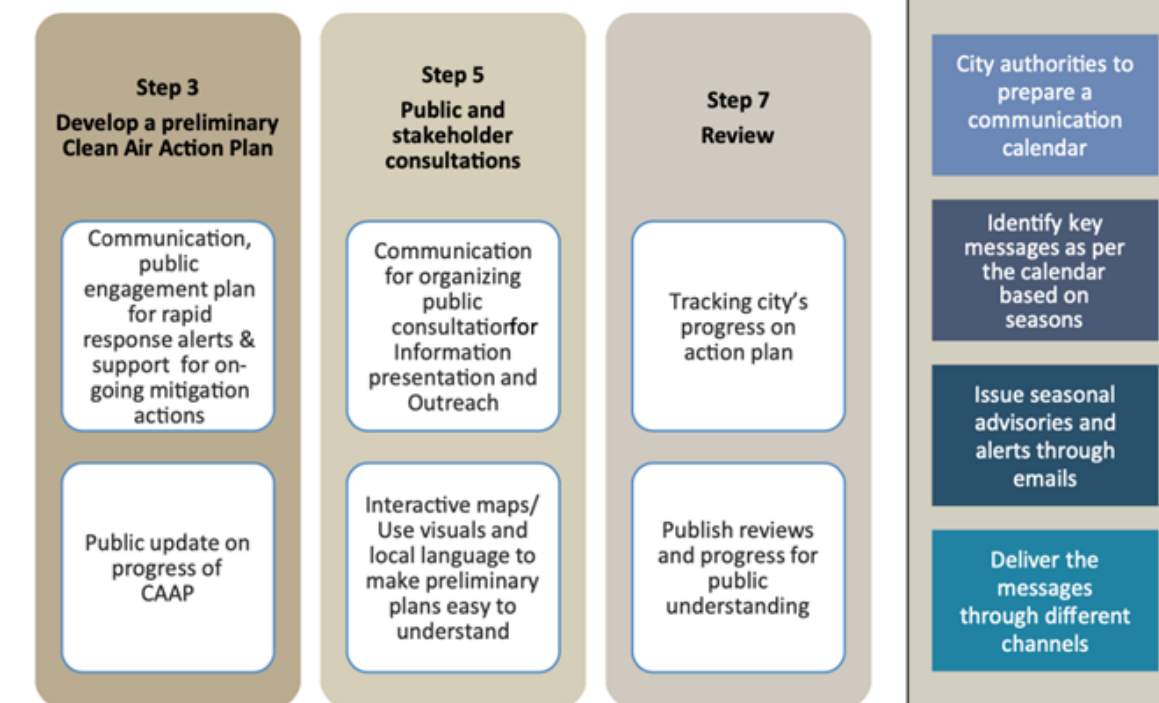


Figure 16: Stepwise public engagement strategy for a city action plan³³

One of the objectives of India's NCAP relevant to Indian cities is to increase public awareness and capacity building. This will enable inclusive public participation and ensure there are trained individuals to address the air pollution problem. Table 6 outlines how communication is integrated into each strategy of the NCAP.

Several key challenges currently exist in India's cities, which prevent the effective communication of AQ information. These include:

- Limited capacity in processing AQ information. Where AQ data is available, there may not be in-house capacity to use this data and develop awareness-raising programmes to target different stakeholder groups.
- Limited dissemination and coverage of AQ information: The availability of AQ data may be limited. If data is available, its scope, type and frequency may be restricted to certain cities.
- Limited understanding of AQIs by the public: Use of AQI by the public to understand its implications on themselves and the gravity of the situation is absent. Awareness regarding behaviour changes required and relevant local

individual actions to be taken to reduce air pollution is also lacking.

- Limited public guidance on air pollution episodes: Information on what the public should do to reduce exposure and emissions in a severe air pollution event may be unavailable.
- Limited influence of AQ communication on attitudes and behaviour: Where public information is available, it may not be developed to have an impact on influencing the attitudes and behaviours of different target audiences to reduce emissions and health impacts. This could be partly due to the poor understanding of influential groups – for example, media and civil society – of air pollution issues.
- Limited availability of financial resources for AQ communication: Communication may be considered less important compared to identifying air pollution sources, determining the status of air quality, and assessing its impact on human health and wellbeing. However, in order to reduce pollution and protect public health, the communication of air pollution information should be seen as a key component of effective air quality management.

33 Clean Air Asia/Centre for Environment Education (2019) National Module for Advancing Air Quality, New Delhi, India.

Table 6: Focused communication activities in NCAP

Strategy	Communication part of the strategy	Level of implementation	Agency(ies)
Mitigation Acton			
Stringent enforcement through Three Tier Monitoring Assessment and Inspection	Intensive training of all stakeholders involved in the implementation of the web - based system.	State/City	MoEF&CC CPCB SPCB
Sectoral Interventions – Agricultural Emission	The capacity-building initiatives for Krisha Vigyan Kendra (KVK) shall be strengthened	State	MoA
Sectoral interventions – Emissions from Unsustainable Waste Management Practices	Mandatory training and capacity building of municipalities and the RWA to implement the Municipal Solid Waste Management Rules, 2016,	City/State	MoHUA Municipal Corporation
Air Pollution and Health and Impact Studies	Awareness and orientation workshops to be undertaken focusing on a target audience	Centre	MoH&FW MoEF&CC CPCB
	Media is to be used for wide dissemination of information and the precise information to be shared has to be carefully worked out by a team of experts in air pollution and environmental health		
	Training researchers in study design through holding workshops in epidemiology, toxicology and biostatistics		
Institutional Strengthening			
Public Awareness and Education	City-specific awareness programme targeting key stakeholders to be formulated and taken up for implementation. This could include awareness generation in the general public for prevention of adverse effects of air pollution	State	CPCB SPCB
	Sensitization of the media for right interpretation of international reports and data as well as for disseminating information on measures being taken by the government for the abatement of air pollution to be undertaken.		
Training and Capacity Building	Extensive capacity building for both the CPCB and the SPCBs with. Reference to both manpower and infrastructure augmentation.	Centre/State	MoEF&CC CPCB SPCB
	Intensive training, comprising national and international best practice and technological options of all associated stakeholders.		
Setting up Air Information Centre	Air information centres at the central level will be set up in some of the identified institutes		

Strategy	Communication part of the strategy	Level of implementation	Agency(ies)
Network of Technical Institute Institutions, Knowledge Partners	System of a regular web-based online interaction mechanism evolved to ensure the continuity of interactions policy	Centre	MoEF&CC CPCB SPCB
Administrative, rule and law Policy setting up	Formulating the policy on Green Plantation and Maintenance which raised concerns about the poor quality and lack of maintenance of green cover along most national highways	Centre/State	Minister of Road and Transport

3.1 Graded Response Action Plan

A Graded Response Action Plan (GRAP) is a set of stratified actions that are taken once air pollution levels reach a specified limit.

CATEGORY	ACTION PLAN
<div>Moderate to Poor</div> <div>PM2.5—61-120 µg/m3</div> <div>PM10— 101-350 µg/m3</div>	<div><div><div>➤ Stop garbage burning, impose heavy fines</div><div>➤ Enforce pollution regulations in all industries</div><div>➤ Do periodic mechanised road sweeping</div><div>➤ Stop plying of visibly polluting vehicles</div><div>➤ Enforce SC order on diversion, ban on crackers</div><div>➤ Ensure fly ash ponds are watered every alternate day from Mar – May</div><div>➤ Use apps to inform people and register complaints</div></div><div></div></div>
<div>Very Poor</div> <div>PM2.5—121-250µg/m3</div> <div>PM10— 351-430 µg/m3</div>	<div><div><div>➤ Stop use of diesel gensets</div><div>➤ Enhance parking fee by 3-4 times</div><div>➤ Increase bus and Metro services</div><div>➤ Stop use of coal/firewood in hotels and restaurants</div><div>➤ RWAs to provide electric heaters to security staff to stop bonfires</div><div>➤ Issue media alerts and advisories</div></div><div></div></div>
<div>Severe</div> <div>PM2.5—250 µg/m3</div> <div>PM10—430µg/m3</div>	<div><div><div>➤ Close hot mix plants, stone crushers</div><div>➤ Shut down Badarpur power plant and maximise generation from natural gas-based plants</div><div>➤ Intensify public transport</div><div>➤ Mechanised cleaning of road and sprinkling of water</div></div><div></div></div>
<div>Emergency</div> <div>PM2.5—300µg/m3</div> <div>PM10—500 µg/m3</div> <div>(persist for 48 hours or more)</div>	<div><div><div>➤ Stop entry of trucks except those carrying essential commodities</div><div>➤ Stop construction</div><div>➤ Introduce odd-even scheme without exemptions</div><div>➤ Task Force to decide on additional steps</div></div><div></div></div>

Figure 17: Graded Response Action Plan³⁴

34 Indian Express (2019) Explained: How plan for clean air works. 9 October 2019.

The Indian Supreme Court mandated the Environmental Pollution Control Authority (EPCA) to develop such a plan.

In January 2017, a GRAP was adopted for the prevention, control and abatement of air pollution in New Delhi and the National Capital Region (NCR).³⁵ The Plan required action and coordination among 13 different agencies in Delhi, Uttar Pradesh, Haryana and Rajasthan (NCR areas).

It outlined graded measures and implementing agencies to respond to four AQI categories: Moderate to Poor, Very Poor, Severe and a new category of Severe + or Emergency (see Figure 17). For example, in severe category if ambient PM_{2.5} and PM₁₀ concentration values reach 300 ug/m³ and 500 ug/m³ respectively, and persists for 48 hours or more, Municipal corporations and traffic police of Delhi and NCR take measures to stop the entry of trucks into Delhi or stop

construction activities. The Delhi pollution control committee are main implementing authority.³⁶ The GRAP has been successful in establishing accountability and setting deadlines. For each action to be taken under a particular air quality category, the role of executing agencies is defined. This made a crucial difference in Delhi, where a multiplicity of authorities has been a long-standing impediment to effective governance. Also, coordination among 13 agencies from four states is simplified because of the clear demarcation of responsibilities.

Three major policy decisions credited to EPCA and GRAP are the closure of the thermal power plant at Badarpur, bringing BS-VI fuel to Delhi before the deadline, and the ban on Pet coke as a fuel in Delhi NCR. Figure 18 shows the trend in PM_{2.5} emissions and during the period the GRAP was implemented in Delhi.

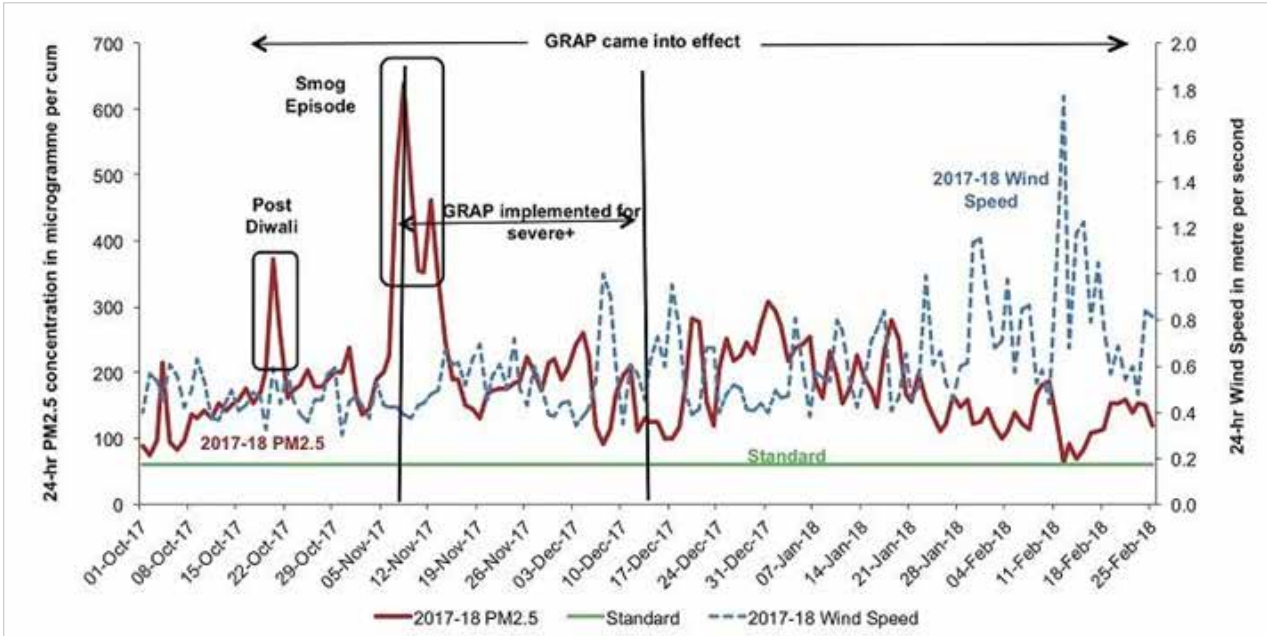


Figure 18: PM_{2.5} trend from 1 October 2017 to 25 February 2018 for 17 locations in New Delhi³⁷

In 2018, the Central Pollution Control Board (CPCB) directed the implementation of a Comprehensive Action Plan (CAP) for air pollution control in Delhi and NCR. The CAP outlines medium and long-term actions for all pollution sources for Delhi and NCR. CAP has been formulated with participation of concerned governments of NCT and NCR. The CAP details the strategies for implementation and monitoring for all key sources of pollution - including vehicles, power plants.

3.2 Developing An Air Quality Communication Plan

AQ communication requires information to be clear, comprehensive, accurate, precise, understandable and relevant to current concerns. The information should also provide some indication of reliability and uncertainty. Messages need to be directed at a specific target group, given at the right time and distributed

through an appropriate channel. To do this, an AQ communication plan has to be formulated.³⁸ Eight key steps in developing an AQ communication plan are outlined below (see Figure 19).³⁹

3.2.1 Determine communication goals
At the outset, identifying the aim of communication and the level of ambition is important. This could range from increasing awareness and knowledge, to influencing attitudes, and even changing the behaviour of the intended target audience (e.g., motivating individuals and communities to change behaviours to reduce pollutant levels and health risks).

In considering the aim of the communication plan, the following questions should be asked:

- Which target group needs this information?
- How useful is the information to the target group?
- How much knowledge does the target group have on this subject?
- What format should the information take?
- What is the best channel of communication to reach the intended target group?

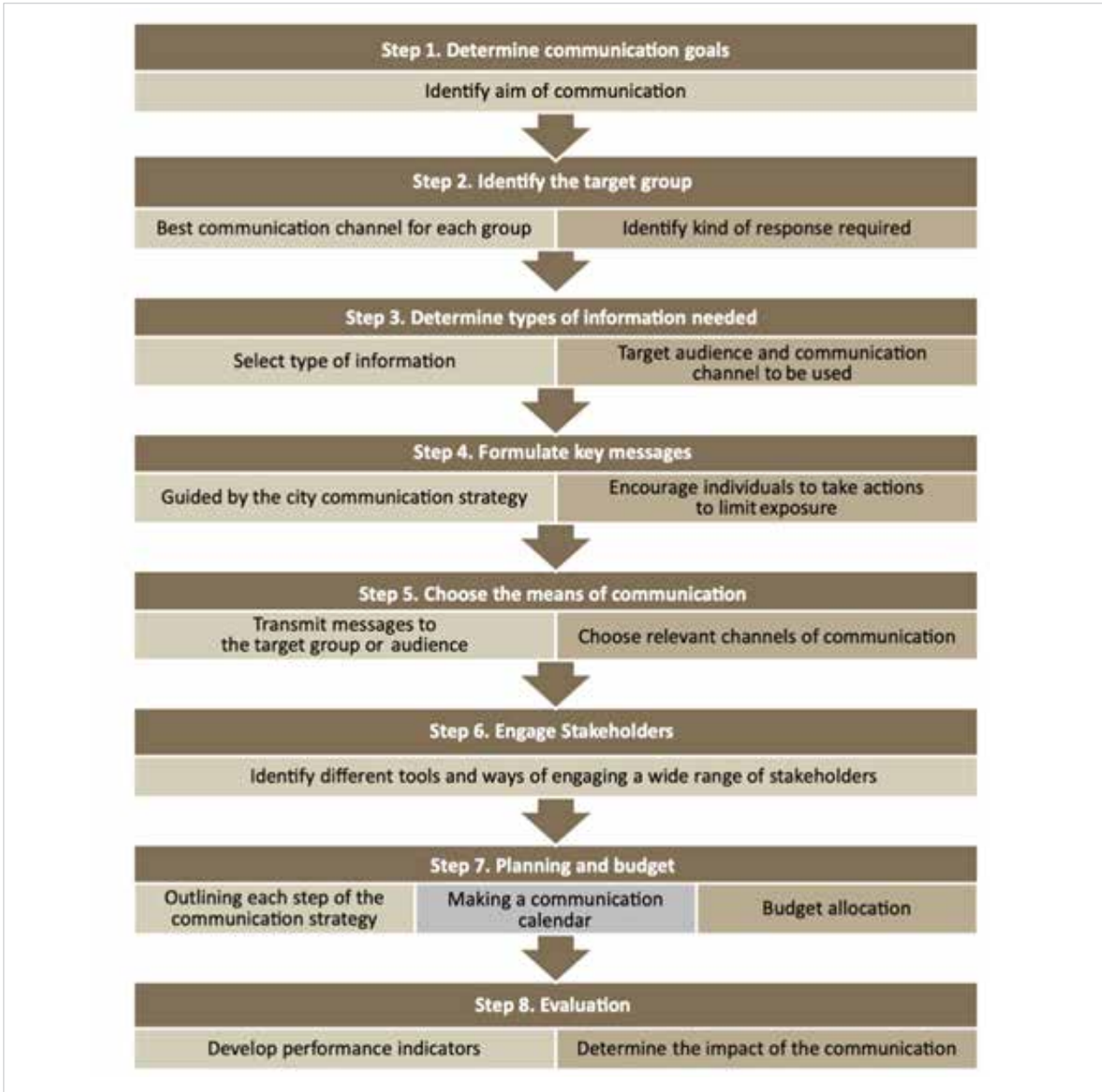


Figure 19: Developing a communication plan⁴⁰

³⁵ Government of India (2017) GRAP Notification. 12 January 2017, New Delhi, India.

³⁶ Sulania, D. and Singh, S. (2019) National Clean Air Programme in India: an introduction. International Journal of Scientific Research, 8:10

³⁷ CSE (2018) Delhi & NCR: Air Pollution Report Card. Centre for Science and Environment, New Delhi, India.

³⁸ Wartenberg, D. (2009) Some considerations for the communication of results of air pollution health effect tracking, Air Qual Atmos Health, 2, 207-221.

³⁹ CiteAir. (2007). Communicating air quality: A guidebook on communication with the public about air quality. Schiedam, The Netherlands.

⁴⁰ Clean Air Asia/Centre for Environment Education (2019) National Module for Advancing Air Quality, New Delhi, India.

3.2.2 Identify the target group

A message targeted at a specific group (e.g., policy makers, media, environmental and health professionals, sector pollution managers and workers, healthcare providers, the public and vulnerable populations) in a format and tone that they understand is likely to be more effective than a general message aimed at everyone. It is important to identify the target group and the best communication channel to reach the group, as well as determining what kind of response you hope to elicit from the target group. For example:

- **Policymakers:** To motivate action and assist in making informed decision by providing clear and understandable information and knowledge on current air pollution issues.
- **General public:** To inform residents of the quality of air they breathe and corresponding risks, to warn residents of high pollution episodes, and to encourage them to take action to reduce emissions.
- **Academe:** To engage them further in AQ research that supports local AQM and GHG reduction.

Each audience has different concerns about the health effects attributable to poor AQ, levels of knowledge and goals. These differences influence what individuals want to hear about, how they interpret the specific information, the degree to which they believe the specific information addresses their concerns, and the technical level at which the information can be understood.

Having several different messages with the same general core content is therefore effective, with each of the messages specifically tailored to each target group.

3.2.3 Assessing the communication needs of the target group

Once the stakeholders are identified it is necessary to have an overview of the existing communication system if any. In some cases, such work can be extensive, regardless of whether it is a review of existing data or establishing status by collecting data for the first time. The information generated must also give answers to the following questions:

- Does the present system address the environmental, health and safety issues?
- Does the present system represent an adequate administrative and organisational framework in terms of efficiency?
- Does the present communication system meet the goal of achieving public support?

The communication activities are most efficient when tailored to the specific needs of well-defined audience groups. Effective communication planning involves collecting and analysing information about the target audience, their social settings, characteristics and factors affecting their behaviour. It is important to understand the potential target audience, to examine their situation, assess problems and information needs and identify solutions. The effectiveness of communication and the relevance of messages depend on knowing and understanding the audience, in particular, their knowledge, their beliefs and attitudes.

Situation Analysis

Identification of Target Groups and stakeholders, who can play a key role in influencing Government decisions.

Communication & capacity building need assessment

Preparation of Communication Strategy
Kick off meeting to elaborate and finalize the approach, strategy and methodology

The needs assessment must be planned to capture the relevant information from the target audience to understand their sensitivity, attitude and current skills with regard to air quality issues and their willingness to participate in the air quality improvement programmes in their respective areas.

Characteristics of the audience such as their age, sex, literacy and income level determine which communication mechanism will be most appropriate. It is also important to collectively assess the characteristics of different community groups to formulate community level communication strategy. Not everyone is equally open to new ideas and different population groups vary in their knowledge and attitude about changes. Therefore, communication strategies need to be audience specific using appropriate communication channels.

Some of the information that might form a basis for communication needs assessment could be:

Demographic factors

- Gender
- Literacy
- Average family size
- Socio-economic profile

Awareness related to general Air Quality Issues

- Quality of Air in their area
- Air Quality and Risks to Health
- Sources of Air Pollution in their area
- Existing Legislations
- Action plan in place for improvement of Air Quality

Role of Public and Current Level of Awareness

- Awareness on importance of public participation
- Willingness to participate
- Awareness on individual activities affecting Air Quality
- Willingness to change personal behaviour to benefit AQM
- Suggestions for better AQM strategy

Communication Infrastructure

- Source of information or entertainment and time spent on such sources - television/radio/newspaper/internet/others
- Frequency of cultural programs in the neighbourhood
- Suggestion for best medium for promoting AQM strategy

Others

- Obstacles to Citizen Action/ Barriers

The above information may be collected in the form of a questionnaire designed specifically for different target groups. Statistical analysis of information collected from the target audience provides insight into gaps in knowledge, attitudes and practices which need to be targeted.

3.2.4 Determine types of information needed

It is necessary to determine the type of information that needs to be conveyed, before focusing on detailed content. The type of information could be ambient AQ data, ambient air monitoring observations, integrated/modelled emissions and simulated ambient air data, and suspected or observed health impacts (see Table 7).

These types of data differ with regard to time, place, pollutant and impact. The type of information to be shared, the target audience and the communication channel to be used should be defined to determine the frequency of reporting, provide guidance on the frequency of reporting of different types of AQ information for some media vectors.

Table 7: Communication channels used to share information and frequency of use

Communication	Real-time	Hourly/Daily	Weekly	Monthly	Annual	As needed
Print newspapers		X				
Email/mobile alerts	X					X
Social networking sites and microblogs e.g., twitter	X					
Website	X		X			
Television and radio	X	X				
Billboards in the city	X					
Published (printed) reports				X	X	X

3.3.5 Formulate the key messages

In developing messages for AQ communication, clarity of the message to be delivered and specifying the response it hopes to elicit is necessary. The message will need to break through the “information clutter” of society and should therefore be based on what the target audience perceives as most important to them and what they want to know.

In addition, key messages should be guided by the communication goal. For example, the general aim may be to inform the target groups about the level of a hazardous pollutant. The specific aim may be to encourage individuals to take personal actions to limit exposure; or to encourage the community to support political action because they are disproportionately affected. Whatever the key message, careful thought

should be given in developing the message and the channel through which the information will be conveyed.

Factors that help determine target group acceptance include:

- **Clarity** – Messages must be jargon-free and the information should be clearly conveyed to ensure understanding.
- **Consistency** – All messages should be consistent. The main points should be stressed, repeated, and never hidden or lost within less strategic information.
- **Credibility** – The spokesperson and source of the information should be believable and trustworthy.

Formulate a target group specific questionnaire/ survey form.

Messages need to be tailored to target audiences so that the AQM issues are brought forth. Only then will the audiences be persuaded to support the communication efforts.

The three main questions that would guide the process of developing the messages are:

- Who do we want to reach?
- What do we want to achieve?
- How do we want the recipients of the message to respond?

Content and Approach:
Determine the idea(s) we want to convey and the arguments that are needed to persuade the audience. There should be balanced perspective/information provided in an interactive form.

Language
Identify the words that should be used (and those that should be avoided) to communicate the message effectively. Simple expression is best for effective and clear communication.

Time and Place
Choose the best time and place to communicate the message. The number of times that the message has to be repeated or the frequency of its delivery.



Table 8: Type of information and frequency of reporting⁴¹

	Real-time	Hourly/Daily	Weekly	Monthly	Annual	As needed
Status of air quality						
• Real-time air quality levels, daily Air Quality Index (AQI)	X	X				
• Air quality forecast		X	X			
• Number of days where standard is exceeded				X	X*	
• Air quality trend and tendency analysis					X	
• Air quality warnings	X					X
• Sources of Air Pollution					X	X
• Emissions inventory						X**
• Source Apportionment					X	X
Impacts of air pollution						
• Health impacts					X	X
• Costs of air pollution (health, economic)					X	X
• Other impacts (visibility, tourism, others)					X	X
Air quality management						
• Legislation and regulations on air quality						X***
• Achievements on clean air management					X	X
• Status of implementation of control measures				X	X	X
• Planned air pollution control measures					X	X
• Yearly budget for clean air management					X	

* Can also be quarterly;
** Can also range from every two to five years;
*** Usually when there is new legislation or revisions in existing legislation.

41 Adapted from ADB/Clean Air Asia (2014) Improving Air Quality Monitoring in Asia: A good practice guidance, Asian Development/Clean Air Asia, Mandaluyang City, Philippines.

3.3.6 Choose the means of communication

Once the present level of knowledge, attitude and behaviour of the target group is established, the responsibility lies in developing the approach for educating these groups. Communication channels transmit the messages to the target group or audience. The choice for channels of communication is also influenced by the available budget. Channels take numerous forms and make it possible for a wide range of tactics for outreach work.

These include:

- Non-media communication: e.g., telemarketing, exhibitions, fairs, and “open door” events. A wide audience cannot be reached by means of non-media communication.
- Media communication: e.g., electronic media (television, radio, video, smartphone, Internet, CD-ROM).

For successful implementation of any program involving the public at large, it is essential to spell out clearly and make them know the manner in which the problem is proposed to be tackled to improve the quality of air leading to better quality of life.

The communication material should be developed in accordance with the results of the needs assessment and utilised in public awareness programs. Some of the communication tools that should be developed and used for this purpose are:

- Focused Group Discussion Formats
- Interpersonal communications such as individual discussions and guidelines
- Checklist for Community meetings and events
- Development of awareness programme tools specific for students (training programme, seminars, educational camps, AQM initiatives and successful stories, brochures, leaflets, competition programmes, awareness Rallies, site visits, etc.)
- Preparation of printed materials and audio-visual aids

Table 9: Range of stakeholder engagement⁴²

Outreach	Inform	Providing information to the public and key stakeholders about the state of air quality and air quality management activities. This information can help in understanding air quality problems and potential solutions. It can also assist stakeholders in providing feedback to authorities for AQM.
	Connect	The provision of public information on a website. This can help the public understand air quality problems and potential solutions. It also provides an interactive source of information that allows stakeholders to engage with air pollution issues by leaving feedback and comments at any time.

- Other forms of one-way communication, such as handouts, brochures, leaflets and posters, banners and audio - visual presentations
- While preparing slogans or other text, easily understandable and catchy words/phrases should be used carefully, e.g., cartoons often catch the eye of most people and the illustrations often remain in the memory for a long time thereby creating a lasting impact
- Mass media communication (such as radio, television, some forms of electronic communication and messages and write-up for newspapers, magazines, etc.)
- Media support is important. Without media support political support for radical actions often evaporates
- Folk programmes as per the requirement of the locality
- Other locally popular media

No communication tool alone can give the desired results. A combination of tools and channels needs to be planned and used to achieve the desired purpose. Use a combination of various tools mentioned above to prepare target audience specific manuals.

For example, spreading awareness within children can go a long way in producing results. The mechanism and content used to educate children should be different from those used for adults.

3.3.7 Engage stakeholders

Identifying different tools and ways of engaging a wide range of stakeholders in AQM is necessary. Stakeholders include individuals, small businesses, local governments, industries and other interested parties affected by air pollution. Table 9. presents the range of stakeholder engagement activities while Table 10 presents the different tools that stakeholders could utilize depending on their degree of involvement.

Engagement activities	Involve	Involving different stakeholders -- such as community groups, industrial, energy and transport managers, local governments and residents -- in the formulation of air quality management measures to ensure that they are comprehensive and effective.
	Comment	Seeking stakeholder comment and input on the formulation of air quality management projects and programs. This usually occurs after a solution has been proposed.
	Collaborate	Collaborating with interested parties to gather ideas and feedback on air quality issues.
	Partner	Harnessing partnerships with groups, organizations or businesses to promote key messages and achieve positive change.

Table 10: Tools for stakeholder participation in air quality management

Tools	Inform	Connect	Involve	Comment	Collaborate	Partner
Website	X	X				
Printed materials	X	X				
Telephone communications	X		X	X	X	
Email communications	X		X	X		
Direct mail	X				X	
Public notices in newspapers and advertisements	X					
Media news releases	X					
Door-to-door outreach				X		
Community events and booths			X	X	X	X
Social media	X		X		X	X
Text messaging and applications	X		X	X	X	
Public comments during board and council meetings			X	X		
Public hearings			X	X		
Written comments	X			X		
Comments by phone	X		X	X		
Workshops			X	X	X	
Webinars			X	X	X	
Small group meetings					X	X
Presentations to standing committees, commissions and boards			X	X		
Direct conversation			X	X	X	

42 Bay Area Air Quality District (2013).Bay Area District Public Participation Plan.

Tools	Inform	Connect	Involve	Comment	Collaborate	Partner
Task forces			X	X	X	X
Focus groups			X			
Surveys			X			
Technical working group meeting			X	X	X	
Industry compliance training programs			X	X	X	
Grants and incentives	X	X	X		X	

3.3.8 Planning and budget

Following a detailed timetable of implementation and an appropriate level of financial and human resources will determine the success and effectiveness of any communication plan.

3.3.9 Organise feedback/concurrent evaluation

To determine the impact of the communication, its effects need to be measured, which could be done by developing performance indicators. A common way of measuring impact is by determining the knowledge, attitude, and/or behaviour levels before and after the communication activity.

A feedback mechanism must be developed so that regular feedback can be used in updating content and ensuring efficiency of communication medium. It should be noted that the feedback forms/ response recording mechanism itself need also to be pilot-tested and modified accordingly. A team can be formed to conduct pilot testing of the communication strategy carried out for a certain area.

Proper sampling of all target groups would be done for taking feedback during the pilot phase. The pilot testing is helpful in preparation of the monitoring mechanism and methods. The monitoring mechanism may also be finalized in close consultation with the stakeholders.

During implementation of strategy, its effects and impacts (accuracy, efficiency and problems) must be monitored and evaluated to track the effectiveness of desired changes on following lines:

- Effectiveness of the communication programme
- Level of participation in programs
- Increased level of awareness
- Quality and volume of communication tools produced
- Distribution of materials with regard to target group
- Quality of interpersonal communication
- Effective utilisation of communication materials
- Level of public support for AQM

4. Types Of Information And Target Groups



The type of air quality information generated and disseminated depends on the objectives set and the target stakeholder group. The aim could be to induce action in the case of an emergency alert or to increase air pollution awareness over the long-term. For example, in raising public awareness, four types of air pollution information are available to the public: air quality levels, health impacts of air pollution, actions to reduce pollution and behaviours to minimise exposure to pollution.⁴³ Table 11 presents the types of information that could be used to meet specific objectives to improve air quality.⁴⁴

Different groups will require different Information (see Figure 20). For example, the public would require information on:

- Health is affected by exposure to air pollutants
- Travel choices contribute to pollution and exposure to levels of local pollution
- Engine 'idling' affects air quality in the vehicle as well as outside

- To minimise exposure to by altering travel habits or routes (this includes restricting time spent with an engine 'idling', particularly near schools)
- To mitigate both outdoor and indoor air pollutant exposure during a pollution episode (e.g. using appropriate air masks (outdoor), air filters/ cleaners and clean cook stoves in rural or peri-urban areas (indoor)).



⁴³ Oltra, C. and Sala, R. (2015) Communicating the risk of urban air pollution to the public. A study of urban air pollution information services. Rev. Int. Contam. Ambie. 31(4), 361-375.

⁴⁴ Elshout (2014) Air quality communication with special reference to the AQI, D2.3- Part I, Task 2.2., AirInForm, Vito, Belgium

Table 11: Identifying information needs⁴⁵

Aim	Example	Intended Audience	Type of Information
To formulate/ evaluate air quality policy	To improve air quality and reduce health impacts of long-term exposure; to comply with (inter)national emission reduction programmes.	Specialised government departments Research institutes	Long-term detailed information on individual pollutants: <ul style="list-style-type: none">• Air quality time series for various pollutants, annual averages, maps etc.;• Emissions, models to make scenarios;• Health impact assessments.
To be accountable	To inform the government and the public (in non-technical language) about the state of quality in a specific area (e.g. city/region) and of its development over time and space.	Government authorities Policy makers Non-governmental organisations General public	Information in a condensed form such as index or summary of statistics that is easy to understand by a non-specialist. Information can be provided on two-time scales: annual average (trends) for policy monitoring; near real-time (today's air quality).
To raise awareness	To inform non-specialists on the causes and impact of air pollution and to gain public support for air quality management measures and foster attitudinal and behavioural change.	The public Local authorities Non-governmental organisations	Information in an easy-to-understand format that allows individuals to understand the link between certain activities/events and emissions of air pollutants. For example, a register of main polluters, on-line information showing the difference in air quality at different industrial, traffic and urban sites.
To communicate risk	Authorities need to understand the causes of the air pollution problem and what can be done to reduce polluting air emissions and their impacts.	Authorities that need to take immediate action.	Short-term scenario analysis for peak situations has to be undertaken (prior to an event) to study intervention options. Short-term (hourly/daily) forecasted air quality and weather information at high spatial resolution.
To communicate an emergency response	Authorities that may want to advise the public or a specific target group to avoid certain behaviours.	Public that has to adapt their behaviour	Air quality is such that I might cause short-term health effects and people to reduce exposure or adapt medicine use. Forecasted (or at least hourly update real-time) air quality with specific behavioural advice.

Information can be provided to businesses on how they can reduce road-traffic related air pollution and improve fuel efficiency. For example, businesses could consider:

- Ensuring their drivers develop an energy-efficient driving style;
- Schedule deliveries to minimise congestion; and
- Encourage employees to use public transport,

walking and cycling to work rather than the motor vehicle or developing a car sharing scheme.

Actions could be taken to protect vulnerable groups who are more at risk from air pollution. For example, ensuring health professionals are aware of daily air quality indices and alerts and that they understand the long-term effects of exposure to air pollution.

Health professionals could raise awareness of poor outdoor air quality and advise high risk groups on how to minimise their exposure and impact. This could include advice to:

- Avoid or reduce strenuous activity outside, especially in highly polluted locations such as busy streets, especially if experiencing symptoms

such as sore eyes, a cough or sore throat.

- Use an asthma reliever inhaler more often, as necessary.
- Close external doors and windows facing a busy street at times when traffic is heavy or congested to help highly polluted air getting in.

Target Group	Sub Groups	Key messages
Urban citizens	Town occupants, Motorists and public transport, and non-motorized transport, Users, Pedestrians, cyclists, tourists, parents of babies and small children, Sports people (outside), Shop owners	<ul style="list-style-type: none">• General city information• Real-time air quality levels• Daily AQI• Air quality forecast• Number of days where standard has exceeded air quality trends and tendency analysis
People sensitive to air pollution	Older people, Parents of babies and small children, Asthmatics, patients' association Groups, People with allergies, Heart and lung patients	<ul style="list-style-type: none">• Air quality warnings• Health impacts, Costs of air pollution (health, economic, etc.), Other impacts (visibility, tourism, others)
Health professionals	General practitioners, Specialists (hospital), Public health service	<ul style="list-style-type: none">• Air quality legislation and regulations
Managers	Industry, transport, power plants	<ul style="list-style-type: none">• Annual achievements on clean air management
Non-governmental	Interest groups (in general), Consumer organizations, Environmental groups	<ul style="list-style-type: none">• Status of implementation on control measures• Planned air pollution control measures
Organizations	Research institutions, Universities	<ul style="list-style-type: none">• Yearly budget for clean air management
Academia	Individual researchers	

Figure 20: Questions to consider in communicating to different target groups⁴⁶

45 Based on Elshout (2014) Air quality communication with special reference to the AQI, D2.3- Part I, Task 2.2., AirInform, Vito, Belgium.

46 Clean Air Asia/Centre for Environment Education (2019) National Module for Advancing Air Quality, New Delhi, India.

4.1 Emergency Alerts

Air quality information needs to be communicated differently during an emergency compared to a long term strategy to enable individual/community action. In the case of air pollution alerts, test procedures should be followed to ensure effective action.

The AQI provides an alert system to protect citizens from air pollution (see Figure 21). Health alert should be issued when the AQI is forecasted to be Very Poor And a health warning when the AQI is forecasted to be Severe. A health advisory is issued to vulnerable groups when the AQI is forecasted to be Poor.

Air Quality Index (AQI)	PM 2.5 Health Advisory	PM 2.5 Health Effect Statement	Overall Associated Health Impact with AQI Level
Good (0 – 100)	No cautionary action required	Air pollution poses little or no risk	Minimal impact
Moderate (101 – 200)	Unusually sensitive people should consider reducing prolonged or heavy exertion and heavy outdoor work	Air quality acceptable for general public but moderate health concern for sensitive people	May cause breathing discomfort to the people with lung disease such as asthma and discomfort to people with heart disease, children and older adults
Poor (201 – 300)	Children and adult with heart or lung disease, should reduce prolonged or heavy exertion and limit outdoor activity	Children and adult people at risk. More chances of precipitating respiratory symptoms in sensitive individuals.	May precipitate severe attack on short term exposure in high risk individuals and respiratory symptoms (breathing discomfort) in normal individual on long term exposure.
Very Poor (301 – 400) Triggers “Health Alert”	Everyone should reduce prolonged or heavy exertion. More caution for children or adult with heart or lung disease.	Triggers health alert. Everyone may experience more health effects. Significant increase in respiratory effects in general population	May cause mild respiratory problems in normal individual/ more pronounced in people with lung and heart disease.
Severe (401 – 500) Triggers “Health Warning”	Everyone should avoid all outdoor physical activity. Sensitive individual should remain indoor with minimal activity.	Should be declared as emergency condition. Serious risk of respiratory effect in general population as high risk.	May cause respiratory effects even on healthy people and serious health impacts on people with lung and heart diseases. The health impacts may be experienced even during light physical activity

Figure 21: AQI and associated health advisory and effects⁴⁷

4.1.1 Health advisory

An air health advisory is issued to vulnerable groups when the AQI is forecasted as Poor (levels 201 – 300). Information about alerts will be shared with

the Pollution Control Board. Actions to be carried out under health advisory include informing relevant departments, medical facilities and schools about the air quality conditions.

4.1.2 Health alert

An air health alert would be called when AQI levels are forecasted to be Very Poor at 301 or greater within the next 24 hours.

Actions to be carried out under health alert include informing urban health centres as well as private medical practitioners, pulmonologists, paediatricians to alert them to expect and be prepared for more cases of respiratory health effects.

4.1.3 Health warning

A health warning should be called when AQI levels are forecasted to be Severe and equal to or greater than 401 within the next 24 hours.

Actions to be carried out for a health warning include informing urban health centres as well as private medical practitioners, pulmonologists, paediatricians to alert them to expect and be prepared for more cases of respiratory health effects. Inform 108 emergency ambulance service that air pollution is forecast to be Severe.

City departments include transport, traffic police, estate department, schools and colleges and environmental management should also be informed. Finally, an Air Health Warning should be published in the print and broadcast media, including newspapers, radio and television.

4.1.4 Interagency coordination

The successful implementation of action to reduce the health risk of poor air quality requires a coordinated effort between diverse stakeholders including government departments; health care professionals including emergency medical personnel, health centre staff, and hospital staff; and community groups.

Following the forecasting of air pollution events, immediate notification of the public and all those participating in the response is critical to ensure the action is taken (see Figure 22).

Table 12 presents suggested agency actions during high pollution episodes.



Figure 22: Air pollution awareness posters⁴⁸

47 AMC (2018) Ahmedabad Air Information and Response Plan. Ahmedabad Metropolitan Corporation, Ahmedabad, India.

48 CPCB (2019) Envis Centre on Control of Pollution, Water, Air and Noise.

Table 12: Suggested agency action during high air pollution episodes⁴⁹

Air Pollution Index Level	Actions	Responsible agency
POOR (201 – 300)	Activate response system – inform all relevant departments	State and Regional Offices, Pollution Control Board
	Alert schools to inform children of the pollution risk, alert vulnerable groups via emails, and WhatsApp groups	Publicity Dept.
	Inform hospital to prepare for higher cases of respiratory illness.	Health Dept.
VERY POOR (301 – 400)	Activate health Alert and response system – inform all relevant departments	State and Regional Offices, Pollution Control Board
Triggers Health Alert	Alert schools to inform children of the pollution risk, alert vulnerable groups via emails, and WhatsApp groups	State and Regional Offices, Pollution Control Board
	Alert newspapers/TV/radio/FM Stations to advise people with respiratory and cardiac illnesses to avoid polluted areas and restrict outdoor movement.	Publicity Dept.
	Inform hospitals to be prepared for higher cases of respiratory illness, ensure adequate supply of oxygen and medicine.	Health Dept.
	Inform outside workers about air pollution risk.	Urban Development Department
	Strict vigilance and no tolerance for visible emissions – stop plying of visibly polluting vehicles by impounding or heavy fine.	Municipal Transport Service Traffic Police
	Deploy traffic police for smooth traffic flow in areas likely to have congestion.	Traffic Police
	Stringently enforce/stop garbage burning landfills and other places and impose a fine on the person responsible.	Solid waste Management Dept.
	Activate health Warning and response system – inform all relevant departments	State and Regional Offices, Pollution Control Board
	Alert schools to inform children of the pollution risk, alert vulnerable groups via emails, and WhatsApp groups	State and Regional Offices, Pollution Control Board
Triggers Health Warnings	Alert newspapers/TV/radio/FM Stations to advise people with respiratory and cardiac illnesses to avoid polluted areas and restrict outdoor movement.	Publicity Dept.
	Inform hospitals to be prepared for higher cases of respiratory illness, ensure adequate supply of oxygen and medicine.	Health Dept.
	Inform outside workers about air pollution risk, stop outside work. Ensure workers use masks if working outside.	Urban Development Department

Air Pollution Index Level	Actions	Responsible agency
	Strict vigilance and no tolerance for visible emissions – stop plying of visibly polluting vehicles by impounding or heavy fine.	Municipal Transport Service Traffic Police
	Deploy traffic police for smooth traffic flow in areas likely to have congestion.	Traffic Police
	Ensure no garbage burning landfills and other places and impose a fine on the person responsible.	Solid waste Management Dept.
	Increase frequency of mechanised cleaning of road and sprinkling of water on roads.	Dept. Health and Urban Development Department
	Stringently enforce rules for dust control in construction activities and close non-compliant sites.	Urban Development Department
	Stop use of diesel generator sets.	Pollution Control Board
	Increase parking fee by 3-4 times, ensure higher frequency of public buses.	Municipal Transport Service
	Order shutting down of schools if Severe pollution persists for two consecutive days.	Education Dept. in consultation with Education boards.
	Shut down of polluting industries till the emergence of remedial measures.	Industrial Department and Central Pollution Control Board
	Preparation and enforcement of action plans for designated Polluted Industrial Areas by the government.	
	Continuous Monitoring System Installation and submission of compiled data related to air pollution.	

49 AMC (2018) Ahmedabad Air Information and Response Plan. Ahmedabad Metropolitan Corporation, Ahmedabad, India.

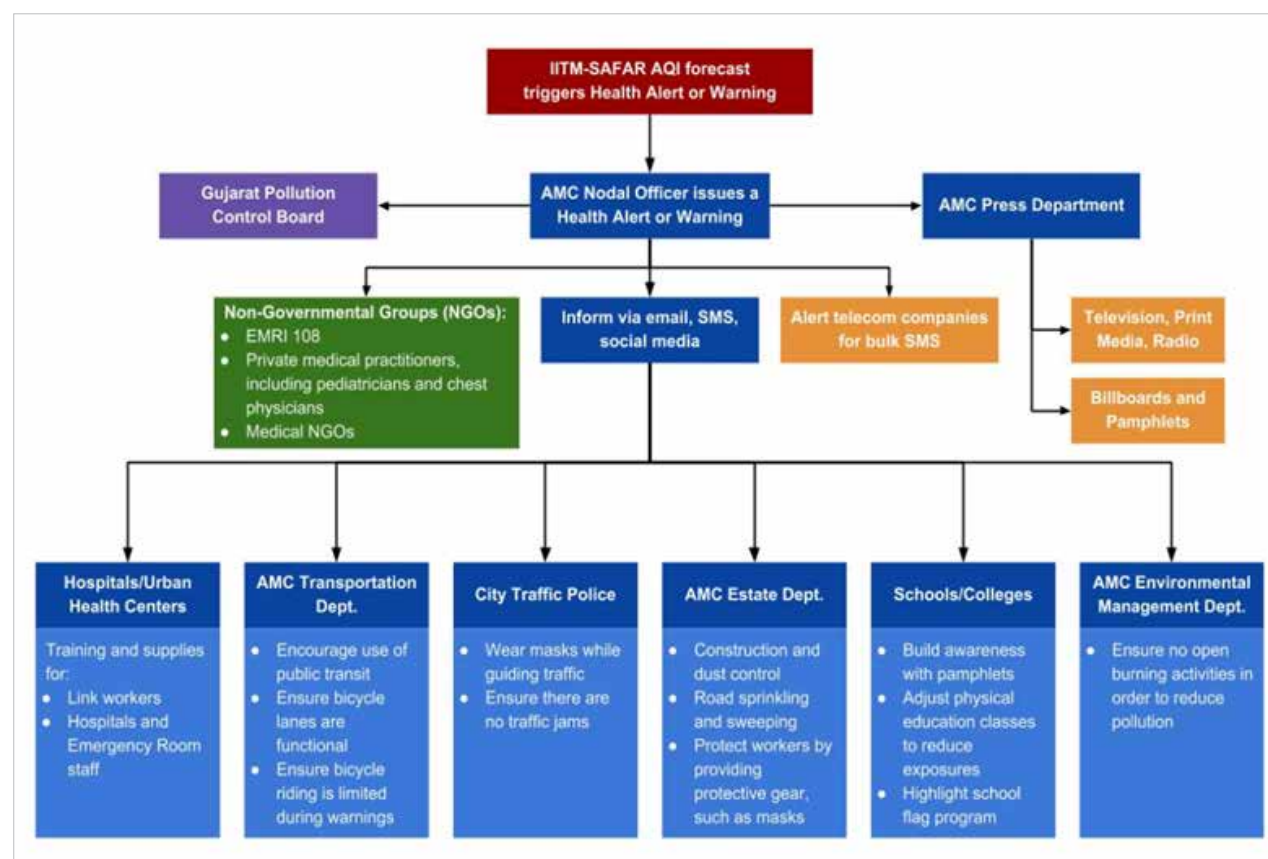


Figure 23: Example of Ahmedabad Air Information and Response Plan for emergency alert and interagency communication⁵⁰

4.2 Long Term Stakeholder Engagement

As well as communication during emergency air pollution alerts, there are other activities that can be undertaken to increase general air pollution awareness of all key stakeholders. These include providing air pollution for the general public as well as targeting key groups such as vulnerable people, medical and media professionals.

Activities for greater public awareness could include disseminating of education materials, hoardings, pamphlets and videos, updating websites with AQI, engaging the media to ensure regular coverage of the AQI and associated health advisors in the media, when necessary.

Activities aimed at vulnerable groups include the dissemination of up-to-date pamphlets, hoardings, videos, SMS to increase awareness. Developing specific programmes (e.g. school air quality flag programme) targeted at specific individuals such as those with chronic respiratory illness to increase

understanding of how air pollution can affect their condition. Undertaking air pollution awareness programme aimed at asthma and pulmonary health clinics.

Air pollution activities aimed at private and public medical professionals can include training to build capacity on air pollution, health and mitigation measures and increase awareness of air pollution prevention and health protection strategies. This could involve working in public health and medical science to undertake health studies to assess the health impact of air pollution.

4.3 Prepare Public Campaign

Without public support, all efforts towards a successful AQM programme will be unsuccessful. It is therefore necessary to ensure widespread public involvement in the programme. Local citizen groups can accomplish this by the following means:

- Broad educational and information programmes. Creating public awareness about health impacts

of air pollution. Schools and educational institutions should play a major role in this process. It is absolutely necessary to establish capacity building programmes.

- Involvement of public communities in environmental programmes. The local government should take an active part in arranging and stimulating these programmes. Examples of how the public can contribute include car-pooling; using mass transit; walking; biking; using energy efficient appliances; using air conditioners wisely with non-ozone depleting (Chlorofluorocarbons-free) refrigerants; regularly maintaining cars and making sure these meet emission standards; composting waste; planting trees; and reporting smoke-belching vehicles to relevant authorities.
- Influence the government to develop recycling, composting and sanitary landfill facilities so that waste burning is banned effectively.
- Support and collaborate with the private sector, associations, independent groups and all categories of mass media to participate in public relation efforts and campaigns to educate and increase understanding and awareness of threats from pollutants in air and be informed of enforcement of laws against all categories of polluters.
- Support study, research and training in technologies for prevention, minimisation and eradication of air pollution. Promote the use of cleaner technologies.
- Public awareness about safety issues should be increased using different kinds of informal meetings with medical staff.



⁵⁰ AMC (2018) Ahmedabad Air Information and Response Plan. Ahmedabad Metropolitan Corporation, Ahmedabad, India.

5. Case Studies



5.1 Communication During Emergency - Ahmedabad's Heat Action Plan

The Ahmedabad's Heat Action Plan is a comprehensive early warning system and preparedness plan for extreme heat events in Ahmedabad.⁵¹ The Plan presents immediate and long-term actions to increase preparedness, information-sharing, and response coordination to reduce the health impacts of extreme heat on vulnerable populations. The Ahmedabad's Heat Action Plan is a good and relevant example on how to prepare the early warning system in case of higher air pollution episodes. The level of preparedness, communication procedure can be referred by authorities to deal with the episode of higher air pollution.

The communication is affected through the dissemination of public messages on how to protect people against extreme heat, through media outlets and informational materials such as pamphlets and advertisements on heat stress prevention (see Figure 24). Efforts also include the use of social media such as SMS, text messages, email, radio and mobile applications such as WhatsApp, especially to communicate alerts. Special efforts are made to reach vulnerable people through interpersonal communication as well as other outreach methods. The Ahmedabad Municipal Corporation has created formal communication channels to alert governmental agencies, the Met Centre, health officials and hospitals, emergency responders, local community groups, and media outlets, of forecasted extreme temperatures.



Figure 24: Heat Alert Poster⁵²

51 AMC (2017) Ahmedabad Heat Action Pan 2017. Ahmedabad Metropolitan Council, Ahmedabad, India.

52 AMC (2017) Ahmedabad Heat Action Pan 2017. Ahmedabad Metropolitan Council, Ahmedabad, India.

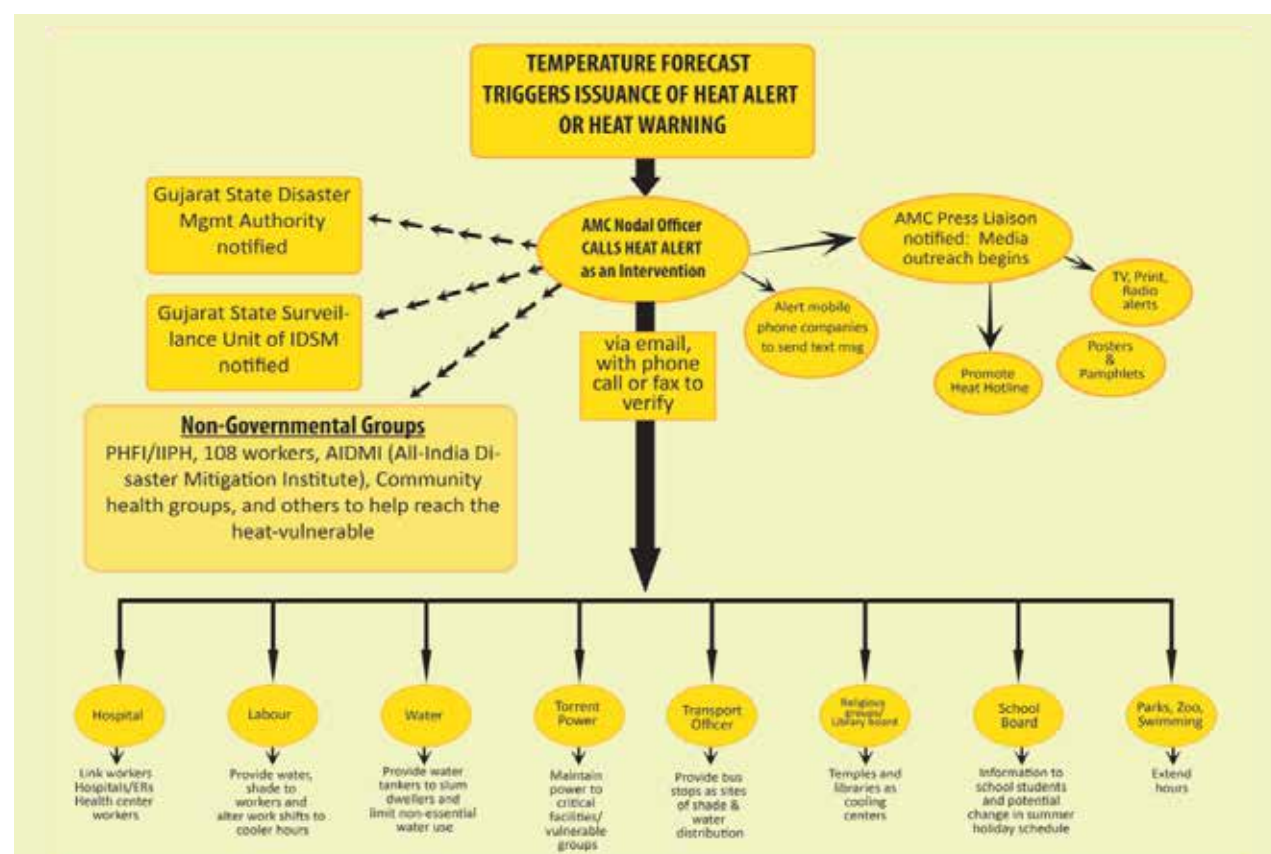


Figure 25: Communication plan when a heat alert is activated⁵⁴

5.2 Ballon de Paris

Since 2008, the Ballon de Paris (Paris, France), has been partnering with AIRPARIF (a licensed air-quality-measurement company in France).⁵³ Not only does the balloon have the capacity to take air quality measurements, but it also changes colour depending on the quality of ambient air in Paris. Every two hours the balloon shows two air quality indices: ambient air quality provided by six urban stations and air quality measured at five traffic stations in Paris.

The indices illustrate in a simple and easily understandable manner the amount of the three most problematic pollutants in major European cities: particulate matter, nitrogen dioxide, and ground-level ozone. The balloon turns green for good air quality in Paris, orange for fair and red for poor. It can be seen for over 19 kilometres (12 miles).

5.3 Air Quality School Flag Programme

Ahmedabad Air Information and Response (AIR) plan has been developed in collaboration with

Ahmedabad Municipal Corporation (AMC), Gujarat State Pollution Control Board (GPCB), Indian Institute of Public Health, Gandhinagar (IIPHG), and Natural Resources Defence Council (NRDC) as well as Indian Institute of Tropical Meteorology (IITM) and Indian Meteorological Department's SAFAR project.

One of the key strategies of the Ahmedabad Air Information and Response plan is to focus on vulnerable groups, especially children. With this view, the AMC has developed a "school flags" programme with the objective of protecting children in Ahmedabad.

Under the programme, the AMC provides brightly coloured flags corresponding to the AQI colour codes to fifty schools across the city. The flags are hoisted daily, based on the AQI reading for that day and accompanied by informative posters that educate students on the AQI levels as well as preventative health guidance.

The information includes advice on how to modify outdoor activities when the air quality is dangerously unhealthy.



Figure 26: Air quality flag programme⁵⁵

5.4 Success Story: "Spare the Air" Campaign

In 1991 the Bay Area Air Quality Management District (BAAQMD) created a communication based approach to control vehicular emissions in San Francisco, California, USA. The campaign addresses ground level ozone concentration, a persistent pollution problem in the Bay Area.

Participation and partnership were key approaches integrated in Spare the Air planning and launch. After undertaking public opinion surveys to assess people's awareness of local air pollution issues and to examine commuters' travel choices, focused group discussions were carried out in local language as well as in English to examine how people perceived the programme's messaging and to find out if they would take the issue of bad air quality seriously. Organisers included children, other stakeholders and the media in coordinating promotional events and developing incentives.

For example, actual information about air quality - communicated through various channels by meteorologists from the BAAQMD - is meant to educate the public and inform them when the predicted ozone concentration is in excess of the federal health standard. Such days are declared "Spare the Air" days. Spare the Air advisories are announced. Television and radio stations, newspapers, participating employers, and individuals registered

with the network are notified by phone, fax or email. These stations and media outlets then announce Spare the Air days and the advisories in their news, weather reports, Air Quality Index reports, publish articles and display the Spare the Air Day slogan on their mastheads. As people prepare to leave for work, these announcements remind them to avoid contributing to the ozone problem. Updated forecasts are posted on the Spare the Air website. A registration form is available online for individuals who wish to receive email notification of Spare the Air days.

To motivate people to participate, the programme's messaging informs people that ground-level ozone is harmful to human health because it damages lung tissue, especially in children, the elderly, and those with respiratory problems. The message is that ground-level ozone is a local, real-life problem that people can take simple, discrete actions to help prevent. One key action is leaving one's car at home and trying a commute alternative. To overcome possible barriers to behaviour change, there are private non-profit organizations offering free commute services and consultations to determine a commuter's best alternative, carpool and vanpool referrals from its database of over 12,000 commuters, bicycle information and referrals, assistance in taking public transit or forming carpools and vanpools, and the like. Its messages include "We can help you get there faster, cheaper and easier", and "Use a commute alternative to driving alone, and you'll save money, time, and stress." Residents are also asked to consider their non-work activities, and to monitor them for

⁵³ Ballon de Paris: <https://www.ballondeparis.com/en/>

⁵⁴ AMC (2017) Ahmedabad Heat Action Plan 2017. Ahmedabad Metropolitan Council, Ahmedabad, India.

⁵⁵ AMC (2018) Ahmedabad Air Information and Response Plan. Ahmedabad Metropolitan Corporation, Ahmedabad, India.

possible environmental impacts - perhaps by not using gas-powered lawn mowers and leaf blowers, avoiding using hairspray and household cleaners, igniting barbecues with an electric or chimney starter only (no lighter fluids), and forgoing household maintenance activities that produce emissions of volatile organic compounds (e.g., painting).



Figure 27: Public Campaign

Several strategies are used, entertaining strategies are used to engage children and young people, financial incentives and recognition are used to motivate people to take action to protect the environment, incentives are also central to the employer participation component of Spare the Air. With the help of the Bay Area Clean Air Partnership (BayCAP) - a public/private partnership initiated in 1996 to promote voluntary actions to improve air quality in the Bay Area - local businesses and public agencies have promoted the programme to the public and their employees. BayCAP has helped develop outreach materials during monthly workshops; these workshops led to the formation of resource teams that provide additional promotional support and incentives.

5.5 Health Air Campaign: Help Britain Breathe

Working with a coalition of transport, health and environmental charities, the UK social impact agency, Purpose, created a campaign brand, content strategy and social media campaign to increase public awareness of air pollution outside of London, particularly targeting parents in five key cities.⁵⁶

The campaign used a rigorous message testing process and the development of highly targeted creative content that was tailored to the audience, including over 50 pieces of original items that generated 500K+ engagements and a series of offline advertisements in 80+ locations across the country. The work undertaken by this project was done in conjunction with key partners Client Earth, the UK100, British Lung Foundation and the Healthy Air Campaign and distribution and producing partners Oxbow, Clean Air Now, Bootstrapped PR, RKM Communications and Exterior Media.

The campaign built a new data-driven and responsive campaign, called Help Britain Breathe, as a sub-campaign of the existing Healthy Air Campaign coalition. The campaign focused on learning and adapting in real time, testing messaging on social media and using the results to further inform content and narrative development among our target audience. After building a sub-brand for the campaign, campaign microsite was established and an email program developed that garnered engagement rates at twice the industry average. On social media, the campaign generated 50 pieces of digital content items, including 16 videos and 34 social graphics, all of which generated 579,006 engagements on Facebook as well as 5,136,431 impressions and 652,658 video views across Twitter, Youtube and Facebook.

Two outdoor advertising campaigns were undertaken. The first included five different billboard designs in nine locations across our target cities, and the second included three different train advertisement designs in 77 train stations across four of the country's most air polluted regions: Birmingham, Leeds, Liverpool and Manchester. The billboard campaign was shortlisted for the National Air Quality Awards and testing around the train stations campaign showed an average 5.4% increase of awareness of air pollution as a health risk following interacting with the campaign content.

Drawing on previous work with the Healthy Air Campaign, two consultation tools were built that enabled people to participate with greater ease in the UK's Air Quality Consultation and the Diesel Scrappage Scheme Consultation. For the national consultation fifteen times the responses recorded during the previous consultation were generated and were greatly supported by the distribution of Healthy Air Campaign partners.

The campaign was composed of online and offline activations that included localised billboards and train ads in our five target cities, a bespoke set of lesson plans and animations for primary school learning, social media explainer videos and graphic content, a tool to better engage in consultations on air quality and a standalone message campaign on air pollution and beauty.

National polling conducted in January 2018 measured the following changes in perception as compared to similar national polling conducted in February 2017:

- 4% increase in public concerns about the impact of air pollution on respondents' health and health of their families;
- 7% increase in the percentage of the country supporting banning diesel vehicles from areas of high pollution, with a 5%, 8% and 10% increase in the South, Midlands/Wales and the North respectively;
- 4% increase in the percentage of the country that would support or oppose a new 'Clean Air Act,' with a 4%, and 10% increase in the South, Midlands/Wales and the North respectively; and
- 6% increase in the percentage of the country that would support stronger air quality laws than the EU, with a 4%, 9% and 9% increase in the South, Midlands/Wales and the North respectively

Lastly, working with Bootstrapped PR and RKM Communications, the campaign garnered 138 media hits in print and digital, ranging from local periodicals like the Liverpool Echo to bigger media outlets like the BBC and Huffington Post, and was supported by the sharing of campaign content from parenting lifestyle influencers.

56 Shortyawards (2020) Healthy Air Campaign: Help Britain Breathe: <https://shortyawards.com/3rd-socialgood/help-britain-breathe>

