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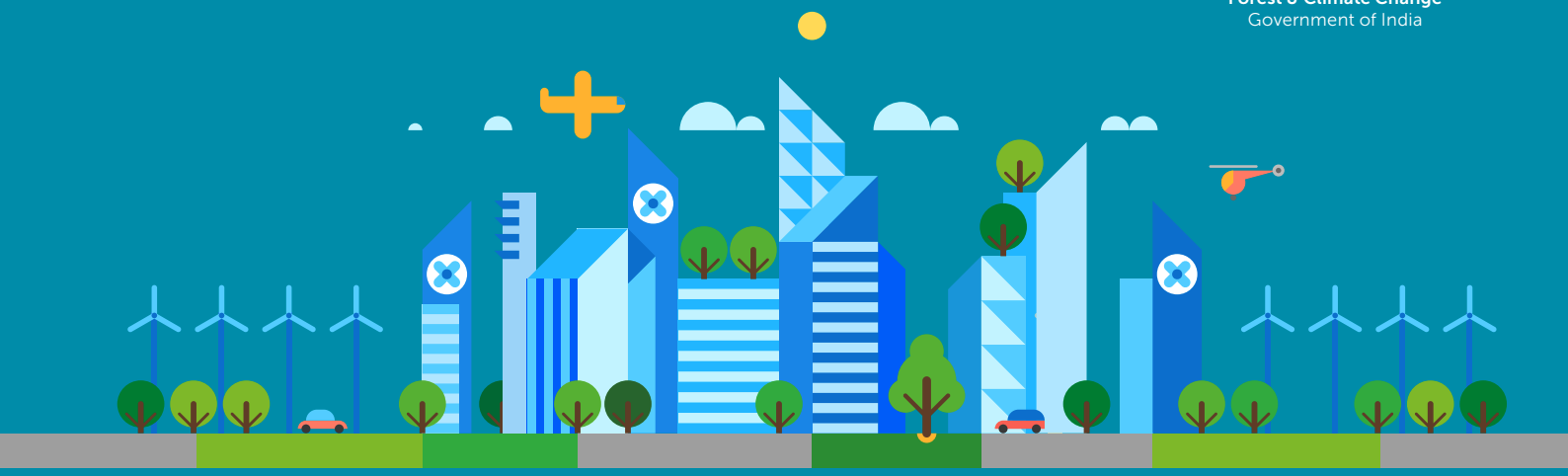
NCAP

NATIONAL CLEAN AIR PROGRAMME

Ministry of Environment,
Forest & Climate Change
Government of India



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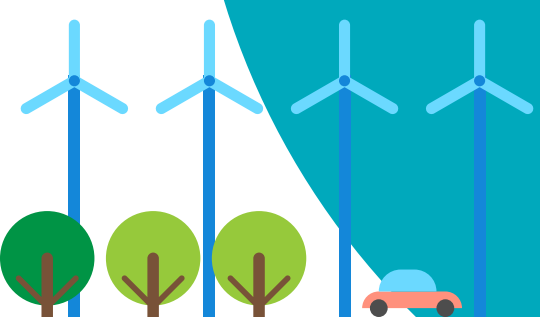

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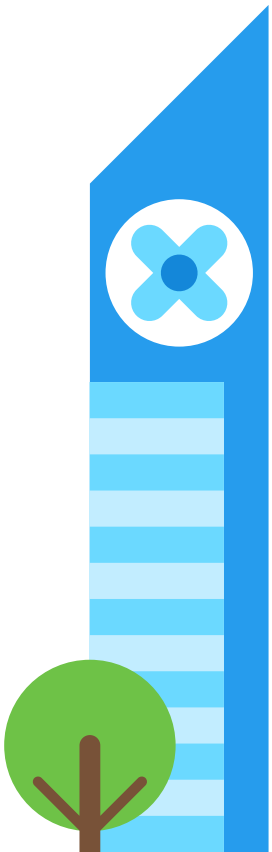
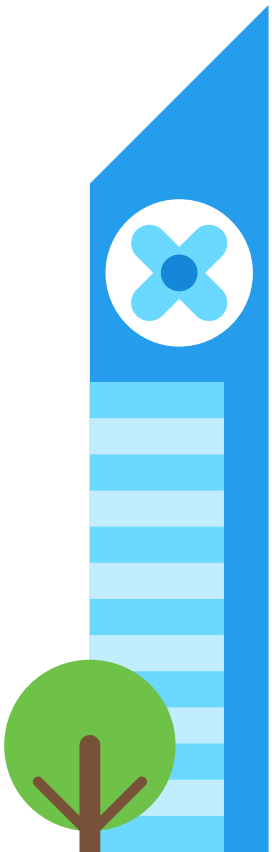


LIST OF ABBREVIATIONS

AAQFS	Ambient Air Quality Forecasting System
AOD	Aerosol Optical Depth
AQI	Air Quality index
ARAI	Automotive Research Association of India
BEE	Bureau of Energy Efficiency
BS	Bharat Stage
C&D	Construction and demolition
CAAQMS	Continuous Ambient Air Quality Monitoring Stations
CAAQMS	Continuous Ambient Air Quality Monitoring Stations
CAMPA	Compensatory Afforestation Management and Planning Authority
CEPI	Comprehensive Environmental Pollution Index
CNG	Compressed Natural Gas
CPAs	Critically Polluted Areas
CPCB	Central Pollution Control Board
CSIR	Centre for Scientific and Industrial Research
DST	Directorate of Science and Technology
EPA	Environmental Protection Agency
EPCA	Environment Pollution Prevention and Control Authority
EV	Electric Vehicles
FGD	Flue Gas Desulfurization
GAIL	Gas Authority of India Limited
GHG	Greenhouse Gas
GRAP	Graded Response Action Plan
GTAP	Graded Response Action Plan
HDV	Heavy-Duty Vehicles
ICMR	Indian Council of Medical Research
IIFM	Institutes as Indian Institute of Forest Management
IITM	Indian Institute of Tropical Meteorology
IMD	India Meteorological Department
INDC	Intended Nationally Determined Contribution
ISRO	Indian Space Research Organisation
LPG	Liquid Petroleum Gas
MHCV	Medium & Heavy Commercial Vehicles
MNRE	Ministry of New and Renewable Energy
MoA	Ministry of Agriculture
MoEF&CC	Ministry of Environment, Forest and Climate Change
MoPNG	Ministry of Petroleum & Natural Gas
MoRTH	Ministry of Road Transport and Highways
MSW	Municipal Solid Waste
NAAQS	National Ambient Air Quality Standards
NAMP	National Air Quality Monitoring Programme
NAPCC	National Action Plan on Climate Change
NAPCC	National Action Plan on Climate Change

NCAP	National Clean Air Programme
NCR	National Capital Region
NEERI	National Environmental Engineering Research Institute
NEMMP	National Mission for Electric Mobility
NICB	NPL-India certification body
NMHC	Non-methane hydrocarbons
NPMCR	National Policy for Management of Crop Residues
OCEMS	Online Continuous Emission Monitoring System
PAHs	Polycyclic Aromatic Hydrocarbons
PMUY	Pradhan Mantri Ujjwala Yojana
PNGRB	Petroleum and Natural Gas Regulatory Board
PUC	Pollution under Control
PWD	Public Works Department
SACEP	South Asia Co-operative Environment Programme
SAFAR	System of Air Quality and Weather Forecasting and Research
SDGs	Sustainable Development Goals
SOP	Standard Operating Procedure.
SPAs	Severely Polluted Areas
SPCB	State Pollution Control Board
TERI	The Energy and Resources Institute
TPP	Thermal Power Plants
UNCCD	United Nations Convention to Combat Desertification
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
VVMP	Voluntary Vehicle Fleet Modernization Programme
WHO	World Health Organization



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MESSAGE

Air Quality failing to meet the prescribed national air quality standards is recognized for causing adverse health impact on human health, agricultural production and ecosystem. Rapidly expanding economy and migration of people to urban centers in India is a significant factor for the deterioration of ambient air quality, particularly in metropolitan areas in the country. In order to combat the challenge of unhealthy air quality in regional and urban areas in India, Government has taken number of significant positive measures which inter-alia include setting and revising of national ambient air quality and industrial emission standards, establishment of National Air Quality Monitoring Programme, stringent regulation of vehicular emissions and introducing fuel quality norms, enhanced penetration of LPG etc. to name a few. These measures are expected to curb the escalating pollution levels to an extent. However, with the availability of monitoring data from increasing number of non-attainment cities, the need was felt to intensify the efforts for well-planned technological actions and solutions for improving the air quality in the country.

Moving forward in this direction, the Ministry of Environment, Forest and Climate Change, Government of India has come up with this National Clean Air Program (NCAP) as a national-level strategy document prescribing the actions for reducing the levels of air pollution at city and regional levels in India. Acknowledging the Trans boundary impact of air pollution, actions are also proposed for evolving effective regional and global coordination mechanism.

Effective air pollution reduction plan will be formulated on the basis of source apportionment studies for 102 non-attainment cities of the country and will be implemented through a stringent enforcement mechanism. Collaborative, multi-scale, inter-sate and cross-sectoral coordination between the relevant central ministries, state governments and bodies forms the crux of the programme. NCAP incorporates several measures for effective monitoring, assessment and control of air pollution in India. The approach for expediting implementation under NCAP is through mainstreaming and integration into the existing policies and programmes of the Government of India.

I commend all those who have put intensive efforts in formulation of this national programme.

Date: 31.12.2018

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MESSAGE

Clean air is an essential component for ensuring healthy lives and ecosystem. India, through its journey of rapid economic growth to meet the needs of burgeoning population, is now dealing with the menace of air pollution. There is a whole range of pollutants which can detrimentally impact the human health and equally varied are the sources from which these are emitted. It is utmost important to effectively monitor and assess the sources of air pollution, in order to draft adequate strategies for its control. Government of India has taken many initiatives and the efforts started way back in 1981 with coming into existence of Air (Prevention and Control of Pollution) Act, 1981 followed by Environment (Protection) Act, 1986. In fact, Indian constitution is foundation stone of environmental jurisprudence in India. Right to clean environment and pollution free air and water is one of the fundamental right and duty to protect the environment is fundamental duty under the constitution.

However, the need of the hour is to intensify efforts towards control of air pollution at pan India level so as to ensure its decoupling with the rapidly growing economy. Working towards this endeavor, the National Clean Air Program (NCAP) has been formulated with aim to improve the air quality in India. It is a national-level response to reduce the levels of air pollution at both the regional and urban scales in the country. The NCAP emphasis on comprehensive mitigation actions not limited to cities but extended to rural areas while also focusing on actions for transboundary pollution sources. It also envisages augmenting and evolving an effective and widespread ambient air quality monitoring network across the country besides focusing on awareness and capacity building.

NCAP has been formulated through a participatory and collaborative approach involving sectoral ministries, state pollution control boards, research institutions, technical institutions, universities, other government, and non-governmental and private organizations, incorporating vast regional diversity and sectoral complexities in India. I believe the activities planned in the NCAP will be implemented with stringent timelines.

I would like to congratulate all those who have been part of evolution and finalization of this important national policy document.

(Dr. Mahesh Sharma)

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SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

MESSAGE

Air pollution is presently one of the biggest global environmental challenges with impacts now known to be not limited at local level. Far- reaching impacts due to its transport over long distance; and with geographical and meteorological conditions influencing the outcome, it has become a significant health concern for developing countries like India. As an emerging populated economy, India is going through the phase of accelerated growth. This has significance for meeting India's commitments with respect to major Sustainable Development Goals (SDGs) of no poverty, zero hunger, good health, quality education etc.

Increased demands for mobility, power, and products coupled with this economic growth has led to increase in emissions. The source apportionment studies are pointing towards dust, biomass, industries, and agricultural residues as other primary sources for pollution in Indian cities. While city-specific action plans to control air pollution are in place in some form for some of the cities, India felt the need of national scale program for prevention, control and mitigation of air. The basic premise for the national level programme arises from two important observations. Firstly, significant number of cities, where air quality monitoring is carried out in India, violate the prescribed annual ambient air quality standards. Secondly, factors influencing the air pollution are not limited to local sources but regional and trans-boundary sources have proven to be determining the outcome. This widespread violation of air quality is validated by several modelling-based studies and satellite based air quality data.

Acknowledging the issue, the Ministry of Environment, Forest and Climate Change, Government of India has now come up with National Clean Air Programme (NCAP) as national level strategy. The aim of the Programme is to gradually improve the ambient air quality and to meet the prescribed annual average ambient air quality standards at all locations in the country in stipulated time frame. For control of pollution at national scale, the NCAP emphasizes on actions distributed across mitigation, knowledgebase augmentation and institutional strengthening. The NCAP focuses on collaborative and participatory approach covering all sources of pollution and coordination between relevant Central Ministries, State Governments, local bodies and other stakeholders. International cooperation is one of the major components to garner the benefits of international experiences and also to address the issue of regional and trans-boundary sources of air pollution.

I would like to put on record great sense of appreciation for all the efforts put in by Shri A.K. Mehta, Additional Secretary, Shri Nikunja Kishore Sundaray, Joint Secretary and Dr. Shruti Rai Bhardwaj, Additional Director in this endeavour.

[C. K. Mishra]

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1 PROCESS FOR FORMULATION OF NCAP

Since collaborative and participatory approach involving relevant Central Ministries, State Governments, Local bodies and other Stakeholder with focus on all sources of pollution form crux of the Programme, extensive consultation with all the relevant stakeholders forms the foundation for formulation of NCAP. The first draft of the NCAP document formulated by the Ministry on the basis of available background information was shared with State Government, relevant Ministries and other Stakeholders. NCAP was uploaded to ministry's website for comments from stakeholders including general public and last date for receipt of comments was 17.05.2018. NCAP was shared with Resident Commissioners of all the States and UTs during the meeting held on 26.3.2018 in the Ministry.

Ministry of Environment, Forest, and Climate Change (MoEF&CC) conducted a 2-day stakeholder consultation on 19th -20th April 2018 to discuss NCAP along with State Government. Another Stakeholder consultation on NCAP involving other stakeholders in addition to State Government was held on 21st-22nd May 2018. In addition to significant inputs from State Government, various international best practices were also shared by international experts during these consultations. A thematic knowledge session on 'National Clean Air Programme' was organized on 04.06.2018 at Vigyan Bhawan, New Delhi as part of the 'State Environment Minister's Conference' under the five-day long celebration of World Environment Day, 2018 (WED-2018).

The NCAP was amended on the basis of available inputs from these consultations and meetings.Final inter-ministerial meeting involving the key ministries, States and experts was held on 9th October 2018 in the Ministry and the redrafted NCAP document was unanimously approved.

2 OVERVIEW

India is committed to create a clean environment and pollution free air and water. In fact, it is mandated in our constitution. India's commitments and obligations to environmental conservation and protection within the ambit of the targeted goals on environmental sustainability under the Sustainable Development Goals (SDGs) is manifested in the fact that several administrative and regulatory measures, including a separate statute on air and water pollution are under implementation since long. The Air (Prevention and Control of Pollution) Act, 1981, was enacted under Art. 253 of the Constitution to implement the decisions taken at the United Nations Conference on Human Environment held at Stockholm in June 1972, in which India participated. Sustainable development, in terms of enhancement of human well- being, is an integral part of India's development philosophy.

However, a vast country and an emerging economy like India, faces enormous challenges with its burgeoning population and widespread poverty, in meeting its various other significant commitments associated with poverty, and eradication of hunger under the SDGs. India has been going through a phase of accelerated industrial activities for the past three decades. The associated growth in terms of industrialization and urbanization has led to manifold increase in pollution issues, more specifically air pollution issues.

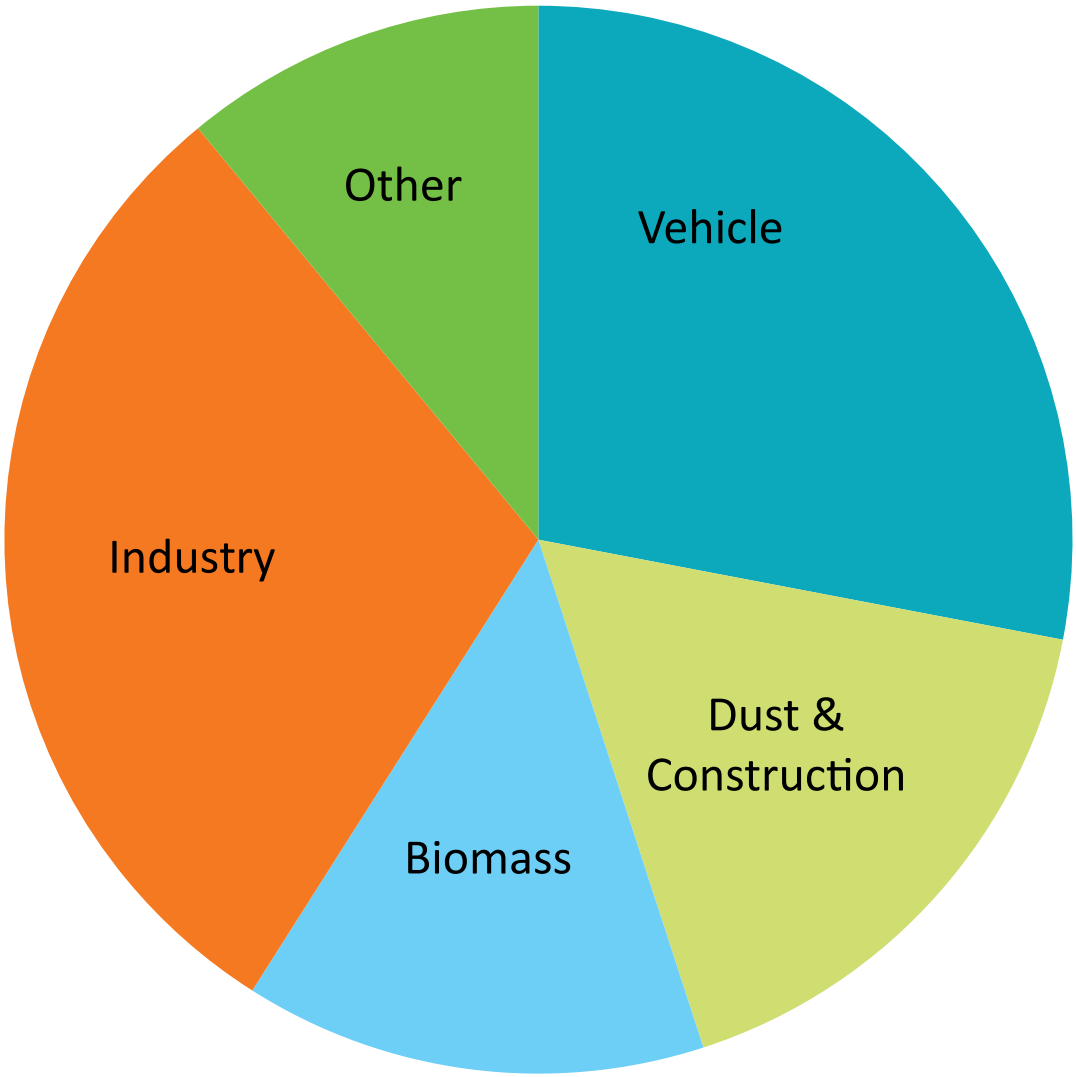
In recent years, medium and small towns and cities have also witnessed an increase in pollution, thus getting fast reflected in the non-attainment cities of India. Air pollution has increasingly become a serious concern, predominantly because of its health impacts. The reported perplexing statistics in various international reports, correlating air pollution with health impacts without the use of indigenous dose response functions, further complicates the issue by possibly creating an ambiguous public perception.

Air pollution emission issues are associated with many sectors, which inter-alia include power, transport, industry, residential, construction, and agriculture. Burning fossil fuels causes air pollution that both contributes to global climate change and also contributes to air pollution. Global climate change is caused by the overabundance of greenhouse gas (GHG) emissions in the atmosphere. The local air quality generally refers to the level of pollutants in the air that we breathe, which is typically found in the lowest part of the atmosphere, and the air quality is reduced by excess concentration of specific pollutants, namely, PM_{10}, $PM_{2.5}$, NO_x, SO_x, CO, etc. There exists a considerable quantitative literature estimating the local pollution co-benefits of climate change mitigation interventions. The sectors in which fuel combustion contributes to GHG emissions, such as energy, buildings, industry, and transport, are the ones with the most significant air quality co-benefits and the most substantial quantitative literature. In energy and industry, the largest co-benefits come from replacing

coal combustion with less polluting fossil fuels, from replacing fossil fuels with renewable energy, from improving energy efficiency, and from improving the characteristics of coal via coal washing and briquetting. For buildings, the largest air quality co-benefits are typically linked to improvements in energy efficiency and modifications in cooking stoves. Transport studies typically aggregate the effects from a collection of interventions, including greater use of public transport and improving vehicle fuel efficiency, but transport-related studies also often aggregate effects on health outcomes from other non-pollution effects such as benefits from increased walking and cycling.

The impact of air pollution is not limited to health but extends to agriculture and the general well-being of humans, floral and faunal population. Furthermore, since air pollution is not a localized phenomenon, the effect is felt in cities and towns far away from the source, thus creating the need for regional-level initiatives through inter-state and inter-city coordination in addition to multi-sectoral synchronization. While the problem of air pollution is mainly urban centric, studies show the regional scale pollution, is more concentrated in the Indo-Gangetic plains and more industrialized states. Incidences of episodic air pollution during the winters in Delhi NCR in the recent years have attracted significant media attention, thus bringing the entire issue of air pollution under regular public scrutiny.

SOURCES



SOURCES

Data generated from National Air Quality Monitoring Programme (NAMP) over the years reveal that particulate matters (PM_{10} and $PM_{2.5}$) are the major challenge which are found to be exceeding the National Ambient Air Quality Standard (NAAQS) all across the country more specifically in urban areas of Indo-Gangetic plain. Other pollutants such as SO_x, NO_x and ozone (O_3) are mostly observed to be within the prescribed national standards. The sources of emissions in India have been estimated emissions in several research studies.

While there are some variations due to differences in methodologies and the year of estimation, however, there is broad convergence of the estimates. While vehicles, industries, rampant constructions, biomass burning, diesel gensets, commercial and domestic use of fuel, etc are major sources of pollution, the inherent disadvantages specifically of the Indo-Gangetic plain stemming from its geographical location and soil composition, compounds the air pollution woes for the region. The Indo-Gangetic plain is essentially landlocked and the Himalayas prevent polluted air from escaping to the north creating the so called "valley effect" and dry alluvial soil significantly contributes to wind-blown dust.

As per TERI's inventory (Sharma and Kumar, 2016)[1], the share in $PM_{2.5}$ emissions are dominated by the industrial (36%) and residential combustion (39%) sectors. Transport contributes to just 4% of $PM_{2.5}$ emissions at the National scale, however, these emissions are concentrated in the urban centers. Moreover, being ground-based sources, their contribution to prevailing air quality levels could be much high. Open burning of agricultural residue in rural areas contributes about 7% to the total $PM_{2.5}$ emissions. Other sectors cumulatively contribute 11% of emissions. Power plants contribute 4% of $PM_{2.5}$ emissions; however, these may contribute significantly to the pollution levels in the specific zones of influence of the power plants. The current inventories of NO_x emissions show dominance of the transport sector (35%), power plants (22%), and DG and agricultural pump sets (15%). SO_2 emissions are estimated to be generated mainly by the industry (49%) and power sectors (43%). Hydrocarbon emissions are mainly generated from biomass combustion activities in the residential sector.

There is a drastic difference in the contribution of sources at the urban scales. CPCB, 2011, shows the results of a comprehensive source apportionment studies carried out in six cities during 2007–2010, namely, Bengaluru, Chennai, Delhi, Kanpur, Mumbai, and Pune. The results show that dust from road dust re-suspension, construction activities, and soil has the major contribution (6%–58%) to PM_{10} concentrations in these six cities. The share of the transport sector remains smaller in PM_{10} but increases significantly in $PM_{2.5}$ (finer fractions)

1 Sharma, S., Kumar, A., Datta, A., Mohan, I., Das, S., Mahtta, R., Lakshmi, C. S., Pal, S., Malik, J., (2016). Air pollutant emissions scenario for India. ISBN 978-81-7993-639-9

concentrations. Secondary particulates formed due to chemical conversion of gaseous pollutants such as SO_2 and NO_x also contribute significantly to $PM_{2.5}$ concentrations in different cities. A 2016 IIT-Kanpur study titled 'Comprehensive Study on Air Pollution and Green House Gases (GHGs) in Delhi'[2] indicated secondary particulates (30%) and vehicular emissions (25%) to be a major source of pollution during the summer with construction and road dust (31%) and coal and fly ash (26%) contributing majorly during the winter (Table 1). TERI and Automotive Research Association of India (ARAI) in their recent study conducted for the Department of Heavy Industry on 'Source Apportionment of $PM_{2.5}$ & PM_{10} of Delhi NCR for Identification of Major Sources'[3], published during August 2018, states that seasonal variation of PM_{10} shows higher contribution of dusty sources in summer (38%–42%) as compared to the winters in Delhi as well as in the NCR region. This can be attributed to dry conditions and higher wind velocities resulting in entrainment of dust. However, contribution of dusty sources (e.g., road, construction and soil dust) was also significant in the winter season (23%–31%). Contribution of vehicles to PM_{10} was slightly higher in winters (17%–

TABLE 1: SOURCE APPORTIONMENT OF DELHI

CPCB Study (2010)				
Source	**% contribution (PM_{10}): Range for 10 monitoring locations**			
Vehicles	8.7–20.5			
Road dust	14.5–29.0			
Construction	22–23.1			
Industries	6.3–9.3			
Garbage burning	10.5–24.4			
Domestic	2.7–9.4			
DG sets	6.8–12.3			
IIT Kanpur Study (2015)				
Source	**Average for six monitoring locations**			
	% contribution (PM_{10})		**% contribution ($PM_{2.5}$)**	
	Winter	**Summer**	**Winter**	**Summer**
Vehicles	19.7	6.4	25.1	8.5
Secondary particulates	24.6	10.15	29.9	14.9
Biomass burning	16.7	6.8	25.8	12.2
Industries	0.65	1.05	0.8	1.2
Coal and fly ash	12.1	37.2	4.8	25.95
Construction material	3.1	4.1	1.5	3.0
Soil and road dust	14.4	26.5	4.3	27.1
Soil waste burning	8.75	7.75	7.75	7.2

2 DPCC, 2016. Comprehensive study on air pollution and greenhouse gases (GHGs) in Delhi. Delhi Pollution Control Committee, New Delhi.

3 DOHI, 2018. Source Apportionment of $PM_{2.5}$ & PM_{10} of Delhi NCR for Identification of Major Sources. Department of Heavy Industry Ministry of Heavy Industries and Public Enterprises, New Delhi.

18%) in Delhi and NCR regions than in summers (15%–16%). Biomass burning contribution was slightly higher in winters in Delhi (14%) than in summers (12%), whereas in the NCR regions the contribution was similar in both the seasons (15%–16%). Contribution from industrial sources was similar in both the summer and winter seasons in Delhi (10%–12%) and NCR regions (14%–15%). Contribution in the NCR regions was higher as compared to Delhi due to the close proximity of industries. Other sources, which include DG sets showed similar contribution of about 4%–5%. Contribution of secondary ions to PM_{10} is significantly higher in winters (23%–25%) than in summers (11%–15%) in both Delhi and the NCR regions.

Seasonal variation of $PM_{2.5}$ shows significantly higher contribution of dusty sources in summers (31%–34%), as compared to winters (15%) in Delhi as well as

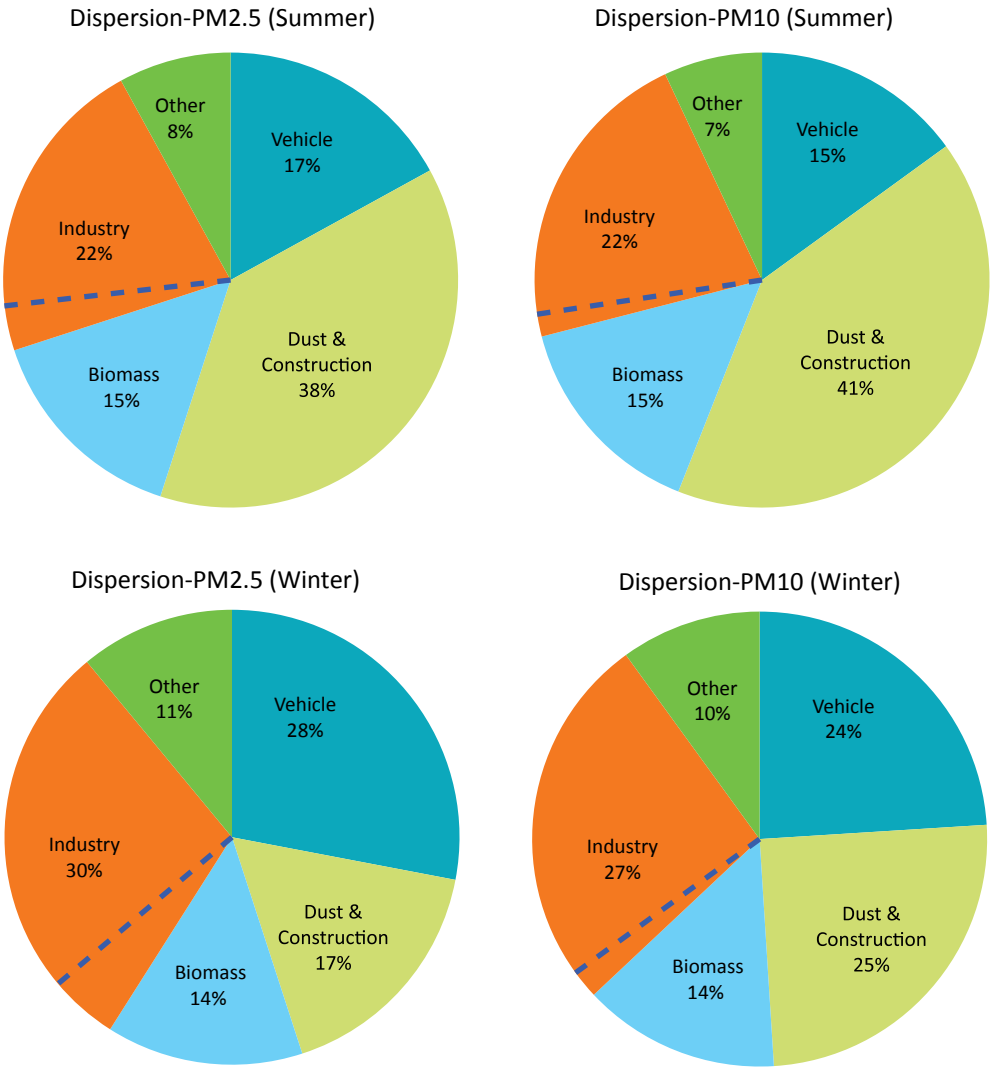


FIGURE 1. SOURCE CONTRIBUTIONS IN $PM_{2.5}$ AND PM_{10} CONCENTRATIONS IN DELHI (TERI-ARAI SOURCE APPORTIONMENT STUDY)

* Dotted line represents the contribution of biomass burning in industrial sector

the NCR regions. Higher contribution of the dusty sources, even in $PM_{2.5}$, can be attributed to dry weather conditions and higher wind velocities in summers, thus resulting in contribution from far-off sources. Primary contribution of vehicles to $PM_{2.5}$ was higher in winters (20%–23%) in Delhi and the NCR regions than in summers (18%–20%). Biomass burning contribution was significantly higher in winters in Delhi and the NCR regions (22%) than in summers (15%). Contribution from industrial sources was similar in both the summer and winter seasons in Delhi (10%–11%) and NCR regions (13%). Contribution in the NCR regions was higher as compared to Delhi due to the presence of industries in the proximity. Other sources, which include DG sets showed contribution of less than 5%. Contribution of secondary ions to $PM_{2.5}$ was higher in winters (26%) than in summer (17%–18%) in both Delhi and the NCR regions.

The study concluded that significantly higher contribution of dust in PM_{10} and also in $PM_{2.5}$ particularly in the summer season may be attributed to the transboundary contribution. Variation in the contribution of sources, such as vehicles (15%–23%), biomass burning (12%–22%), and dust (15%–42%) may be attributed to the variation in activities at local the level and meteorology. Contribution from sources outside Delhi, such as residential cooking, agricultural waste burning, industries (tall stacks), and dust particles are likely due to winds carrying pollution with the incoming air towards Delhi and the NCR regions indicating the regional aspect of air pollution. Current knowledge on the urban sources provide a basis to initiate action in the different sectors, though city-specific source apportionment studies is needed to refine air quality management plans for the city.

Accordingly, the air quality management framework should include strategies at different levels i.e. local, city, state, regional and trans-boundary level, for effective control of pollution.

4 ONGOING GOVERNMENT INITIATIVES

4.1 NATIONAL AIR QUALITY MONITORING PROGRAMME

The government is executing a nation-wide programme of ambient air quality monitoring known as NAMP. The network consists of 703 manual operating stations covering 307 cities/towns in 29 states and 6 Union Territories of the country. Under NAMP, four air pollutants viz. SO_2, NO_2, suspended particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$) have been identified for regular monitoring at all the locations. In addition, there are 134 real-time Continuous Ambient Air Quality Monitoring stations (CAAQMS) in 71 cities across 17 states, monitoring 08 pollutants viz. PM_{10}, $PM_{2.5}$, SO_2, NO_x, ammonia (NH_3), CO, ozone (O_3), and benzene. PM_{10} are inhalable coarse particles, which are particles with a diameter between 2.5 and 10 micrometers (μm) and $PM_{2.5}$ are fine particles with a diameter of 2.5 μm or less. Particulates are the deadliest form of air pollutants due to their ability to penetrate deep into the lungs and blood streams unfiltered. The smaller $PM_{2.5}$ are particularly deadly as it can penetrate deep into the lungs.

The objectives of NAMP are: (i) to determine the status and trends of ambient air quality; (ii) to ascertain whether the prescribed ambient air quality standards are violated; (iii) to identify non-attainment cities; (iv) to obtain the knowledge and understanding necessary for developing preventive and corrective measures; and (v) to understand the natural cleansing process undergoing in the environment through pollution dilution, dispersion, wind-based movement, dry deposition, precipitation, and chemical transformation of the pollutants generated.

The monitoring of meteorological parameters, such as wind speed and wind direction, relative humidity (RH), and temperature were also integrated with the monitoring of the air quality. The monitoring of pollutants is carried out for 24 hours (a 4-hourly sampling for gaseous pollutants and an 8-hourly sampling for particulate matter) twice a week, to have 104 observations in a year. The monitoring is being carried out with the help of the Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCB), Pollution Control Committees (PCC), National Environmental Engineering Research Institute (NEERI). The CPCB co-ordinates with these agencies to ensure uniformity and consistency of air quality data and provides technical and financial support for operating the monitoring stations. NAMP is being operated through various monitoring agencies. A large number of personnel and equipments are involved in the sampling, chemical analysis, data reporting, etc. It increases the probability of variation and personnel biases reflecting in the data, hence it is pertinent to mention that these data be treated as indicative rather than absolute. A state and city-wise distribution of the operating stations under NAMP along with their location has been given in Appendix I.

4.2 NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

Ambient air quality refers to the condition or quality of the outdoor air. NAAQs are the standards for ambient air quality with reference to various identified pollutant notified by the CPCB under the Air (Prevention and Control of Pollution) Act, 1981. Major objectives of NAAQS are: (i) to indicate necessary air quality levels and appropriate margins required to ensure the protection of vegetation, health, and property, (ii) to provide a uniform yardstick for the assessment of air quality at the national level and (iii) to indicate the extent and need of the monitoring programme. Annual standards are basically the annual arithmetic mean of a minimum 104 measurements in a year, at a particular site taken twice a week, at a uniform 24-hourly interval and at either a 24 hourly, 8 hourly, or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. However, there is a 2% chance of exceeding the limits but not on two consecutive days of monitoring. The NAAQS notified as on November 2009 has been given in Table 2.

TABLE 2: NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

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/m³	Annual*	50	20
		24 hours**	80	80
2	Nitrogen dioxide (NO_2), µg/m³	Annual*	40	30
		24 hours**	80	80
3	Particulate matter (Size <10 µm) or PM_{10} µg/m³	Annual*	60	60
		24 hours**	100	100
4	Particulate matter (Size<2.5 µm) or $PM_{2.5}$ µg/m³	Annual*	40	40
		24 hours**	60	60
5	Ozone (O_3), µg/m³	8 hours**	100	100
		1 hours **	180	180
6	Lead (Pb), µg/m³	Annual*	0.50	0.50
		24 hours**	1.0	1.0
7	Carbon monoxide (CO), mg/m³	8 hours**	02	02
		1 hours **	04	04
8	Ammonia (NH_3), µg/m³	Annual*	100	100
		24 hours**	400	400
9	Benzene (C6 H6) , µg/m³	Annual*	05	05
10	Benzo(a) pyrene (BaP)-particulate phase only, ng/m³	Annual*	01	01
11	Arsenic (As), ng/m³	Annual*	06	06
12	Nickel (Ni), ng/m³	Annual*	20	20

* Annual arithematic 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.

Additionally, the MoEF&CC has notified environmental standards for 84 sectors, out of which, the effluent standards have been notified for 45 industrial sectors and the emission standards have been notified for 63 industrial sectors. Beside, ambient air quality standards and general standards for emission and effluent have also been developed. The installation of an online continuous (24x7) monitoring system has been made mandatory in 17 categories of highly polluting industries.

4.3 NATIONAL AIR QUALITY INDEX (AQI)

The AQI was launched by the Prime Minister in April, 2015 starting with 14 cities and now extended to 71 cities in 17 states. The AQI is a tool for the effective communication of air quality status to people in terms, which are easy to understand. It transforms complex air quality data of various pollutants into a single number (index value), nomenclature and colour. There are six AQI categories, namely, good, satisfactory, moderately polluted, poor, very poor, and severe. Each of these categories is decided based on the ambient concentration values of air pollutants and their likely health impacts (known as health breakpoints). The AQ sub-index and health breakpoints are evolved for eight pollutants (PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO, O_3, NH_3, and Lead (Pb)) for which short-term (upto 24-hours) National Ambient Air Quality Standards are prescribed. Based on the measured ambient concentrations of a pollutant, a sub-index is calculated, which is a linear function of concentration (e.g., the sub-index for $PM_{2.5}$ will be 51 at concentration 31 µg/m^3, 100 at concentration 60 µg/m^3, and 75 at concentration of 45 µg/m^3). The worst sub-index determines the overall AQI. The AQI categories and health breakpoints for the eight pollutants are given in Table 3.

TABLE 3: AQI CATEGORIES AND HEALTH BREAKPOINTS

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

4.4 FORTY-TWO ACTION POINTS

The CPCB has issued a comprehensive set of directions under Section 18 (1) (b) of Air (Prevention and Control of Pollution) Act, 1986, for the implementation of 42 measures to mitigate air pollution in the major cities, including Delhi and NCR comprising action points to counter air pollution, which include control and mitigation measures related to vehicular emissions, re-suspension of road dust and other fugitive emissions, bio-mass/municipal solid waste (MSW) burning, industrial pollution, construction and demolition (C&D) activities, and other general steps. Directions containing 42 action points, which was issued initially for implementation in NCR was subsequently extended to state boards for the implementation in other non-attainment cities. The copy of the direction is given in Appendix II.

In addition, few regular, specific directions are being issued to various authorities in all 22 districts in the NCR, that is, to the municipal commissioners for road dust and garbage burning; to the Superintendent of Police for the effective movement of traffic at busy intersections; to the Director (Agriculture) in the NCR regions and Punjab for stubble burning.

4.5 ENVIRONMENT POLLUTION (PREVENTION AND CONTROL) AUTHORITY (EPCA)

Environment Pollution (Prevention and Control) Authority (EPCA) was constituted under Section 3(3) of Environment (Protection) Act, 1986, in 1998 in pursuance of the Hon'ble Supreme Court Order dated 7.1.1998 in Writ Petition (C) no. 13029/1985 in the matter of M.C. Mehta vs UoI & Ors to look into the matter pertaining to environmental pollution in the NCR region. As per the order, the authority was proposed to be comprised of Shri Bhure Lal, Secretary, CVC as Chairman; and Shri D K Biswas, Shri Anil Aggarwal, Shri Jagdish Khattar, and Smt Kiran Dhingra as members. Accordingly, this ministry notified the constitution of the EPCA vide notification no. SO 93(E) dated 29.2.1998 for two years comprising the above-stated members and TOR. In the notification, jurisdiction of the EPCA has been stated as the NCR region as defined in clause (f) of section 2 of National Capital Region Planning Board Act, 1985 (2 of 1985). The EPCA has been subsequently re-constituted from time to time, extending the tenure of the authority and/or substituting or including new members.

4.6 GRADED RESPONSE ACTION PLAN (GRAP)

The government has notified a graded response action plan for Delhi and the NCR region, which comprises the graded measures for each source framed according to the AQI categories. It also takes note of the broad health advisory for each level of the AQI that was adopted by the Government of India along with the AQI. The proposal has been framed keeping in view the key pollution sources in Delhi and the NCR region. While the major sources of pollution, including vehicles, road dust, biomass burning, construction, power plants, and industries remain continuous throughout all seasons, the episodic pollution from stubble burning, increase in biomass burning, etc., varies across seasons.

During winters, the relative share of vehicles, biomass burning, MSW burning, firecracker, stubble burning, construction, and secondary particles increase. During summers, the influence of road dust, fly ash, vehicles, biomass burning, etc., is high. The proposed graded measure approach has considered all these aspects and includes appropriate measures for each level of pollution according to the AQI. The graded measures according to the AQI are listed, starting from the public health emergency level and then progressing downwards. The measures are cumulative. The emergency and severe levels include cumulatively all other measures listed in the lower levels of the AQI, including very poor, poor, and moderate. It is also clear that the actions listed in the poor category need to be implemented throughout the year. However, during months when the weather conditions turn adverse, there is a need for greater scrutiny on enforcements. The responsibility of implementing GRAP lies with the EPCA. GRAP has been given as Appendix III.

4.7 OTHER MEASURES

Focussing on pollution from waste, five waste management rules on solid waste, hazardous waste, plastic waste, biomedical waste, and e-waste have been revised and the rules pertaining to construction and demolition waste as a major source of dust pollution was newly notified during 2016. Further, a ban was imposed on the burning of leaves, biomass, and MSW. There are other measures which were taken by the government for improvements in energy efficiency and air pollution control in India. Some of which are cited below:

1. Advanced vehicle emission and fuel quality standards– BSIV from 2017 and BS-VI from 2020.
2. Plan to introduce a voluntary fleet modernization and an old-vehicle scrappage programme in India.
3. Introducing a National Electric Mobility Mission Plan 2020.
4. Introducing gas as an automotive fuel in many cities.
5. Introduction and enhancement of the metro-rail and bus-based public transport systems in selected cities.
6. Ujjawala scheme to accelerate the LPG penetration programme for cooking in households.
7. Electrification to reduce kerosene consumption for lighting.
8. Introducing an energy-efficiency labelling programme for energy-intensive home appliances such as air conditioners.
9. Notifying new stringent standards for diesel generator sets for standby power generation.

NON-ATTAINMENT CITIES

Legend

Non-attainment cities

PM_{10} ($\mu g/m^3$)

- 61 - 120
- 121 - 180
- 181 - 240
- 241 - 260

NON-ATTAINMENT CITIES

The CPCB has identified a list of polluted cities in which the prescribed NAAQS are violated. These cities have been identified based on the ambient air quality data obtained (2011–2015) under NAMP. PM_{10} has been found to be exceeding in 94 cities consecutively for five years and NO_2 is exceeding the limits in five cities. $PM_{2.5}$ data since 2015 indicates 16 cities as non-attainment cities. In addition, recently in April 2018, the WHO has updated the fourth Ambient Air Quality Database on its website on the basis of $PM_{2.5}$ data. The aim of its database was to reflect the monitoring efforts undertaken in countries reflected in the list. This was further to raise awareness and facilitate adequate response to protect public health from the adverse impacts of outdoor air pollution. Integrating the top 10 cities from the WHO list, there are 102 non-attainment cities. The list of the 102 non-attainment cities has been given in Table 4.

TABLE 4: NON-ATTAINMENT CITIES WITH RESPECT TO AMBIENT AIR QUALITY INDIA (2011–2015) AND THE WHO REPORT 2014–2018

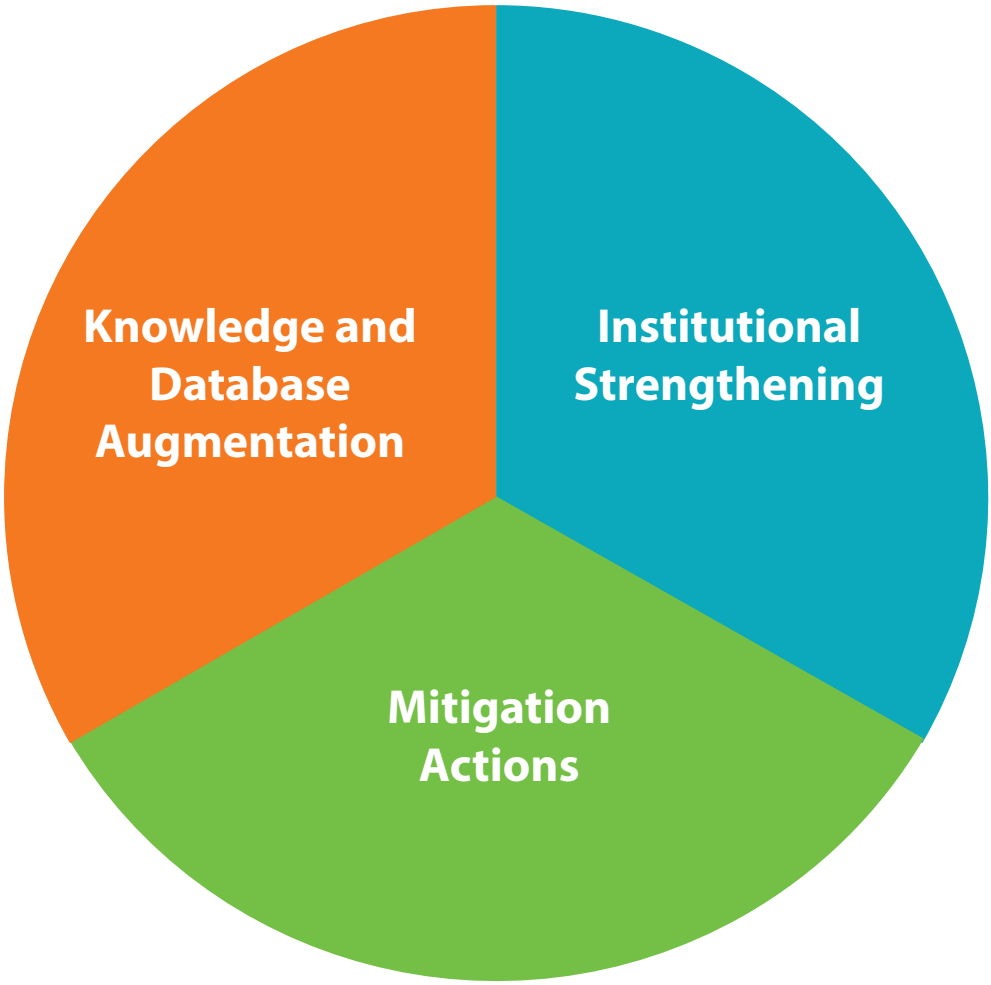
Sl. No	State	Cities Sl. No.	Cities
1	Andhra Pradesh	1.	Guntur
		2.	Kurnool
		3.	Nellore
		4.	Vijaywada
		5.	Vishakhapatnam
2	Assam	6.	Guwahati
		7.	Nagaon
		8.	Nalbari
		9.	Sibsagar
		10.	Silchar
3	Chandigarh	11.	Chandigarh
4	Chattisgarh	12.	Bhillai
		13.	Korba
		14.	Raipur
5	Delhi	15.	Delhi
6	Gujarat	16.	Surat
		17.	Ahmedabad

Sl. No	State	Cities Sl. No.	Cities
7	Himachal Pradesh	18.	Baddi
		19.	Damtal
		20.	Kala Amb
		21.	Nalagarh
		22.	Paonta Sahib
		23.	Parwanoo
		24.	Sunder Nagar
8	Jammu & Kashmir	25.	Jammu
		26.	Srinagar
9	Jharkhand	27.	Dhanbad
10	Karnataka	28.	Bangalore
		29.	Devanagere
		30.	Gulburga
		31.	Hubli-Dharwad
11	Madhya Pradesh	32.	Bhopal
		33.	Dewas
		34.	Indore
		35.	Sagar
		36.	Ujjain
		37.	Gwalior
12	Maharashtra	38.	Akola
		39.	Amravati
		40.	Aurangabad
		41.	Badlapur
		42.	Chandrapur
		43.	Jalgaon
		44.	Jalna
		45.	Kolhapur
		46.	Latur
		47.	Mumbai
		48.	Nagpur
		49.	Nashik
		50.	Navi Mumbai
		51.	Pune
		52.	Sangli
		53.	Solapur
		54.	Ulhasnagar

Sl. No	State	Cities Sl. No.	Cities
13	Meghalaya	55.	Byrnihat
14	Nagaland	56.	Dimapur
		57.	Kohima
15	Odisha	58.	Angul
		59.	Balasore
		60.	Bhubneshwar
		61.	Cuttack
		62.	Rourkela
		63.	Talcher
16	Punjab	64.	Dera Bassi
		65.	Gobindgarh
		66.	Jalandhar
		67.	Khanna
		68.	Ludhiana
		69.	Naya Nangal
		70.	Pathankot/Dera Baba
		71.	Patiala
		72.	Amritsar
17	Rajasthan	73.	Alwar
		74.	Jaipur
		75.	Jodhpur
		76.	Kota
		77.	Udaipur
18	Tamil Nadu	78.	Tuticorin
19	Telangana	79.	Hydrabad
		80.	Nalgonda
		81.	Patencheru

Sl. No	State	Cities Sl. No.	Cities
20	Uttar Pradesh	82.	Agra
		83.	Allahabad
		84.	Anpara
		85.	Bareily
		86.	Firozabad
		87.	Gajraula
		88.	Ghaziabad
		89.	Jhansi
		90.	Kanpur
		91.	Khurja
		92.	Lucknow
		93.	Muradabad
		94.	Noida
		95.	Raebareli
		96.	Varanasi
21	Uttarakhand	97.	Kashipur
		98.	Rishikesh
22	West Bengal	99.	Kolkata
23	Bihar	100.	Patna
		101.	Gaya
		102.	Muzaffarpur

NATIONAL CLEAN AIR ACTION PLAN



6 NATIONAL CLEAN AIR ACTION PLAN

With these recent policy interventions, the air quality has purportedly shown some minor improvement in some major cities in recent times, which, as of now, cannot be called a trend. This is not sufficient and a higher level of focused, time-bound initiatives, at both the city and rural level, appear obligatory to address the issue in a comprehensive manner at the national level. It is in this context that the need for a National Clean Air Programme (NCAP) as a national-level strategy for reducing the levels of air pollution at both the regional and urban scales is felt. Overview of NCAP is shown in Figure 2.

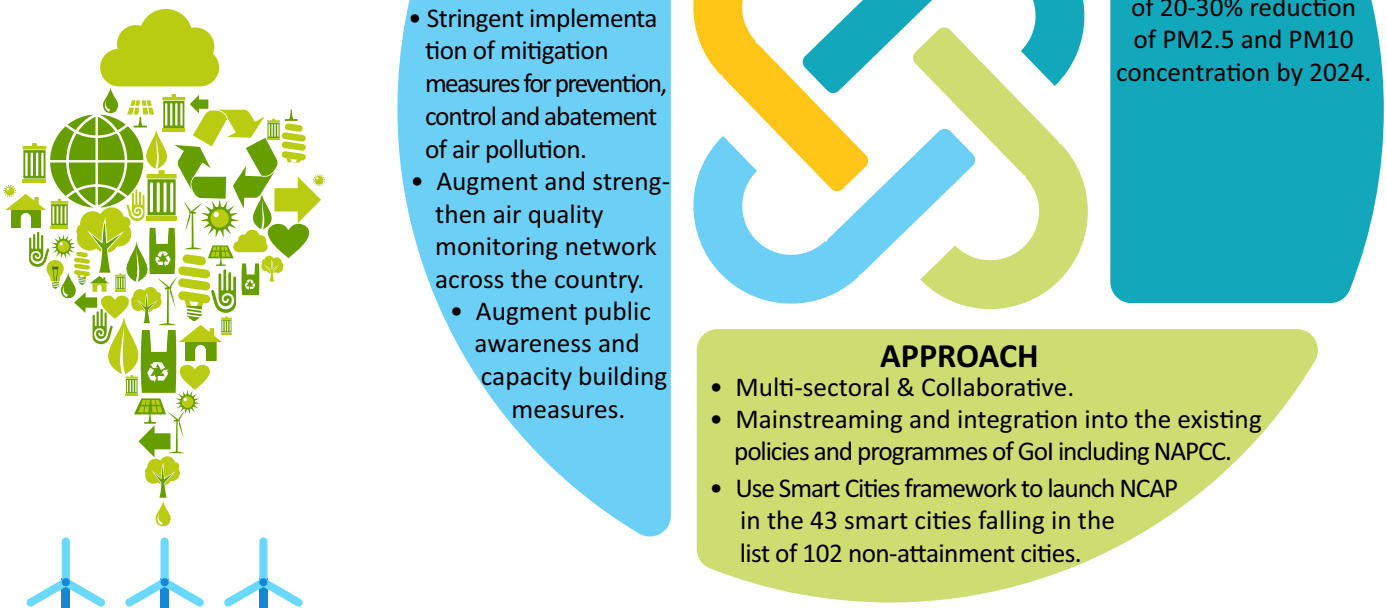


FIGURE 2. OVERVIEW OF NATIONAL CLEAN AIR PROGRAM

6.1 GOAL

The goal of the NCAP is to meet the prescribed annual average ambient air quality standards at all locations in the country in a stipulated timeframe (long-term).

6.2 TARGET

The global experiences clearly highlight the fact that internationally, the actions had been city specific rather than country oriented and, accordingly, the statistics indicates 35%–40% $PM_{2.5}$ reduction in five years for cities, such as Beijing and Seoul, whereas cities, such as Santiago and Mexico City have shown 73% and 61% reduction in 22 to 25 years with regard to $PM_{2.5}$ and PM_{10} concentrations, respectively (this has been given in Appendix IV).

Recently, a new Lancet study by Peking University School of Public Health on the impact of China's 'Air Pollution Prevention and Control Action Plan'(2013–2017) has found that an annual average concentration of $PM_{2.5}$ decreased by 33.3% and PM_{10} levels reduced by 27.8% in the 74 key cities in China where the plan was implemented in the last five years. Sulphur dioxide reduced by 54.1% and CO by 28.2% in five years, but no significant improvements were seen in NO_2 or O_3 concentrations.

TERI and ARAI report dated August, 2018, analysed various interventions and estimated their possible impacts over $PM_{2.5}$ and PM_{10} concentrations in Delhi and NCR. An alternative scenario has been developed considering the interventions which can provide maximum air quality benefits. The alternative scenario results in a reduction of 58% and 61% in $PM_{2.5}$ and PM_{10} concentrations in 2030, in Delhi and NCR with respect to the business-as-usual scenario, and achieves the daily ambient air quality standards for PM_{10} and $PM_{2.5}$. It is to be noted that in Delhi and NCR, the initiatives started in 1992 with the creation of the EPCA, and thus has a definite edge over other non-attainment cities.

Taking into account the available international experiences and national studies, the tentative national level target of 20%–30% reduction of $PM_{2.5}$ and PM_{10} concentration by 2024 is proposed under the NCAP. This is keeping 2017 as the base year for the comparison of concentration.

6.3 OBJECTIVES

1. To ensure stringent implementation of mitigation measures for prevention, control and abatement of air pollution.
2. To augment and evolve effective and proficient ambient air quality monitoring network across the country for ensuring a comprehensive and reliable database.
3. To augment public awareness and capacity-building measures encompassing data dissemination and public outreach programmes for inclusive public participation and for ensuring trained manpower and infrastructure on air pollution.

6.4 TENURE

This will be a mid-term, five-year action plan to begin with keeping 2019 as the base year. However, the international experiences and national studies indicate that significant outcome in terms of air pollution initiatives are visible only in the long-term, and hence the programme may be further extended to 20–25 years in the long-term after a mid-term review of the outcomes.

6.5 APPROACH

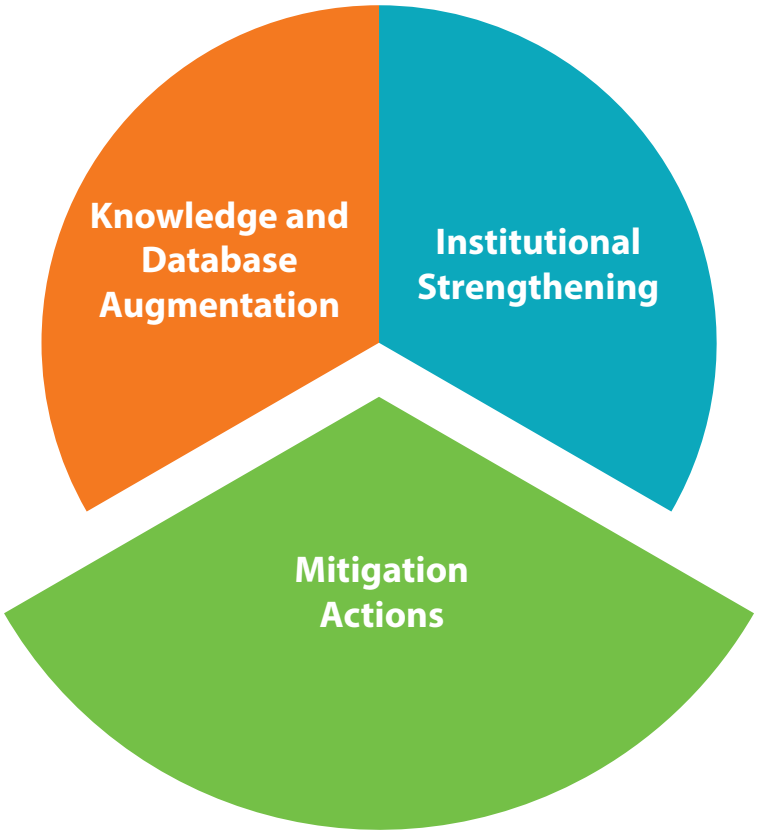
1. Collaborative, multi-scale and cross-sectoral coordination between the relevant central ministries, state governments and local bodies.
2. Mainstreaming and integrating the existing policies and programmes of the including the National Action Plan on Climate Change (NAPCC) and other initiatives of Government of India in reference to climate changes.
3. With reference to NAPCC the main focus will be on mainstreaming the initiatives under five national missions of NAPCC viz. National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission on Sustainable Habitat, National Mission for a Green India and National Mission for Sustainable Agriculture.
4. While many of these policies and programmes are already part of our current actions, they may need a change in direction, enhancement of scope, and effectiveness and an accelerated implementation of time-bound plans.
5. Use the smart cities framework to launch the NCAP in the 43 smart cities falling in the list of the 102 non-attainment cities.
6. The NCAP will be dynamic and will continue to evolve based on the additional available scientific and technical information as they emerge and in response to international best practices and experiences that are available.

6.6 IMPLEMENTATION OF NCAP

1. The CPCB shall, in consonance with the Air (Prevention and control of Pollution) Act, 1981, and in particular with the provision of Section 16(2)(b) of the Act, execute the nation-wide programme for the prevention, control, and abetment of air pollution within the framework of the NCAP.
2. The NCAP will be institutionalized by respective ministries and will be organized through inter-sectoral groups, which include, in addition to the related ministries, the Ministry of Finance, Ministry of Health, NITI Aayog, CPCB, experts from the industry, academia, and civil society.
3. The Ministry of Road Transport and Highways (MoRTH) acts as a nodal agency for the implementation of various provisions on control of air pollution from vehicles through Motor Vehicle Act, 1988, and Central Motor Vehicle Rules 1989.
4. In addition, various other ministries viz. MoEF&CC, M/o Power, M/o Petroleum Petroleum and Natural Gas, M/o New and Renewable Energy, M/o Heavy Industry, M/o Housing and Urban Affairs, M/o Agriculture through incorporating pollution in their sectoral policies contribute to air pollution mitigation.

5. Ministry of Environment, Forest and Climate Change (MoEF&CC) is implementing NAPCC with eight missions spreading across various sectors. Five of the missions viz. National Mission for a Green India, National Mission for Enhanced Energy Efficiency, National Solar Mission, National Mission on Sustainable Habitat, National Mission for Sustainable Agriculture have direct link with mitigation of air pollution, which can be one of the co-benefit of these ongoing missions.
6. Each sector specific Working Group will be tasked to evolve specific objectives spanning the remaining years of this Plan Period and subsequently.
7. Comprehensive component-wise documents detailing objectives, strategies, plan of action, timelines and monitoring, and evaluation criteria would be developed.
8. The Apex Committee in the Ministry will periodically review the progress of these Components. Annual performance will be periodically reported upon. Appropriate indicators will be evolved for assessing the emission reduction benefits of the actions.

MITIGATION ACTIONS



7 MITIGATION ACTIONS

7.1. STRINGENT ENFORCEMENT THROUGH THREE TIER MECHANISM FOR REVIEW OF MONITORING, ASSESSMENT AND INSPECTION

The experience indicates lack of regular monitoring and inspection as the major reason for non-compliance. Trained manpower and regular inspection drive will be ensured for stringent implementation purpose. A credible, transparent, and accountable data collection, and monitoring system that is available for timely swift action is required. A three-tier system that include real-time physical data collection, data archiving and data analytics infrastructure, and action trigger system to be created. This three-tier system will work independently under the supervision of a single authority, which will ensure accreditation of three independently operating entities. These entities will interface only through IT software and communication system.

For data collection, a phone application that could be adapted to any smart phone will be developed. The application allows a user to quickly and easily generate simple reports about individual industry that include: the current position (provided by the phones built-in GPS), type of industry, and parameters such as monitored data on site, and a picture of the industry (taken with the phone's camera). This facility at each state will be operated by a third party verifiers in close coordination with SPCBs. The data collected will be archived at a central location and will be used by high-quality IT companies specialized in data analytics to corroborate the data, establish its authenticity (with industry standards, previously collected information, data from other utilities like electricity bill and water bill), and feed into the system with GPS information. The action trigger system, will decide on appropriate action once the data authenticity is established. The action trigger system will have predefined action based on the status of the data. There will be minimal human interface in action trigger system.

Action Points

1. Web-based system on the above-mentioned lines to be evolved in association with the NIC and other relevant national and international agencies.
2. Adequate manpower will be made available for strengthening, monitoring, and inspection.
3. Intensive training of all the stakeholders involved in implementation of this web based system.
4. Mandating use of this three tier mechanism in 102 cities.

7.2 EXTENSIVE PLANTATION DRIVE

Trees mitigate air pollution primarily by absorbing pollutants via leaf stomata (pores on the outer "skin" layers of the leaf). Some gaseous pollutants are also removed via the plant surface. As has been reported, one of the efficient and effective options for preventing air pollution hazards and as well as for enhancing the environmental quality, including enrichment of human microbiome that reduces health risks and public health burden is the development of native vegetation filter strips and biodiversity Parks. The Vegetation filter strips along roads and highways and at intersecting road junctions clean the air originating from the point source pollution, while biodiversity parks serve as filters for nonpoint source air pollution. As research shows the efficacy of the vegetation filter strips depends upon the stratification of the plant community, type of species, architecture of the canopy, leaf size and morphology and surface area. A vegetation filter strips of a 100-m long stretch and 5–12 m wide with three-storied community with a 8–12 m high canopy is effective in dust trapping and also in assimilating air pollutants, including polycyclic Aromatic Hydrocarbons (PAHs), prevent flooding of roads and recharging groundwater. Such filter strips also make cities climate resilient.

Thus extensive planation drive in urban areas more specific in reference to pollution hotspots as traffic junctions, industrial zones, footpaths, dust prone areas, etc., by identification and use of specialized plant species having high pollutants absorbing capacity is expected not only to purify air but also will help in improvement of health.

The National Mission for Green India (GIM) is one of the eight missions outlined under the National Action Plan on Climate Change (NAPCC). It aims at protecting; restoring and enhancing India's diminishing forest cover and responding to climate change by a combination of adaptation and mitigation measures. This mission has adopted an integrated cross-sectoral approach as it will be implemented on both public as well as private lands with a key role of the local communities in planning, decision making, implementation and monitoring. An initial corpus of over Rs 6,000 crore has been earmarked for the programme through the Compensatory Afforestation Management and Planning Authority (CAMPA) to commence work. The programme may be scaled up to cover pollution hot spots in the cities/towns along with degraded forest land. The institutional arrangement provides for using the corpus to leverage more funds to scale up activity.

Action Points

1. Plantation initiatives under NCAP at pollution hot spots in the cities/towns to be undertaken under GIMs with Compensatory Afforestation Fund (CAF) being managed by National Compensatory Afforestation Management and Planning Authority (CAMPA).
2. Development of plantation plans for the non-attainment cities/towns.
3. Execution of city-specific plantation plans.
4. Institutes as Indian Institute of Forest Management (IIFM), Universities

as Delhi University and other Research Organizations and institutions with expertise in plantation to be involved for evolving these plans and for implementation of these plans in these 102 cities.

5. Planation target to be indicated in city-specific plantation plans.
6. Scheme on agroforestry to be prioritized and strengthened.

7.3 TECHNOLOGY SUPPORT

Science, technology, engineering, and innovation have played a game changing role in India's journey towards sustainable development. It has been integral not just in contributing to the economic boom that the country is seeing today but also has been crucial for social development and environmental protection. The government with a steadfast approach has been aiming to establish India as one of the global leaders in science and technology. New technologies, particularly the ones that are indigenously developed hold tremendous potential in resolving air pollution challenges and improving human lives. While developing and implementing technologies, it is of paramount importance that the technology suits the Indian scenario with respect to short- and long-term ecological and environment impacts, social infrastructure, cultural ethos, and characteristics of the Indian economy.

Action Points

1. Clean Technologies with potential for air pollution prevention and mitigation will be supported for R&D, pilot scale demonstration and field scale implementation.
2. The mechanism for such support will be formulated as an action plan.

7.4 REGIONAL AND TRANSBOUNDARY PLAN

As stated above, with reference to Delhi and NCR, it has been reported that a significantly higher contribution of dust in PM_{10} and $PM_{2.5}$ particularly in the summer season may be attributed to the transboundary contribution. Contribution from sources outside Delhi, such as residential cooking, agricultural waste burning, industries and dust particles are likely due to winds from regions outs Delhi indicating towards regional aspect of air pollution.

Accordingly, regional and transboundary plan have major role for effective control of pollution more specifically with reference to the Indo-Gangetic plain.

Action Points

Regional

1. Various measures specially implementation of pollution abatement policies as Transport- Auto fuel policy for stringent norms for fuel and vehicles, road to rail/waterways, fleet modernization, electric vehicle policies, clean fuels, bye-passes, taxation policies, etc.; Industries—stringent industrial standards, clean fuels, clean technology, enforcement (continuous monitoring); and biomass– enhanced LPG penetration, agricultural burning control and management need to emphasized through regional level inter-state coordination specifically for the Indo-Gangetic plain.

2. A comprehensive regional Plan to be formulated incorporating the inputs from the regional source apportionment studies.

Transboundary

1. Linking NDC's target of additional forest and tree cover of 2.5 to 3 billion tonnes of CO_2 equivalent by 2030 to NCAP. There needs to be more focus on the western regions of India (Rajasthan and Gujarat) for enhanced tree cover, which will reduce wind-blown dust within the country and will also act as barriers for trans-boundary dust.
2. The initiatives under United Nations Convention to Combat Desertification (UNCCD) to be integrated for addressing the issue of transboundary dust.
3. Air quality management at South-Asia regional level by activating the initiatives under 'Male Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia' and South Asia Co-operative Environment Programme (SACEP) to be explored.
4. A comprehensive Transboundary Plan to be formulated.

7.5 SECTORAL INTERVENTIONS

7.5.1 POLLUTION FROM ROAD DUST AND C&D

Road dust and dust arising from construction and demolition (C&D) are the major contributors to the pollution in Indian cities. IIT Kanpur report for Delhi, indicates dust as the major contributor of air pollution specifically in the summer season, going upto 50% for PM_{10}. The potential control options are sweeping and watering of roads, better construction and maintenance, growing plants, grass, etc., to prevent re-suspension of dust. City-specific plans need to evaluate the options of mechanical sweeping, greening, and landscaping of the major arterial roads, identification of major-impact roads, including national highways, etc. Spraying of water twice per day (before peak hours of traffic) is very effective in reducing air-borne dust load. Grassing of open spaces with native grasses also prevent dust pollution and clean air.

FIGURE 3. KEY SECTORAL INTERVENTIONS UNDER NCAP

The mechanical sweepers were introduced in Delhi as manual sweeping by brooms blow more dust particles in air than it cleans off the ground. Delhi has now more than a dozen mechanical sweepers, which keeps the road free of dust. At present, the dust collected is mostly taken to the landfill sites and dumped. When the wind blows, these particles return to the city rendering the entire sweeping process ineffective. Even a light wind is able to raise a dust storm if the dumped dust is not dampened with water or have a green cover over it. There is no proper mechanism or standard operating procedure (SOP) on how to dump the dust collected so that they do not return to the city after disposal.

The government has notified Construction & Demolition (C&D) Waste Management Rules, 2016, which had been an initiative towards effectively tackling the issues of pollution and waste management. The basis of these rules is to recover, recycle, and reuse the waste generated through C&D. Segregating C&D and depositing it to the collection centres for processing is now be the responsibility of every waste generator. Local bodies are to utilize 10%–20% material from C&D waste in municipal and government contracts.

It was noted that there was no regulation prescribing preventive measures to be taken for the management of dust, including road dust and C&D dust that arises during construction. Taking note of the increasing air pollution and to keep dust material under control in towns and cities, the MoEF&CC has issued a Dust Mitigation notification in January 2018 under EPA, 1986; making mandatory dust mitigation measures in infrastructural projects and demolition activities in the country. This would help to keep the dust under control to reduce air pollution in metros and cities. The notified rules inserted 11-point measures in the existing act, thereby empowering the ministry to issue notices against local authorities and state agencies for non-implementation of those actions.

Action Points

1. Introducing mechanical sweepers on the basis of feasibility study in cities.
2. Evolve SOP for addressing the specific issue of disposal of collected dust from mechanical sweeping, taking into consideration all the above cited factors.
3. Stringent implementation of C&D Rules, 2016, and Dust Mitigation notification, 2018, of Government of India.
4. Wall-to-wall paving of roads to be mandated.
5. Stringent control of dust from construction activities using enclosures, fogging machines, and barriers.
6. Greening and landscaping of all the major arterial roads and national highways after identification of major polluting stretches.
7. Maintenance and repair of roads on priority.
8. Sewage treatment plant-treated water sprinkling system along the roads and at intersecting road junctions and spraying of water twice a day before peak traffic hours.

7.5.2 POWER SECTOR EMISSIONS

MoEF&CC notified 'Environment (Protection) Amendment Rules, 2015" for Thermal Power Plants (TPPs) on 07.12.2015 regarding standards for particulate matter (PM), SO_x, NO_x, mercury emissions, and water consumption. As per the notification, all the existing stations were required to comply with the new standards within two years, that is, by December, 2017, and the new stations, including all stations presently under construction were required to meet the new norms w.e.f. 01.01.2017. Subsequently, reviewing the representation from Ministry of Power and Central Electricity Authority highlighting practical difficulties with respect to compliance of the prescribed TPP emission norms by December 2017 an earliest practical feasible plan extending up-to December 2022 was prepared for installation of FGDs and other pollution control equipment at the identified coal-based TPP units in consultation with Regional Power Committees and the utilities and notified by the Ministry in December 2017.

The TPPs shall be steadily replaced with power plants using natural gas and other cleaner fuels. As far as availability of natural gas for power plants and industries in the country is concerned, on the basis of submission of Petroleum and Natural Gas Regulatory Board (PNGRB), it is noted that there are 22 districts in the NCR region in three states, namely, Haryana, Uttar Pradesh, and Rajasthan and a whole of NCT Delhi in National Capital Region (NCR). CNG and PNG form part of the city or local distribution (CGD) networks. Out of 23 districts, the city or local gas distribution network (CGD) exists in 13 districts. With regard to states, such as UP, Haryana, Rajasthan, and Delhi; CGD covers whole Delhi. Out of the total 119 districts in the three NCR states, CGD exists only in 24 geographical areas (GAs), and baring 7 GAs, each GA comprises the entire district. The availability of network of pipelines across the country is an issue. Presently, 78 GAs have been authorized by the PNGRB for the development of a CGD network in the country and the necessary procedures have been initiated.

India has started the world's largest renewable energy expansion programme. India aims to generate 175 GW electricity from renewable sources of energy by 2022, of which, 100 GW will be from solar power. India has already achieved 20 GW installed solar power.

The National Solar Mission, is an initiative of the Government of India and the state governments to promote solar power. The mission is one of the several initiatives that are part of the National Action Plan on Climate Change (NAPCC). The programme was started in January 2010 with a target of 20GW by 2022 which was later increased to 100 GW by the 2015 Union budget of India. To meet the scaled up target of 100,000 MW, MNRE has proposed to achieve it through 60 GW of large and medium scale solar projects, and 40 GW through rooftop solar projects.

National Mission for Enhanced Energy Efficiency, one of the eight missions under NAPCC is supported by the Energy Conservation Act of 2001 which provides a legal mandate for the implementation of the energy efficiency measures

through the institutional mechanism of the Bureau of Energy Efficiency (BEE) in the Central Government and designated agencies in each state. A number of schemes and programmes have been initiated and it was anticipated that these would result in a saving of 10,000 MW by the end of 11th Five Year Plan in 2012, reducing burden on TPP.

Action Points

1. Stringent compliance by all TPPs with respect to the emission norms according to the timelines upto December 2022 and as per the action plan prescribed in the direction dated December 2017 issued under EPA 1986.
2. CGD network distribution shall be taken up on priority within the country, emphasizing on 102 non-attainment cities.
3. There is need for optimizing the use of the existing power plants by prioritizing capacity utilization of natural gas/ clean fuel-based thermal power plants.
4. Phasing out older coal-based power plants and converting specific coal based power plants to natural gas.
5. Emphasis on improved power reliability in urban areas to eliminate the operation of DG sets.
6. Emphasizing the expansion of renewable power initiatives prioritizing the use of existing framework of NAPCC in non-attainment cities.
7. Need to explore the possibility of Flyash utilization in extensive way in 102 non-attainment cities.

7.5.3 INDUSTRIAL EMISSION

Industrial pollution is another area of concern that contributes majorly to the air pollution in India. Industries are growing at common centres/estates/parks as the resources, manpower, transportation and marketing are feasible. Generally, medium- and small-scale industries are developed in such areas and form industrial clusters. These industrial clusters are a major hub of pollution, thus indicating the lack of awareness and enforcement issues. To address the issue of enforcement and awareness in the industrial clusters, the CPCB has developed Comprehensive Environmental Pollution Index (CEPI) to characterize quality of the environment. In 2009, 88 prominent industrial clusters were identified for a CEPI analysis. Out of identified 88 prominent industrial clusters, 43 industrial clusters in 17 States with a CEPI score of 70 and above are identified as Critically Polluted Areas (CPAs). Further, 32 industrial clusters with CEPI scores between 60 and below 70 are categorized as severely polluted areas (SPAs). The CPCB has revised the CEPI concept and, subsequently, issued directions during April 2016 to all SPCBs/PCCs for taking stringent measures with reference to the revised CEPI concept, which inter alia includes environmental quality monitoring in all the CPAs, installation of continuous ambient air quality monitoring stations, etc. It was also directed to undertake environmental quality monitoring in the critically polluted areas falling under their jurisdiction through a third-party agency (laboratory) recognized under the Environment (Protection) Act, 1986. The environmental quality data, including CEPI score of the industrial area, as per

the revised concept, shall be placed in public domain by the concerned SPCBs/ PCCs through the Internet and also to be published by the State Government periodically. Control of Industrial Pollution has become a governance problem within India and is marred by law enforcement issues. Lack of accurate, independent and easily accessible data on emissions creates hurdles in ensuring compliance to standards and law enforcement.

In one of the experiments conducted in Gujarat through randomized evaluation it was observed that random assignment of auditors to industrial plants, payment from a common pool, their monitoring for accuracy and providing them with financial incentives for better reports for compliance auditing, led to 80% less likeliness of submission of false pollution readings. In addition to this, according to a study, industrial plants too reduced their air and water polluting emissions by 28%.

The ministry has developed a total of 63 industry-specific emission standards. Ten emission standards (diesel and LPG/CNG gensets; petrol and LPG/CNG gensets; dedicated LPG/CNG gensets; industrial boiler; SO_2 and NO_x standards for glass, lime kiln, reheating furnaces, foundry, ceramic industry, and airport noise) have been evolved and six emission standards (thermal power plant, sugar, man-made fibres, fertilizer, cement, and brick kiln) have been revised during 2014–till date. Criteria for categorizing industries in red/orange/green/white categories, which have been adopted by SPCBs/PCCs for strengthening the enforcement mechanism of environmental norms, have been revised.

For strengthening the monitoring mechanism and ensure the compliance of environmental standards, the CPCB has directed 17 categories of highly polluting industries to install and provide connectivity to the CPCB server for Online Continuous Emission/Effluent Monitoring System (OCEMS). So far, out of 3,531 industries, 2,743 industries have installed OCEMS and closure-directions are in force for 740 non-complying units. The CPCB under Section 18(1)(b) of the Air Act ,1981, directed SPCBs/PCCs of the NCR for the installation of online continuous emission monitoring systems in the red category-air polluting industries located in 23 districts of the NCR and Delhi in December, 2017.

Various directions have been issued by the CPCB for closure of brick kilns and stone crushers in Delhi and the NCR during air pollution exigencies. All brick kilns operating without permission and valid consent from SPCBs, not meeting prescribed norms and siting guidelines and not converted from natural draft to induced draft brick kilns (with rectangular kiln shape and zig-zag brick setting), were closed down till March 31, 2017 vide the CPCB direction dated November 2016. Regulations have been put in place regarding the use of pet coke and furnace oil in Delhi and the NCR.

It has been noted that though the CPCB has notified various emission norms for manufacturers of diesel generators, there is no regulation for generators in-use after commissioning (except the 800 KW and above category). This is in spite of the fact that PM is the major source of air pollution in our country. Accordingly, 91% of DG Sets have no regulations beyond the point of manufacture. Studies

show that as DG Sets get older, they might emit 11 times the standards set for the manufacturers. Overall, DG Sets contribute to 7-18% to the ambient air pollution in non-attainment cities. As the current norms only address new generators and a limited population of old generators, it becomes crucial to address emissions from older in-use generators. Accordingly, it is proposed to formulate a notification on control of pollution from diesel generators in-use to include control and mitigation measures related to these generators. In addition to the formulation of standards by the CPCB, this may include following:

Users would be required to a. Shift to gas-based generators either by retrofitting existing generators for partial usage of gas (a mixture of diesel and gas) or buying new gas-based generators b. Use retro-fitted emission control equipment with diesel generators having a minimum specified particulate matter capturing efficiency of at least 70%. This would be the lower cost solution to consumers with a cost less than 10% of the generator set.

The retrofit emission control devices/ gas retrofits can be certified by one of the following institutions (CPCB approved institutions which also provide emissions approval for diesel generators at manufacturers' stage): (a) Automotive Research Association of India, Pune (Maharashtra); (b) International Centre for Automotive Technology, Manesar (Haryana); (c) Indian Oil Corporation, Research and Development Centre, Faridabad (Haryana); (d) Indian Institute of Petroleum, Dehradun (Uttarakhand); and (e) Vehicle Research Development Establishment, Ahmednagar (Maharashtra). These institutions can be authorized to carry out such tests, for giving certificates of Type Approval and Conformity of Production to emission control equipment manufacturers or products. The Compliance and Testing Procedure, as published by the CPCB for diesel engines, can be followed."

Action Points

1. Introduction of gaseous fuels and enforcement of new and stringent SO_2/ NO_x/$PM_{2.5}$ standards for industries using solid fuels.
2. Stricter enforcement of standards in large industries through continuous monitoring.
3. Full enforcement of zig-zag brick technology in brick kilns.
4. Elimination of DG set usage by provision of 24x7 electricity.
5. Control by innovative end of pipe control technologies.
6. Evolve standards and norms for in-use DG sets below 800 KW category.
7. For DG Sets already operational, ensure usage of either of the two options: (a) use of retrofitted emission control equipment having a minimum specified PM capturing efficiency of at least 70%, type approved by one of the 5 CPCB-recognized labs; or (b) shifting to gas-based generators by employing new gas-based generators or retrofitting the existing DG sets for partial gas usage.
8. Utilize the Gujarat case study for a compelling case for other states to adopt third-party audits for polluting industries for enhancing implementation(States)

7.5.4 TRANSPORT SECTOR EMISSION

Vehicles being identified as a major source of pollution, there had been greater emphasis on regulation of vehicular pollution. In this regard Bharat Stage IV (BS-IV) norms have been launched for mandatory implementation since April 1, 2017, and leap-frogging to BS- VI by April 1, 2020, has been proposed. Bharat stage emission standards are emission standards instituted by the Government of India to regulate the output of air pollutants from internal combustion engines and spark-ignition engines equipment, including motor vehicles. The standards and the timeline for implementation are set by the CPCB under the MoEF&CC. The standards, based on European regulations were first introduced in 2000. Progressively stringent norms have been rolled out since then. All new vehicles manufactured after the implementation of the norms have to be compliant with the regulations. Since October 2010, Bharat Stage (BS) III norms have been enforced across the country. In the 13 major cities, Bharat Stage IV emission norms have been in place since April 2010 and it is enforced for whole country from April 2017. In 2016, the Indian government announced that the country would skip the BS-V norms altogether and adopt BS-VI norms by 2020. Fuel quality standard are prescribed by M/o Petroleum and Natural Gas from time to time in advance in corroboration with the prescribed norms. Sulphur content in petrol and diesel is expected to reduce from existing 50 ppm in BSIV vehicles to 10 ppm in BSVI vehicles.

In addition to the BS norms, various other measures have been taken up by the government for control and management of vehicular emission. These measures include emphasis on cleaner / alternate gaseous fuel like CNG, LPG, etc., ethanol blending in petrol in order to reduce vehicle exhaust emissions, promotion of public transport, Pollution under Control (PUC) certificate, lane discipline, vehicle maintenance, etc.

National Mission on Sustainable Habitat under NAPCC is to make habitat sustainable through among others better urban planning and model shift to public transport. Making long term transport plans will facilitate the growth of medium and small cities in ways that ensure efficient and convenient public transport.

Pollution from In-Use vehicle

As per the Central Motor Vehicles Rules, 1989, every motor vehicle (including those conforming to BS-I/ BS-II/ BS-III/BS-IV as well as vehicles plying on CNG/ LPG) is required to carry a valid PUC certificate after the expiry of period of one year from the date of its first registration. However, the validity of 4 wheeled BS-IV compliant vehicles is one year and for other vehicles it is three months. MoRTH has proposed to develop model inspection and certification (I&C) centers in all the states.

The MoRTH, in May 2016, released the first draft of the proposed Voluntary Vehicle Fleet Modernization Programme (V-VMP). The programme proposes to offer tax benefits and discounts to people who junk old vehicles and replace them with new ones. Its primary intention is to reduce emissions and the

priority is to get old fuel-guzzling and polluting trucks off the roads. Analysis of segment and age of vehicles causing air pollution has shown that MHCVs (Medium & Heavy Commercial Vehicles) constitute just 2.5% of the total fleet but contribute to 60% of pollution. Besides, the older vehicles, typically more than 10 years of age and pre-BS I compliant, constitute 15% of the total fleet but pollute 10–12 times more than a new vehicle because of drastic change in pollution norms. The scheme has the potential to reduce the vehicular emission by 25%–30%. The MoRTH is likely to announce this policy on the end of life commercial vehicles. Union Ministry of Steel will set up 20 scrapping centres in various parts of the country to produce steel from the scrap.

Green Mobility

India has for years trailed the official target of blending 5%ethanol and biodiesel in petrol and diesel, respectively to cut pricey oil import and save foreign exchange. The current blending ratio is about 2% for petrol and less than 0.5% for diesel against the target of 5%. Recently approved National Biofuel Policy, 2018, set for achieving blending target of 20% of ethanol in Petrol and 5% of biodiesel in diesel by 2030. Under the new National Policy on Biofuels, the central government has expanded the scope of raw material for ethanol production by allowing use of various agro-waste products

Further, GAIL Gas is also implementing Green Corridor Project to facilitate the availability of CNG beyond city limits so that the clean fuel can be used for long distance journeys. It also enhances the CNG usage.

Ministry of Petroleum & Natural Gas (MoPNG) launched a pilot project aimed at introducing compressed natural gas (CNG) as fuel for two-wheelers. The pilot, uses CNG-retrofitted two wheelers and aims at cutting down the rising pollution levels in cities.

The Ministry of Petroleum & Natural Gas has set up a Hydrogen Corpus Fund with a corpus of Rs.100 crores with contribution from five major Oil Companies and Oil Industry Development Board (OIDB) for supporting Research and Development in various aspects of hydrogen, which could substitute part of natural gas as transport fuel in future.

E-Mobility

The studies have demonstrated that the overall emissions are lower for Electric Vehicles than for gasoline and diesel vehicles: GHGs are reported to be reduced by approximately 82% over the lifetime of an EV, compared to a gasoline vehicle. Local air pollutants were reduced by 36% for PM, 45% for SO_x, 96% for VOCs, 81% for NO_x and 99% for CO.

The government has launched the scheme, namely, Faster Adoption and Manufacturing of Hybrid & Electric Vehicles (FAME India) under National Mission for Electric Mobility (NEMMP), 2020, in the Union Budget for 2015–16. The scheme is to provide a major push for early adoption and market creation of both hybrid and electric technologies vehicles in the country. The Ministry of Power launched the National E-Mobility Programme in 2018

announcing the Government of India's vision to provide an impetus to the entire e-mobility ecosystem, including vehicle manufacturers, charging infrastructure companies, fleet operators, service providers, etc. The programme will be implemented by Energy Efficiency Services Limited (EESL), which will aggregate demand by procuring electric vehicles in bulk to get the economies of scale. The government is focusing on creating charging infrastructure and policy frameworks so that by 2030, more than 30% vehicles are electricity-run vehicles.

However, there are some key challenges which need to be addressed while evolving any future plan on e-mobility and these include:

1. Technology: As a large component of the overall EV costs, high battery prices impact manufacturing and sales. Improved technology and indigenization of battery manufacturing can reduce battery costs, increase efficiency, and improve driving range, making EVs more accessible and attractive to potential customers. Further, lithium ion resources non-availability in India expose us to increased import dependency which can be addressed through exploring the possibility of alternate batteries which can be developed in India using the indigenous resources.
2. Infrastructure: Easy and affordable access to charging infrastructure—both standard AC charging as well as rapid DC charging—is a key to meeting customer needs.
3. Increase in Resource Demand: Globally it is predicted to increasing lithium demand fourfold and more than doubling demand for cobalt — two of the essential elements of lithium batteries. The price of cobalt has already risen by more than 80% this year.
4. Disposal of end-of life batteries: Rechargeable batteries used in electric vehicles majorly include lithium ion batteries, millions of which are already used in various electronic gadgets from smartphones to electronic toothbrushes and consume a lot of resources
   Due to lack of recycling facilities in India for these batteries, almost all of them end up in waste dumps or remain in unused gadgets in people's homes. The batteries used in electric cars are much bigger, last eight to 10 years, and will reportedly will account for 90% of the lithium-ion battery market by 2025 globally. Recycling of lithium-ion batteries is major challenge not only in India but globally.

Action Points

1. Stringent implementation of BS VI norms all over India by April 2020.

Green Mobility

1. Stringent implementation of National Biofuel Policy with respect to ethanol and biodiesel blending target of 20% and 5%, respectively by 2030.
2. City action plans to review the extension of MRT in cities/towns.
3. Improvement and strengthening of inspection and maintenance system for vehicles through extension of I&C centres.
4. Stringent implementation of PUC certificate through regular inspection and monitoring.

5. Fleet modernization and retro-fitment programmes with control devices.
6. Reducing real-world emissions by congestion management.
7. Review the Green Corridor Project and feasibility of its extension with reference to 102 cities.
8. To review the scaling up of Pilot project of MoPNG for introducing CNG in 2-wheelers and ensure timely implementation.
9. Scaling up of R&D on use of Hydrogen as transport fuel.

E-mobility

1. Formulation of a national-, state-, and city-specific action plan for e-mobility.
2. Rapid augmentation of charging infrastructure in the country focusing on 102 cities.
3. Central government offices fleets older than 15 years to be shifted to electric vehicles.
4. Government-run buses for public transport, private buses, and 3-wheelers to be converted to EVs.
5. Gradual transition to e-mobility in the 2-wheeler sector.
6. Specific allocations for creating a venture capital fund.
7. Investment in R&D and pilots focusing on the indigenization of battery manufacturing, cheap alternate resource to lithium and cobalt, resource efficiency associated with a circular economy, re-use and recycling for lithium batteries, etc.

7.5.5 AGRICULTURAL EMISSION

Various studies, including satellite data observations on aerosol properties suggests transport of particles from agriculture crop residue burning in the Indo-Gangetic Plains over large regions. Studies suggest that although outdoor fires are not the dominant air pollution source in India throughout the year, post-monsoon fires contribute substantially to regional air pollution and high levels of population exposure around Delhi. These results suggest that providing viable alternatives to agricultural residue burning could help improve post-monsoon air quality for a growing population within Delhi's air shed.

Paddy straw burning is currently practiced on a, large scale in Punjab and Haryana to clear the fields for the sowing of rabi crops, that is, rainy wheat and potato, because the time window available between the harvesting of paddy crop (September 20–November 15, depending upon the varieties of paddy) and the sowing of the next crop is very short (two–three weeks). Burning of paddy straw is most common in combine harvested fields because it leaves harvested paddy straw and standing stubbles (25–30 cm height) in the field. Paddy straw is seldom used as fodder due to its high silica content.

Environmentally sustainable paddy crop residue management practices entail incremental costs for the farmers (additional tractor operations and use of required machinery, etc.). Farmers, therefore, prefer burning as they can avoid incurring such costs by resorting to burning. They also believe that burning destroys the soil-born insects/pests and diseases to a large extent. An estimated 23 million tonnes of paddy straw is burnt in Punjab, Haryana, and Uttar Pradesh.

The stubble burning shoots up the carbon dioxide levels GHG in the air by 70%. The concentration of carbon monoxide and nitrogen dioxide also rises by 7% and 2.1%, respectively. It has been estimated that, burning of one tonne of paddy straw releases 3 kg particulate matter, 60 kg CO, 1460 kg CO_2, 199 kg ash, and 2 kg $S0_2$. These gases affect human health due to general degradation in air quality, thus resulting in the aggravation of eye and skin diseases. Fine particles also aggravate chronic heart and lung diseases. On the other hand, one tonne of paddy straw contains approximately 5.5 kg N, 2.3 kg P_2O_5, 25 kg K_2O, 1.2 kg S, 50%-70% of micro nutrient absorbed by rice and 400 kg of carbon, which are lost due to burning. Some of the soil properties' like soil temperature, pH, moisture, available phosphorus and soil organic matter are greatly affected due to burning.

Amongst all available options for management of paddy straw (viz., Bio-Char, pellets/ briquettes making for thermal power plants, ethanol production, etc.), in situ use of paddy straw as mulch for sowing of wheat and its incorporation in soil for planting of potato and other vegetable crops has been observed to be most feasible and economical option for handling the paddy straw to begin with. Accordingly, a new Central Sector Scheme (100% Central Share) on 'Promotion of Agricultural Mechanization for In-Situ Management of Crop Residue in the States of Punjab, Haryana, Uttar Pradesh and NCT of Delhi' for the period from 2018-19 to 2019-20 has been approved with the total outgo from the Central funds of Rs. 1,151.80 crore. Out of this total allocation as amount of Rs 575.18 has been released for the FY 2018/19.

The scheme has the components on (i) establishment of farm machinery banks for custom hiring of in-situ crop residue management machinery; (ii) financial assistance to farmers for the procurement of agriculture machinery and equipment for in-situ crop residue management; and (iii) information, education, and communication for awareness on in situ crop residue management. The State Department of Agriculture of the State Governments of Punjab, Haryana, Uttar Pradesh, and the Delhi NCT are the nodal departments for implementing the scheme in the states.

Ministry of Agriculture, Government of India, had finalized National Policy for Management of Crop Residues (NPMCR) – 2014. The policy envisages adoption of technical measures and extending central financial assistance for various interventions. Various ex-situ options for management of crop residue burning such as production of Prali-Char, biochar, pellets, briquettes, bioCNG, bioethanol are alternate fuel for brick kilns, industrial boilers, paper and packaging, coal-fired TPPs, transport sector, etc.

The government has recently announced National Policy on Biofuels (NPB), 2018, which aims to achieve 20% blending of ethanol in Petrol & 5% blending of biodiesel in diesel by 2030. The policy not only widens the feedstock base which now also includes crop residues for the production of biofuels but also indicates the roadmap for achieving the blending targets.

Air pollution from farms directly affects the environment, chiefly through the production of gaseous nitrogen and some of the greenhouse gases responsible

for global warming. Agricultural air pollution comes mainly in the form of ammonia, which enters the air as a gas from heavily fertilized fields and livestock waste. It then combines with pollutants from combustion—mainly nitrogen oxides and sulfates from vehicles, power plants and industrial processes—to create tiny solid particles, or aerosols. Nitrous oxide is the major GHG that is contributed by fertilizers. Many studies indicate it as single biggest source of air pollution.

Action Points

1. Evaluate the status of implementation of the above scheme in the states and impact on reduction of air pollution in Delhi and the NCR.
2. Evaluate the socio-economic feasibility for implementation of ex-situ options like production of Prali-Char, biochar, pellets, briquettes, bioCNG, bioethanol, etc., as ex-situ solutions for management of crop residue burning especially with NPB in place.
3. Extending the initiatives for addressing the issue of crop residue burning from the NCR to other part of the country and from paddy to sugarcane and other crops.
4. Coordination with ISRO for regular availability of Remote Sensing Monitoring data for crop burning by the farmers.
5. Evolve plan for management of agricultural emissions from fertilizers and livestock waste on the basis of strong R&D. The R&D for the purpose to be supported.
6. Implement plan for management of agricultural emissions
7. The capacity-building initiatives for Krishi Vigyan Kendra (KVK) shall be strengthened.

7.5.6 EMISSIONS FROM UNSUSTAINABLE WASTE MANAGEMENT PRACTICES

It is estimated that, annually, 62 MMT of municipal solid waste gets generated in India. The generation of MSW in Indian cities has resulted in severe environmental and health problems due to improper management. Air pollution is one of the major environmental concerns in India due open disposal and burning of MSW. Waste products, such as plastic and rubber when burnt pollute the atmosphere with noxious fumes, such as dioxins and furans. E-waste burning releases toxic ashes, cadmium, dioxin, and furans. Organic solid wastes emit an obnoxious odour on their decomposition and make the environment polluted. Centralized waste disposal systems involving the use of landfills is the most commonly adopted practice for disposal of waste all over the world.

The waste sector is uniquely situated to substantially mitigate the second most-abundant greenhouse gas, methane. Focusing on waste with improvements in solid waste management can also bring various co-benefits such as an improvement in air quality, a reduction in contamination-related illnesses, economic growth, and a boost to energy resources.

An integrated solid waste management strategy, including targeting waste prevention, recycling, composting, energy recovery, treatment, and disposal, can

have a significant impact on reducing greenhouse gas emissions. For instance, landfill gas, which is composed of about 50% methane and 50% carbon dioxide, can be captured and used as a source of clean energy and a substitute for fossil fuel. Methane not only contributes to warming the atmosphere, it has also been linked to the concentration of surface ozone, which is known to cause air quality and public health issues.

An study investigating global emissions of trace gases, particulate matter, and hazardous air pollutants from open burning of domestic waste revealed that the fires (open trash burning) produce emissions equivalent to as much as 29% of officially reported human-related global emissions of small particulates ($PM_{2.5}$), as well as 10% of mercury and 64% of a group of gases known as polycyclic aromatic hydrocarbons (PAHs).

The dumpsites are riddled with instances of dangerous methane discharge, incessant fire outbreaks, landfill slides, and human rights violations of wastepickers as well as residents in the area. As per one of the estimation, emissions from biomass and open burning of waste contribute to almost 20%–30% of the total air pollution in cities like Delhi. Yet, unsustainable solid waste management practices, including open burning, landfill fires, and incineration are a common sight not only in the capital city but across the country.

Shortage of landfill capacity has consistently been touted as the reason to push for waste to energy incinerators in India. However, burning waste in inefficient incinerators only worsens the already-polluted air. Inefficient waste-to-energy incinerators, have proven to be notorious sources of air pollution and highly toxic ash residues. The most lethal incineration emissions are dioxins and furans, which are highly carcinogenic and persist in the environment.

National Mission on Sustainable Habitat under NAPCC is to make habitat sustainable through improvements in energy efficiency in buildings, management of solid waste and modal shift to public transport. Recycling of material and Urban Waste Management will be a major component of ecologically sustainable economic development. India already has a significantly higher rate of recycling of waste compared to developed countries. A special area of focus is development of technology for producing power from waste.

The smart city mission, is an urban renewal and retrofitting programme administered by the Union Ministry of Housing and Urban Affairs with the mission to develop 100 cities across the country, making them citizen friendly and sustainable. The mission is being implemented in collaboration with the state governments of the respective cities. Features of Smart cities inter-alia include reduce congestion, air pollution and resource depletion, boost local economy, promote interactions and ensure security. The road network is to be created or refurbished not only for vehicles and public transport, but also for pedestrians and cyclists, Promoting a variety of transport options - Transit Oriented Development (TOD), public transport and last mile para-transport connectivity. 43 of these smart cities fall in the list of 102 non-attainment cities.

Similarly, the Swachh Bharat Mission is a campaign that aims to clean up the streets, roads and infrastructure of India's cities, smaller towns, and rural areas. Swachh Hawa is an integral component of Swachh Bharat. Integrated Solid Waste Management including C&D, E-waste, hazardous waste will be useful in meeting the outcome under the NCAP.

Action Points

1. Use the smart cities framework to launch the NCAP in the 43 smart cities falling in the list of 102 non-attainment cities.
2. Transform our centralised waste disposal infrastructure to a sustainable decentralized system in 102 cities.
3. Source segregation into dry and wet waste to be made mandatory through involvement of municipalities and the RWA.
4. Mandatory Training and capacity building of municipalities and the RWA.
5. Transitioning towards a zero-waste pathway through an integrated solid waste management strategy, including targeting waste prevention, recycling, composting, energy recovery, treatment, and disposal.
6. Waste reduction schemes such as 'polluters pay' principle, recycling projects, composting, biomethanation, RDF plants and co-processing to be supported under an integrated solid waste management strategy.
7. Construction of decentralized compositing plant, biomethanation plant and C&D waste plants.
8. Deployment of fixed compactor and doing away with dhalaos.
9. Focus on training municipalities and SPCBs to be on national and international technologies for integrated waste management options.
10. In line with the National Biofuel Policy, promote technologies which can convert waste/plastic, MSW to energy resulting in reduction of traditional fuel use.
11. Stringent implementation and monitoring for extended producer responsibility for e-waste and plastic waste.
12. Strict implementation of existing six waste management's rules on solid, Hazardous, Electronic, Bio-medical, Plastics and C&D waste.
13. The Swachh Bharat Mission and National Mission on Sustainable Habitat to be used as a platform to push the objectives under this sector.

7.5.7 INDOOR AIR POLLUTION MANAGEMENT

It refers to the physical, chemical, and biological characteristics of air in the indoor environment within a home, building, or an institution or commercial facility. Health risks related to indoor air pollution have become an issue of concern because people generally spend most of their time indoors at home and at work. The problem has been exacerbated by well-meaning efforts to lower air-exchange rates in buildings in order to conserve energy; these efforts unfortunately allow contaminants to accumulate indoors.

Indoor air pollutants include various combustion products from stoves, kerosene space heaters, and fireplaces as well as volatile organic compounds (VOCs) from

household products (e.g., paints, cleaning agents, and pesticides). Formaldehyde off-gassing from building products (especially particleboard and plywood), and from dry-cleaned textiles can accumulate in indoor air. Bacteria, viruses, moulds, animal dander, dust mites, and pollen are biological contaminants that can cause diseases and other health problems, especially if they build up in and are spread by central heating or cooling systems. Environmental tobacco smoke, also called second-hand smoke, is an indoor air pollutant in many homes, despite widespread knowledge about the harmful effects of smoking. Second-hand smoke contains many carcinogenic compounds as well as strong irritants. In some geographic regions, naturally occurring radon, radioactive gas, can seep from the ground into buildings and accumulate to harmful levels. Indoor air pollution can begin within the building or be drawn in from outdoors. Other than nitrogen dioxide, carbon monoxide, and lead, there are a number of other pollutants that affect the air quality in an enclosed space. Exposure to all indoor air pollutants can be reduced by appropriate building construction and maintenance methods, limitations on pollutant sources, and provision of adequate ventilation.

In the developing countries, it is the rural areas that face the greatest threat from indoor pollution, where some 3.5 billion people continue to rely on traditional fuels such as firewood, charcoal, and cowdung for cooking and heating. India is home to more than 24 crore households out of which about 10 crore households are still deprived of LPG as cooking fuel and have to rely on firewood, coal, dung cakes, etc., as a primary source of cooking. The smoke from burning, such fuels cause alarming household pollution and adversely affect the health of women and children causing several respiratory diseases/ disorders. The Pradhan Mantri Ujjwala Yojana (PMUY) aims to safeguard the health of women & children by providing them with a clean cooking fuel – LPG, so that they don't have to compromise their health in smoky kitchens or wander in unsafe areas collecting firewood.
The Pradhan Mantri Ujjwala Yojana was launched by the Hon'ble Prime Minister Shri Narendra Modi on May 1, 2016, in Ballia, Uttar Pradesh. Under this scheme, 5 crore LPG connections have been provided to BPL families with a support of Rs 1,600 per connection over the next three years.

Action Points

1. Building specific guidelines and protocols on monitoring and management of indoor air pollution.
2. Extend PMUY in 102 cities/towns and the associated village areas.
3. Guidelines and provisions for building designs that define proper ventilation, clean cooking, and living areas to maintain healthy air quality inside the house to be integrated with the Pradhan Mantri Awas Yojana (PMAY).

7.6 CITY SPECIFIC AIR QUALITY MANAGEMENT PLAN FOR 102 NON-ATTAINMENT CITIES

The city action plans need to be guided by a comprehensive science-based approach, involving source apportionment studies. Source apportionment study

is resource intensive and a highly specialized technical work, considering that such studies are required in about 102 non-attainment cities/towns; capacity building and networking of domestic institutes will be extremely important.

These studies are taken up in a few cities and towns, to begin with. It has been observed that towns in northern India, particularly in the Indo-gangetic plains, have higher ambient particulate concentrations in comparison to the southern parts. Similarly, source activities (industries, typical urban, etc.) and meteorological settings (e.g., coastal) are the other important factors that may influence the air pollution levels. It is, therefore, proposed to select candidate cities and towns considering the above-mentioned factors. Further, the state capitals and cities with a population more than a million (due to a higher number of people being exposed to higher PM concentrations) may be taken up on priority. All the non-attainment cities and towns may be covered in a phased manner. In the first phase, 10 cities may be taken up with support of leading institutes like the IITs, NEERI, TERI, ARAI, etc. Each of these Institutes may associate two or three Institutes during the study for their capacity building and involvement in subsequent phases.

Action Points

1. Preliminary city-specific action plans to be formulated for 102 non-attainment cities.
2. City-specific action plans to be taken up for implementation by State Government and city administration.
3. City-based clean air action plans are to be dynamic and evolve based on the available scientific evidence, including the information available through source apportionment studies.
4. A separate emergency action plan in line with GRAP for Delhi to be formulated for each city for addressing the severe and emergency AQIs.

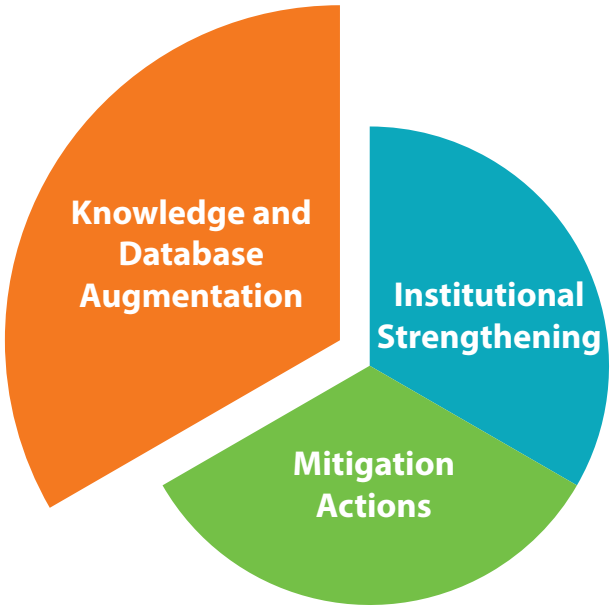
7.7 STATE ACTION PLAN FOR AIR POLLUTION

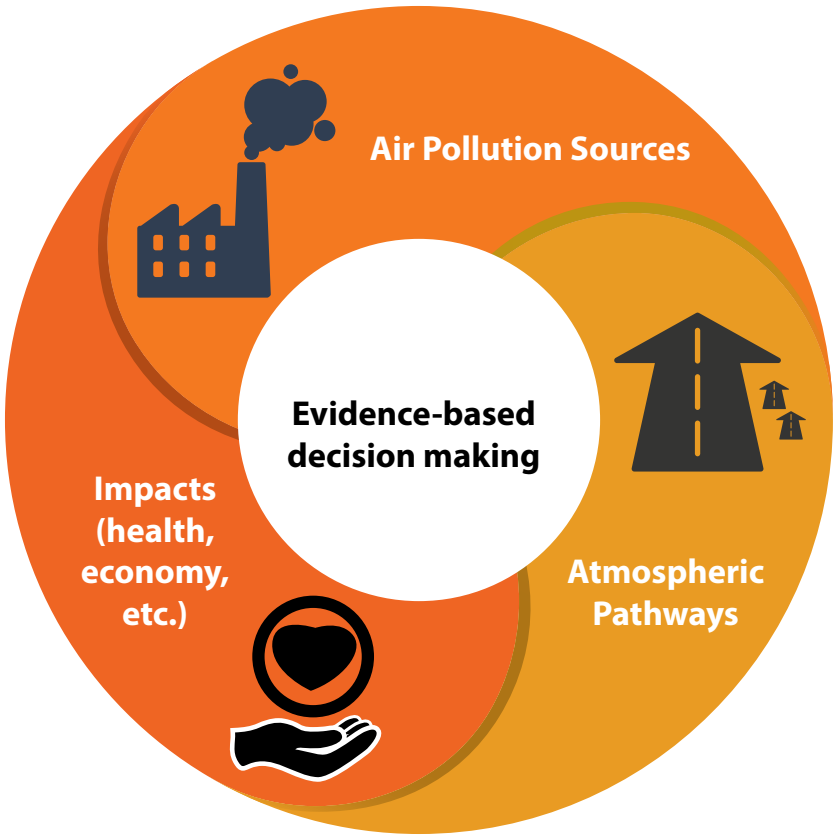
Since collaborative and participatory approach involving State Governments, Local bodies, relevant Central Ministries, and other Stakeholder with focus on all sources of pollution form crux of the Programme, success of NCAP is depending upon active involvement of State Governments. State Government's participation is not limited for evolving an effective implementation strategy but as has been indicated by Department of Expenditure since the outcome of the NCAP would be contingent upon the investments to be made by the States, more involvement of the States in the area of funding is to be explored.

Action Points

1. Preliminary State Action Plan for Air Pollution to be formulated for all 23 states which harbour 102 non-attainment cities;
2. State Action Plan for Air Pollution to be taken up for implementation by State Government and city administration;
3. The State Action Plan to have detailed funding mechanism.

KNOWLEDGE & DATABASE AUGMENTATION





8 ACTIONS FOR KNOWLEDGE AND DATABASE AUGMENTATION

8.1 AIR QUALITY MONITORING NETWORK

Air quality monitoring network is one of the key components under NCAP (Figure 4). National air quality monitoring network to be revisited, past data to be analyzed for rationalization of monitored parameters, and monitoring needs be reassessed for augmenting the monitoring network adopting optimum blending of techniques such as manual, continuous, sensor & satellite based techniques.

Action Points

1. Manual monitoring stations

With reference to existing 4000 cities in the country, 703 manual monitoring stations in 307 cities reflects limited number and need augmentation. It is proposed to augment it to 1500 stations from existing 703 stations.

FIGURE 4. KEY COMPONENTS OF NCAP

2. CAAQMS

Recognizing the need to monitor real time and peak concentration levels of critical pollutants avoiding the time lag, more specifically with reference to the AQI, it is proposed under the NCAP to augment the existing number of Continuous Ambient Air Quality Monitoring Stations (CAAQMS). Presently, there are 134 CAAQMS stations in 71 cities and 17 States. Acknowledging the fact that air pollution in India has regional ramifications and the Indo-Gangetic plain, spanning approximately 45–50 cities spreads across the states of Assam, Bihar, Haryana, Jharkhand, Madhya Pradesh, Punjab, Rajasthan, Uttarakhand, Uttar Pradesh, and West Bengal, is the main region impacted by air pollution; the expansion of real-time monitoring stations would mainly focus on this region, and approximately 150 CAAQMS with an average of 2–3 stations in each city is to be decided on the basis of population, industrial activities, etc., will be targeted. Further, impetus will be on low-cost indigenous real-time monitoring stations. Real-time monitoring in other cities will be taken up with identification of these low-cost sensors.

3. Satellite based monitoring

Application of Aerosol Optical Depth (AOD) from satellite-based observations is being widely accepted for the assessment of ambient particulate matter levels. This is significant considering the extensive monitoring needs and required resources. The NCAP proposes to use this technique to supplement its monitoring network. Under the programme, capacities will be strengthened to develop indigenous satellite-based products and techniques to derive useful air quality information. The required algorithm to correlate AOD values with ground-level PM concentrations over the Indian regions will be derived from an indigenous database. Other satellite-based products also need to be explored to assess gaseous pollutant concentrations.

4. Identification of alternative technology for real time monitoring

CPCB is to steer the process of identifying and for developing/validating alternative cost-effective technology for source and ambient air quality monitoring in consultation with the IIT, CSIR, and other such institutes as NEERI. Mobile air quality monitoring network are to be made part of these alternative technologies.

5. Rural Monitoring Network

Air quality in rural areas remains a neglected issue so far. The common belief is that rural areas are free from air pollution. On the contrary, air quality in the rural areas all over the world and particularly in the developing countries may be more polluted than some of the urban areas. Rural areas suffer from outdoor air pollution as well as indoor air pollution. Major sources of outdoor air pollution are indiscriminate use of insecticides/pesticides sprays and burning of wheat and paddy straw. Atmospheric concentration of ozone has been observed higher in rural areas as compared to urban areas. Since rural areas have not been covered under NAMP it is proposed to set up 75 such stations in rural areas.

6. Protocol for setting up of monitoring stations and monitoring

Guidelines for Ambient Air Quality Monitoring has been issued by the CPCB in 2003 for assisting and taking decision with respect to the setting up of monitoring stations. However, it is noted that the guideline needs revision in reference to sound decision making in selection of pollutants, selection of locations, frequency, duration of sampling, sampling techniques, infrastructural facilities, man power, and operation and maintenance costs. The network design also depends upon the type of pollutants in the atmosphere through various common sources. Accordingly, it is planned to review the existing guideline and issue protocol for setting up of monitoring stations and monitoring.

7. Monitoring of $PM_{2.5}$

Particulates are the deadliest form of air pollutants due to their ability to penetrate deep into the lungs and blood streams unfiltered, causing various health issues. The smaller $PM_{2.5}$ are particularly deadly, as it can penetrate deeper into the lungs and blood stream. The monitoring data also indicates higher concentration of $PM_{2.5}$ in major cities. Accordingly, in order to evolve a comprehensive mechanism for the management of $PM_{2.5}$, it is proposed to augment the number of monitoring stations for $PM_{2.5}$ from the existing 167 in 80 cities to all stations under NAMP.

8. Setting up of 10 city Super Network

This network may capture the overall air quality dynamics of the nation, impact of interventions, trends, investigative measurements, etc. The cities may be identified for capturing possible variations (e.g., metro city, village, mid-level town, coastal town, controlled background location, industrial town, etc.). Each city may have one well-equipped monitoring station representing the city background. In addition to the notified 12 pollutants, constituents of PM1, particle number, etc., may be monitored. It should generate highly-quality controlled data and will represent national air quality dynamics. The plan for this network to be formulated and implemented in consultation with the CPCB.

9. Super sites as representative sites in cities and rural areas

These representative monitoring sites are to be selected to assess the background level and major sources so as to draw a scientific statistically sound assessment of pollution and its impact on health.

8.2 EXTENDING SOURCE APPORTIONMENT STUDIES TO ALL NON-ATTAINMENT CITIES

The air pollution problem becomes complex due to the multiplicity and complexity of air-polluting sources (e.g., industries, automobiles, generator sets, domestic fuel burning, road side dusts, construction activities, etc.). A cost-effective approach for improving air quality in the polluted areas involves (i) identification of emission sources; (ii) assessment of extent of contribution of these sources on ambient environment; (iii) prioritizing the sources that need to be tackled; (iv) evaluating various options for controlling the sources with regard

to feasibility and economic viability; and (v) formulation and implementation of most appropriate action plans. Source apportionment study, which is primarily based on measurements and tracking down the sources through receptor modelling, helps in identifying the sources and extent of their contribution. The auto fuel policy document of the Government of India also recommended carrying out source apportionment studies. Accordingly, source apportionment studies have been initiated in six major cities, viz. (i) Delhi; (ii) Mumbai; (iii) Chennai; (iv) Bangalore; (v) Pune; and (vi) Kanpur. The study would focus on the apportionment of particulate matters (PM_{10} and $PM_{2.5}$), being the most critical. Statistics generated from source apportionment studies of Delhi by the CPCB and IIT Kanpur, showing percentage contribution of PM_{10} from various sources, is given in Table 1.

Source apportionment study, which is primarily based on measurements and tracking down the sources through receptor and dispersion modelling, helps in identifying the sources and extent of their contribution.

Action Points

1. Unified guideline for source apportionment study will be formulated and updated (centre).
2. Source apportionment studies to be extended to all 102 non-attainments (centre).

8.3 AIR POLLUTION HEALTH AND ECONOMIC IMPACT STUDIES

Many international studies often report data on mortality due to air pollution exposures. These studies use extrapolation techniques for air quality- and health/disease-related data, which probably may not be realistic. While there is no denial on serious health implications, attributing one to one correlation and number of deaths due to air pollution needs to be further investigated and supported by indigenous studies. More authentic Indian data and studies may further strengthen our efforts and public participation in improving the air quality. With a focus on environmental health issues, the MoEF&CC has constituted an Apex Committee and a Working Group under the joint chairmanship of the Indian Council of Medical Research (ICMR) and the Ministry to identify thrust areas in environment health and to evaluate the related projects. In line with recommendation of the Working Group, the ministry has initiated action towards a study on the National Environmental Health Profile for 20 cities with an emphasis on the impact of air pollution on health.

There are numerous effects of air pollution on the ecosystem, which in turn have various economic implications. In simple terminology, we can say that air pollution effects can be both direct and indirect. For instance, air pollution primarily causes respiratory and other health hazards in people who are being directly exposed to various harmful gases. The secondary, and long-run impact, would be that following the health problems, the productivity of workers might be adversely affected, which in turn hamper output levels. This is how

air pollution exerts an indirect effect on the overall economy. The recognition of anthropogenic sources of pollutants and their biological and economic effects on managed ecosystems, such as agricultural crops and forests provided impetus for air pollution control programmes.

The link between economics and natural science economic analysis can be an effective tool for comparing the costs and benefits of alternative resource or environmental management policy actions. When correctly formulated, such economic analyses can be useful in estimating the monetary values of vegetation and other receptor losses from air pollution or the welfare consequences of air pollution reductions.

Action Points

1. Study on the National Environmental Health Profile to be completed in time.
2. Response study and cohort study programme to be undertaken.
3. Ministry of Health to actively take up environmental health for ensuring regular health profile or database for assisting decision making.
4. Studies on health and economic impact of air pollution to be supported.
5. Framework for monthly analysis of data w.r.t health to be created. The data from mapping of industry; tabulation of daily AQI, $PM_{2.5}$ and PM_{10} measurements (24 hours average); metrological parameters; deaths due to heart attacks, strokes, respiratory arrest, following the existing respiratory ailments, trends in lung cancer if available with respect to all cities to be fed in to a central computer and to be analysed every month by people trained in environmental health for correct interpretation.
6. Awareness and orientation workshops to be undertaken focussing on a target audience
7. 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.
8. Training researchers in study design through holding workshops in epidemiology, toxicology, and biostatistics

8.4 INTERNATIONAL COOPERATION INCLUDING SHARING OF INTERNATIONAL BEST PRACTICES ON AIR POLLUTION

The issue of management of air pollution in developing countries and countries with economy in transition is impacted by lack of expertise, technology and adequate related information. With reference to developing countries and countries with economy in transition as India, technological and expertise limitations are considered as major hindrance in achieving our obligations under various international conventions and in meeting the national commitments with reference to prevention, control and abatement of pollution; and protection

of environment. Accordingly, technology transfer and information sharing is the way forward for any collaboration on environment. Technology transfer does not just relate to equipment or 'hardware', but also to total systems and their component parts, including know-how, goods and services, equipment, and organizational and managerial procedures. Accordingly, multilateral and bilateral cooperation on air pollution, including in related demonstration/pilot projects, including a prototype development for the best-available technologies and best environmental practices for pollution prevention, minimization, and mitigation strategies and for the control and abatement of pollution, specifically air pollution, are being proposed.

Action Points

1. International scientific and technical cooperation in the area of air pollution will be established in accordance with national priorities and socio-economic development strategies and goals.
2. Modalities of such cooperation may include joint research and technology development, field studies, pilot scale plants and field demonstration projects with active involvement of academia, research institutions and industry on either side.

8.5 REVIEW OF AMBIENT AIR QUALITY STANDARDS AND EMISSION STANDARDS

Ambient air standards which sets limits on pollutants with reference to quality of air surrounding us in the outdoors and emission standards which set quantitative limits on the permissible amount of specific air pollutants that may be released from specific sources over specific timeframes have already been notified barring for some of the sources.

Action Points

1. The CPCB to come up with guidelines with respect to the periodicity of review of such standards.
2. The existing standards need to be strengthened periodically and new standards need to be formulated for the sources where standards are not available, based on extensive scientific evidence with reference to protection of public health and environment.

8.6 NATIONAL EMISSION INVENTORY

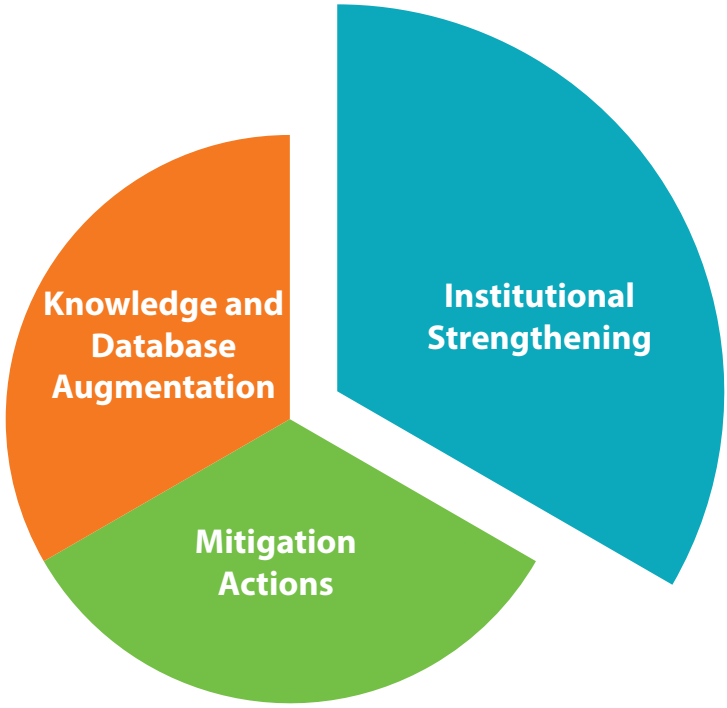
An emission inventory is an accounting of the amount of pollutants discharged into the atmosphere. An emission inventory usually contains the total emissions for one or more specific air pollutants, originating from all source categories in a certain geographical area and within a specified time span, usually a specific year. Emissions and releases to the environment are the starting point of every environmental pollution problem. Information on emissions therefore

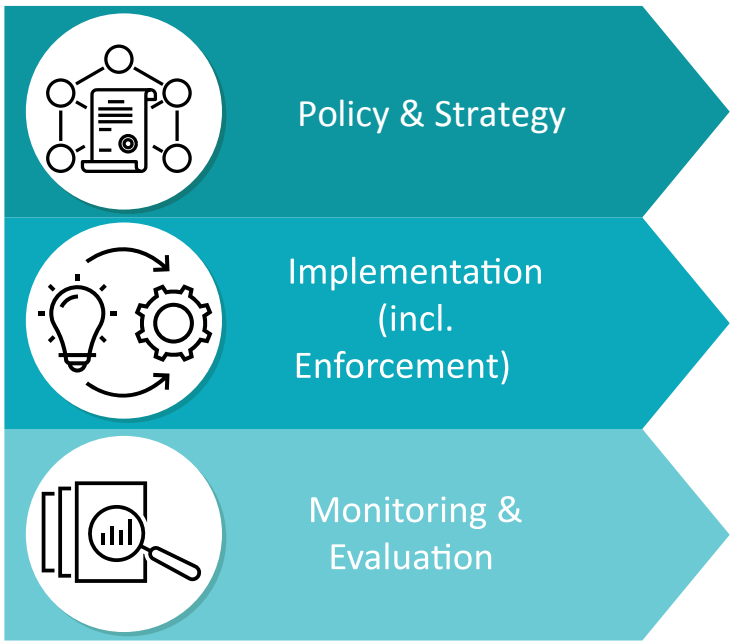
is an absolute requirement in understanding environmental problems and in monitoring progress towards resolving these. Emission inventories are essential for policy formulation and implementation, and other related scientific studies. Its significance is in tracking progress towards emission reduction targets and as inputs to air quality model.

Action Points

1. Comprehensive National Emission Inventory which is still lacking in the country will be formalized under the NCAP.

INSTITUTIONAL STRENGTHENING





9 ACTIONS FOR INSTITUTIONAL STRENGTHENING

9.1 PUBLIC AWARENESS AND EDUCATION

Awareness and education initiatives towards prevention, control, and mitigation of air pollution combined with specific information sharing on health advisories and dealing with air pollution exigency is an essential component, which provides communities with the knowledge and tools to take action and 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. Studies shows that simple measures such as walking just a few yards away from the kerbside of a busy road could reduce exposure by 30%. Idling your car engine uses more fuel and is worse for your engine than restarting. The all-important first step is awareness. Engaging children at an early age is the best way to ensure we build a foundation in order to ensure clean air for the future generations. With air quality now engrained 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 their air quality footprint. The public can become more involved in reducing local air pollution impacts in their communities. Extensive awareness and outreach programme for various stakeholder groups need to be taken up prioritizing the non-attainment cities. Building public awareness will be vital in supporting implementation of the NCAP. This will be achieved through national portals, media engagement, civil society involvement, curricula reform and recognition/ awards, details of which will be worked out by an empowered group. The Group will also consider methods of capacity building to support the goals of the NCAP. Advocacy and IEC to be strategy element.

Action Points

1. City-specific awareness programme targeting key stakeholders to be formulated and taken up for implementation. This could include awareness generation in general public for prevention of adverse effects of air pollution.
2. 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.

9.2 TRAINING AND CAPACITY BUILDING

One of the major issues, which is a hurdle in an effective implementation of air pollution management plans have been observed to be a lack of capacity on air quality issues due to limited manpower and infrastructure in the CPCB and SPCBs, lack of formal training for various associated stakeholders, a limited number of trained individuals in air quality management, limited publications

designed to provide information on local air quality issues, limited collaboration between government, universities, and other research institutions, lack of a forum for sharing of published local research work on air quality, etc.

Action Points

1. Extensive capacity-building programmes for both the CPCB and SPCBs with reference to both manpower and infrastructure augmentation.
2. Intensive training, comprising national and international best practices and technological options, of all the associated stakeholders.

9.3 SETTING UP AIR INFORMATION CENTRE

Air information centers may be set up at the central and state level, which will be responsible for creating a dash board, data analysis, interpretation, dissemination, including through GIS platform, issuing bulletins, keeping track of international developments, and bringing out policy updates. This may be set up with the assistance of the IITs, IIMs, and other universities and research organizations involved in such studies. The Government of India is implementing the National Action Plan on Climate Change (NAPCC), wherein various institutes are engaged under National Communication (NATCOM). Relevant institutes from NATCOM list can be utilized for setting up such centres.

Action Points

1. Plan accordingly for setting up of these centres will be formulated.
2. Air information centres at the central level and regional level will be set up in some of the identified institutes.

9.4 CERTIFICATION SYSTEM FOR MONITORING INSTRUMENTS

In the field of environmental monitoring, the data quality is posing a major challenge as the reliability of such measurements needs to be ascertained. The roles of instrument and the calibration are the major issues that need to be addressed. While most of the instrument used are usually imported from abroad which comes with certifications from agencies such as the USEPA, TUV, MCERTS, etc. These certificates are issued based on the environmental conditions of the certificate issuing country which are different from the environmental conditions prevalent in India, for example, high variability in temperature and humidity during the different seasons and different geographical regions. This affects the quality of measurements by the instrument operating for a long time in the Indian conditions and warrants a revisit of the certification process at regular intervals. However, as of now, no certification system is available in India for environmental monitoring equipment. The traceability of measurement is also an integral part of generation of reliable data. A measurement is valid only if the traceability to SI units is established and the uncertainties in each measurement are estimated.

CSIR-National Physical Laboratory is the National Metrology Institute (NMI) of India. It is a member of Bureau International des Poids et Mesures (BIPM) and signatory to the International Committee for Weights and Measures - Mutual Recognition Arrangement (CIPM-MRA). The NMIs demonstrate the international equivalence of their measurements through CIPM-MRA.

In view of the above, the CSIR-NPL proposes to establish an NPL-India Certification Scheme (NPL-ICS) to cater to the country's needs in respect of Online Continuous Emission Monitoring System (OCEMS), Continuous Ambient Air Quality Monitoring System (CAAQMS), and $PM_{2.5}$/PM_{10} samplers. The scheme will provide a complete and cost effective solution for test, calibration, and certification to the Indian as well as foreign manufacturers of these equipment/ systems. Due to a signatory to the CIPM-MRA, the certificates issued by the CSIR-NPL will be acceptable world-wide. This will help manufacturers of the equipment to trade in international market as well lend a helping hand in the `Make in India' programme.

The proposed certification scheme will have three major components i.e. 1) NPL-India certification body (NICB), 2) certification committee, and 3) testing and calibration facility. In this proposed scheme, the NICB will be the highest body with five members, which includes the chairman, member secretary. and the three expert members, one each from the National Metrology Institute (CSIR-NPL), Environmental Regulatory Body (CPCB), and CSIR-National Environmental Engineering & Research Institute (CSIR-NEERI).

The certification committee will have seven members (four permanent and three co-opted). The three co-opted members must be associated with independent institutes or organizations like the IITs, NABL, or other academic institutes as per the required technical/academic expertise on case to case basis.

The third component will be the heart of this scheme and will provide the required test reports. The facility will be fully capable for testing and calibrating extractive, in-stack, or cross stack measurements to allow more than one system to be tested at a time as per the test programme generated by the certification committee. The proposed facility will allow to test the online continuous emissions monitoring systems (OCEMS), continuous ambient air quality monitoring systems (CAAQMS), and data-handling systems (DAHS), besides other air pollution monitoring equipment such as $PM_{2.5}$ and PM_{10} samplers.

Other than this, the proposed testing and calibration facility will also be capable of conducting three months of field testing as per the requirement of EN-15267-3 (or Indian equivalent) and QAL-3 of EN-14181 (or Indian equivalent). The testing and calibration facility may sub-contract field testing of the system to another organization. It is the responsibility of the main testing and calibration facility to ensure that the sub-contracted organization is accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) and registered with regulatory body (the CPCB) for the scope of work sub-contracted.

The process execution time for certification starts from the date of submission of request application from the client. The overall time required for the proposed certification from submission of application to the issue of certificate will be about 20 months.

Action Points

1. To operationlize the NPL-India Certification Scheme (NPL-ICS) at the central and regional levels to cater to the country's needs with respect to the online monitoring of air pollution.
2. To evolve an action plan for the need of certification agencies for air pollution mitigation equipment in addition to monitoring equipment.

9.5 AIR QUALITY FORECASTING SYSTEM

The Air Quality Forecasting System (AAQFS) as a state-of-the-art modelling system which forecasts the following day's air quality is being envisaged. The meteorological and emissions information is to be entered into the model which aims to accurately forecast air pollution on daily basis and also expected air pollution exigencies.

Currently, Indian Institute of Tropical Meteorology (IITM), Pune, under the Ministry of Earth Sciences (MoES), is the apex body, which runs the System of Air Quality and Weather Forecasting and Research (SAFAR) as programme to forecast 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 PM_1, $PM_{2.5}$, PM_{10}, NO_x (NO, NO_2), CO, ozonbvve, SO_2, BC, Methane (CH_4), non-methane hydrocarbons (NMHC), benzene, VOCs, and mercury. SAFAR was developed indigenously by the Indian Institute of Tropical Meteorology (IITM), Pune, and operationalized by the India Meteorological Department (IMD). It 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.

The Ministry of Earth Sciences institutions are working towards the development of new air quality warning modelling framework with real-time data assimilation of air pollutants derived from satellites and ground based observations. Using such modelling frameworks, an operational air quality early warning system will be put in place by the middle of October 2018. To begin with, the early warning system will give forecasts for the next two days and the outlook for another couple of days. A special password-protected website will be created by IITM, Pune, to host all observations, satellite data, and the model forecasts related to trajectory and air quality to be hosted as link to the existing Ministry of Earth Sciences-SAFAR website. SAFAR will continue to be the backbone for pollution forecast but this new system will use different method of analysis for better resolution and more accurate forecasts. Besides health, SAFAR system will benefit cost savings to several other sectors, such as agriculture, aviation, infrastructure, disaster management skill, tourism,

and many others, which directly or indirectly get affected by air quality and weather.

Action Points

All the ongoing and future initiatives under SAFAR will be integrated with the NCAP for taking all preventive measures to draw the benefits for addressing the air pollution issue from available information.

1. The efforts will be to extend it to 102 non-attainment cities under NCAP.
2. Hotspot-based forecasting to be taken up moving ahead from city-specific forecasting in 102 cities.
3. The satellite data available through the satellite network of ISRO to be integrated for monitoring and forecasting under the NCAP.

9.6 NETWORK OF TECHNICAL INSTITUTIONS-KNOWLEDGE PARTNERS

A network of highly qualified and experienced academicians, academic administrators, and technical institutions in the field of air pollution will be created to provide holistic services for the establishment and operation of policies and programmes of the Government of India on air pollution. Further, knowledge partners will also endeavour towards making these universities and higher education institutions in India globally competitive in terms of the body of knowledge, academic resources, and academic processes on the issue of air pollution. Dedicated air pollution units will be supported in these universities, organizations, and institutions. Major universities as University of Delhi, Jawaharlal Nehru University, Banaras Hindu University, the IITs, IIMs, and other academic institutions will be an integral part of this network. International expertise will also be used for effective solutions on the basis of international experiences. The national-level network is to be fed by the regional networks since air pollution has major regional implications.

Action Points

1. A detailed action plan for the setting up of the network integrating with the existing network under the NAPCC needs to be formulated.
2. System of a regular web-based online interaction mechanism will be evolved to ensure continuity of interactions.

9.7 TECHNOLOGY ASSESSMENT CELL

Technology assessment and evaluation of new technologies is based on the conviction that new technologies are relevant for the world at large rather than just for the scientific experts themselves. Technology assessment in reference to prevention, control, and mitigation of air pollution assumes a global perspective. Technology assessments, which are a form of cost–benefit analysis needs to assume an interdisciplinary approach to solving the problem of air pollution so as to prevent potential damage caused by the commercialization of new technologies. The Technology Assessment Cell is being envisaged to

evaluate significant technologies with reference to prevention, control, and abatement of pollution. The cell is expected to focus on both indigenous and international monitoring and abatement technologies. The technologies in air pollution now range from engineering and chemical technologies to various sustainable biological technologies including planation technologies. The cell is also expected to contribute towards evaluating the technology and devising the mechanism of technology transfer under various bilateral and multilateral agreements.

Technology induction/ transfer would be facilitated, where necessary, with time bound goals for indigenization and local manufacturing. Appropriate bilateral and multi-lateral cooperation programmes for sharing of technologies and funding would be developed, and participation in international partnerships, where necessary, will also be explored.

Action Points

1. A detailed action plan for this cell is to be formulated.
2. The Technology Assessment Cell will be created involving the IITs, IIMs, the major universities, industries, and using the existing mechanisms and programme of the DST, India Innovation Hub, etc.

9.8 INSTITUTIONAL FRAMEWORK

An effective institutional framework, which basically refers to formal organizational structures, is the precondition for the successful implementation of pollution, specifically air pollution-related intervention tools and, therefore, needs to be considered in particular. In the field of air pollution institutional framework involves creation of a specific organizational structure and outlining the responsibilities. Institutional structure may vary as per the requirement; however the purpose is to have mechanisms for a focused dialogue and to facilitate a smooth coordination on issues pertaining to air pollution.

Action Points

Centre level

1. National Apex Committee at the MoEF&CC
2. Five sectoral working groups on a co-chairing basis
3. Technical Expert Committee at the MoEF&CC
4. National-level Project Monitoring Unit (PMU) at the MoEF&CC
5. National-level Project Implementation Unit (PIU) at the CPCB

State level

1. State-level Apex Committee under the chief secretaries in various states
2. City-level Review Committee under the municipal commissioner
3. DM-level Committee in the districts
4. State-level Project Monitoring Unit (PMU) at the SPCBs.

10 BROAD STRATEGIES AT DIFFERENT LEVELS

Level	Strategies	Implimenting Agencies
Local (city level)	▪ Control of local activities generating pollution: refuse burning, construction activities, unpaved/dusty roads ▪ Congestion management at traffic junctions: intelligent transport system (ITS), congestion pricing , low-emission zones (LEZ), etc.	▪ Municipal Corp. ▪ RO (SPCB) ▪ Traffic police
City (city/state level)	▪ Landuse planning: demand side management ▪ Transport: enhancing public transport, plying restrictions, I&M, and non-motorized transportation ▪ Waste: Solid waste management , landfill gas recovery ▪ Roads: Paving, maintenance and cleaning of roads ▪ DG set: 24x7 power supply ▪ Enforcement	▪ Dept. of Planning ▪ Dept. of Transport, ▪ Municipal Corp. ▪ PWD ▪ Dept. of Energy ▪ SPCBs
Regional (India)	▪ Transport: Auto fuel policy for stringent norms for fuel and vehicles, road to rail/ waterways, fleet modernization, electric vehicle policies, clean fuels, bye-passes, taxation policies, etc. ▪ Industries: Stringent industrial standards, clean fuels, clean technology, emission trading schemes, and enforcement (continuous monitoring) ▪ Biomass: Enhanced LPG penetration, agricultural burning control, and management	▪ MoRTH, MoPNG ▪ MoEF&CC, CPCB ▪ MoPNG, MoA
Trans-boundary	Linking INDC's target of additional forest and tree cover of 2.5 to 3 billion tonnes of CO_2 equivalent by 2030 to the NCAP. There needs to be more focus on the western regions of India (Rajasthan and Gujarat) for an enhanced tree cover, which will reduce wind-blown dust within the country and will also act as barriers for transboundary dust. Air quality management at the South-Asia regional level	MoEF&CC Intergovernmental task force.

10.1 ACTION POINT WISE AGENCIES AND TIMELINES

A Meeting was held in Department of Economic Affairs (DEA) for discussion on the funding mechanism for NCAP with reference to Memorandum for Expenditure Finance Committee (EFC) on 'Pollution Abatement' Scheme of the Ministry. NCAP is one of the sub-scheme of 'Pollution Abatement' Scheme. It concluded it to be a Central Sector Scheme, with expected contribution from State Government as the outcome of the scheme would be contingent upon the investments to be made by the States. It has also been stated by DEA in their Office Memorandum dated 14th September 2018 (Appendix V). The OM also states that other sources of funding like external sources is also to be explored. The idea is to make use of the international experiences and best practices and to expedite the implementation. Agencies and timelines are provided in the Appendix VI.

11

APPENDICES

APPENDIX I (A): STATUS OF CAAQM STATIONS INSTALLED

As on August 13, 2018

Sl. No	State	City	Station Name	No. of stations
1	Andhra Pradesh	Amaravati	Secretariat, Amaravati - APPCB	1
		Rajamahen-dravaram	Anand Kala Kshetram, Rajamahendravaram - APPCB	1
		Tirupati	Tirumala, Tirupati - APPCB	1
		Vijayawada	PWD Grounds, Vijayawada - APPCB	1
		Visakhapatnam	APIIC Kancharapalem, Visakhapatnam - APPCB	2
			GVM Corporation, Visakhapatnam - APPCB	
2	Bihar	Gaya	Collectorate, Gaya - BSPCB	1
		Muzaffarpur	Muzaffarpur Collectorate,Muzaffarpur - BSPCB	1
		Patna	IGSC Planetarium Complex, Patna - BSPCB	1
3	Delhi	Delhi	Alipur- DPCC	38
			Anand Vihar, Delhi - DPCC	
			Ashok Vihar, Delhi - DPCC	
			Aya Nagar, New Delhi - IMD	
			Bawana - DPCC	
			Burari Crossing, New Delhi - IMD	
			CRRI Mathura Road, New Delhi - IMD	
			Dr. Karni Singh Shooting Range, Delhi - DPCC	
			DTU, New Delhi - CPCB	
			Dwarka-Sector 8, Delhi - DPCC	
			Mundaka -DPCC	
			IGI Airport Terminal - 3, New Delhi - IMD	
			IHBAS, Dilshad Garden,New Delhi - CPCB	
			ITO, New Delhi - CPCB	
			Jahangirpuri, Delhi - DPCC	
			Jawaharlal Nehru Stadium, Delhi - DPCC	
			Lodhi Road, New Delhi - IMD	
			Major Dhyan Chand National Stadium, Delhi - DPCC	
			Mandir Marg, New Delhi - DPCC	
			Najafgarh, Delhi - DPCC	
			Narela, Delhi - DPCC	

Sl. No	State	City	Station Name	No. of stations
			Nehru Nagar, Delhi - DPCC	
			North Campus, DU, New Delhi - IMD	
			NSIT Dwarka, New Delhi - CPCB	
			Okhla Phase-2, Delhi - DPCC	
			Patparganj, Delhi - DPCC	
			Punjabi Bagh, Delhi - DPCC	
			Pitampura Delhi- IMD	
			Pusa, New Delhi - DPCC	
			Pusa, New Delhi - IMD	
			R K Puram, New Delhi - DPCC	
			Rohini, Delhi - DPCC	
			Shadipur, New Delhi - CPCB	
			Sirifort, New Delhi - CPCB	
			Sonia Vihar, Delhi - DPCC	
			Sri Aurobindo Marg- DPCC	
			Vivek Vihar, Delhi - DPCC	
			Wazirpur, Delhi - DPCC	
4	Gujarat	Ahmedabad	Maninagar, Ahmedabad - GPCB	1
5	Haryana	Faridabad	Sector- 16A, Faridabad, Haryana - HSPCB	1
		Gurugram	Vikas Sadan, Gurgaon, Haryana - HSPCB	1
		Panchkula	Sector-6, Panchkula - HSPCB	1
		Rohtak	MD University, Rohtak, Haryana - HSPCB	1
6	Jharkhand	Jorapokhar	Tata Stadium, Jorapokhar - JSPCB	1
7	Karnataka	Bengaluru	BTM Layout, Bengaluru - CPCB	10
			BWSSB Kadabesanahalli, Bengaluru - CPCB	
			Bapuji Nagar, Bengaluru - KSPCB	
			City Railway Station, Bengaluru - KSPCB	
			Hebbal, Bengaluru - KSPCB	
			Hombegowda Nagar, Bengaluru - KSPCB	
			Jayanagar 5th Block, Bengaluru - KSPCB	
			Peenya, Bengaluru - CPCB	
			Sanegurava Halli, Bengaluru - KSPCB	
			Silk Board, Bengaluru - KSPCB	
		Chikkaballapur	Chikkaballapur Rural	1
		Kalaburagi	Lal Bahadur Shastri Nagar	1
8	Kerala	Thiruvananthapuram	Plammoodu, Thiruvananthapuram - Kerala PCB	1

Sl. No	State	City	Station Name	No. of stations
9	Madhya Pradesh	Dewas	Bhopal Chauraha, Dewas - MPPCB	1
		Mandideep	Sector-D Industrial Area, Mandideep - MPPCB	1
		Pithampur	Sector-2 Industrial Area, Pithampur - MPPCB	1
		Satna	Bandhavgar Colony, Satna - MPPCB	1
		Singrauli	Vindhyachal STPS, Singrauli - MPPCB	1
		Ujjain	Mahakaleshwar Temple, Ujjain - MPPCB	1
10	Maharashtra	Aurangabad	More Chowk Waluj, Aurangabad - MPCB	1
		Chandrapur	Chandrapur, Chandrapur - MPCB	2
			MIDC Khutala, Chandrapur - MPCB	
		Mumbai	Bandra, Mumbai - MPCB	1
		Nagpur	Opp GPO Civil Lines, Nagpur - MPCB	1
		Nashik	Gangapur Road, Nashik - MPCB	1
		Navi Mumbai	Airoli, Navi Mumbai - MPCB	1
		Pune	Karve Road Pune, Pune - MPCB	1
		Solapur	Solapur, Solapur - MPCB	1
		Thane	Pimpleshwar Mandir, Thane - MPCB	1
11	Odisha	Brajrajnagar	GM Office, Brajrajnagar - OSPCB	1
		Talcher	Talcher Coalfields,Talcher - OSPCB	1
12	Punjab	Amritsar	Golden Temple, Amritsar - PPCB	1
		Bathinda	Hardev Nagar, Bathinda - PPCB	1
		Jalandhar	Civil Line, Jalandhar - PPCB	1
		Khanna	Kalal Majra, Khanna - PPCB	1
		Ludhiana	Punjab Agricultural University, Ludhiana - PPCB	1
		Mandi Gobindgarh	RIMT University, Mandi Gobindgarh - PPCB	1
		Patiala	Model Town, Patiala - PPCB	1
		Rupnagar	Ratanpura, Rupnagar - PPCB	1
13	Rajasthan	Alwar	Moti Doongri, Alwar, Rajasthan - RSPCB	1
		Ajmer	Civil Lines, Ajmer - RSPCB	1
		Bhiwadi	RIICO Ind. Area III, Bhiwadi, Rajasthan - RSPCB	1
		Jaipur	Adarsh Nagar, Jaipur - RSPCB	3
			Police Commissionerate, Jaipur - RSPCB	
			Shastri Nagar, Jaipur - RSPCB	
		Jodhpur	Collectorate, Jodhpur - RSPCB	1
		Kota	Shrinath Puram, Kota - RSPCB	1
		Pali	Indira Colony Vistar, Pali - RSPCB	1
		Udaipur	Ashok Nagar, Udaipur - RSPCB	1

Sl. No	State	City	Station Name	No. of stations
14	Tamil Nadu	Chennai	Alandur Bus Depot, Chennai - CPCB	3
			Manali, Chennai - CPCB	
			Velachery Res. Area, Chennai - CPCB	
15	Telangana	Hyderabad	Bollaram Industrial Area, Hyderabad - TSPCB	6
			Central University, Hyderabad - TSPCB	
			ICRISAT Patancheru, Hyderabad - TSPCB	
			IDA Pashamylaram, Hyderabad - TSPCB	
			Sanathnagar, Hyderabad - TSPCB	
			Zoo Park, Hyderabad - TSPCB	
16	Uttar Pradesh	Agra	Sanjay Palace, Agra - UPPCB	1
		Baghpat	New Collectorate- UPPCB	1
		Bulandshahr	Yamunapuram, Bulandshahr - UPPCB	1
		Ghaziabad	Vasundhara, Ghaziabad, UP - UPPCB	1
		Greater Noida	Knowledge Park - III, Greater Noida - UPPCB	1
		Kanpur	Nehru Nagar, Kanpur - UPPCB	1
		Lucknow	Central School, Lucknow - CPCB	4
			Lalbagh, Lucknow - CPCB	
			Nishant Ganj, Lucknow - UPPCB	
			Talkatora District Industries Center, Lucknow - CPCB	
		Moradabad	Lajpat Nagar, Moradabad - UPPCB	1
		Muzaffarnagar	New Mandi, Muzaffarnagar - UPPCB	1
		Noida	Sector - 125, Noida, UP - UPPCB	2
			Sector - 62, Noida, UP - IMD	
		Varanasi	Ardhali Bazar, Varanasi - UPPCB	1
17	West Bengal	Asanol	Asanol Court Area, Asanol - WBPCB	1
		Durgapur	Sidhu Kanhu Indoor Stadium, Durgapur - WBPCB	1
		Haldia	Haldia, Haldia - WBPCB	1
		Howrah	Ghusuri, Howrah - WBPCB	2
			Padmapukur, Howrah - WBPCB	
		Kolkata	Rabindra Bharati University, Kolkata - WBPCB	2
			Victoria, Kolkata - WBPCB	
		Siliguri	Ward-32 Bapupara, Siliguri - WBPCB	1

Total number of states: 17 | Total number of cities: 71 | Total number of stations installed: 134

APPENDIX I (B): STATUS OF MANUAL AMBIENT AIR QUALITY MONIROTING STATIONS OPERATING UNDER NATIONAL AIR QUALITY MONITORING PROGRAMME (NAMP)

Sl.	State/Union Territory	City	Operating Monitoring Station
1	Arunachal Pradesh	Itananagar	1
		Naharlagun	1
2	Andhra Pradesh	Visakhapatnam	8
		Kakinada	1
		Rajamundry	1
		Eluru	1
		Vizianagaram	1
		Srikakulam	1
		Kurnool	1
		Tirupati	1
		Chittor	2
		Kadapa	1
		Anatapur	1
		Vijayawada	3
		Ongole	1
		Guntur	1
		Nellore	1
3	Assam	Bongaigaon	3
		Gawahati	6
		Tezpur	1
		Sibasagar	2
		Dibrugarh	1
		Golaghat	1
		Silcher	2
		Daranga	1
		Margheita	1
		North Lakhimpur	1
		Nagaon	1
		Tinsukhia	3
		Nalbari	1
4	Bihar	Patna	2
		Barauni	1
		Mujjafarpur	1
		Gaya/Bodhgaya	1
5	Chandigarh (UT)	Chandigarh	5

Sl.	State/Union Territory	City	Operating Monitoring Station
6	Chattisgarh	Korba	3
		Bhilai	3
		Raipur	3
		Bilaspur	1
		Raigarh	2
7	Delhi (UT)	Delhi	10
8	Dadara & Nagar Haveli (UT)	Silvasa	2
9	Daman Diu (UT)	Daman	2
10	Goa	Panaji	1
		Vasco	1
		Marmagao	1
		Codli tisk	1
		Honda Junction	1
		Bicholim City	1
		Amona	1
		Assanora Junction	1
		Curchorem	1
		Usgao-Pale	1
		Margao Town	1
		Mapusa Town	1
		Sanguem	1
		ponda	1
		Tilamol	1
		Kundaim	1
		Tuem Industrial Estate	1
		Cuncolim	1
11	Gujarat	Ahmedabad	9
		Ankaleshwar	2
		Jamnagar	1
		Rajkot	2
		Surat	3
		Vadodara	5
		Vapi	2
12	Haryana	Faridabad	2
		Hissar	2
		Yamuna Nagar	1

Sl.	State/Union Territory	City	Operating Monitoring Station
13	Himachal Pradesh	Damtal	2
		Parwanoo	2
		Poanta Sahib	2
		Shimla	2
		Kala Amb	2
		Baddi-Barotiwala	3
		Nalagarh	1
		Una	2
		Sunder Nagar	2
		Dharamshala	2
		Marhi	1
		Gulaba	1
		Vashisht	1
		Manali	2
14	Jammu& Kashmir	Jammu	3
15	Jharkand	Dhanbad	3
		Jharia	1
		Sindri	1
		Jamshedpur	2
		Ranchi	1
		Saraikela-Kharsawan	1
		West Singhbhum	1
16	Karnataka	Bangalore	9
		Dharwar, Hubli	2
		Mangalore	1
		Hassan	1
		Mysore	2
		Gulbarga	1
		Belgaum	1
		Devanagere	3
		Mandya	1
		Raichur	1
		Bijapur	1
		Chitradurga	1
		Shimaga	1
		Karwar	1
		Bagalkote	1
		Kolar	1
		Tumkar	1
		Bidar	1

Sl.	State/Union Territory	City	Operating Monitoring Station
17	Kerala	Kozhikode	2
		Kottayam	2
		Cochin	7
		Thiruvanantapuram	4
		Palakkad	1
		Alappuzha	2
		Pathanamthitta	1
		Kollam	2
		Sulthan, Bathery, Wayanad	1
		Kakkanchery, Mallappuram	1
		Thrissur	1
18	Lakswadeep	Lakswadeep islands	1
19	Madhya Pradesh	Bhopal	8
		Indore	3
		Jabalpur	2
		Nagda	3
		Gwalior	2
		Sagar	2
		Satna	2
		Singrauli	3
		Ujjain	4
		Prithampur	2
		Chindwara	2
		Amlai	2
		Katni	2
		Dewas	3
20	Maharashtra	Aurangabad	4
		Bhiwandi	3
		Lote	2
		Tarapur	3
		Kolhapur	3
		Mumbai	3
		Ambernath	2
		Chandrapur	6
		Nagpur	7
		Nasik	4

Sl.	State/Union Territory	City	Operating Monitoring Station
		Solapur	2
		Pune	3
		Pimpri Chinchiwad	1
		Thane	3
		Navi Mumbai	6
		Mahad	3
		Roha	2
		Sangli	3
		Amravati	3
		Latur	3
		Ulhas Nagar	2
		Badlapur	1
		Nanded	3
		Jalgaon	3
		Jalna	2
		Akola	3
21	Meghalaya	Shillong	4
		Dwaki	1
		Ri-Bhoi, Brynihat	1
		Tura	1
		Nongstoin	1
		Umaim	1
		Khlihriat	1
22	Mizoram	Aizwal	5
		Lunglei	2
		Kolasib	2
		Champhai	2
23	Manipur	Imphal	1
24	Nagaland	Dimapur	2
		Kohima	2
25	Orissa	Rayagada	2
		Rourkela	6
		Talcher	2
		Angul	2
		Bhubaneshwar	6
		Cuttack	3
		Sambalpur	1
		Balasore	3
		Kalinga Nagar	3
		Berhampur	1
		Puri	2
		Konark	1
		Jarsuguda	3
		Paradeep	3

Sl.	State/Union Territory	City	Operating Monitoring Station
26	Punjab	Gobindgarh	3
		Jalandhar	4
		Ludhiana	4
		Naya Nangal	2
		Khanna	2
		Pathankot(Dera baba)	1
		Amritsar	2
		Derra Bassi	2
		Bhatinda	1
		Batala	1
		Patiala	2
		Sangrur	1
		Rasulpur	1
		Faridkot	1
		Jaito/Gurdaspur	2
		Firozpur Ludhiana District	2
		Hoshiarpur	1
27	Puducherry (UT)	Pondicherry	3
		Karaikal	3
28	Rajasthan	Alwar	3
		Jaipur	9
		Jodhpur	9
		Kota	6
		Udaipur	3
		Bharatpur	3
		Bhiwadi	3
29	Sikkim	Gangtok	2
		Namchi (South Sikkim)	1
		Jorithang / Ravangla (South Sikkim)	1
		Mangan (North Sikkim)	1
		Chungthang (North Sikkim)	1
		Singtam (East Sikkim)	1
		Rangpo (East Sikkim)	1
		Pelling (West Sikkim)	1

Sl.	State/Union Territory	City	Operating Monitoring Station
30	Tamilnadu	Chennai	11
		Tuticorin	3
		Coimbatore	3
		Madurai	3
		Salem	1
		Trichy	5
		Cuddalore	3
		Mettur	2
31	Tirupura	Agartala	2
32	Telangana	Hyderabad	10
		Ramagundum	1
		Patencheru	1
		Nalgonda	2
		Khammam	2
		Warangal	2
		Karimnagar	1
		Sangareddy	3
		Nizamabad	1
		Kothur	1
		Manchiriala, Adilabad	1
33	Uttar Pradesh	Agra	6
		Allahabad	5
		Anpara	2
		Firozabad	3
		Gajroula	2
		Ghaziabad	2
		Kanpur	9
		Lucknow	8
		Noida	2
		Varanasi	5
		Jhansi	2
		Khurja	2
		Meerut	2
		Bareily	2
		Moradabad	2
		Mathura	2
		Saharanpur	2
		Unnao	2
		Gorakhpur	3
		Rai Bareli	3

Sl.	State/Union Territory	City	Operating Monitoring Station
34	Uttaranchal	Dehradun	3
		Haridwar	1
		Rishikesh	1
		Haldwani	1
		Rudrapur	1
		kashipur	1
35	West Bengal	Kolkata	20
		Durgapur	4
		Haldia	5
		Howrah	4
		Asansol	3
		South Suburban	3
		Barrckpore	3
		Sankrail	4
		Raniganj	3
		Uluberia	1
		Barasat	1
		Kalyani	1
		Ranaghat	1
		Krishnanagar	1
		Baharampur	1
		Dankuni	1
		Rishra	1
		Chinsura	1
		Tribeni	1
		Kharagpur	1
		Medinipur Town	1
		Ghatal	1
		Tamluk	1
		Bardhaman	1
		Bankura	1
		Suri	1
		Rampurhat	1
		Bolpur	1
		Purulia	1
		Malda	1
		Siliguri	1
		Jalpaiguri	1
		Darjeeling	1
		Coochbihar	2
		Balurghat	1
		Raigun	1

Stations: 703 | Cities: 307 | States: 29 | UTs: 6

APPENDIX II:42 ACTION POINTS

Control of Vehicular Emissions

Sl. No.	Action Points	Time Frame for implementation
i)	Launch extensive awareness drive against polluting vehicles;	Immediate
ii)	Ensure Strict action against visibly polluting vehicles;	Immediate
iii)	Install weigh i n mot ion bridges at Delhi borders to prevent overloading;	Immediate
iv)	Take steps to prevent parking of vehicles in the non-designated areas;	Immediate
v)	Introduce early alarm system for benefit of commuters related to traffic congestion on major routes for route diversion ;	Immediate
vi)	Consider introducing plan for Flexi/staggered timings to minimize peak movement of vehicles on the road;	Immediate
vii)	Take steps for retrofitting of diesel vehicles with Particulate Filters;	Immediate
viii)	De-congest pathways;	Immediate
ix)	Synchronize traffic movements / Introduce intelligent traffic systems for lane-driving;	30 days
x)	Install vapor recovery system in fueling stations;	30 days
xi)	Take steps for installation of remote sensor based PUC system etc.;	90 days
xii)	Formulate action plan for controlling decongestion of fuel stations including increasing number of dispensing machines;	90 days
xiii)	Prepare action plan to check fuel adulteration and random monitoring of fuel quality data;	90 days
xiv)	Prepare action plan for public transport on CNG mode;	90 days
xv)	Undertake road widening and improvement of infrastructure for decongestion of road ;	90 days
xvi)	Promote battery operated vehicles;	90 days
xvii)	Take steps to expedite ea.rly completion of Western and Eastern Peripheral expressway and submit completion schedule;	60 days

Control of Road Dust Re-suspension of Dust and Other Fugitive Emission

Sl. No.	Action Points	Time Frame for implementation
i)	Formulate action plan for creation of green buffers along the traffic corridors;	immediate
ii)	Introduce wet/ mechanized vacuum sweeping of roads;	30 days
iii)	Maintain pot holes free roads for free-flow of traffic to reduce emissions and dust;	60 days
iv)	lntroduce water fountains at major traffic intersect ion, wherever feasible;	90 days
v)	Undertake greening of open areas, gardens, community places, schools and housing societies;	90 days
vi)	Take steps for blacktopping/pavement of road shoulders to avoid road dust;	180 days

Control of Air Pollution from Bio-Mass Burning

Sl. No.	Action Points	Time Frame for implementation
i)	Take stringent action against open burning of bio-mass mass/leaves/tyres etc to control such activities and submit periodic status reports;	Immediate
ii)	Ensure proper collection of horticulture waste (bio-mass) and cornposting- cum-gardening approach;	Immediate
iii)	Ensure strict enforcement of ban on burning of agriculture waste and crop residues;	Immediate
iv)	Prohibit use of coal in hotels and restaurants and eliminate use of kerosene for cooking in Delhi ;	60 days

Control of lndustrial Air Pollution

Sl. No.	Action Points	Time Frame for implementation
i)	Ensure strict action against unauthorized brick kilns;	30 days
ii)	Ensure strict action against industrial units not complying with standards ;	60 days
iii)	Enforce strict compliance of conversion of Natural draft brick kilns to induced-draft;	90 days
iv)	Launch action plan for switching over to natural gas by industries, wherever feasible.	120 days

Control of Air Pollution from Construction and Demolition Activities

Sl. No.	Action Points	Time frame for implementation
i)	Control dust pollution at construction sites through appropriate cover;	Immediate
ii)	Undertake control measures for fugitive emissions from material handling, conveying and screening operations through water sprinkling, curtains, barriers and dust suppression units;	30 days
iii)	Ensure carriage of construction material in closed/cove red vessels;	30 days

Other Steps to control Air Pollution

Sl. No.	Action Points	Time Frame for implementation
i)	Set-up helpline in States/UT for taking action against reported compliance;	Immediate
ii)	Evolve a system of reporting of garbage / municipal solid waste burning through mobile based applications and other social media platform linked with Central and State level Control Rooms;	30 days
iii)	Establish Standard Operating Procedure to provide quick and effective response to complaints;	30 days
v)	Ensure DG sets meeting the standards only be allowed to operate;	30 days
vi)	Promote use of LPG instead of coal in restaurants/ dhabas/ road side;	90 days
vii)	Undertake Satellite based monitoring for tracking and enforcing agriculture;	90 days
viii)	Take steps for setting up of bio-mass based power generation units;	One year

APPENDIX III: GRADED RESPONSE ACTION PLAN

The graded measures according to AQI are listed from public health emergency level to downward. The measures are cumulative. Emergency and Severe levels include cumulatively all other measures listed in the lower levels of AQI including Very Poor, Poor and Moderate. It is also clear that the actions listed in the poor category need to be implemented though out the year. But during months when weather conditions turn more adverse there is need for greater scrutiny on enforcement.

Severe + or Emergency	Agency responsible/ Implementing Agency
When $PM_{2.5}$ levels cross 300 µg/m³ or PM_{10} levels cross 500 µg/m³ (5 times above the standard) and persist for 48 hours or more	
Stop entry of truck traffic into Delhi (except essential commodities)	Municipal Corporations and Traffic Police of Delhi and NCR Towns
Stop construction activities	Delhi Pollution Control Committee/Municipal Corporations of Delhi and NCR towns
Introduce odd and even scheme for private vehicles based on license plate numbers and minimize exemptions	Secretary cum Commissioner of Transport Department, NCT of Delhi, and Transport Commissioners of NCR towns
Task Force to take decision on any additional steps including shutting of schools	
Severe	
When $PM_{2.5}$ levels are above 250 µg/m³ or	
PM_{10} levels are above 430 µg/m³	
Close brick kilns, Hot Mix plants, Stone Crushers	Chairpersons of Delhi Pollution Control Committee, State Pollution Control Boards of Haryana, Rajasthan, and Uttar Pradesh
	Superintendent of Police and Deputy Commissioner of respective districts
Shut down Badarpur power plant and maximize generation of power from existing natural gas based plants to reduce operation of coal based power plants in the NCR.	Chairpersons of Delhi Pollution Control Committee, State Pollution Control Boards of Haryana, Rajasthan, and Uttar Pradesh
Intensify public transport services. Introduce differential rates to encourage off-peak travel.	Secretary cum Commissioner of Transport Department, NCT of Delhi, and Transport Commissioners of NCR towns
	Chairperson, Delhi Metro Rail Corporation (DMRC)

Severe + or Emergency	Agency responsible/ Implementing Agency
When $PM_{2.5}$ levels cross 300 µg/m³ or PM_{10} levels cross 500 µg/m³ (5 times above the standard) and persist for 48 hours or more	
	Chairpersons, State Transport Corporations
Increase frequency of mechanized cleaning of road and sprinkling of water on roads. Identify road stretches with high dust generation.	All road owning agencies including Municipal Corporations of NCT of Delhi and NCR towns, Public Works Departments and National Highway Authority of India
Very Poor	
When $PM_{2.5}$ levels are between 121-250 µg/m³ or	
PM_{10} levels are between 351-430 µg/m³	
Stop use of diesel generator sets	Chairpersons of Delhi Pollution Control Committee, State Pollution Control Boards of Haryana, Rajasthan, Uttar Pradesh
Enhance parking fee by 3-4 times	Municipal Commissioner
	Municipal Corporations of NCT of Delhi and NCR towns
Increase bus and metro services by augmenting contract buses and increasing frequency of service	Principal Secretary, Department of Transport of NCT of Delhi
	Delhi Transport Corporation (DTC)
	Delhi Integrated Multi-modal Transit System Ltd (DIMTS)
	Delhi Metro Rail Corporation (DMRC)
	State Transport Corporations in NCR towns
Stop use of coal/firewood in hotels and open eateries	Municipal Corporations of NCT of Delhi and NCR towns
Residential Welfare Associations and individual house owners to provide electric heaters during winter to security staff to avoid open burning by them	Resident Welfare Associations
Alert in newspapers/TV/radio to advise people with respiratory and cardiac patients to avoid polluted areas and restrict outdoor movement.	Chairpersons, Delhi Pollution Control Committee, State Pollution Control Boards of Haryana, Rajasthan, and Uttar Pradesh
Moderate to poor	

Severe + or Emergency	Agency responsible/ Implementing Agency
When $PM_{2.5}$ levels cross 300 µg/m³ or PM_{10} levels cross 500 µg/m³ (5 times above the standard) and persist for 48 hours or more	
Poor – When $PM_{2.5}$ levels are between 91-120 µg/m³ or	
PM_{10} levels are between 251-350 µg/m³	
Moderate – When $PM_{2.5}$ is between 61-90 µg/m³ or	
PM_{10} is between 101-250 µg/m³	
Stringently enforce/stop garbage burning in landfills and other places and impose heavy fines on person responsible	Municipal Commissioner
	Municipal corporations of Delhi and NCR towns
Close/stringently enforce all pollution control regulations in brick kilns and industries	Chairpersons, Delhi Pollution Control Committee, State Pollution Control Boards of Haryana, Rajasthan, and Uttar Pradesh
Stringently enforce pollution control in thermal power plants through PCB monitoring	Plant in-charge of power plants in NCR, and Delhi Pollution Control Committee and State Pollution Control Boards of Haryana, Rajasthan and Uttar Pradesh
Do periodic mechanized sweeping on roads with heavy traffic and water sprinkling also on unpaved roads every two days	Municipal Commissioner, Municipal Corporations of NCT of Delhi and NCR towns
	Commissioners, Traffic Police of Delhi and NCR towns to identify roads with heavy traffic and provide information to respective Municipal Commissioners
	Chief Engineers of officers in charge of CPWD, PWD of Delhi and NCR towns to identify unpaved roads with heavy traffic and provide information to respective Municipal Commissioners
Strict vigilance and no tolerance for visible emissions – stop plying of visibly polluting vehicles by impounding or heavy fine.	Commissioner or Officer in Charge, Transport Department and Traffic Police of NCT Delhi and NCR towns
Strict norms vigilance and enforcement of PUC	
Stringently enforce rules for dust control in construction activities and close non-compliant sites	Commissioner or Officers in charge of Police Departments of Delhi and NCR towns

Severe + or Emergency	Agency responsible/ Implementing Agency
When $PM_{2.5}$ levels cross 300 µg/m³ or PM_{10} levels cross 500 µg/m³ (5 times above the standard) and persist for 48 hours or more	
Deploy traffic police for smooth traffic flow at identified vulnerable areas	Commissioners of Traffic Police of Delhi and NCR Towns
Strictly enforce Supreme Court order on diversion of non-destined truck traffic and ensure only trucks registered after 2005 are allowed entry into Delhi	Municipal Corporations of NCT of Delhi and NCR towns
	Traffic Police of NCT of Delhi and NCR towns
Strictly enforce Supreme Court on firecrackers ban	Chief Controller of Explosives
	Petroleum and Explosive Safety Organizations (PESO)
	Commissioner of Officer in charge of licensing in the police departments of Delhi and NCR
Ensure fly ash ponds* are watered every alternate day during summer months (March – May).	Plant in charge of Power Plants in Delhi and NCR towns
Information dissemination—Social media, mobile Apps should be used to inform people about the pollution levels, contact details of control room, enable them to report polluting activities/sources to the concerned authorities, and actions that will be taken by government based on the level of pollution.	Chairpersons, Delhi Pollution Control Committee, State Pollution Control Boards of Haryana, Rajasthan, and Uttar Pradesh

Note: * IIT Kanpur Report finds high fly ash in air during summer months. Therefore, action is necessary during this period. But long term action has to be removal of this source of pollution from Delhi and its vicinity through the reuse and removal of all fly ash dumps.

APPENDIX IV: GLOBAL EXPERIENCES

City, Country	Highest Concentration	% Reduction	Timeframe
Beijing, China	$PM_{2.5}$ > 100 µg/m³	<40%(to <60 µg/m³)	5 years (2013-2017)
Mexico City, Mexico	PM_{10}> 180 µg/m³	73%(to 48 µg/m³)	25 years (1990-2015)
Santiago, Chile	$PM_{2.5}$ > 54 µg/m³	61%(to 21 µg/m³)	22 years (1989/90-2011/12)
Seoul, South Korea	$PM_{2.5}$ > 40 µg/m³	35%(to 26 µg/m³)	5 years (2002-2008)
Ulan Batar, Mongolia	$PM_{2.5}$ > 250 µg/m³	64%(to 90 µg/m³)	6 years (2009-2015)
Bangkok, Thailand	PM_{10} > 85 µg/m³	(to 40 µg/m³)	13 years (1997-2010)

APPENDIX V: OFFICE MEMORANDUM BY DEA

F.No.54 (05)/PFC-I/2017
Government of India
Ministry of Finance
Department of Expenditure
Public Finance Central-I Division

North Block, New Delhi.
Dated: 14th September, 2018

OFFICE MEMORANDUM

Subject: Revised Draft Memorandum for Expenditure Finance Committee (EFC) for "Pollution Abatement" Scheme for the year 2018-19 and 2019-20-reg.

The undersigned is directed to refer to Minister of Environment Forests, Climate Change (M/o EF&CC), CP Division's Revised Draft Memorandum for Expenditure Finance Committee (EFC) for "Pollution Abetment" Schemes for the year 2018-19 and 2019-20 submitted vide O.M. No. G-27017/02/2017-CPW dated 5th September, 2018 and to state that:

(i) The response of M/o EF&CC to the comments of this Department submitted vide O.M. of even number dated 24th July, 2018 may be suitably incorporated in the final EFC Memo.

(ii) It may be ensured that the financial estimates are realistic and within the Medium-Term Expenditure Framework (MTEF) of M/o EF&CC and also within the budgetary resources available/likely to be available.

(iii) Other sources of funding like external sources may be explored. It may be ensured that there is adequate convergence with the existing schemes within M/o EF&CC and schemes of other Ministries catering to similar objectives and duplication of efforts be avoided.

(iv) Funds may be arranged out of the savings made under available schemes of the Ministry through re-appropriation.

(v) As the outcome of the scheme would be contingent upon the investments to be made by the States, more involvement of the States in the area of funding may be explored.

2. This issues with the approval of Additional Secretary (Expenditure).

Swayamprava Pani 14/9/18
(Swayamprava Pani)
Joint Director (PFC-I)
Tel No. 23092280

Ministry of Environment, Forests & Climate Change,
[Shri R.N. Pankaj, Scientist 'D' (CP Division)],
2nd Floor, Prithvi Wing, Indira Paryavaran Bhawan,
Aliganj, Jor Bagh Road, New Delhi.

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APPENDIX VI: NCAP– AGENCIES AND TIMELINES

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1	**AIR POLLUTION MITIGATION ACTIONS**				
1.1	**STRINGENT ENFORCEMENT THROUGH A THREE-TIER MECHANISM FOR REVIEW MONITORING, ASSESSMENT, AND INSPECTION**				
1.1.1	Web-based system on the above line to be evolved in association with the NIC and other relevant national and international agencies.	Centre	Centre/ State	MoEF&CC/ CPCB	2020
1.1.2	Intensive training of all the stakeholders involved in the implementation of this web-based system.	Centre	State/ City	MoEF&CC/ CPCB	Ongoing
1.1.3	Mandatory use of this three-tier mechanism in 102 cities.	State/ City	State/ City	MoEF&CC/ CPCB	ongoing
1.1.4	Review of the existing legislations to ensure an effective implementation of the NCAP	Centre	Centre/ State	MoEF&CC/ CPCB	2019
1.2	**EXTENSIVE PLANTATION DRIVE**				
1.2.1	Plantation initiatives under the NCAP at pollution hot spots in the cities/towns to be undertaken under GIMs with Compensatory Afforestation Fund (CAF) being managed by National Compensatory Afforestation Management and Planning Authority (CAMPA).	State	State/City	MoEF&CC	Ongoing

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.2.2	Institutes, such as the Indian Institute of Forest Management (IIFM), universities, such as the University Delhi, and other research organizations and institutions with expertise in plantation are to be involved for developing these plans along with ensuring the implementation in the identified 102 cities.	Centre	Cities/ States	MoEF&CC	2019
1.2.3	Execution of city-specific plantation plans.	State	Cities/ States	MoEF&CC	ongoing
1.3	**TECHNOLOGY SUPPORT**				
1.3.1	Clean technologies with potential for air pollution mitigation will be supported for R&D, pilot-scale demonstration, and field-scale implementation.	Centre	Cities/ States	MoEF&CC	2024
1.3.2	The mechanism for such support will be formulated as an action plan.	Centre	Centre	MoEF&CC	2019
1.4	**REGIONAL AND TRANSBOUNDARY PLAN**				
	Regional Measures				

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.4.1	Various measures, especially the implementation of pollution-abatement policies need to be emphasized through regional-level interstate coordination for the Indo-Gangetic plain. The following policies should be taken into consideration: Transport: Auto fuel policy for stringent norms for fuel and vehicles, road to rail/ waterways, fleet modernization, electric vehicle (EV) policies, clean fuels, bypasses, taxation policies, etc. Industries: Stringent industrial standards, clean fuels, clean technology, and enforcement (continuous monitoring) Biomass: Enhanced LPG penetration, agricultural burning, control, and management	Centre/ State	States	MoRTH, MoPNG MoEF&CC, CPCB MoPNG, MoA, MoHUA	ongoing
1.4.2	A comprehensive regional plan to be formulated incorporating the inputs from the regional source apportionment studies.	Centre	Centre/ State		2020
	Transboundary Measures				

Sl. No.	Component/Activities	Level for Funding	Level For Implemen-tation	Agencies	Timeline (Year)
1.4.3	Linking the NDC's target of an additional forest and tree cover of 2.5 to 3 billion tonnes of CO2 equivalent by 2030 to the NCAP. There needs to be more focus on the western regions of India (Rajasthan and Gujarat) for an enhanced tree cover, which will reduce wind-blown dust within the country and will also act as a barrier for transboundary dust.	Centre	State	MoEF&CC	2019
1.4.4	The initiatives under the United Nations Convention to Combat Desertification (UNCCD) to be integrated here for addressing the issue of transboundary dust.	Centre	Centre	MoEF&CC	2019
1.4.4	Air quality management at the South-Asian regional level by activating the initiatives under 'Male Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia' and SACEP to be explored.	Centre	Centre	MoEF&CC	2019
1.4.5	A comprehensive transboundary plan to be formulated	Centre	State	MoEF&CC	2019
	SECTORAL INTERVENTIONS				
1.5	**DUST MANAGEMENT (ROAD DUST and C&D)**				
1.5.1	Introducing mechanical sweepers on the basis of feasibility study in cities.	State	State	MoHUA, Municipal Corporation	ongoing
1.5.2	Evolve SOP for addressing the specific issue of disposal of the collected dust from mechanical sweeping.	Centre	Cities/State	MoEF&CC/ CPCB	2019

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.5.3	Stringent implementation of C&D Rules, 2016, and Dust Mitigation Notification, 2018, of the Government of India.	Centre/ State	Cities/State	CPCB, SPCBs, Municipal Corporation	ongoing
1.5.4	Wall-to-wall paving of roads to be mandated.	State	Cities/State	Municipal Corporation	ongoing
1.5.5	Control of dust from construction activities by using enclosures, fogging machines, and barriers along with a close adherence to the C&D rules. - stringent implementation of C&D Rules	State	Cities/State	SPCBs, Municipal Corporation	ongoing
1.5.6	Greening and landscaping of all the major arterial roads and national highways after identifying all the major polluting stretches.	State	Cities/State	SPCBs, Municipal Corporation	ongoing
1.5.7	Maintenance and repair of roads on priority.	State	Cities/State	SPCBs, Municipal Corporation	ongoing
1.5.8	Sewage treatment plant-treated water sprinkling system with PVC (Polyvinyl Chloride) pipeline along the roads and at intersecting road junctions and spraying of water twice a day before peak traffic hours.	State	Cities/State	SPCBs, Municipal Corporation	ongoing
1.6	**INDOOR AIR POLLUTION MANAGEMENT**				
1.6.1	Building specific guidelines and protocols on monitoring and management of indoor air pollution.	Centre	Centre	MoEF&CC, CPCB, MoH	2019
1.6.2	Extend PMUY in 102 cities, towns, and associated village areas.	Centre	City/ State	MoPNG	2019

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.6.3	Guidelines and provisions for building designs that define proper ventilation, clean cooking and living area to maintain healthy air quality inside the house to be integrated with Pradhan Mantri Awas Yojana (PMAY)	Centre	Centre/ State	MoHUA, MoRD	2019
1.7	**POWER SECTOR EMISSIONS**				
1.7.1	Stringent compliance by all TPPs with respect to the emission norms according to the timelines up to December 2022, and as per the action plan prescribed in the direction dated December 2017, issued under the EPA, 1986.	State	State	MoP, MoEF&CC	2022
1.7.2	The CGD network distribution shall be taken up on priority within the country, emphasizing on 102 non-attainment cities.	State	City/State	MoPNG	2019
1.7.3	There is a need for optimizing the use of the existing power plants by prioritizing the capacity utilization of natural gas/ clean fuel-based thermal power plants.	State	State	MoPNG	2021
1.7.4	Phasing out older coal-based power plants and converting the specific coal-based power plants to natural gas.	State	City/State	MoP, MoPNG	2024
1.7.5	Emphasis on improved power reliability in urban areas to eliminate the operation of the DG sets. A 30% reduction in the usage of DG sets.	State	City/State	MoP, D/o Energy, DISCOMs	2024

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.7.6	Emphasizing the expansion of renewable power initiatives prioritizing the use of the existing framework of the NAPCC in non-attainment cities.	Centre	City/State	MoP, MNRE, MoEF&CC	2024
1.8	**INDUSTRIAL EMISSION**				
1.8.1	Introduction of gaseous fuels in industries, including SMEs. The report for 102 cities has been completed.	State	State	D/o Heavy Industry, SPCBs	2022
1.8.2	Enforcement of new and stringent SO_2/NO_x/ $PM_{2.5}$ standards for industries using solid fuels.	State	State	SPCBs, CPCB	immediately
1.8.3	Stricter enforcement of standards in large industries through continuous monitoring.	State	State	SPCBs, CPCB	immediately
1.8.4	Full enforcement of zig-zag brick technology in brick kilns.	State	State	SPCBs, CPCB	immediately
1.8.5	Elimination of the usage of industrial DG sets by the provision of round-the-clock 24x7 electricity.	State	City/State	MoP, D/o Energy, DISCOMs	
1.8.6	Evaluate and evolve industry-specific innovative end-pipe control technologies.	Centre	City/State	MoEF&CC, CPCB	2024
1.8.7	Evolve standards and norms for in-use DG sets.	Centre	City/State	CPCB, MoEF&CC	2020
1.8.8	Ensure that only the DG sets that meet the standards are the ones allowed to be marketed and sold.	State	City/State	SPCB, CPCB	immediately

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.8.9	For the DG sets already operational, ensure usage of either of the two options: (i) Use of retrofitted emission-control equipment with a minimum specified PM-capturing efficiency of at least 70%, type approved by one of the five CPCB-recognized labs. (ii) Shifting to gas-based generators by employing new gas-based generators or retrofitting the existing DG sets for partial gas usage.	State	City/State	SPCB, CPCB	2022
1.8.10	Utilize the Gujarat case study for a compelling case for the other states to adopt third-party audits for polluting industries for enhancing implementation.	State	City/State	SPCBs, CPCB	2021
1.9	**TRANSPORT SECTOR EMISSION**				
1.9.1	Stringent implementation of BS VI norms all over India by April 2020.	State	City/State	MoRTH, D/o Transport, SPCB	2020
	Green Mobility				
1.9.2	Stringent implementation of the national biofuel policy with respect to ethanol and biodiesel blending target of 20% and 5%, respectively by 2030.	Centre	State	MoP, MNRE, MoA	2030
1.9.3	City action plans to review the extension of Mass Rapid Transit (MRT) in cities/towns.	Centre	City/State	MoRTH, D/o Transport, CPCB	2024

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.9.4	Improvement and strengthening of inspection and maintenance systems for vehicles through the extension of inspection and certification (I&C) centres.	Centre	City/State	MoRTH, D/o Transport	2022
1.9.5	Stringent implementation of the PUC certificate through regular inspection and monitoring.	State	City/State	MoRTH, D/o Transport	immediately
1.9.6	Fleet modernization and retrofitting programmes with control devices in place.	Centre	City/State	MoRTH, D/o Transport	2020
1.9.7	Reducing real-world emissions by congestion management.	State	State	D/o Transport	immediately
1.9.8	Review the 'Green Corridor' project and the feasibility of its extension with reference to the 102 cities.	Centre	City/State	MoPNG, MNRE	2022
1.9.9	To review the scaling up of the pilot project of the MoPNG for introducing CNG in two-wheelers and ensure a timely implementation.	Centre	City/State	MoPNG	2020
1.9.10	Scaling up of R&D on the use of hydrogen as a transport fuel.	Centre	City/State	MoPNG &MNRE	2022
	E-Mobility				
1.9.11	Formulation of national-, state-, and city-specific action plans for e-mobility.	Centre	City/ State	MoP, DHI, NITI Aayog, MoEF&CC	2021
1.9.12	Rapid augmentation of the charging infrastructure in the country focusing on the identified 102 cities.	Centre	City/ State	MoP, DHI	2024

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.9.12	Central government offices fleets older than 15 years to be shifted to EVs.	Centre	Centre	MoP, DHI	2020
1.9.13	Government-run buses for public transport, private buses, and three-wheelers to be converted to EVs.	Centre	City/ State	MoP, DHI	2024
1.9.14	Gradual transition to e-mobility in the two-wheeler sector.	Centre	City/ State	MoP, DHI	2024
1.9.15	Specific allocations for creating a venture capital fund for e-mobility.	Centre	Centre	DoE, MoF	2020
1.9.16	Investment in R&D and pilots focusing on the indigenization of battery manufacturing, cheap alternate resource to lithium and cobalt, resource efficiency associated with a circular economy, re-use and recycling of lithium batteries, etc.	Centre	Centre	MoEF&CC	ongoing
1.10	**AGRICULTURAL EMISSION**				
1.10.1	Evaluate the status of the implementation of the MoA-funded scheme in the states and the impact on the reduction of air pollution in Delhi and the NCR.	Centre	States	MoEF&CC, CPCB	2024
1.10.2	Evaluate the socio-economic feasibility for the implementation of ex-situ options, such as production of Prali-Char, biochar, pellets, briquettes, bioCNG, bioethanol, etc., as ex-situ solutions for the management of crop residue burning, especially with the NPB in place.	Centre	State	MoA, MoEF&CC, CPCB	2020

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.10.3	Extending the initiatives for addressing the issue of crop residue burning from the NCR to other parts of the country and from paddy to sugarcane and other crops.	Centre	State	MoA, MoEF&CC, CPCB	2020
1.10.4	Coordination with ISRO for a regular availability of remote sensing monitoring data for crop burning by the farmers.	Centre	Centre	MoEF&CC, CPCB	2019
1.10.5	Evolve a plan for the management of agricultural emissions from fertilizers and livestock waste on the basis of strong R&D.	Centre	Centre	MoEF&CC MoA	2020
1.10.6	Implement plan for the management of agricultural emissions.	Centre	State	MoA	2024
1.11	**WASTE MANAGEMENT**				
1.11.1	Formulate plan for use of Smart Cities framework to launch NCAP in the 43 smart cities falling in the list of 102 non-attainment cities.	Centre	City/State	MoHUA, MoEF&CC	2019
1.11.2	Transform our centralized waste disposal infrastructure to a sustainable decentralized system in 102 cities.	State	City/State	MoHUA, MoEF&CC	2024
1.11.3	Source segregation into dry and wet waste to be made mandatory through the involvement of municipalities and the RWA.	State	City/State	MoHUA, Municipal Corporation	2020
1.11.4	Mandatory training and capacity building of municipalities and the RWA.	State	City/State	MoHUA, Municipal Corporation	ongoing

Sl. No.	Component/Activities	Level for Funding	Level For Implemen-tation	Agencies	Timeline (Year)
1.11.5	Formulation of a city-specific plan for transitioning towards a zero-waste pathway through an integrated solid waste management strategy, including targeting waste prevention, recycling, composting, energy recovery, treatment, and disposal.	Centre	City/State	MoHUA, Municipal Corporation	2020
1.11.6	Stringent implementation of integrated waste management plan in cities.	State	City/State	MoHUA, Municipal Corporation	ongoing
1.11.7	Waste reduction schemes, such as the 'polluters pay' principle, recycling projects, composting, biomethanation, RDF plants, and co-processing to be supported under an integrated solid waste management strategy.	State	City/State	MoHUA, Municipal Corporation	2020
1.11.8	Construction of a decentralized compositing plant, biomethanation plant, and C&D waste plants.	State	City/State	MoHUA, Municipal Corporation	2024
1.11.9	Deployment of a fixed compactor and doing away with dhalaos.	State	City/State	MoHUA, Municipal Corporation	2024
1.11.10	Focus on training the municipalities and SPCBs to be on national and international technologies for integrated waste management options.	Centre	City/State	MoHUA, MoEF&CC, Municipal Corporation	ongoing

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.11.11	In line with the National Biofuel Policy, promote technologies which can convert waste/plastic and cause the MSW to drop in fuels. A tonne of such waste has the potential to provide a 20% (approx.) of drop in fuels.	Centre	City/State	MNRE, MoHUA, Municipal Corporation	2020
1.11.12	Stringent implementation and monitoring for extended producer responsibility for e-waste and plastic waste.	State	City/State	CPCB, SPCB, Municipal Corporation	immediately
1.11.13	Strict implementation of the existing six waste management rules on solid, hazardous, electronic, bio-medical, plastics, and C&D waste.	State	City/State	CPCB, SPCB, Municipal Corporation	immediately
1.11.14	The Swachh Bharat Mission and National Mission on Sustainable Habitat to be used as platforms to push the objectives of this sector.	Centre	City/State	MoHUA, MoEF&CC	immediately
1.12	**CITY-SPECIFIC AIR QUALITY MANAGEMENT PLAN FOR 102 NON-ATTAINMENT CITIES**				
1.12.1	Preliminary city-specific action plans to be formulated for 102 non-attainment cities.	Centre	City/State	CPCB, MoEF&CC	2019
1.12.2	City-specific action plans to be taken up for implementation by the state government and city administration.	State	City/State	D/o Environment, SPCB	2020

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.12.3	City-based clean air action plans should be dynamic and evolve based on the available scientific evidence, including the information available through source apportionment studies.	Centre	City/State	CPCB, MoEF&CC	2020
1.12.4	A separate emergency action plan in line with GRAP for Delhi to be formulated for each city for addressing the severe and emergency AQI.	Centre	City/State	CPCB, MoEF&CC	2020
1.13	**STATE ACTION PLAN FOR AIR POLLUTION**				
1.13.1	A preliminary state action plan for air pollution to be formulated for all the 23 states, which harbour 102 non-attainment cities.	Centre	State	SPCB, CPCB, MoEF&CC	2020
1.13.2	State action plan for air pollution to be taken up for implementation by the state government and city administration.	State	State	State Govt	2020
1.13.3	The guidelines for the preparation of the state action plan to be formulated.	Centre	Centre	MoEF&CC, CPCB	2019
2	**KNOWLEDGE AND DATABASE AUGMENTATION**				
2.1	**AIR QUALITY MONITORING NETWORK**				
2.1.1	Augment the manual monitoring stations from the existing 703 stations to 1,500 stations.	Centre	City/State	CPCB, SPCBs	2024
2.1.2	150 CAAQMS with an average of 2–3 stations in each city to be installed, prioritizing the Indo-Gangetic plain.	Centre	City/State	CPCB, SPCBs	2024
2.1.3	Satellite-based measurements.	Centre	City/State	CPCB, SPCBs, SAC, ISRO	2024

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
2.1.3	Identification of an alternative technology for real-time monitoring with an impetus on low-cost indigenous real-time monitoring stations and promoting real-time monitoring in other cities with these low-cost sensors. With average of 10 sensors in each city, 1,000 sensors are being targeted.	Centre	City/State	CPCB, SPCBs	2024
2.1.4	Mobile air quality monitoring network to be made part of these alternative technologies. At least one mobile monitoring station for each city is to be considered. This will facilitate preliminary assessment in areas without conventional monitoring stations.	Centre	City/State	CPCB, SPCBs	2024
2.1.5	Set-up 100 monitoring stations in the rural areas.	Centre	City/State	CPCB, SPCBs	2024
2.1.6	Review the existing guidelines and issue a protocol for the setting up of monitoring stations and monitoring.	Centre	City/State	CPCB, SPCBs	2024
2.1.7	Augment the number of monitoring stations for $PM_{2.5}$ from the existing 167 in 80 cities to all stations under NAMP.	Centre	City/State	CPCB, SPCBs	2024
2.1.8	Set-up 10 city Super Network to generate highly-quality controlled data and represent national air quality dynamics.	Centre	City/State	CPCB, SPCBs, MoEF&CC	2021

Sl. No.	Component/Activities	Level for Funding	Level For Implemen-tation	Agencies	Timeline (Year)
2.1.9	The plan for 10 city Super Networks to be formulated.	Centre	Centre	CPCB, MoEF&CC	2019
2.1.10	Super sites as representative sites in cities and rural areas	Centre	Centre	CPCB, MoEF&CC	2019
2.2	**EXTENDING SOURCE APPORTIONMENT STUDIES TO ALL NON-ATTAINMENT CITIES**				
2.2.1	Unified guidelines for source apportionment study will be formulated and updated.	Centre	Centre	CPCB, MoEF&CC	2019
2.2.2	Source apportionment studies to be extended to all 102 non-attainment cities.	Centre	Cities/State	MoEF&CC, CPCB	2020
2.3	**AIR POLLUTION HEALTH AND ECONOMIC IMPACT STUDIES**				
2.3.1	Study on the national environmental health profile to be completed in time.	Centre	Centre	MoEF&CC	2019
2.3.2	Response study and cohort study programme to be undertaken.	Centre	Centre	MoH&FW	2019
2.3.3	Ministry of Health to actively take up environmental health for ensuring a regular health profile or database for assisting decision making.	Centre	Centre	MoH&FW	2019

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
2.3.4	Framework for a monthly analysis of data wrt health to be created. The data from mapping of the industry; tabulation of a daily AQI, $PM_{2.5}$ and PM_{10} measurements (24 hours average); metrological parameters; deaths due to heart attack, strokes, respiratory arrest following the existing respiratory ailments, trends in lung cancer if available wrt all cities to be fed in to a central computer and to be analysed every month by people trained in environmental health for correct interpretation.	Centre	Centre	MoH&FW	2024
2.3.5	Awareness and orientation workshops shall focus on a target audience and the media is to be used for a wide dissemination of information. However, the precise information to be shared has to be carefully worked out by a team of experts in air pollution and environmental health.	Centre	Centre	MoH&FW, MoEF&CC, CPCB	2024
2.3.6	Training researchers in study design through holding workshops in epidemiology, toxicology, and biostatistics.	Centre	Centre	MoH&FW, MoEF&CC, CPCB	2024
2.3.7	'Studies on health and economic impact of air pollution to be supported.	Centre	Centre	MoH&FW, MoEF&CC, CPCB	2024

Sl. No.	Component/Activities	Level for Funding	Level For Implemen-tation	Agencies	Timeline (Year)
2.3.8	'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.	Centre	Centre	MoH&FW	2024
2.4	**INTERNATIONAL COOPERATION INCLUDING SHARING OF INTERNATIONAL BEST PRACTICES ON AIR POLLUTION**				
2.4.1	International scientific and technical cooperation in the area of air pollution will be established in accordance with national priorities and socio-economic development strategies and goals.	Centre	Centre	MoEF&CC	2019
2.4.2	Modalities of such cooperation may include joint research and technology development, field studies, pilot -scale plants, and field demonstration projects with an active involvement of academia, research institutions, and industry on either side. Funding for co-financing purposes are to be indicated.	Centre	Centre	MoEF&CC	2019
2.5	**REVIEW OF AMBIENT AIR QUALITY STANDARDS AND EMISSION STANDARDS**				
2.5.1	Guidelines with respect to the periodicity of reviews of such standards to be formulated.	Centre	Centre	CPCB, MoEF&CC	2020

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
2.5.2	The existing standards need to be strengthened periodically and new standards need to be formulated for the sources where the standards are not available, based on extensive scientific evidence with reference to the protection of public health and environment.	Centre	Centre	MoEF&CC	2024
2.6	**NATIONAL EMISSION INVENTORY**				
2.6.1	A comprehensive national emissions inventory, which is still lacking in the country will be formalized under the NCAP.	Centre	Centre	MoEF&CC, CPCB	2020
3	**INSTITUTIONAL STRENGTHENING**				
3.1	**PUBLIC AWARENESS AND EDUCATION**				
3.1.1	City-specific awareness programme targeting key stakeholders to be formulated and taken up for implementation.	Centre	State	CPCB, SPCBs	ongoing
3.2	**TRAINING AND CAPACITY BUILDING**				
3.2.1	Extensive capacity-building programme for both the CPCB and SPCBs with reference to both manpower and infrastructure augmentation.	Centre	Centre, State	MoEF&CC, CPCB, SPCBs	2020
3.2.2	Intensive training, comprising national and international best practices and technological options, of all the associated stakeholders.	Centre	Centre, State	MoEF&CC, CPCB, SPCBs	ongoing

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
3.3	**SETTING UP OF AIR INFORMATION CENTRE**				
3.3.1	A plan for setting up air information centres will be formulated.	Centre	Centre, State	MoEF&CC, CPCB, SPCBs	2019
3.3.2	Air information centres at the central and regional levels will be set up in some of the identified institutes.	Centre	Centre, State	MoEF&CC, CPCB, SPCBs	2020
3.4	**CERTIFICATION SYSTEM FOR MONITORING INSTRUMENTS**				
3.4.1	To operationalize NPL-India Certification Scheme (NPL-ICS) at the central and regional level to cater to the country's needs in respect of online monitoring of air pollution.	Centre	Centre	MoEF&CC, CPCB	2019
3.4.2	To evolve an action plan for the need of certification agencies for air pollution mitigation equipment in addition to the monitoring equipment.	Centre	Centre	MoEF&CC, CPCB	2019
3.5	**AIR QUALITY FORECASTING SYSTEM**				
3.5.1	All the ongoing and future initiatives under SAFAR will be integrated with the NCAP for taking all preventive measures to draw the benefits for addressing the air pollution issue from the available information.	Centre	Centre	MoES, CPCB	2019
3.5.2	The forecasting to be extended to 102 non-attainment cities under the NCAP.	Centre	Centre	MoES, CPCB	2022
3.5.3	Hotspot-based forecasting to be taken up moving ahead from city-specific forecasting in 102 cities.	Centre	Centre	MoES, CPCB	2022

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
3.5.4	The satellite data available through the satellite network of ISRO to be integrated for monitoring and forecasting under the NCAP.	Centre	Centre	MoES, CPCB	2022
3.6	**NETWORK OF TECHNICAL INSTITUTIONS- KNOWLEDGE PARTNERS**				
3.6.1	A detailed action plan for setting up the network to be formulated.	Centre	Centre	MoEF&CC, CPCB	2019
3.6.2	A system of a regular web-based online interaction mechanism will be evolved to ensure continuity of interactions.	Centre	Centre	MoEF&CC, CPCB	2020
3.7	**TECHNOLOGY ASSESSMENT CELL**				
3.7.1	A detailed action plan for a technology assessment cell to be formulated.	Centre	Centre	DST, MoEF&CC, CPCB	2019
3.7.2	A technology assessment cell will be created involving the IITs, IIMs, universities, industries, and using the existing DST mechanisms and programmes, India Innovation Hub, etc.	Centre	Centre	DST, MoEF&CC, CPCB	2019
3.8	**INSTITUTIONAL FRAMEWORK**				
	Centre Level				
3.8.1	Apex committee at the MoEF&CC	Centre	Centre	MoEF&CC	2019
3.8.2	National Level PMU at the MoEF&CC	Centre	Centre	MoEF&CC	2019
3.8.3	Five Sectoral Working Groups on a co-chairing basis	Centre	Centre	MoEF&CC, MoP, MoRTH, MoHUA, MoA, DIPP	2019
3.8.5	A Monitoring and Forecasting Working Group	Centre	Centre	MoEF&CC	2019
3.8.4	A Technical Expert Committee at the MoEF&CC	Centre	Centre	MoEF&CC	2019

Sl. No.	Component/Activities	Level for Funding	Level For Implemen-tation	Agencies	Timeline (Year)
3.8.5	A national-level Project Implementation Unit (PIU) at the CPCB	Centre	Centre	CPCB	2019
	State Level				
3.8.6	A State Monitoring Committee under the chief secretary in the states	State	State	DoE	2019
3.8.7	State-level PMU at the SPCB	State	State	SPCB	2019
3.8.8	City-level Review Committee under the municipal commissioner	State	City	Municipal Corporation	2019
3.8.9	A DM-level committee in the districts	State	City/District	DM	2019

India is committed to create a clean environment and pollution free air and water. It is mandated in our constitution. India's commitments and obligations to environmental conservation and protection within the ambit of the targeted goals on environmental sustainability under the Sustainable Development Goals (SDGs) is manifested in the fact that several administrative and regulatory measures, Sustainable development, in terms of enhancement of human well-being, is an integral part of India's development philosophy.

However, a vast country and an emerging economy like India, faces enormous challenges with its burgeoning population and widespread poverty, in meeting its various other significant commitments associated with poverty, and eradication of hunger under the SDGs. India has been going through a phase of accelerated industrial activities for the past three decades. The associated growth in terms of industrialization and urbanization has led to manifold increase in pollution issues, in recent years.

Since Collaborative and participatory approach involving relevant Central Ministries, State Governments, Local bodies and other Stakeholder with focus on all sources of pollution form crux of the Programme, extensive consultation with all the relevant stakeholders forms the foundation for formulation of NCAP.

सत्यमेव जयते

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