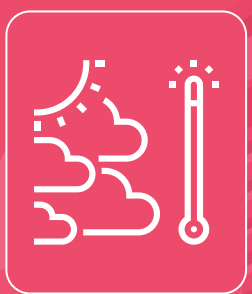
सत्यमेव जयते

Ministry of Housing and Urban Affairs
Government of India



Clean Air Action Plan

(Planning & Implementation)

TRAINING MANUAL

Climate Centre for Cities

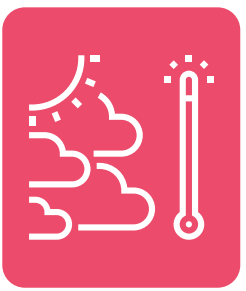
CLEAN AIR ASIA

ClimateSmart Cities Assessment Framework

Mobility and Air Quality

सत्यमेव जयते

Ministry of Housing and Urban Affairs
Government of India



Clean Air Action Plan

(Planning & Implementation)

TRAINING MANUAL

ClimateSmart Cities Assessment Framework

Mobility and Air Quality

Climate Centre for Cities

CLEAN AIR ASIA

Clean Air Action Plan (Planning and Implementation)
Training manual

Developed by:
Climate Centre for Cities, NIUA in association with Clean Air Asia

Author
Clean Air Asia India - Prarthana Borah and Gitanjali Sreedhar

Editors
C-Cube, NIUA - Umamaheswaran Rajasekar, Vaishnavi. T. G. Shankar and Mohini Bhaisare

December, 2021

Contact information
Climate Centre for Cities
National Institute of Urban Affairs

1st Floor, Core 4B, India Habitat Centre,
Lodhi Road, New Delhi -110003, India
Telephone: (91-11) 24617517, 24617543, 24617595
Website: www.niua.org, www.niua.org/c-cube

Photo Credits: Hardik Joshi on unsplash

Executive Summary

On one hand, cities are a significant contributor of carbon emissions aggravating climate change and on the other, cities are considerably impacted by climate disasters. The recently released Global Climate Risk Index 2021 ranks India as the 7th most affected country from climate related extreme weather events (storms, floods, heatwaves etc.). Further, studies indicate that poor planning and urban management are expected to cost Indian cities somewhere between $2.6 and $13 billion annually[1]. Cities are increasingly at the forefront of addressing both urbanization and climate change and to strengthen climate-sensitive urban development, a holistic understanding of the urban development from a climate lens is crucial. The ClimateSmart Cities Assessment Framework (CSCAF) launched in 2019 by the Ministry of Housing and Urban Affairs (MoHUA), Government of India aimed to address this gap. This first-of-its-kind assessment with 28 progressive indicators across 5 thematic areas helps cities to benchmark their development, understand the gaps and further prioritize climate relevant development.

With a focus on building local capacities to develop and adopt climate measures, the Climate Centre for Cities (C-Cube) at the National Institute of Urban Affairs (NIUA) initiated a series of training aligned to the thematic areas of CSCAF - Energy and Green Buildings, Urban Planning, Green Cover & Biodiversity, Mobility and Air Quality, Water Management, Waste Management. The focus of the training is to provide a step-by-step approach of conducting studies, assessments and stakeholder consultations, establishing committees, developing action plans and implementing relevant measures that not only makes the cities climate resilient but also helps them progress across the assessment of CSCAF. The training on the 'Clean Air Action (planning and implementation)' under the thematic areas of Mobility and Air Quality in the CSCAF is developed in association with Clean Air Asia.

The rationale behind the indicator is to bring in sustainable urban planning, encourage sustainable technological solutions in the city for better air quality management. The

[1]*Mani, M. et al., 2018. South Asia's Hotspots: The Impact of Temperature and Precipitation Changes on Living Standards, Washington D.C.: World Bank Group.*

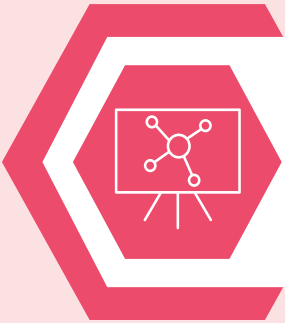
Smart City Mission that promotes the urban policy design of transit oriented urban mobility, smart parking, intelligent traffic management and integrated multi-modal transport, prioritising non-motorised transport, digitalisation of public services, and waste management e.g. reduction of C&D (construction and demolition) waste, are also good practices for improving air quality. However, a holistic and dedicated plan to minimize air pollution is essential.

The Clean Air Action Plans (CAAP) mandated by the National Clean Air Programme (NCAP) (2019) of Government of India integrates the cumulative city level actions and provides a framework for cities to enhance air quality. The indicator, 'Clean Air Action (planning and implementation)' in CSCAF assesses to what extent the city has made efforts to improve the air quality, through clean air action planning and proper air quality management strategy. The progressive nature of the assessment ensures that cities generate data and identify sources through scientific methods and subsequently develop and implement sectoral strategies and projects to mitigate air pollution. Close co-ordination with the state level monitoring authorities and other stakeholders along with the review of plans and monitor of improvements in the air quality is also emphasized.

Cities should take up the responsibility for providing healthy air quality to the citizens. For a city to be climate smart it should be able to address the issues of reducing not only air pollutants but also climate pollutants. Both air and climate pollutants arise from similar sources and addressing one will result in the co-benefit of addressing both challenges. Clean air is integral for improving the quality of lives and achieving climate smartness by a city.

The National Clean Air Program that was launched in 2019 mandates 124 cities that are considered as non-attainment cities to develop clean air action plans. It is important at this juncture that those who are involved in the process of developing/formulating these plans take into consideration the technical and management processes for preparation of the plans as well as understand the scientific methodology for successful implementation. This module gives a basic understanding along with steps to prepare a clean air action plan at city level.

The main objective of the module is to help the participants understand the importance of steps that need to be taken while planning for clean air action and to integrate both technical and management elements in the Clean Air Action Plan.

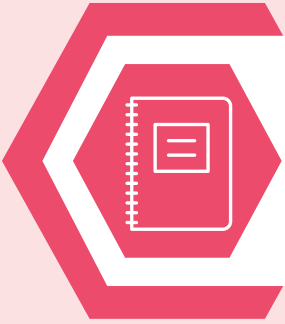


Who is the training manual designed for?

What is the focus of the training manual?

How to make use of this manual?

What are the Learning outcomes of the training?



Scope and limitations of the training

The training manual has been designed for

- Senior and mid - level smart city officials and engineers
- Mid- level officials and engineers involved in the work around mitigating air pollution at the city level
- Urban planners, architects, designers involved in city planning may also benefit from this training

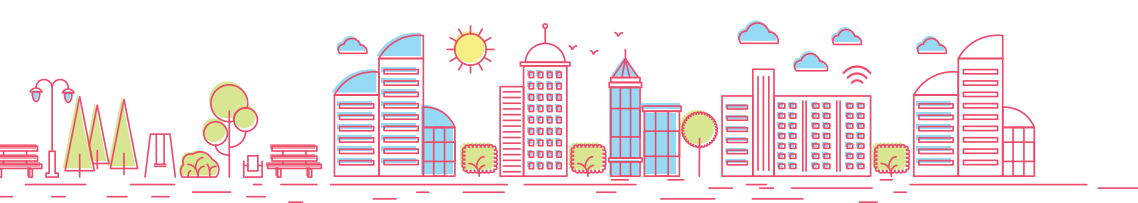
The focus of the manual is to make the participants familiar with the concept and ideation of Clean Air Action Planning (CAAP) and its significance in the Air Quality Management (AQM). The manual will facilitate understanding of participants on the need to strategize and formulate a CAAP.

The manual is designed to guide readers to achieve a basic understanding of clean air action plans, in specific the components of the plan and how to implement some of the measures. In addition to detailed information provided in the manual, a set of reference materials are indicated for additional reading. Case studies to demonstrate the theoretical concepts are also covered to demonstrate the practical application of concepts.

- Basic understanding of scientific processes involved so as to be able to develop a Clean Air Action Plan
- Understanding the stages involved in developing Clean Air Action Plans
- Understanding the co-benefits of addressing GHG emission and air pollution
- Improved understanding of Clean Air Action Planning

The manual is designed to guide readers to achieve basic understanding of clean air action plans. Scientific methods like source apportionment and emissions inventory or other assessments have not been included. However, additional reference materials indicated can support further understanding the scientific methods.

Contents

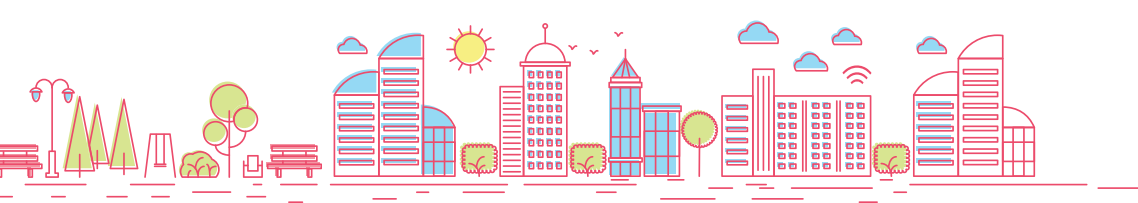


List of Figures

List of Tables

Abbreviations

AQI	Air Quality Index
AQM	Air Quality Management
CAAP	Clean Air Action Plan/Planning
CAST	Clean Air Scorecard Tool
CCAC	Climate and Clean Air Coalition
CH4	Methane
CO	Carbon Monoxide
CO2	Carbon Dioxide
CPCB	Central Pollution Control Board
EPCA	Environment Pollution (Prevention and Control) Authority
GHG	Greenhouse Gases
GRAP	Graded Response Action Plan
N2O	Nitrous Oxide
NCAP	National Clean Air Programme
NCR	National Capital Region
NGO	Non-Governmental Organisation
NOx	Nitrogen Oxide
O3	Ozone
Pb	Lead
PM	Particulate Matter
PRD	Pearl River Delta
SLCPs	Short – Lived Climate Pollutants
SOx	Sulphur Oxide
SPM	Suspended Particulate Matter
UEPPCB	Uttarakhand Environment Pollution Prevention Control Board
WHO	World Health Organization
YRD	Yangtze River Delta



1

Introduction

The air we breathe has a big impact on our day-to-day lives. According to WHO, air pollution is one of the greatest environmental risk to human health. Measures to ensure clean air such as the use of catalytic converters in cars and industries to reduce harmful pollutants from entering the air exist.[1] However, cities deal with a variety of sources of air pollution, and therefore a well laid strategy to deal with the everchanging challenges of air pollution is required. An effective way for cities to achieve this is by incorporating a Clean Air Action Plan (CAAP) as the key part of Air Quality Management (AQM).

1.1. Air Quality Management

Air quality management (AQM) is all the activities that are aimed at creating and maintaining clean air to protect human health and provide protection for ecosystems.[2] Activities such as standard setting, ambient monitoring, developing permitting programs, enforcement activities, and establishment of economic incentives to reduce air pollution can all be included under management activities. A set of responsibilities and relationships are prescribed amongst the government agencies at national and local levels, through various policies and legislation defined under air quality management. The foundation of any successful AQM program is a sound government policy and adequate legislation.

The right to clean air for all, access to environmental information and an awareness of the air pollution situation are some of the principles on which the AQM is based.

---

[1] *BASF Global (2018). The importance of Cleaner Air: The air we breathe affects each one of us. How do we improve it? [online] https://tinyurl.com/arf6uk63 (accessed 3rd Nov 2021)*

[2] *United States Environmental Protection Agency (2021). Air Quality Management Process Cycle [online] https://tinyurl.com/k6mxmacz (accessed 3rd Nov 2021)*

Principles like polluter pay and precautionary principles are important while developing an AQM program to ensure that the best available technologies are used while making sure that a cost-effective approach is adopted. Despite these factors, several economic, institutional, and political constraints may hinder the complete implementation of all the guiding principles.

1.2. Key Components of Air Quality Management

To achieve and further maintain clean air, AQM needs to enable governmental authorities to garner the support of numerous stakeholders from governmental institutions, research institutes, non-governmental organisations (NGOs), private organisations, the public, and the media.[3] AQM also needs to consider the local circumstances such as the sources of air pollution, background air pollutant concentrations, technological feasibility; cultural and social conditions; and available financial and human resources. AQM is a dynamic and iterative process which involves the following key components:[4]

- Ambient air quality objectives/standards are defined to protect human health and the environment.
- The main aim of AQM is to provide information on the status of air quality. It helps to evaluate existing policies and their effective implementation. A key component of an AQM programme is the planning, design and establishment of a monitoring network based on the air quality objectives.[5]

---

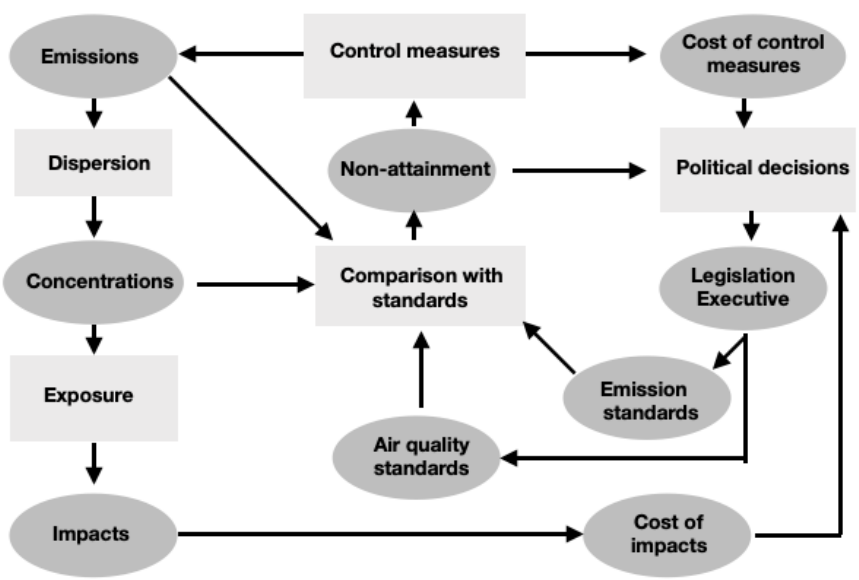
[3]*Dietrich Schwela and Gary Haq (2004), A Strategic Framework for Air Quality Management in Asia, Stockholm Environment Institute at the University of York (https://tinyurl.com/5wasvmxu)*

[4]*Gulia, S. et al. (2015) Urban air quality management: a review. Atmospheric Pollution Research, 286-304.(https://tinyurl.com/2atvfdbf)*

[5]*Sivertsen, B. (2008) Monitoring air quality, objectives, and design. Chemical Industry & Chemical Engineering Quarterly14: 167–171*

- Identifying and quantifying the impact of different sources of air pollutants at receptor sites is done through source apportionment studies This provides input on categories of sources that may contribute to ambient air pollution followed by their quantification.
- As compilation of an accurate emission inventory is an integral part of AQM, a comprehensive emission inventory is compiled to develop an emission control strategy for selected pollutants.
- Air quality modelling is undertaken to formulate air pollution control and management strategies by providing guidelines for efficient air quality planning. The main objective is to predict ambient air pollutant concentrations of one and more species in space and time as related to independent variables such as emission and meteorological parameters.
- Air pollution exposure and health assessments are undertaken to ensure that the impact of air pollution on human health is minimal. These can involve studies to assess the effects of short term and long-term exposure to air pollution.
- Air pollution prevention and control strategies are adopted to maintain acceptable ambient air quality in key urban areas. For example, improved fuel quality in fuel quality, inspection, and maintenance programme for vehicles or the banning the open burning of waste (see Figure 1).

Figure 1 Key Components of AQM



Source: A Strategic Framework for Air Quality Management in Asia. Stockholm Environment Institute

1.3. Why Clean Air Action Planning?

Cities deal with a variety of sources of air pollution, and therefore require a well laid strategy to deal with the everchanging issues and situations with respect to air pollution. The AQM developed for individual cities needs to ensure that these changes are considered while implementing the program. An effective way to achieve this could be by incorporating the Clean Air Action Plan (CAAP) as the part of the core foundation of AQM[6].

Clean air action plans assist in acquiring information related to levels of air pollution, emission sources as well as local health and environmental impacts of pollution which in turn are used to provide a comprehensive understanding of the air quality status in the city. This information guides the government and other stakeholders to incorporate select measures as part of the planning process that will ensure reduction of emissions from transport, industries, waste deposits, residential burning, and other sources.

1.4. What is the Clean Air Action Plan?

A clean air action plan (CAAP) intends to improve air quality and public health by identifying cost-effective measures to reduce emissions from sectors such as transport, industries, waste deposits and residential burning, among others.8 A CAAP is also a collection of regulations, policies, and programs for cleaner air. The process of CAAP development is led by the government and involves multiple stakeholders.

Each city develops a CAAP suitable to their specific air pollution status. Cities can adopt varied approaches depending on their needs and capacities to develop and implement a CAAP, keeping in mind the limitations and availability of resources.

The key features of CAAP include:

i. instruments and strategies to comply with air quality and emission standards;
ii. adoption and implementation of control measures;
iii. continuous improvement after compliance, and
iv. anticipation of future trends such as national policies and international commitments.

The main aim of CAAP is to develop measures that will ensure reduction of emissions from pollution sources such as transport, industries, waste deposits, residential burning, and other sources. This is also the core of AQM and is led by the government, in coordination with other relevant stakeholders. As a tool to meet air quality objectives and emission reduction targets, the CAAP involves the following good practices:

[6]*Clean Air Asia (2016), Guidance Framework for Better Air Quality in Asian Cities, Pasig City, Philippines*

- Drawing inputs from the assessment of air pollution sources and emissions, ambient air pollution levels (adequately representing temporal and spatial variations), air quality goals (standards or target values), information on source apportionment and exposure assessment (through dispersion modelling), health, and environmental impacts assessment;
- Considering air pollution drivers, future development growths, and projected air pollution scenarios;
- Discussing measures with all major stakeholders, and delineating their roles and responsibilities;
- Evaluating control options for their efficacy (based on cost-benefit or cost-effectiveness analysis), technical feasibility, and ease of implementation;
- Setting targets and timelines for actions;

- Addressing implementation issues such as institutional arrangements and partnerships, infrastructure, and financial resources;
- Giving due consideration to technological advancements;
- Defining monitoring and evaluation mechanism, providing opportunities for mid-term corrections; and
- Setting a period for reviews and regular upgrades.

The efficiency of CAAP as an effective instrument in air pollution control has been demonstrated by the experiences of developed nations. It enables effective and efficient resource mobilization in identifying and planning for operationalization of reduction measures. With the CAAP, multi-year efforts to reduce emissions have been made through various control measures and clear frameworks for implementation and enforcement of the control strategies. As a result, emissions from anthropogenic sources have been substantially reduced, and most developed countries reported improvement in their nation's urban air quality.[8]

This training manual will focus on the Clean Air Action Plan (Planning and Implementation) indicator under the Mobility and Air Quality thematic area, which is aligned with CSCAF 2.0 aims to support adoption, implementation, and dissemination of global best practices towards green, sustainable, and urban resilient habitats.

The indicator of Clean Air Action Plan assesses cities based on their efforts to develop Clean Air Action Plan (CAAP) and air quality management strategy in a comprehensive manner addressing all sectors like transport, industry, energy etc. Identifying the basic level of pollutant sources along with regular monitoring and the preparation, assessment, and implementation of CAAP are considered for assessing cities. For a city to become climate smart it should be able to address the issues of reducing air pollution wherein the multiple benefits of good public health and economic growth can also be achieved.

Ambient Air Quality Monitoring Station
Photo Credits: Rajkot Smart City

1.5. Aligning with ClimateSmart Cities Assessment Framework 2.0

Figure 2: Climate Smart City Assessment Framework 2.0, including five themes and 28 indicators, indicating Clean Air Action Plan (Planning and Implementation)

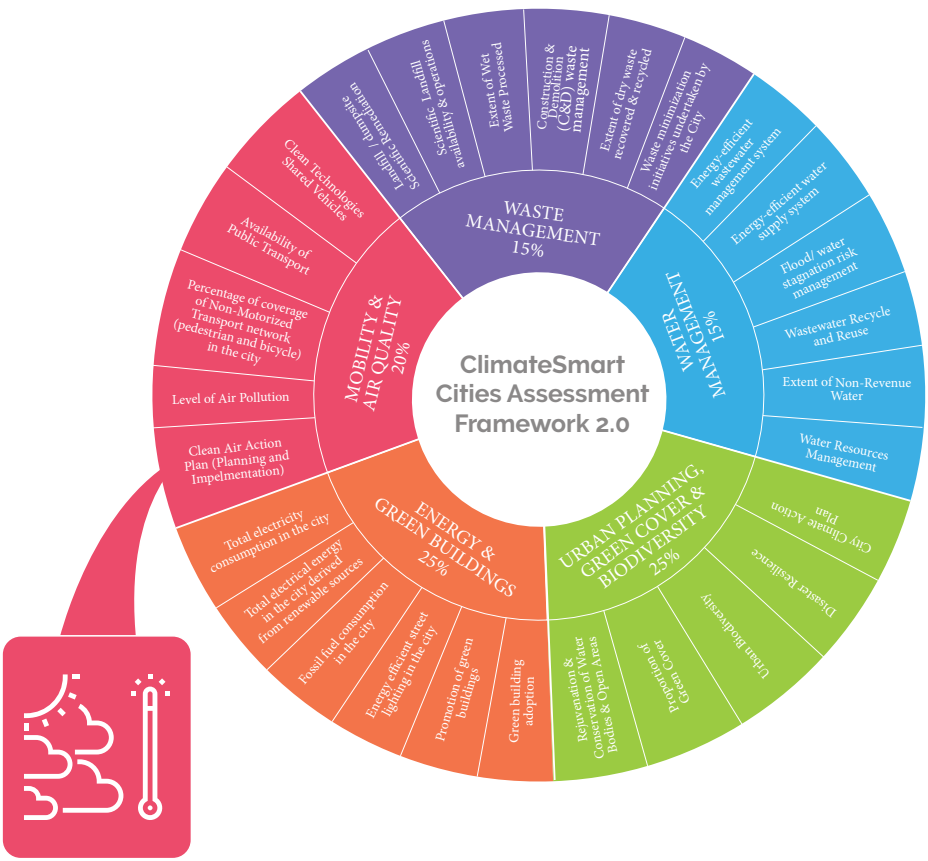


Table 1 CSCAF progress evaluation framework for Clean Air Action Plan (Planning and Implementation) indicator.

	1	2	3	4	5
Progression Levels	**No Air Pollutant Monitoring Clean Air Action Plan**	**Air Pollutant Monitoring**	**Clean Air Action Plan and Pollutants Source Identification**	**Implementation of Clean Air Action Plan**	**Assessing Impacts of Clean Air Action Plan Implementation**
Evidence/ Data sources		• Monitoring Stations for measuring Ambient Air Quality (please indicate number of stations, differentiate between manual stations /continuous ambient air quality monitoring stations (CAAQMS) / continuous emission monitoring system (CEMS) • Air Quality Monitoring mechanism linked with ICCC/ Sensors based monitoring systems • Map of monitoring stations in the city as .kml files (point or polygon geometry) • Map of air pollution sensors in the city as .kml files (point geometry)	• Clean Air Action Plan prepared by SPCB based on CPCB guidelines as per National Clean Air Programme, (NCAP) developed • Any other Clean Air Action Plan developed by Municipal Authority / Smart City Mission in case of other cities • Scientific study based on CPCB / SPCB led Source Apportionment Studies and Emissions Inventories • Any other available government validated studies for identifying source/EIs	• Implementation of at least 2 measures under the domain of the ULB as specified in Clean Air Action Plan	• Impact assessment for implementation of Clean Air Action Plan measures with evidence of improvements in air quality
Responsible Department/ Agency	Central Pollution Control Board, State Pollution Control Board and Pollution Control Committee				
Reference Document	National Clean Air Programme (MoEF & CC; 2019) http://moef.gov.in/wp-content/uploads/2019/05/NCAP_Report.pdf				
Score	**0**	**25**	**50**	**75**	**100**

2

Developing Clean Air Action Planning

The process of developing a CAAP for any city includes the following four steps, assisted by stakeholder participation and communication throughout.[1]

1. Assessment
2. Action plan development
3. Implementation and enforcement
4. Review and improvement

2.1 Assessment

The process of CAAP development begins by an assessment of current and projected scenarios. This includes review and analysis of the status and trends of air quality, impact on health and the environment, information on key pollutants and sources of pollutant emissions, indicators of economic growth, energy use and population growth and their projections in future years; baseline emissions inventory (EI) for targeted pollutants; and projected levels of emissions. In addition to these, source apportionment (SA) information may be used for identifying domain area and pollutants, to prioritize the source types that need to be addressed.

[1]*Clean Air Asia (2016), Guidance Framework for Better Air Quality in Asian Cities, Pasig City, Philippines*

2.2 Action Plan Development

Action plan development incorporates addressing not only the existing situation, but the future scenarios as well. Due consideration is given to projected population growth; demand and management of services (energy, transport, among others); sector specific developmental plans (e.g., road network, housing, industries) from municipal corporations and urban and industrial development agencies; and expected technological advancements (e.g., new vehicles with better engine and emission control devices). Different types of control measures, estimation of effect of the control measures on pollutant emission reduction, cost-effectiveness of the control measures, and co-benefits are also identified as part of Action Plan development.

2.3 Implementation and Enforcement

Effective implementation and enforcement are key to reducing air pollutant emissions and achieving air quality objectives. A successful and implementable CAAP needs clear institutional framework and responsibilities, stakeholder coordination and communication, political support, allocation of financial resources, technical capabilities, and review and improvement.[2] Three factors that determine the success in providing better air quality are:

---

[2]*Clean Air Initiative for Asian Cities (CAI-Asia) Center, 2012. "Clean Air Action Planning in Chinese Cities: Hangzhou and Jinan Cases". Pasig City, Philippines*

- The existence of policies and action plans, and their implementation details (mechanism, timeline, assignment of responsibility);
- Provision of enough resources to implement the policies and action plans; and
- Actual implementation of the policies and action plans.

2.4 Review and Improvement

Once the CAAP has been implemented, it needs to be tracked to understand the effectiveness of the program. This is known as the review and improvement stage. Reports are drawn on data based on the implementation of measures versus overall changes in emissions (comparing the plan and change in monitored air quality). This is an important step as it helps the government and stakeholders to identify mechanisms and responsibilities for monitoring/tracking progress. This in turn enables a review of the effectiveness of the available control measures and to determine if changes are needed to achieve greater reductions, address excessive costs or amend measures for the future.

Table 2 Recommended components of a Clean Air Action Plan[3]

Components of CAAP	
Heading	Details
Executive Summary	
Introduction and Background	City overview: Geography and meteorology Population and urbanization Economic and industrial development Energy and transport
Legal Framework/Legislative and Policy Context	
Roles and Responsibilities (National/ Provincial/Municipal)	
Current status and challenges of air quality Baseline assessment	
· Current status, Air Pollution Index (API) and comparisons to objective/standard	
· Emissions inventory and key pollutants	
· Causal analysis of effects and attribution to individual sources	
· Air pollution trends and tendencies analysis	Trends in air pollutant concentration

[3]*Clean Air Initiative for Asian Cities (CAI-Asia) Center, 2012. "Clean Air Action Planning in Chinese Cities: Hangzhou and Jinan Cases". Pasig City, Philippines*

Components of CAAP	
· Impact on public health and the environment	Evaluation of health effects, exposure to pollution investigation Environmental and economic impacts
Target and goals	Air quality objectives Emission reduction targets Long-term environmental/development planning
Development of the Action Plan	
· Process of development	
· Focus areas and main tasks	Specific planning linked with/refer to other government departments plan
· Expected impacts	Probability of success and risk factors for control measures and possible economic and social impacts
Implementation of the Action Plan	
· Analysis of costs and feasibility	Cost and impact on air quality
· Institutional arrangements (enforcement procedures, coordination, roles and responsibilities)	
· Steps, working periods, timeline	
Supporting Policies	Specific planning linked with/refer to other government departments plan
· Monitoring and evaluation	Annual self-review Mid-term evaluation by independent party
· Resource commitment (Institution, financing, policy, technology, social)	
Key Projects	Key projects and their relevance to control measures Specific sources of funding, how to guarantee the investment
· Analysis of costs and feasibility	
· Expected impacts	

3

Control Measures to Improve Air Quality

The CAAP encompasses short-term, medium-term, and long-term mitigation and control measures to reduce emissions from mobile (transport), stationary (industry), and area sources.[1] Several different types of measures include:

- Conservation: this refers to reducing the use of resources through energy conservation
  - Efficiency: This can be defined as conducting the same activity in a more efficient manner, resulting in lesser use of resources and lower emissions of air pollutants.
  - Abatement: this refers to the application of a technological approach to reduce emissions
  - Fuel switching: this is described as substituting a lower emission fuel for a higher emission fuel thereby reducing the release of air pollutants into the atmosphere.
  - Demand management: explained as the implementation of policies or measures which serve to control or influence the demand for a product or service
  - Behavioural change: this refers to adopting practices that will facilitate in changing the habits of individuals or organizations in such a way as to reduce emissions.

3.1 Measures to reduce emission from transport

Pollutants released from motor vehicles are dependent on a number of factors like the type of fuel used in that particular vehicle, the quality of the fuel, the fuel combustion technology, land use and vehicle use. In order to control or reduce the emissions from motor vehicles, each of these factors need to be addressed. This can be done by undertaking the following measures:

[1]*Clean Air Asia (2016), Guidance Framework for Better Air Quality in Asian Cities, Pasig City, Philippines*

I. Improved emissions standards and technologies;
II. Cleaner fuels;
III. Improved fuel efficiency;
IV. Improved inspection and maintenance;
V. Improved transport planning and traffic demand management;
VI. Shift to public transport, promotion of non-motorized/active transport (i.e., cycling, walking)

3.2 Measures to reduce air pollution from industrial sources

Measures to reduce air pollution from industrial sources may include the following key areas:

I. Land use planning and zoning
   - location of new industries should be assigned keeping in mind the planning regulations. Along with this, suitable industrial areas/zones should also be established as part of city planning.
   - all new industries, especially specific major industries should compulsorily undergo environmental impact assessment to ascertain their potential to contribute to the air pollution. This should be followed by recommendations to improve location, processes, fuels, industry technology and emission limits; and
   - relocation of existing industries away from residential and other sensitive land uses.

II. Promotion of cleaner production
- increase the efficiency of industrial processes;
- promote energy and materials saving by adopting good manufacturing practices;
- use of improved quality fuels (e.g., with lower sulphur content) or switch to cleaner fuels such as natural gas; and
- adoption of new technologies.

III. Reduction of emissions in industry
- setting priorities by focusing on emissions from the major emission sources;
- emphasising on the requirements for use of cleaner fuels;
- highlighting the requirement for the use of – and providing an action plan for implementation of – best available technology for specific industrial processes.
- compulsory notification of accidents;
- strict licensing of specified polluting processes;
- to follow the norms of compulsory emission standards, as well as an enforcement strategy for such; and
- imposing strict fines for exceeding emission standards

3.3 Measures to reduce air pollution from area sources

Urban cities are faced with pollution from a number of area sources. Some of them can be due to natural occurrences like forest fires, dust from soil (due to dust storms) and others can be from manmade activities, like burning of biomass, open burning of waste, and dust from roads and construction sites. Measures to control these emissions may include:

- enforcement of bans on burning of materials or waste;
- promotion of alternative solutions to burning of waste.
- better waste management and monitoring; and
- proper strategies for paving roads, revegetation programs in dust control areas and use of street sweeping equipment

It is preferable to execute actions that result in high effectiveness and make use of shorter implementation periods and low costs, as opposed to actions that may result in highly effective outcomes but also require high costs and longer implementation periods. A source model can be an effective tool to evaluate certain particular promising scenarios incorporating a select combination of options. Model predictions should particularly focus on hotspots. Discussing alternative plans with stakeholders should also be encouraged to finalise on adopting the most appropriate one. For example, a discussion about the fuel quality improvement program can be done with petroleum oil companies or automobile manufacturers can be consulted about the provision for stricter norms for vehicle manufacturing and use. The choice between adopting technology-based options (cost-intensive) versus management-based options (less costly but may be difficult to enforce) will always be a dilemma. As a guiding principle, it is advisable to adopt cleaner technologies as their impacts are long-lasting.

In 2012, China published the new Ambient Air Quality Standards (GB 3095-2012). In response, the State Council issued and implemented the 2013-2017 Action Plan for Air Pollution Prevention and Control (also known as the Ten Measures), with a special focus on PM2.5. The Action Plan designated air quality targets for Chengdu, which included PM10 and PM2.5 concentration targets of 97μg/m3 and 58μg/m3, respectively.

Chengdu's Action Plan identified the following emission reduction measures to effectively address pollution sources and meet its assigned air quality targets:

1. Industrial structure adjustments: accelerated the upgrade of traditional industries, gradually optimized industrial structures and advanced the development of 13 major industries, thereby beginning the formation of a modern industrial system.
2. Energy structure adjustment: cutting the consumption of high-polluting fuels, controlling total coal consumption, and increasing the proportion of clean energy consumption
3. Air pollution control in industrial sector: accelerated the desulfurization, denigration and dedusting upgrade in thermal power, steel and iron, cement, non-ferrous metal smelting, plate glass and other major sectors.
4. Fugitive dust pollution control: established a fugitive dust management system, implemented engineering measures, conducted online monitoring of construction sites, conducted gridded micro-station monitoring, strengthened road dust pollution control, enhanced fugitive dust control from construction waste transportation.
5. Mobile source pollution prevention and control: eliminating vehicles which do not comply to emission standards, promoted new energy vehicles, implementing environmental label management for off-road machinery, and strengthening exhaust control and prevention
6. Straw burning control: implementing ban on burning and providing guidance for utilizing straw into fertilizer, feed, aggregate, raw materials, fuel.

Aside from the regular emission reduction measures cited above, Chengdu issued the Heavy Pollution Emergency Response Plan of Chengdu (Trial). This included a list of companies that should halt or limit production every year as well as measures on warning measures, health protection and pollution reduction for each emergency alert level.

Since implementing the Action Plan from 2013 to 2017, Chengdu has seen continuous air quality improvement. It has increased 96 days attaining air quality standards and decreased 38 heavy pollution days, attaining compliance to standards for 64.9% of the year.

Source: Chengdu Municipal Environmental Protection Bureau (2018)

4

Government of India Policies that integrate Clean Air Action Planning

4.1 Forty – Two Points Action Plan for Control and Mitigation

In 2015, the Central Pollution Control Board (CPCB) directed the implementation of Forty – Two points Action Plan, to mitigate air pollution in major cities. These comprised of action plans to counter air pollution including control and mitigation measures related to vehicular emissions, resuspension of road dust and other fugitive emissions, biomass/ municipal solid waste burning, industrial pollution, construction, and demolition activities.

A multipronged and integrated approach was the need of the hour and urgent steps were required to be implemented to improve air quality. Thus, after much consultations with the states, the CPCB formulated these short- term and long- term mitigation measures, in an effort to improve the air quality of the cities.

4.2 National Clean Air Program

In 2019, the Ministry of Environment, Forest and Climate Change launched the National Clean Air Programme (NCAP). This program is a long – term, time-bound, national level strategy to tackle air pollution across the country in a comprehensive manner.

The target of NCAP is to achieve 20% - 30% reduction in Particulate Matter (PM) concentration by 2024 keeping 2017 as the base year for comparison concentration.[1]

---

[1] *MoHUA (2020). Long-Term, Time-Bound, National Level Strategy to Tackle Air Pollution-National Clean Air Programme (NCAP). Press Information Bureau. [Online] Accessible at: https://pib.gov.in/PressReleasePage.aspx?PRID=1655203*

There are several initiatives which are being taken under the NCAP:

I. Augmenting Air Quality Monitoring Network.
II. Air Quality Management Plans for Non-Attainment Cities
III. Indoor Air Pollution Monitoring and Management
IV. National Emission Inventory
V. Network of Technical Institutions
VI. Technology Assessment Cell
VII. Institution Framework.

The NCAP proposed to formulate time bound clean air action plans for the identified 102 Non – Attainment[2] cities as a need was felt to design city specific action plans, catering to the specific requirements of the respective cities to control specific air pollution sources. The city action plans were to be formulated under the NCAP and guided by the objectives and desired outcomes proposed under it. This was to be done through multidimensional actions by bringing several implementation agencies together to work as a collective group. Other important aspects of the clean air action plans for cities include expansion of ambient air quality network, source apportionment studies, public awareness, grievance redressal mechanism and sector specific action points.

It was clearly expressed that these action plans need to be guided by a comprehensive science-based approach involving:

---

[2]*Non – attainment cities are those cities which have failed to meet the National Ambient Air Quality Standards for over five years.*

- Identification of emission sources
- Assessment of extent of contribution of these sources
- Prioritising the sources that need to be tackled.
- Evaluation of various options for controlling sources with regard to feasibility and economic viability.
- Formulation of action plans

Figure 3 Key Components of NCAP, 2019

There are currently 132 Non – Attainment Cities which have been identified, out which 122 city action plans have been prepared and approved by the Central Pollution Control Board.

The non-attainment cities prepare action plans detailing how to build internal capacity and achieve clean air. In 2018, the National Green Tribunal (NGT) directed a state-level six-member committee called the Air Quality Monitoring Committee, comprising of Directors of Environment, Transport, Industries, Urban Development, Agriculture, and the Member Secretary of Pollution Control Boards, for the purpose of preparing the city clean air action plans.

The National Clean Air Programme is a collaborative programme, and requires multi-scale and cross-sectoral coordination between central ministries, state governments and the local bodies. They need to assist each other in devising, implementing, executing and monitoring the NCAP through their respective city clean air action plans.

4.3 Implementation of NCAP (as defined by MoEF&CC)

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 abatement 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 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. The 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-benefits 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. The main purpose of this committee would be to give overall guidance and directions to agencies executing the action plans to ensure effective implementation of the programmes.

5

Co-benefits and Integration of Clean Air Action Plan and Greenhouse Gases Mitigation Plan

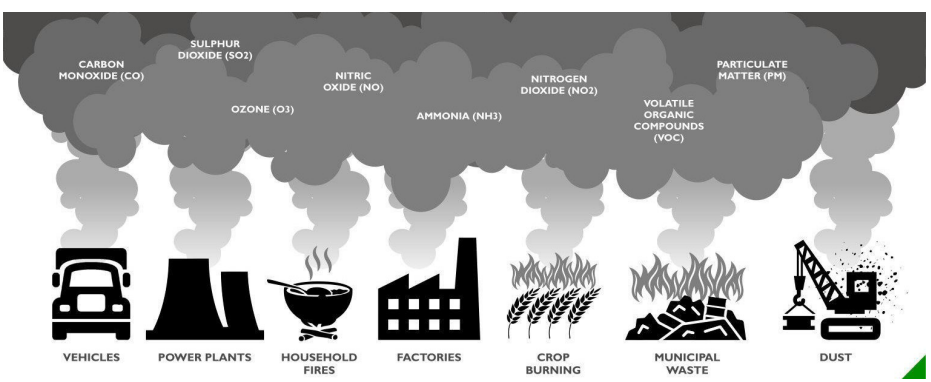
Air pollutants can be defined as a collection of unwanted substances in the ambient air in high concentrations that cause adverse effects to health and environment. Additionally, greenhouse gases (GHGs) trap heat in the atmosphere, causing global warming and climate change). Air pollution and climate change are closely interconnected. As shown in Figure 5, air pollutants and GHGs are produced by the same sources – fuel combustion in transport, power generation, household activities, industries; crop and municipal waste burning.[1]

However, there is a clear difference in the spatial scales between air pollution and GHGs. Ambient air pollutants generally stay in the atmosphere for a short period (e.g., a few days or weeks), while GHGs such as CO2 and CH4 have a lifetime of approximately 150 years and 12 years, respectively (ibid).

Interaction of air pollutants and GHG emissions in the atmosphere, results in a variety of direct and indirect health and environmental impacts at the local, regional, and global level. Air pollutants cause direct impacts while GHGs lead to climate change with indirect effects on human health and the environment (ibid).

[1] *German International Cooperation [GIZ] and Clean Air Asia. (2015). Handbook for Clean Air Management in Smaller Cities. Pasig City, Philippines: Clean Air Asia.*

Figure 4 Common Sources of Air Pollutants and Greenhouse Gases



Source: askhowindia.org

Gases such as black carbon, hydrofluorocarbons and methane are identified as short-lived climate pollutants (SLCPs). These are separate from the traditional definitions of air pollutants and GHGs. Although SLCPs remain in the atmosphere for a much shorter duration than carbon dioxide (CO2), they are powerful climate forcers. Their potential to warm the atmosphere is many times greater. Certain SLCPs are also air pollutants, having harmful impacts on human health, agriculture, and ecosystems.[2]

---

[2]*Climate and Clean Air Coalition (2021). Short-Lived Climate Pollutants. [Online] https://www.ccacoalition.org/en/content/short-lived-climate-pollutants-slcps accessed on 21st May 2021*

Providing integrated solutions for addressing the issues of climate change and air quality has benefits of large cost reductions in public health and reduced risks to the ecosystems. This approach also allows for a more realistic accounting of potential impacts of a proposed policy or measure, along with maximising the use of available resources. In this case, it involves considering the emission reduction for both air pollutants and GHGs as shown for some of the measures below in Table 3.

Table 3 Examples of measures to reduce emissions of air pollutants and GHGs,

Measure	Effect on air pollutants	Effect on GHGs
Switching from coal to natural gas for power generation	Emissions of sulphur dioxide (SO2) and nitrogen oxides (NOX) are reduced	Reduces carbon dioxide (CO2) emissions for each kilowatt generated
Efficiency improvements in domestic appliances and industrial processes	Reduces emissions of both types of pollutant, but efficiency measures sometimes result in increased demand, which must be avoided	
Energy conservation (use less energy)	Reduces emissions of both air pollutants and GHGs	
Use of new technologies in road transport, e.g. • hybrid vehicles • hydrogen from natural gas or from renewable energy sources • lean burn petrol vehicles fitted with nitrogen oxide traps	Reduces emissions of NOX and particulate matter	Reduces CO2 emissions for each kilometre travelled
	It is essential that the whole fuel/ vehicle cycle is analysed (e.g., the emissions associated with hydrogen generation)	
Demand management/ behavioural change: improved public transport coupled with disincentives for private car usage.	Reduces emissions of both air pollutants and GHGs	

Source: Clean Air Asia (2016)

Co-controlling air pollution and GHGs will be more effective than targeting each one individually, particularly for developing countries in Asia where economic and social development is a higher priority than climate change mitigation.[3] However, it is important to note that measures targeting air pollution and GHG emission reduction also contribute to economic and social development, such as cost savings on health care, reduction deaths and diseases attributed to air pollution, improvement in food security and overall environmental sustainability. Consider that many cities have a master plan for urban development.

The master plans will clearly demarcate the areas designated for land use, zoning, infrastructure development, plying of transport etc. As the plans are city specific and will differ based on factors like density of population, total area of the city, geographical factors, industrial production, agricultural production and many more, pollution sources and priorities, will vary accordingly. Keeping these in mind, it will be important to incorporate the CAAP and align it with the city's master plan to avoid any policy and implementation conflicts.

A good method of ensuring this is to incorporate specific air quality objectives into city development plans. The aim of this plan is to ensure the sustainability of finance mechanisms necessary to fund ongoing air quality action planning and implementation.

[3]*German International Cooperation [GIZ] and Clean Air Asia. (2015). Handbook for Clean Air Management in Smaller Cities. Pasig City, Philippines: Clean Air Asia*

6

Case Studies

6.1 Dehradun Air Action Plan

A comprehensive Air Action Plan has been announced under the National Clean Air Programme (NCAP) to overcome the challenges faced in improving air quality in over a hundred non-attainment cities.

Clean Air Asia and Pollution Central Research Institute under the guidance of Uttarakhand Environment Protection and Pollution Control Board (UEPPCB) prepared Clean Air Action Plan for the City of Dehradun.[1]

The objective of the clean air action plan is to meet the prescribed annual average ambient air quality standards in a stipulated time frame.

Methodology

Clean Air Asia (CAA) developed a comprehensive analysis tool for understanding the air quality management status in cities – the Clean Air Scorecard Tool (CAST). CAST is an excel based tool which incorporates three indices:

i. Air Pollution and Health,
ii. Clean Air Management Capacity, and
iii. Clean Air Policies and Actions,

The methodology used to prepare the Clean Air Action Plan was to first conduct a need assessment for the city. The exercise was carried out with the help of the Clean Air Scorecard Tool (CAST).

---

[1]*Central Pollution Control Board, Dehradun Air Action Plan, (2021) Uttarakhand Environment Protection and Pollution Control Board (UEPPCB)*

Figure 5 CAST Indices

Source: Clean Air Asia

Using CAST for making an assessment, the following observations were made for the city of Dehradun:

- The city of Dehradun had only three manual monitoring stations which would calculate ambient air quality of three pollutants – PM10, NOx and SOx. This is insufficient as several other pollutants and factors need to be considered while calculating the Air Quality Index (AQI) or issue advisories. Thus, this aggravated the fact that there is a need for city specific health effects studies and assessment.
- There is a lack of city specific source apportionment and emission inventories. Source Apportionment study is an important tool in framing policy as every city has different sources of pollution depending on the city specifics.

- Though there are policies in place to improve the air quality, there is a need to facilitate collaborations across departments at the city level so that air quality actions can be mainstreamed in all urban development related decisions. There is a need for all relevant agencies and stakeholders to work collectively for effective results.

Stakeholder Consultation

A Stakeholder Consultation was organised between different concerned parties to address the issue of Air Quality in Dehradun. The discussion was centred around identifying the steps/actions that need to be taken in order to prepare an effective Clean Air Action Plan for the City of Dehradun. The discussion also highlighted the need for a collective involvement of different stakeholders in the planning process.

The consultation identified that the main sources of air pollution in the city were:

- vehicular emissions,
- open air burning of municipal solid waste,
- dust from construction and demolition,
- resuspended dust.

As an outcome of the consultation:

- The Pollution Control Research Institute, in 2016-2017, undertook an intensive study to measure baseline pollutants and air toxic levels at different locations of Dehradun city which includes residential, industrial, background (reference), commercial and sensitive areas. The study included monitoring ambient air quality for 30 days continuously for three seasons (summer, post-monsoon, and winter) at seven identified locations in the city where air monitoring stations were installed.
- The Chief Secretary appointed UEPPCB as the nodal agency to facilitate co-ordination amongst the transport department, municipal corporation, forest department, public works department, traffic police and other relevant agencies to identify actions for CAAP

Outcome

A sector- specific Clean Air Action Plan for the City of Dehradun was devised after numerous consultations and under the guidance of UEPPCB, Clean Air Asia and PCRI.

The total time period envisaged for the Dehradun Clean Air Action Plan is a period of 5 years. The estimated time for the implementation of the specified actions were divided into 3 sets of time periods:

Short – actions completed in less than 6 months
Medium – actions realised between 6 – 12 months
Long – actions taking more than 2 years or greater
Graded Response Action Plan

6.2 Graded Response Action Plan

Delhi and the National Capital Region (NCR) has been plagued by high levels of air pollution for many years now. This becomes clearly visible during the winter months. To address this problem, a Graded Response Action Plan or GRAP was formulated for Delhi –(NCR). It is a set of stratified actions that are triggered in response to specific pollution levels.

In 2016, after the festival of Diwali, the city of Delhi – NCR woke up to a thick layer of smog and the air quality levels had reached a severe category. Following this incident, on 10th November 2016, the Supreme Court2, directed the Central Pollution Control Board to evolve a definitive plan of action to respond to the severe level of pollution in Delhi - NCR. On November 25, 20163 CPCB submitted the completed draft of the Graded Response Action Plan (GRAP) to the court. As per the court's directive, this was further modified by the CPCB. On December 2, 2016 the court directed the Central Government to examine the GRAP and issue appropriate notification. Hence, on January 12, 2017 the Ministry of Environment, Forest, and Climate Change (MoEF&CC) notified GRAP under sub-section (1) of section 3 of the Environment (Protection) Act, 19864.

The GRAP is a set of measures which was prepared for implementation under different Air Quality Index (AQI). The pollution levels are divided into four categories for which specific actions need to be taken when the pollutants indicate reaching harmful levels as prescribed in the AQI. Each of the specified measures are implemented by the different expert agencies identified and given the requisite responsibility. The Supreme Court has mandated the Environment Pollution (Prevention and Control) Authority (EPCA) to implement the GRAP which will further delegate the responsibility to the concerned departments.

The four categories of air pollution levels as per the Air Quality Index are:

I. MODERATE TO POOR
   Moderate – PM2.5 is between 61µg/m3 – 90µg/m3
   PM10 is between 101µg/m3 – 250µg/m3
   Poor – PM2.5 is between 91µg/m3 – 120µg/m3
   PM10 is between 251µg/m3 - 350µg/m3

---

[2] *Order dated 10th November 2016, Writ Petition (Civil) No. 13029 of 1985, M.C. Mehta vs. Union of India and Others.*

[3] *Order dated 25th November 2016, Writ Petition (Civil) No. 13029 of 1985, M.C. Mehta vs. Union of India and Others.*

[4] *Graded Response Action Plan, 12th January 2017, Central Pollution Control Board*

II. VERY POOR
PM2.5 is between 121µg/m3 – 250µg/m3
PM10 is between 351µg/m3 – 430µg/m3

III. Severe
PM2.5 is above 250µg/m3
PM10 is above 430µg/m3

IV. Severe+ or Emergency
When PM2.5 crosses 300µg/m3 or PM10 crosses 500µg/m3 (5 times above the standard) and persist for 48 hours or more

6.3 China's National Clean Air Action Plan

China had been making continuous efforts and is building its capacity for CAAP[5] development for the past few years. The CAAP in China can be categorized by scope (national, regional, provincial, or city level), duration (five-year plan, three-year plan, and one-year plan) and focus area. In January 2013, almost one-sixth of the Chinese territory was covered in dense air pollution. This episode prompted the Chinese government to take active steps to improve the air quality of China. On 12th September 2013, eight months after the air pollution incident, China's State Council released its Action Plan for Air Pollution Prevention and Control (Action Plan). The Action Plan has a tenure of 5 years (2013 – 2017) and sets the roadmap for air pollution and control for this period in China with a focus on three key regions – Beijing-Tianjin-Hebei area (Jing-Jin-Ji), Yangtze River Delta (YRD) and Pearl River Delta (PRD). The Action Plan release was reported publicly by state media on the website of the China central government, Xinhua News Agency, and CCTV as a crucial step forward for air pollution prevention and control in China.

General requirements

Chinese government plans to establish a new air pollution prevention and control mechanism that will incorporate enterprises' initiatives, market drivers, and public participation. This new mechanism is based on the concept of regional management and stage by stage control, which promotes joint industrial structure optimization, science and technology innovation, and quality economic growth. The goal is to achieve environmental, economic, and social benefits, and strive to build a beautiful China.

Goal

The main goal of the Action Plan entailed an improvement in the overall national air quality after the 5-year initiative. It also stated that heavily polluted days shall be reduced dramatically and regional air quality in Jing-Jin-Ji, YRD, and PRD will be improved. It proposed that through a follow-up initiative lasting another five years or even longer, there will be less and less heavily polluted days until they are eliminated, and the national air quality is improved significantly.

---

[5]*Clean Air Asia (2016), Guidance Framework for Better Air Quality in Asian Cities, Pasig City, Philippines*

Specific indicators

The specific indicators stated that by 2017, the urban concentration of PM10 shall decrease by 10 percent compared to the year 2012, and the annual number of days with good air quality will gradually increase. It also aimed at reducing the concentration of PM2.5 in Jing-Jin-Ji, YRD and PRD region and estimated a fall in pollution levels by around 25 percent, 20 percent, and 15 percent, respectively. Fine particulate matter annual concentration in Beijing was to be maintained at a controlled level below 60 µg/m3.

Measures

In June 2013, 10 measures – called the National 10 Measures – were disclosed in a strongly worded statement by the State Council to prevent and control air pollution. The Action Plan is the detailed implementation strategy of the National 10 Measures:

- Increase efforts of comprehensive control and reduce emission of multi-pollutants
- Optimize the existing industrial structure and promote industrial restructuring.
- Accelerate the technology transformation and improve the innovation capability
- Adjust the existing energy structure and increase the sources of clean energy supply
- Strengthen environmental thresholds and optimize industrial layout
- Improve environmental economic policies through the market mechanism
- Improve law and regulation system; carry on supervision and management based on law
- Establish the regional coordination mechanism and the integrated regional environmental management body
- Establish monitoring, alerting, and emergency response systems for air pollution episodes
- Clarify the responsibilities of the government, enterprise, and society; mobilize the public to participate in environmental protection

Mechanism Development

Establishment of regional collaboration mechanisms in Jing-Jin-Ji and YRD with the participation of provincial governments and relevant central ministries in the region;

Air pollution monitoring and alert systems will be established together by environmental protection and meteorological agencies.

New incentives

Central government will publish a list of 10 best and 10 worst air quality cities every month. Targets for PM2.5 in three key regions and PM10 in other key areas will be considered as compulsory targets in the social and economic development objectives for provinces and be part of the performance evaluation indicators for provincial leaders.

Supporting National Action and Planning on Short-lived climate pollutants in Ghana

The Need for National Planning

Ghana was among the primary nations that started the Climate and Clean Air Coalition (CCAC) in[1] 2012 recognizing they had officially settled that they needed to adjust advancement to supportability, and the CCAC had comparable objectives. The government of Ghana perceived the need for a worldwide collaboration and decided to incorporate ecological concerns and environmental change in the Ghana Shared Growth and Development Agenda, Ghana's national four-year design.

National planning is expected to interface the numerous exercises happening in various divisions to comprehend what they mean for SLCP mitigation. This information is spread between the distinctive services and should be arranged and examined in one area. Change of human wellbeing is an imperative territory for Ghana, which is simple for individuals to get a handle on. To accomplish these upgrades Ghana's primary concentration is to build an economical pathway for growth as they believe that by keeping the environment intact, the health of the people can be protected. In general, the SLCP national arranging process is laying out particular advances that Ghana will take to change the vision of agreeable improvement and maintainability into action.

Getting Started

In Phase I of SNAP, the Ghana EPA Environmental Protection Agency (EPA) created emissions, assessed benefits and distinguished critical SLCP measures as a major aspect of a draft national plan. There is no political support of the plan, however numerous things are going on in numerous parts actualizing measures laid out in the draft design. In the following period of national plan, Long-range Energy Alternatives Planning – Integrated Benefits Calculator (LEAP-IBC)[2] will be moved up to help the methodology advancement and to additionally install the SLCP measures in various arrangement fields. This arrangement will go about as a vital report for the Ghana EPA and the Ministry of Environment, Science, Technology and Innovation (MESTI) empowering them to monitor advance on SLCP alleviation, which is done by the distinctive services in charge of the diverse transmitting segments.

---

[1] *Ghana - National Planning on short-lived climate pollutants CCAC (2016)*

[2] *LEAP-IBC is an integrated planning tool to help governments jointly assess greenhouse gases, short-lived climate pollutants (SLCPs) and other air pollutant emissions; build mitigation scenarios; and understand how emission reductions benefit climate, health and crops (Stockholm Environment Institute, 2019)*

Taking Action

The national arrangement being created with SNAP support goes about as a key archive for the Ghana EPA and the Ministry of Environment, Science, Technology and Innovation (MESTI) to monitor advance on SLCP moderation, which is done by various ministries in charge of the diverse emitting sectors. Ghana saw the National Determined Contributions (NDCs) as a critical chance to execute measures important to SLCP moderation, as it contains measures on transport, vitality, waste and cookstoves, all pertinent to SLCP alleviation. An inter-ministerial group (from energy, petroleum, transport, agriculture, forestry and finance) is assuming responsibility to create methodologies to accomplish the NDCs and subsequently address SLCP discharges simultaneously. Advancing in the SNAP procedure, Ghana will additionally insert SLCP measures in various arrangement territories, for example, the Ghana Shared Growth Agenda stage 2 (from 2013-17) which perceives strategy activities pertinent to diminishing SLCPs.

Addressing Transport. Ghana will make new feasible transport measures and execute them through the national transport arrangement. It is making new vehicle and engine outflow models, which is vital advancement is the inclusion of the private segment in vehicle street value assessments, which can likewise test emission levels.

Reducing HFC use. Ghana has made a Green Cooling Program to encourage the substitution of high-GWP HFC aeration and cooling systems with low-GWP HFC units. As of 2018, they have introduced 30 units in houses and open workplaces that have inbuilt observing abilities to record the productivity of these new choices contrasted with the fundamental units accessible available.

Harnessing the Sun. One of the main focus points of this action plan is to harness the power of the sun and use solar energy to improve air quality. A total of 200,000 solar energy-based lanterns were distributed to families across Ghana to replace lamp fuel lights. This test programme was conducted with an idea to increase the market share of solar energy powered lamps by the year 2018, thereby promoting the use of clean fuel-based lamps, resulting in reduced emissions.

Monitoring and Evaluation. Ghana initiated a 'Ghana 40-year design' starting in the year 2018. The objective was to integrate critical NDC and SLCP activities into one design plan. As of now, it is undergoing a cross-sectoral discussion to incorporate feedback and suggestions from different ministries.

Financing change. Generally, access to reliable finance is a test for residential and other enterprises. These are unsafe investments for the banks as the returns from such ventures have long turn around periods and they also include distributing extensive and numerous individual loans.

7

Exercise

Prioritizing Implementation Activity in CAAP

The objective of this exercise is to engage smart city officials on how to understand the problem and prioritizing the activity based on the problems/ source of pollution during implementation. The prioritization of activities is an important part in Clean Air Action Planning.

Listed below are some measures cities can adopt under CAAP. Please prioritize the activities as per high, medium or low priority.

Source Groups	Actions	High Priority	Medium Priority	Low Priority
Vehicular Emissions	Implementing scrapping policy for old vehicles.			
	Preventing parking of vehicles in non-designated areas			
	Augmenting Public Transport in city			
	Incentivizing the use of cleaner fuels – electric vehicles and CNG/ PNG for Private Vehicles			
	Launch drive against any vehicle with visible smoke coming out of it and ensure strict compliances			
	Good traffic management including re-direction of traffic movement to avoid congestion.			

Source Groups	Actions	High Priority	Medium Priority	Low Priority
Dust Control	Adopting and implementing dust control measures for all types of construction - buildings and infrastructure.			
	Enforcing restrictions on construction activities within urban airshed zones during high pollution period			
	Ensuring carriage of construction material in closed/ covered vessels.			
	Promoting the use of prefabricated blocks for building construction			
	Strict enforcement of CPCB guidelines for construction (use of green screens, side covering of digging sites, etc.)			
	Increasing green cover in the region			
	Regular cleaning of road dust			

Source Groups	Actions	High Priority	Medium Priority	Low Priority
Waste Management	Regular collection and control of municipal solid wastes			
	Regular check & control of open burning of bio-mass, plastics, garbage, leaves etc.			
	Implementing strong public outreach programme to promote household and community-based composting system (composting pits, shredders etc.)			
	Implement citizen reporting application – reporting of garbage/ municipal solid waste burning through mobile based applications and other social media platforms			
	Identify garbage burning locations and strict enforcement Municipal Solid Waste Management Rules, 2016 regarding prohibition of garbage burning			
	Recycling plants for dry waste.			
	Establishing waste to energy plants (WTE)			
	Transportation of municipal solid wastes, construction materials and debris in covered system			

Photo Credits - Amit Chivilkar on Unsplash

8

List of Reading Materials

1. Air Quality Process Cycle, United States Environmental Protection Agency,
   The process of managing air quality can be depicted as a series of interconnected elements. An acceptable level of a pollutant in the air, for example, that will protect public health. Goals and strategies are reviewed and evaluated on a regular basis based on their effectiveness.
   https://www.epa.gov/air-quality-management-process/air-quality-management-process-cycle

2. Clean Air Asia, Guidance Framework for Better Air Quality in Asian Cities, Pasig City, Philippines
   The Guidance Framework serves as a cornerstone document of Clean Air Asia's Integrated Programme for Better Air Quality in Asia (IBAQ Programme), which supports countries and cities in implementing the Guidance Framework through a range of targeted interventions, including knowledge-sharing platforms to strengthen regional collaboration, capacity building activities such as trainings, study tours and city twinning, and technical assistance at both the national and subnational levels
   https://cleanairasia.org/sites/default/files/2021-05/3. Guidance Framework for Better Air Quality in Asian Cities.pdf

3. Clean Air Initiative for Asian Cities (CAI-Asia), “Clean Air Action Planning in Chinese Cities: Hangzhou and Jinan Cases”. Pasig City, Philippines
This report documents the project’s activities and results in relation to recommending improvements to the Clean Air Action Planning for Jinan and Hangzhou. The report will generally follow the chronology of activities as follows: scoping of Clean Air Action Plans in CAI-Asia City members, desktop research on International and Local Best Practices of Clean Air Action Plans, and preparation of an overview of what could/ should be included in CAAPs by Chinese cities.
04-Clean-Air-Action-Planning-in-Chinese-Cities-Hangzhou-and-Jinan-Cases.pdf(learning-cleanairasia.org)

4. German International Cooperation [GIZ] and Clean Air Asia. (2015). Handbook for Clean Air Management in Smaller Cities. Pasig City, Philippines: Clean Air Asia.
The Clean Air for Smaller Cities (CASC) module supports selected medium-sized cities in developing and implementing clean air plans
http://sutp.transport-nama.org/files/contents/documents/resources/J_Others/GIZ_Handbook_for_Clean_Air_Management_in_Smaller_Cities.pdf

References

- GIZ. (2020, January). *Steps towards Safer Streets: A Non-motorised Transport Network Plan for Coimbatore.*
- India Today. (2020, October 14). Cycle sales increased two-folds during coronavirus lockdown in India, say industry experts. India Today. *https://www.indiatoday.in/business/story/cycle-sales-increased-two-folds-during-coronavirus-lockdown-in-india-say-industry-experts-1731551-2020-10-14*
- ITDP India. (2019, April). Complete Streets Framework Toolkit. *https://www.itdp.in/resource/complete-streets-framework-toolkit/*
- Kumar, K., Roychoudhary, A., & Malhotra, A. (2015). Non-Motorised Transport Policy in India. GIZ.
- Luke, N., Tak, R., Samios, A., & Adriazola-Steil, C. (2020, September 10). What Makes a Child-Friendly City? Redesigning Safer and Healthier Urban Spaces for Young People. The City Fix. *https://thecityfix.com/blog/what-makes-a-child-friendly-city-redesigning-safer-and-healthier-urban-spaces-for-young-people-nikita-luke-rohit-tak-ariadne-samios-claudia-adriazola-steil/*
- Singh, K. (2018, October). Mobility and NMT in Sustainable Urban Development – Role of City Developers.
- Tiwari, G., & Jain, D. (2013, August). Promoting low carbon transport in India: NMT Infrastructure in India: Investment, Policy and Design. UNEP.
- Vandy, K. (2020, October 2). Coronavirus: How pandemic sparked European cycling revolution. BBC News. *https://www.bbc.com/news/world-europe-54353914*

Endnotes

- 1Open Government Data Platform. [Online] Available at: (*https://tinyurl.com/vn7fsg6*)
- 2NITI Aayog and RMI, 2018. Moving Forward Together: Enabling Shared Mobility in India. [Online] Available at: *https://www.niti.gov.in/writereaddata/files/document_publication/Shared-mobility.pdf*

Notes:

Notes:

Ministry of Housing and Urban Affairs
Government of India