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NCAP SERIES

REVIEW OF
COMPREHENSIVE AIR QUALITY ACTION PLAN
KOLKATA

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Summary

Cities with poor air quality across India, which do not match the National Ambient Air Quality Standards of 2009, have been identified as non-attainment cities. They have been ordered to form "city action plans" for reducing air pollution levels and meeting the standards within six months. Committees constituted by their respective state governments have formulated action plans for non-attainment cities, which serve as a roadmap for specific tasks to be performed.

This report is a review of such a plan prepared for Kolkata. It offers a critique of the policy measures pushed through the city action plan. Secondary literature analysis finds that Kolkata's action plan takes a city-centric approach to demarcate pollution sources while ignoring major emissions from nearby industrial regions. This process is faulty—emissions outside city limits have a significant role to play in its overall air quality.

Such perceptions exist partly due to inadequate monitoring of air quality. Kolkata only has seven monitoring stations when it requires at least 16, as per some estimates. This means that only some sources of pollution are accounted for while others are ignored.

Lesser data leads to limited knowledge, skewed observations and therefore poor planning for pollution control. For the plan to work, it must be backed by better monitoring. The city's distinct features, such as the less polluting tram system, must be considered during formulation of the action plan instead of a "one size fit all" approach.

Key Findings:

- The plan misses the opportunity to capitalise on the pre-existing tram rail system, which is an emission-free mode of public transport. Instead, its public transport interventions follow trends of adding GPS and IT-based fleet monitoring.

- The plan also does not speak about completing the planned metro routes to encourage public transport usage or adding electric rickshaws for last-mile connectivity.

- High number of prior Environmental Clearances for construction projects means that the city will see increasing construction and demolition (C&D) waste. Despite this, the action plan has no provision for building a processing facility to deal with C&D waste. As per the Construction and Demolition Waste Management Rules, 2016, Kolkata should have commissioned such a facility by September 2017.

Background

It is hardly a thing to celebrate for the "city of joy". Kolkata has been ranked the sixth most polluted city in the world by the 2019 World Air Quality Report. Poor air quality is especially alarming because the city has favourable meteorological conditions: proximity to the sea and high rainfall. Kolkata has also been included in the list of "non-attainment cities" by the Central Pollution Control Board (CPCB). Non-attainment cities are those where the level of air pollution is more than the National Ambient Air Quality Standards (NAAQS), 2009[1].

The National Green Tribunal in an order from October 2018[2], directed state governments to constitute their respective Air Quality Monitoring Committees (AQMCs) for preparation of air quality action plans for the "non-attainment cities" in the state. The objective of this was to meet the NAAQS within six months of finalizing the said action plan.

The Government of West Bengal constituted a ten-member AQMC on December 5, 2018[3] for preparing the Air Quality Action Plan for Kolkata. A meeting of the committee was held on December 27, 2018 following which the Comprehensive Air Quality Action Plan for Kolkata (hereinafter referred to as 'action plan') was prepared.

Objective

The present paper aims to review the action plan prepared for Kolkata city. The objective is to critically evaluate the effectiveness of the plan in meeting the NAAQS 2009.

Salient Features of Action Plan

The proposed action plan comprises of short-term, medium- and long-term programmes, intended to reduce the number of vehicles on roads and vehicular emission; ease out traffic congestion by proper management of traffic and a parking policy; and emission reduction from various industries, incinerators and generator sets. The plan also proposes a ban on garbage burning; collection of horticulture waste for composting; replacement of coal with clean fuel at roadside eateries, hotels and restaurants; control and reduction of road dust emission through blacktopping of roads, mechanical and vacuum based street sweeping; increasing green cover and plantation; control of construction dust by covered transportation of construction materials; decentralised collection system for construction and demolition waste; restricting roadside storage of construction materials and implementation of Construction and Demolition Waste Management Rules, 2016.

Salient Features of City Action Plan

- Introduction of five CAAQMS
- Introduction of 80 electric buses
- Restriction on plying & phasing-out of 15 year-old commercial and transport vehicles
- Infrastructure expansion for LPG/CNG/ battery-operated vehicles
- Bulk transport of coal through water-ways
- Reform of Pollution under Control Centres for vehicle testing

1. A total of 102 cities have been identified as "non-attainment cities" in India in 2018 based on the non-compliance with respect to NAAQS 2009 and based on the list of polluted cities from the WHO data of April 2018
2. In matter of News Item Published in "The Times of India" authored by Shri Vishwa Mohan Titled "NCAP with Multiple Timelines to Clear Air in 102 Cities to be released around August 15" (OA 681 of 2018)
3. Vide Notification No. 3678/EN/(1-10)/3C-38/2018 dated 05/12/2018

Observations

A. City-limit approach questionable

The actions proposed in the action plan are limited to Kolkata city. Even though it details previous actions taken by its neighbouring Howrah Municipal Corporation, the plan does not propose any new initiative for the Howrah industrial belt. Notably, this is a severely polluted area with a Comprehensive Environmental Pollution Index (CEPI) Score of 61.76[4] located 15 kms from Kolkata. There are large numbers of re-rolling mills, metal casting foundries[5] located 10-15 kms away. Therefore, movement of gaseous pollutants from these industrial belts should be expected. Liluah industrial area, located only 11 kms away, also hosts several re-rolling mills. The steel re-rolling sector is known to emit SO_x (oxides of Sulphur), NO_x (oxides of Nitrogen) and CO (Carbon Monoxide). A study of three steel re-rolling mill sites in Hyderabad city in Sindh Province of Pakistan reveals mean concentration of SO_x, NOx and CO in the order of 0.35, 0.280 and 6.333 parts per million (ppm) respectively. The workers who were exposed to these air pollutants suffered from chronic diseases related to breathing and allergies (Noonari et al., 2016).

Metal foundries are also known to emit a variety of Hazardous Air Pollutants (HAP) depending upon the metal used and the final products. For example, iron and steel foundries that produce low alloy metal castings primarily emit lead and manganese with smaller amounts of cadmium, chromium, and nickel. Iron and steel foundries that produce high alloy metal or stainless steel castings have significant emissions of chromium and nickel. Organic HAP emissions include acetophenone, benzene, cumene, dibenzofurans, dioxins, formaldehyde, methanol, naphthalene, phenol, pyrene, toluene, triethylamine, and xylene (NESHAP, USEPA, 2020). Exposure to these substances has been demonstrated to cause adverse health effects, including cancer and chronic or acute disorders of the respiratory, reproductive, and central nervous systems, as claimed by the United States Environmental Protection Agency (NESHAP, USEPA, 2020).

Eastern Bench of National Green Tribunal in its order dated August 11, 2016 in the matter of Subhas Dutta Vs. State of West Bengal & Ors (OA No. 33/2014/EZ), has also directed the West Bengal Pollution Control Board (WBPCB) to look at the source apportionment study for the twin cities together owing to their proximity.

In addition to this, Bandel city, which has been categorised as a "Severely Polluted Area" with a CEPI score of 67.64, is located at a distance of 53 kms. Bandel also has a thermal power plant. Given this, the action plan for Kolkata must revisit its city-limit approach to pollution reduction.

B. Inadequate air quality monitoring stations

The action plan has proposed five Continuous Air Quality Monitoring Stations (CAAQMS)[6] to cover the entire city. It is impossible to understand the city's air quality with just five additional stations, especially for the extended part of Kolkata under the Kolkata Metropolitan Development Authority. For example, the clusters of Rajpur-Sonarpur, Madhyamgram-Barasat and Rajarhat-Newtown under New Town Kolkata Development Authority (NKDA) are some locations seeing

4. According to a report submitted by CPCB at the NGT, in the matter of News item published in "The Asian Age" Authored by Sanjay Kaw Titled "CPCB to rank industrial units on pollution levels" (OA No. 1038/2018), indicating the latest CEPI scores for 100 polluted industrial areas/clusters monitored during 2018
5. Brief Industrial profile of Howrah District, West Bengal can be accessed from http://dcmsme.gov.in/dips/HOWRAH_wb.pdf
6. Action Point No. 8.1.1 of Comprehensive Air Quality Action Plan for Kolkata – Air Quality Monitoring- short term priority action

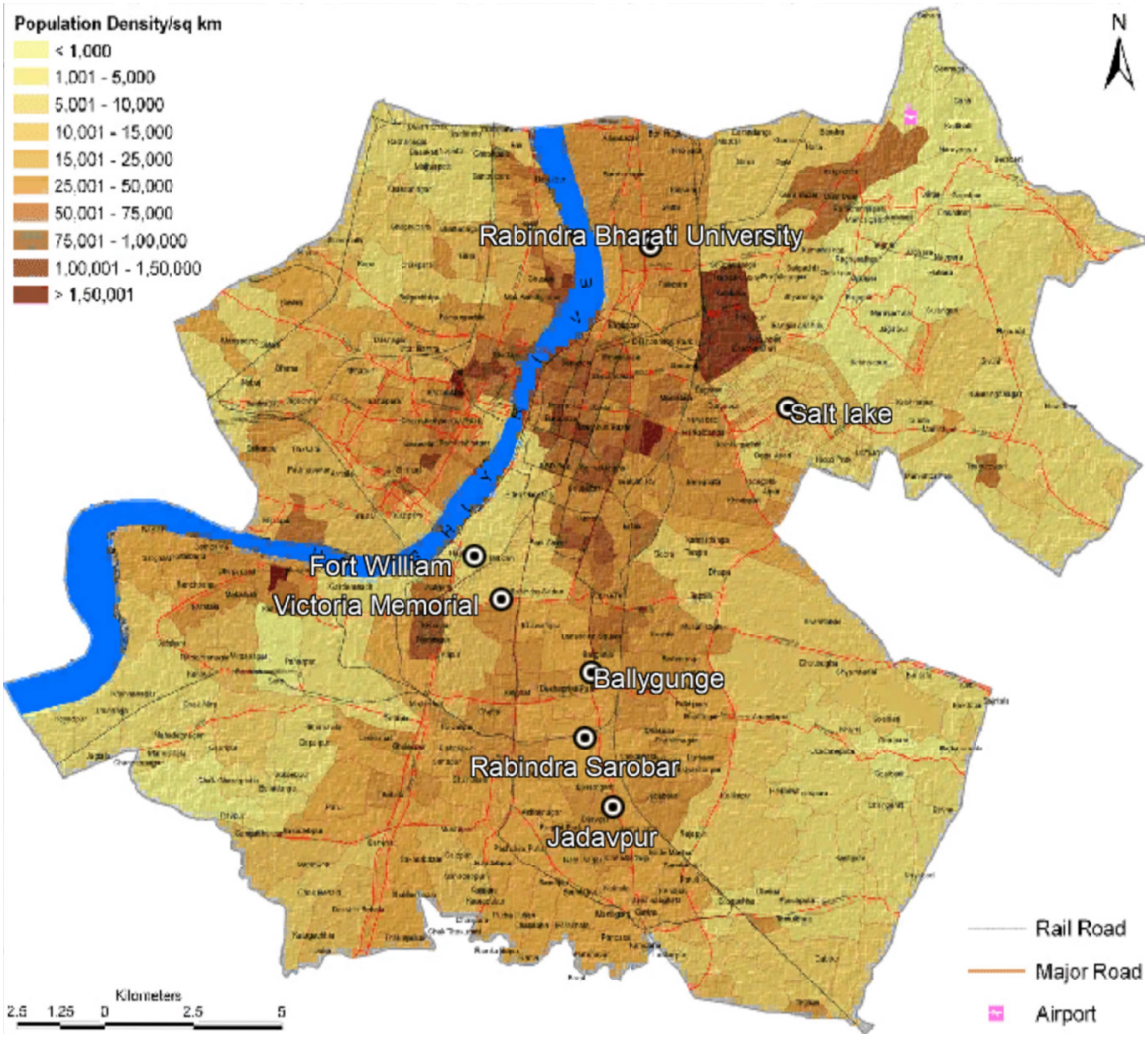
more construction due to emerging residential townships and therefore, installing CAAQMS here is necessary.

According to the "Guidelines for Ambient Air Quality Monitoring" (CPCB, 2003) by CPCB, Kolkata should have 19 monitoring stations based on its population, which should include manual and continuous monitoring stations. In reality, the city has surpassed that number and has 21 manual monitoring stations and seven continuous monitoring stations. At a time when continuous real-time data on air quality is the pre-requisite for public awareness as well as decision-making, more manual monitoring stations defeat the purpose. This is because the manual monitoring stations record data only twice a week as compared to continuous recording by CAAQMS.

According to a study conducted by Urban Emissions, as of September 2019, Kolkata needed 16 CAAQMS[7], whereas there were only seven such stations as of January 2021.

A superimposed map of CAAQMS locations over the population density map of Kolkata shows that none of the stations caters to the densely populated areas of the city.

Figure 1: Location of CAAQMS superimposed on population density map of Kolkata



Base map source: https://www.researchgate.net/figure/Population-density-distribution-of-Kolkata-after-data-from-Census-India-2011_fig4_307728337

7. http://www.urbanemissions.info/india-air-quality/india-ambient-monitoring-data/

C. Reducing vehicles and emissions on roads

i. Poor public transport strategies

In Kolkata, more than 80% of the population uses public transport. The cultural acceptability of public transport can provide the impetus to shift from polluting diesel buses and taxis to low emission vehicles.

The state transport department issued an order[8] restricting 15-year-old commercial and transport vehicles from plying on the city roads[9]. It also directed phasing-out of 1,13,890 vehicles by October 2018[10]. However, there was no push to add public transport vehicles along with this. As per the action plan, only 80 electric buses[11] are to be added to the city transport system for reducing vehicular emissions. Simply removing older vehicles without adding to public transport system will only lead to purchase of new private vehicles.

The action plan document has claimed that 88% people in Kolkata are dependent on public transport facilities like bus, tram, rail, metro etc[12]. However, the plan has largely remained silent on improvement of this system. The addition of only 80 new buses is neither going to improve the public transport system nor change the air quality unless the old polluting vehicles are completely replaced.

The action plan has proposed introducing battery-operated three-wheelers as feeders for last-mile connectivity[13]. However, there is no plan for replacing hand-held and man-pulled rickshaws in the action plan. The traditional hand-pulled rickshaws are not only inhumane, they also harm the health of rickshaw pullers. An epidemiological study of occupationally-exposed population[14] of Kolkata was conducted by Chittaranjan National Cancer Institute (CNCI) to assess the health impact of chronic exposure to vehicular air pollution. This study revealed the prevalence of Chronic Obstructive Pulmonary Disease (COPD) among the traffic police (5.3%), road-side hawkers (3.7%), auto rickshaw drivers (3.6%), bus drivers (5.1%) and garage workers (7.1%), as compared to rural control population (0.7%). The case for reduced lung function was similar: it was more prevalent among bus drivers (56.4%), traffic police (51.8%), street hawkers (40.9%), auto-rickshaw drivers (48.8%) as compared to the rural control population (18%) (Ray et al., 2009). Though the study did not cover the hand-held rickshaw puller community, health impact is unavoidable given the nature of exposure. Under these circumstances, the policymakers should develop a timeline for phasing-out handheld rickshaws and replacing them with battery-operated three-wheelers.

08. Transport Department vide Order No.2827-WT/3M-86/2009 dated 13.08.2012
09. Buses, Mini buses and Meter Taxis
10. Para 5. A of Comprehensive Air Quality Action Plan for Kolkata – Traffic Management
11. Action Point No. 8.2.1 of Comprehensive Air Quality Action Plan for Kolkata – Medium term action to reduce vehicular emission
12. Para 4 of Comprehensive Air Quality Action Plan for Kolkata – Major Source of Air Pollution in Kolkata
13. Action Point No. 8.2.1 of Comprehensive Air Quality Action Plan for Kolkata – Medium term action to reduce vehicular emission
14. Traffic police, road side hawkers, auto rickshaw drivers, bus drivers and garage workers

In the name of public transport strategies, the transport department and Kolkata traffic police are working towards multi-modal and multi-use bus depot with charging stations and maintenance workshops, enforcement of bus lanes, installation of Global Positioning System (GPS) units and Information Technology (IT) system in buses, bus-stops and control centres etc[15]. None of these measures can improve the public transport system unless adequate replacement vehicles are added commensurate with the phased-out vehicles. With continuous expansion of the city limit, many areas are not even connected with adequate buses to cater to the passengers' needs. Given this, modernising the fleet management system with insufficient fleet size and inadequate public transport system will not reduce the pollution levels. Instead, this will lead to increased use of personal vehicles and taxis, eventually increasing pollution levels.

An emission inventory study titled APnA[16] City programme by Urban Emissions, carried out for $PM_{2.5}$ emission during 2018-2030, substantiates this further. According to this study, vehicular exhaust contributed 14% of the total $PM_{2.5}$ emissions in 2018, which will increase to 22% by the year 2030 (Guttikunda, 2019).

In the name of improving pedestrian and cycle movement, there is only one action proposed, the Dakshineswar Skywalk[17]. This is a standalone project, and cannot reduce the pollution level in any manner. There are many pedestrian-heavy road stretches where traffic congestion is common. There needs to be a comprehensive plan to construct suitable paths for pedestrians. It should also be ascertained whether a skywalk is a cost-effective way to facilitate pedestrian movement.

ii. Poor planning and implementation of tram and metro systems

The city action plan talks about optimizing the fleet usage of tramways and increasing service frequency and integration of the existing metro system with bus services[18]. No further strategic discussion was there in the action plan to improve this zero-emission mode of transportation. The action plan has given a timeline of June 2019 for the execution of this activity. However, in reality, there is a gradual disappearance of existing tram lines and tram depots, as opposed to increasing fleet optimisation and frequency. The West Bengal transport department has hardly put any effort into revamping this emission-free mode of transport. An example of the Great Smog of London of December 1952 is worth quoting here. The emission-free tramlines were rapidly usurped by the internal combustion engine and the last London electric tram was replaced by a diesel bus on July 5, 1952, just five months before the Great Smog. By December, 8,000 new diesel buses were on the roads, adding their fumes to the winter fog. Dr Barrty Gray, a chest physician at Kings College Hospital described the change from electric trams to diesel buses in the 1950s as "a disaster [that] has had a huge impact on the health of Londoners" (Smedley, 2019).

The revival of trams has helped in reducing transport sector emissions in many cities worldwide. San Francisco is an established leader in low emission transport, wherein more than half of the city municipal railway fleet, consisting of buses and light rail, is comprised of zero-emission vehicles (San Francisco, 2011). Istanbul's urban metro and light rail network has also undergone

15. Para 8.3 of Comprehensive Air Quality Action Plan for Kolkata - Strategies to reduce vehicle numbers on roads –
16. India – Air Pollution Knowledge Assessment (APnA) city programme
17. Para 5.B (xi) of Comprehensive Air Quality Action Plan for Kolkata – Provision of Cycling and Walkways through the two cities & Action Point 8.2.1 – Medium term action to reduce vehicular pollution
18. Action Point No. 8.3.3 of Comprehensive Air Quality Action Plan for Kolkata

an expansion reaching 230 kms by 2015, as the city believes that the negative impacts caused by the need and want to "be on the move" like air pollution, noise, greenhouse gas emissions can be mitigated by an efficient public transport system. The daily passenger rate of all urban rail traffic is about 700,000 passengers. Istanbul expected 25% reduction in projected emission level by 2015 (Hennig, 2011). In Australia, the Sydney Light Rail plays a key role in enabling Sydney's transport future by taking thousands of commuters between Sydney's Inner West, Central and South Easter suburbs[19].

The Melbourne tram system has 501 vehicles that travel a total of 24.8 million kms each year. A study says cities that use light rail have 41% lower energy use per passenger per km than bus cities; 18% lower automobile passenger kilometres per capita; 23% lower transport emissions per capita; and 38% fewer transport death (Ludlam n.d.).

The city of Calgary in Alberta, Canada has also opted for the light rail network to replace cars. It estimates that when stage 1 of the Green line Light Rail Transportation (LRT) is complete, it will reduce carbon emissions by 30,000 tonnes, every year—that's the equivalent of taking 6,000 vehicles off the roads (Buck, 2019).

Given these developments worldwide, Kolkata should explore revamping tramways, given its pre-existing infrastructure. The building cost of an air-conditioned tram, introduced some years back, was INR 20 lakhs[20], whereas the price of one electric bus ranges from INR 85 lakhs to INR 1 crore[21]. This means four air-conditioned trams can be built and placed on the city road at the cost of one electric bus. Therefore, the city should invest more in upgrading the existing tram tracks and depot, and increasing air-conditioned coaches, instead of only considering the costlier electric buses.

The case of Kolkata's metro railway service is similar. Kolkata was the first Indian city to have metro railways. The glory of the past is however no more, as the city has not been able to make any of its new metro routes (other than one small patch of just six stations, covering approximately 4.5kms) operational. Construction of planned routes has also not been completed, unlike other cities.

Figure 2: Tramways are a zero-emission mode of transport

Credit: Ritwick Dutta

19. https://sydneylightrail.transport.nsw.gov.au/
20. https://economictimes.indiatimes.com/industry/transportation/shipping-/-transport/colonial-era-trams-in-kolkata-getting-new-lease-of-life/articleshow/49348816.cms?from=mdr
21. https://www.thehindubusinessline.com/economy/with-prices-skidding-electric-buses-on-road-to-making-a-mark/article22911695.ece#:~:text=The%20nine%2Dmetre%2Dlong%20electric,and%20%E2%82%B92.1%20crore%2C%20respectively.&text=The%20prices%20of%20the%20winning,powered%20inter%2DState%20transport%20buses.
22. Action Point No. 8.11.2 of Comprehensive Air Quality Action Plan for Kolkata

D. Construction waste not managed

The action plan stated the need to implement the Construction and Demolition Waste Management Rules, 2016[22] as part of control measures for construction dust. Notably, implementation of various provisions of this Rule has been mandatory under the Environment (Protection) Act, 1986.

It is imperative to note here that according to the Schedule III (to be read with Rule 13) of the Construction and Demolition Waste Management Rules, 2016, cities with population of one million and above have to ensure commissioning and implementation of the construction and demolition (C&D) waste management facility within 18 months, i.e. by September 2017. Kolkata, being in this population group, should have commissioned the facility by September 2017. The city action plan has also given a timeline of June 2019 for implementation of provisions of the Construction and Demolition Waste Management Rules, 2016. In spite of this, the city does not have any preparedness to deal with its C&D waste, according to the information received from the Kolkata Municipal Corporation under the Right to Information Act, 2005. It says that the city has just invited Expression of Interest (EOI) for a C&D waste processing plant. This is highly alarming because the dust from construction sector is a major contributor to air pollution in the city. The APnA City programme study by Urban Emissions found that dust contributed to 12% of the total $PM_{2.5}$ emissions in 2018, which will increase to 14% by 2030 (Guttikunda, 2019).

Moreover, the city has the maximum number of prior environmental clearance (EC) for building and construction projects among all sectors in 2019, which means an increase in construction waste and its rampant dumping. Prior EC is mandatory for construction projects having a built-up area (BUA) of 20,000 square metre and above. So, there are projects with BUA less than 20,000 square metre that do not require prior EC, but may generate construction and demolition waste. Therefore, management of construction and demolition waste from these projects is also a necessity.

Thus, it is important to at least have a facility for the collection, storage and processing of such waste. The city action plan has completely missed this crucial intervention.

Conclusion

The city action plan of Kolkata will largely remain unsuccessful in meeting its objective of controlling and abating air pollution. It has only taken into account limited polluting sources due to a city-centric approach. Getting a clear picture of pollution hotspots is of utmost importance and therefore, expanding the existing air quality monitoring network with CAAQMS should be given priority. The regulatory agencies must consider the distinctive features of the city in the planning process. Reviving the tramways should be an immediate priority, as it is an emission-free mode of public transport. Citizens' disposition to use public transport provides a strong foundation to improve the public transport infrastructure. Instead of spending on GPS and IT-based modernisation of fleet management system, the city should focus on increasing the fleet size.

22. Action Point No. 8.11.2 of Comprehensive Air Quality Action Plan for Kolkata

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