

Clearing the Haze

An analysis of air quality improvements
in six smart cities in Maharashtra



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Foreword

We are pleased to publish this report on the actions taken by Smart Cities to address the issue, any crisis being faced, with regards to air pollution. Our finding, in a nutshell, is that the actions taken are superficial and unlikely to address the problem. This represents a wasted opportunity.

The NCAP refers to actions that can be taken up by non-attainment Smart Cities. The SCM was also built around the idea of leveraging technology to solve difficult problems being faced by cities – so called “smart solutions” – through a Special Purpose Vehicle mechanism for fast, efficient deployment, using the power of the private sector and public participation. Air pollution is one such complex problem that cities have been unable to tackle, and which could have been taken on harnessing the power of technology – for monitoring, modelling and developing public outreach systems. Sadly, our investigations show that the Smart Cities Mission lacked the foresight or intent to do this, and the actions proposed, such as they are, are mostly token efforts. They lack the rigour of analysis and the “smart” use of resources to pinpoint the actions and have data-driven, evidence-based approaches that measure the results of the actions and fine-tune them as you proceed.

Our investigations also revealed three more significant issues.

Firstly, the Smart Cities Mission structurally lacks the capacity to fundamentally conceive and execute “smart solutions”. Our engagement with the Smart City Corporations gave us the impression of them being consultant-driven and often dis-connected from the Urban Local Body; they do not have the overarching “view” of the city to be able to plan cross cutting actions that can address multi-sectoral problems like air pollution. They were found to lack the authority, the leadership and the staff to be able to do anything more than individual projects. Systems reforms, critical to solving intractable problems such as air pollution, we conclude, are well outside its reach.

Secondly, one of the key characteristics of a “Smart City”, its reliance on data- and technology- driven solutions was found completely missing. We found it very difficult to get any data on projects, their status, moneys spent etc. In fact, we found no systems in place and getting even basic information boiled down to personal visits and even the need to resort to Right to Information applications – even the latter failed to work. One of our main sources of information about projects and their status came from following up directly with the Smart Mission Director, using essentially our good relationship with the officer in question.

Thirdly, civil society across all the cities unanimously attested to the lack of information available to the public, the opacity of the manner in which the Smart City Corporations operated and the absence of any accountability. All CSO stakeholder interviews revealed a general sense that the Smart City Corporations have utterly failed to deliver and their disconnect from the public at large.

We believe and suggest that the Smart City Mission can still play an important role in addressing air pollution, not just in non-attainment cities, but in all mission cities. The Smart Cities Mission Directorate must create a framework for this, based on consultations with experts. Such a framework would contain guidelines for greater monitoring (already identified as a lacuna in almost all cities), modelling and information dissemination. Identifying some key actions that will have a predictable and measurable impact on pollution levels can be one immediate outcome. But perhaps more than anything, creating greater public awareness and concern about the issue will be an even more significant outcome and driver for future change.

1 Executive Summary

Cities have always been smart - problem solving has been at its crux. Earlier, smart solutions were largely engineering solutions - they were about identifying civic issues and finding ways to fix them. Through trial and error, finding the best alternative solution both in terms of cost and time has always been crucial to the sustainability of a city. Today, though accepting that smart cities have no universal definition, smart has mostly been equated with digital/ technology based solutions. Emphasis and priorities in terms of execution are on the technological component of the mission such as the command and control centres, CCTV cameras, intelligent traffic management system (ITMS), electronic displays without understanding whether the basic services on which these technological maneuvers can be superimposed are even in place. It is common to witness ironic situations in these smart cities such as electronic display boards displaying random, out of context messages, command and control centres shut down for want of information or operational expertise, smart bus shelters without enough buses and so on. Activist Sunita Narain aptly summarises the situation when she says that the smart cities programme needs to reinvent its entire urban planning process even if only for the reason that it's fallacious to assume creating assets makes a city smart. Its air should be breathable, roads walkable, and it should be built anticipating disasters that happen once a century. The programme needs to avoid repeating the mistakes of current city planners, not build on them¹.

This study conducted in six non-attainment smart cities of Maharashtra, namely, Aurangabad, Pune, Nashik, Nagpur, Solapur and Thane intends to find out the impact of the Smart Cities Mission on air quality management. The smart city proposals of these cities were studied to find out if they had any air quality component, and progress on the same was sought from various sources such as meetings with officials, other stakeholders in the six cities and through applications made under the RTI Act.

Among the features of smart cities, air quality remains an important one, which connects to many other urban issues such as solid waste management, open spaces and green spaces, transportation and land use. A brief analysis of the smart city proposals for these 43 cities however, finds one wanting more recognition of the said connections in coming up with smart solutions to improve air quality. With much ground gained in information technology, data collection and analysis, and networking, the city should be capable of providing systems to manage an integrated air quality plan for a city. This becomes key to strengthen institutional capacity, and enables addressing of the issue in an organised manner.

In air quality management, focus has largely been on displaying air quality as a single numerical entity and a color code at most, setting up low-cost monitors, generating data - but not necessarily thinking about how to use this data to come up with a plan to tackle air pollution. Similar is the situation with the Air Action Plans made by cities under the National Clean Air Programme (NCAP). The actions based on these are very generic - and not city specific. It is only 'smart' to first find out the sources of pollution in a city and then strategically tackle the source or sources of the largest pollutant source first.

The Central Pollution Control Board (CPCB) has so far conducted source apportionment studies (SAS) only once for six cities (Kanpur, Pune, Bangalore, Chennai, Mumbai and Delhi), the report for which was submitted in 2009-10. The analysis was conducted for the years 2000-2006/29. The MPCB has commissioned NEERI and IIT (Bombay) to do source apportionment studies for 10 cities within Maharashtra in 2017¹, but neither the results nor the progress of these studies has been reported anywhere. It is quite evident then, that the first step of problem solving in terms of air quality, has not been given much importance in the smart cities mission or even by the city authorities.

Building further on source apportionment is the concept and practice of air quality modeling. Modeling takes into account not only the direct source of pollution but also takes into account various other factors such as weather, wind which affect dispersion of pollutants. Modeling allows a city to be smart because it is able to forecast pollution and suggest precautionary measures as also to ascertain which pollutant sources need to be managed at certain times to improve air quality. There are various organisations in India venturing into this practice, but very little has been done to integrate this as a crucial groundwork before making action plans to improve air quality in cities.

It was also found from interviews with officials and civil society organisations that cities are not really equipped to undertake holistic action against air pollution. Some cities have an environment officer in the municipal corporation and air quality management is one of the many issues in the mandate of urban environment. Officials generally voiced the opinion that merely having one environment officer for the whole city, without a team was insufficient². They are often overburdened with work, as environment is an umbrella term for so many civic issues like air pollution, water pollution, green cover and so on. In the absence of sufficient manpower and expertise and a strong mandate to enforce decisions, the scope of this person's work is reduced to merely producing the Environmental Status Report for the city and other disconnected tasks which do not improve the larger scenario.

Communication, or actually the lack of it, came out as another clear shortcoming in the quest for improving air quality. In all the cities visited and studied, civil society representatives said that the perception among the general public, and at times even officials, that air quality was fine, made it a non-issue. Acceptance of the issue is probably the first hurdle in the process of air quality improvement. It was found that air pollution isn't a priority issue for people. The way air quality communication is being done presently is obviously not very effective. In many cities, it was found that for all the low-cost monitors being put up under the mission, there was little clarity on how this data would be used. How to make sense of information is the most crucial part if that information is to be put to any use. But that seems completely missing in the smart city scenario. Civil society activists questioned the mindless production of such data through the mission, and the uselessness of it in the absence of intelligent analysis³.

The Smart Cities Mission was also about convergence⁴ of different existing schemes like the Swachh Bharat Mission, AMRUT and so on. In keeping with this approach, the National Clean Air Programme (NCAP)⁵ also speaks of working through the mission to address the issue of air pollution in the 43 smart cities. The NCAP mandates city specific action plans to be formulated for implementing mitigation actions. Cities have already prepared action plans in consultation with the Central Pollution Control Board (CPCB). Institutional framework at Centre and State level consisting of an Apex Committee at the Ministry of Environment Forest and Climate Change at the Centre and at Chief Secretary level in the States were to be constituted as of January 2019⁶. This committee was established in April 2019, with the Secretary, Union Environment Ministry chairing it. So far, how this connection or convergence will work out has not been found in any defined guidelines or course of action. Some city action plans have delegated some measures for pollution mitigation to smart city corporations in their cities, while some action plans have no mention of the smart city corporation at all.

The action plans submitted by the cities under the NCAP are hardly being implemented, pertaining to the fact that there are no deadlines for its implementation and the general lethargy about air quality improvement in cities. A quick analysis of the action plans in the context of smart cities reveals that there isn't much convergence as such between these two. Thane doesn't yet have an approved action plan and the Aurangabad action plan doesn't outline any role for the smart city corporation. The remaining four cities have varying roles for their smart city corporations, but again in the absence of a clear deadline, those roles do not translate into action.

Since even basic monitoring continues to be a challenge in many cities, proposing scientific mitigation solutions like pollution source apportionment studies, emissions inventories, and air quality modeling seems a far cry. This kind of data driven solution would have been the most apt project for a smart city proposal, but this seems to have been missed by most cities and the mission itself.

The issue of non-convergence between the corporation and the smart city prevails, and Pune is a glaring example of it. When the smart city decided to install low-cost monitors, neither the Corporation nor the IITM were consulted at the time of purchase or the setting up of these monitors. Currently, the 50 low-cost monitors lie severely underutilized, as there is no authority who can certify their data, when in actuality, they could have been used to supplement and enrich the data the city is already putting out. If the Corporation can get these monitors standardized and calibrated according to the required guidelines even now, the city could well use these readings and increase their area-wise outreach with respect to the locations of these monitors.

While this study was focused on air quality, a general pattern of lack of transparency in data about the mission was observed. An academician rightly observes⁷ that while smart cities were supposed to bring data and transparency to urban development projects, in the Indian context however there is no clarity of what data is being collected, where it resides or how citizens can access it to help improve the functionality of the city. This lack of transparency about data and project implementation has been a problem in the Mission which is striking, because previous urban development programmes did upload systematic and regular updates on their website.

2 Introduction

The launch of the Smart Cities Mission in 2015 was as much of a political statement by the newly elected BJP Government as much as an infrastructure development programme. While there were speculations about the government simply renaming the preceding and ongoing Jawaharlal Nehru National Urban Renewal Mission (JnNURM), the Smart Cities Mission was unveiled as a completely new avatar of urban development. At the launch of the Mission, on June 25th 2015, Prime Minister Narendra Modi said that urbanisation must be viewed as an opportunity to mitigate poverty and that cities are the 'growth engines' of our country⁸. Among other things, he described the Mission as being people-centric, encouraging bottom up approach, participatory, democratic and enabling devolution of power to urban leadership.

At the launch of 14 new projects at Pune, later in 2016, the Prime Minister said that there cannot be a transformation as long as we take things in bits and pieces. We need to adopt a comprehensive, inter-connected and vision-oriented approach⁹.



Smart Solutions (Source: Government of India)

While stating that there is no universal definition of a smart city, according to the guidelines¹⁰, the objective is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'smart' solutions. The focus is on sustainable and inclusive development and the idea is to look at compact areas, create a replicable model which will act like a lighthouse to other aspiring cities.

Inaugurated with much fanfare and lots of publicity, doubts¹¹ about its efficacy started being expressed mid way in 2017, focusing mostly on under expenditure of funds. The mission duration has now officially ended, in 2019, and calls urgently for an appraisal of performance. A report card on the mission was to be released in October 2019¹², though news sources now mention June 2020 to be the new deadline to release this report card¹³.

Independent appraisal of any sort has been an ambitious task with the lack of credible, centralised data from the 100 cities. Ironically, smart cities which thrive on data as a concept, do little to actually deliver it on ground. Reports and analyses by civil society organisations so far have thus relied only on the smart city proposals and secondary data received from news articles and applications made under the Right to Information act. Notable among the studies using this approach are 'India's Smart Cities Mission: Smart for Whom? Cities for Whom?' by the Housing and Land Rights Network¹⁴ and 'An Overview of Smart Cities Mission in India'¹⁵ by the Centre for Policy Research. The picture painted by these reports is not very positive. The mission statement and guidelines seem out of place when seen in reference to the state of our cities today. Relying heavily on technological solutions for civic problems without addressing the underlying systemic, procedural and administrative facets of issues has resulted in failure for the mission to deliver on various fronts. Not just under expenditure of funds, meaning that projects haven't taken off or maintained pace indicates an issue with either the plans (proposals) or the execution mechanism (SPV).

Some analyses have been attempted on the performance of smart cities with a special focus on urban poor and the benefactors of this mission. News reports have generally focused on completion of projects indicated mostly by money spent. But very little can be found in terms of the qualitative impact of the smart city mission, and the objectives it set out to achieve.

Air Quality and Smart Cities

Deteriorating air quality is probably one of the biggest hazards to human life, as it directly affects our health. India is one of the top most countries with poor air quality and according to a report¹⁶ published in 2018, out of the 30 most polluted cities in the world, 22 are Indian¹⁷.

Air quality has become a very visible civic issue in recent times, thanks to the hazardous living conditions it has produced in big cities like New Delhi, the capital of our country.

The National Clean Air Programme (NCAP) was launched by the Government of India to address the issue of urban air pollution. The main intent of this programme is to reduce particulate matter pollution by 20-30% by 2024. The program states that this will be achieved by creating public awareness, building capacity for air pollution management and increasing the air quality monitoring data for better mitigation. The programme had initially mandated the 102 non-attainment cities, which have now increased to 122, to prepare Air Action Plans, which will use these principles of the programme to create a city specific plan to reduce air pollution. A city is declared as non-attainment when its air quality fails to meet the National Ambient Air Quality Standards (NAAQS) set by the Central Pollution Control Board (CPCB).

It was also announced by the central government that the NCAP would use the Smart Cities Mission to leverage its goals of reducing air pollution, considering that 43 of the 102 non-attainment cities were also smart cities¹⁸.

The intention of this study is to find out the role of smart cities in mitigating air pollution and how they have fared in 6 non-attainment smart cities in Maharashtra, namely - Pune, Thane, Nasik, Nagpur, Aurangabad and Solapur. This means looking at the various layers of air quality management in cities, the centre's vision and plan about it, the governance impacts and causes and the role of the citizens in all of this.

3 Methodology

The Smart City proposals (SCP) of the 43 non-attainment cities were analysed to find out any air quality improvement related component in it. It was found that under the mission, air quality is an important criterion, and that all cities have to report the following aspects of it;

1. Base Assessment: The SCP template requires the cities to rate themselves on a range from 'scenario -1' to 'scenario - 4', 4 being ideal. They are also required to specify how they arrived at the self assessment
2. State their goal - which scenario they wish to achieve
3. Specify what they are doing under the mission to improve the air quality so as to reach their desired scenario

These three data points were culled from the proposal annexures, along with other metadata like population of the city, state, round of selection and so on. The third data point stated above was then taken as a reference to find out which projects were undertaken to improve air quality.

This basic information itself provided a robust database, albeit not very precise due to vagueness of project details in the smart city proposals, and lack of any other information to substantiate them. For example in Thane, one of the projects for air quality improvement is titled 'pedestrian improvements'. This description does not specify whether these would be footpaths, their length or whether they would be foot overbridges/ under bridges or anything else.

For a better understanding of the selected cities in Maharashtra, the Smart City offices were visited and observations were made by interviewing concerned officials and stakeholders along with analysis of data on actual ground completion.

Some information regarding projects was obtained by filing applications to the smart city corporation under the Right to Information. On review of information obtained through the Right to Information, a request (Annexure) was made directly to the Director of the Smart Cities Mission, Ministry of Housing and Urban Affairs, to obtain the specific information from different cities. The Director asked his support team to collate the information from the various smart cities and was then provided to us.

4 Overview of Non-attainment Smart Cities in India

A study of the smart city proposals, focusing on their current state of air quality and their objectives/ intentions under the mission provides some insight on the potential of the mission to address the air quality issue.

As described in the methodology, cities were required to evaluate their current state of air quality and determine their base assessment in the proposal. The base assessment doesn't follow a set pattern. Different cities have cited different data for the assessment. Common sources are air monitoring stations present, actual pollution levels and high vehicle ownership in the city. Some cities, for example Amritsar, state facts like existence of monitoring stations but absence of any data, which is ironic. Surprisingly, some cities like Nagpur and Kohima state that pollution is under permissible limits, which cannot be the case as they are all non-attainment cities. The question in this case is which 'limits' or standards are being followed under the mission guidelines. The mission guidelines loosely state that indicators used for base assessment should be from "reliable sources".

4.1 Inputs to achieve Scenario 4/ Ideal Scenario

These are specific actions that a city intends to take to improve air quality. A number of observations can be made from the database about these. Firstly, most projects related to air quality are found in the area-based development plan. Only 10 out of the 43 cities have some air quality improvement component in the pan-city plan (Ahmedabad, Vadodara, Gwalior, Aurangabad, Jalandhar, Ludhiana, Jaipur, Tiruchirapaly, Kanpur, Lucknow), most of which are related to the set-up of a command centre or procurement of buses in some cases. All cities have some transport component for mitigation of air pollution - it ranges from e-rickshaws, to green corridors, street design and bicycle sharing programmes.

Surprisingly, only four cities (Indore, Rourkela, Visakhapatnam, Jaipur) have a direct linkage project of air quality monitoring. However, there are cities where setting up monitoring stations has not been stated explicitly in the proposal but it has been done through allocations made for the command and control centre, and other provisions.

5 City Case Studies

5.1 Aurangabad

Aurangabad Smart City Development Corporation was formed in September 2016, after the city was chosen to be a smart city in the second round of the mission. The city has an area of 170 sq km and population of 11.75 lakhs according to the 2011 census.

According to media reports¹⁹ air quality has been unhealthy in Aurangabad for at least the past 5 years. Aurangabad has a considerable industrial cluster area. The city is also an industrial hub and is the largest automobile manufacturing center called the Marathwada Auto Cluster after the Mumbai-Pune industrial belt. Aurangabad has a very strong aluminium processing industry. Units there process upto 2,500 tonnes of aluminium per month. The region also hosts many seed and agricultural companies such as Nath, Mahyco, Seminis and Monsanto. Wockhart operates its largest bio-pharma plant in Aurangabad. Medium sized industry includes the textile and agro-processing sectors. Like several cities in India, the city is also trying to establish itself as an Information Technology center.

In terms of mobility, as mentioned in the Aurangabad Smart City proposal itself, Aurangabad is serviced by an insufficient fleet of 49 buses run by the MSRTC along 39 routes covering 155 km road length and a daily ridership of 12500 people. Commuters rely heavily on 25000 auto rickshaws plying in the city. The result means reliance on private vehicles which is an important pollutant source in cities. Rickshaws use petrol as fuel, also contributing to pollution.

In the Aurangabad Smart City Proposal, base assessment of current air quality is 2, which is average. To achieve ideal air quality, they have proposed the following measures.

Base Scenario 2

Basis of Base Assessment	Input/ Initiative that would move city to Scenario 4	Project Allocation (amount in crores)
Not mentioned	The city envisions public transport systems which would be working on clean fuels like LPG, CNG etc., supplemented by e-rickshaws and walk to work concept. Making provisions for NMT corridors in new developments.	Road Network incl. Cycle track (ABD) - 136.30 Smart Mobility (pan city project) - 110.2

On the basis of a visit made to the Aurangabad Smart City Development Corporation Ltd, following information about projects related to air quality was recorded.

5.1.1 Air Quality Monitoring

Though not explicitly mentioned in the proposal or the list of projects, low-cost monitors at 4 locations have been proposed under the SCM. Currently MPCB has manual monitors at two locations and proposes to set up two continuous monitoring stations in the city. CPCB website shows one monitoring station at More Walunj. As per data received directly from MoHUA, through the application made to the Mission Director, monitors are located at 5 locations and currently do not provide live air quality information.

Neither is any information related to air quality displayed anywhere in the city. A recent news article, however, reports that there are only two sensors fitted by the ASCDCL²⁰. This discrepancy between information officially given out and actual on ground situation is again a reiteration of the substandard data management in smart cities.

During Maharashtra Chief Minister Uddhav Thackeray's recent visit to Aurangabad²¹, it was announced that AQI will be displayed across the city from the smart monitors.

5.1.2 Status of proposed projects for air quality improvement

Public Bus System

A public bus system had been started by ASCDCL, with a fleet of 100 buses. However, these are regular diesel buses, and not ones running on LPG/ CNG as proposed. Senior Consultant from ASCDCL mentioned that the Aurangabad RTO does not have a procedure in place to give permits for buses running on CNG. So the fact that it was mentioned in the proposal indicates superficiality in the manner in which the plans were prepared. Prior to this, the city is recorded to have had only 25-30 buses operating on 11 routes by MSRTC²². The projects also show proposed construction of 150 bus shelters on PPP basis. Currently, three of these smart shelters are functional, with e-ticketing as one of its smart services²³.

There is mention of e rickshaws in the proposal as well, but a meeting²⁴ with the senior consultant at the smart city office confirmed that they were being explored only as a means to transport solid waste from the city to the dumping ground and not for transportation itself.

Smart Street Network

In terms of other projects proposed in the SCP for improving air quality, none related to mobility or road network have been taken up yet.

5.1.3 Public Participation and civil society presence

Air quality wasn't found to be a visible, significant issue in Aurangabad. This was evident not just from the meetings with officials but also from those with civil society representatives. Stakeholder meeting²⁵ with a civil society representative revealed not much knowledge of what the smart city corporation in the city was up to. He confessed being part of a public engagement exercise at the outset of the mission in the city, but post that there has been nothing he said. His perception was that ASCDCL was currently directionless with no one to lead it and resting on junior officials. While news articles do confirm this to be true in terms of lethargy in funds usage²⁶, other articles read - ASCDCL CEO and Aurangabad Municipal Commissioner Nipun Vinayak recently received an award of Best Smart City CEO by Smart Cities India Council²⁷. From various reports it looks like priority has been given to the Master System Integrator, which is like the command and control centre and the bus service. It has also been mentioned that the buses have been introduced as a private-public partnership with MSRTC.

There is no dedicated website of the ASCDCL, making it difficult for citizens and civil society alike to get any information about its plans and projects. A website²⁸ for the greenfield industrial city exists, which specifies that a separate SPV has been formed for its implementation.

5.1.4 Air Action Plan submitted under NCAP

The Air Action Plan of Aurangabad has no mitigation measures assigned to ASCDCL. None of the stakeholder interviews revealed any information on either the plan or the convergence between the two.

5.2 Nagpur

The Nagpur Smart and Sustainable City Development Corporation Limited (NSSCDCL) was formed in June 2016 to implement the approved smart city proposal. They have a functional website, but it lacks updated information on projects. The city has an area of 227.36 sq kms, with a population of 24,60,000.

The city has proposed the following projects, while making a very good self assessment of its air quality.

Base Scenario 3

Basis of Base Assessment	Input/ Initiative that would move city to Scenario 4	Project Allocation (amount in crores)
Ambient air quality parameters in the city are well within permissible limits. Average particulate matter is 54 micrograms per cubic meter against a limit of 100. Average CO concentration in the city is also less than 1.5 against permissible limit of 4.0	Implementation of metro and strengthening of bus based public transport will improve the mobility scenario in the city. Walking and cycling will be encouraged through provision of cycle tracks and pedestrian friendly footpaths.	Project Tender SURE (Road and NMT)-220, MOVE PEOPLE initiative (e-buses) -37, Smart Bus shelters-3, E-rickshaws-5

It is surprising to note that though Nagpur is considered a non-attainment city, the Nagpur Smart City proposal claims the ambient air quality parameters to be within the permissible limits, and categorises the city as 3 in the base assessment. More information on projects proposed to improve air quality follows.

5.2.1 Air Quality Monitoring

Currently, Nagpur has 6 AAQMS (Ambient Air Quality Monitoring System), 3 operated by CSIR-NEERI under NAMP (National Air Monitoring Program), and 3 by MPCB, and 1 Continuous Ambient Air Quality Monitoring System.

An installation of 10 Alcodex low-cost monitors in different locations of the city has been done under the SCM and the data is stored at the COC (Command and Control) at Nagpur. Although 51 Variable Messaging Systems are put up by the Smart City, the air quality related data displayed on it is from CPCB, and not what the monitors record. Plans to disseminate the air quality data through a web/ mobile application is a work in progress.

5.2.2 Status of proposed projects for air quality improvement

Smart Road Network: Project Tender Sure

This project under the Town Planning Scheme (TPS) envisages the Area Based Development (ABD) for around 1730 acres with a mix of commercial and residential areas. The focus here is on developing a Smart Road network wherein all the urban road elements are given equal importance and designed accordingly. The road standards under this project make it compulsory to include networked services like water, sewage, power, optical fibre cables, gas, and storm water drains under the road. 51 kms of road length has been stipulated for this development. The road will also have dedicated bicycle tracks (33 kms only), and the road width will vary from 12m to 18m and 24m to 32 m.

The Tender Sure proposal states that

- reduction in congestion due to better road design being one of the objectives, an improvement in ambient air quality is expected to be one of the outcomes of the proposed improvements.
- However, these may be offset by the projected increase in traffic.

- Since the project cannot directly influence the adverse impacts of the operation stage, the efforts are concentrated in reducing air pollution during the construction phase.
- Several provisions can be incorporated within the contract, through the provision of the Environment Management Plan, to ensure that the deterioration in air quality is limited to the maximum extent possible, thereafter listing out mitigation measures during the construction stage.

But during the operation stage, the proposal itself mentions that the air pollution mitigation capacity of the project is limited and subject to other factors. It only proposes additional measures like planting broad-leaved pollution resistant species, which can grow in high pollutant concentrations or even absorb pollutants which help settle particulates with their higher surface areas along with thick foliage, and which can reduce the distance for which particles are carried from the road itself.

It acknowledges that other measures such as the reduction of vehicular emissions, ensuring vehicular maintenance and upkeep, educating drivers about driving behaviour methods that will reduce emissions are far more effective in reducing the pollutant levels, but are beyond the scope of the project.

This project hasn't started yet. According to recent news, permission to cut trees for execution of the roads is underway²⁹.

MOVE PEOPLE initiative (e-buses)

The Smart City Proposal (SCP) Nagpur, has proposed procurement of 30 electric buses for PBBP (Pardi-Bharatwad-Bhandewadi-Punapur) area, which is their area chosen under the area based development part of the proposal. The electric buses will be procured for connecting the ABD area to the city centre of Nagpur city as an initiation to move people in Green technology and subsequently promote green technology to other parts of the city. NSSCDCL is liable to procure 30 buses and hand it to the Transport department of Nagpur Municipal Corporation. The department will be responsible for the appointment of Operator for operating these electric buses in PPP model. Only 6 buses have been procured so far. In other news, it can be found that NMC is to procure 40 e-buses³⁰.

Smart Bus shelters

10 Smart and interactive bus stops are proposed. The project is being implemented by NMC on PPP basis. The estimated cost of the project is Rs. 11.53 Crore. Out of 158 bus shelters, "smart elements" have been installed in 77 bus stops. There is no clarity on what these smart elements consist of.

E-rickshaws

100 e-rickshaws are proposed with an estimated cost of 5 crores. From the latest information received, so far only the feasibility report for this project has been completed.

Public Bicycle System

The city (Maharashtra Metro Rail Corporation Ltd) has also set up a public bicycle system, partnering with Bengaluru based company Bounce, in coordination with the Nagpur Metro stations. With this partnership, Bounce will be launching 150 cycles across Nagpur which will be fully functional and available across the city's four major metro routes. The riders can avail services at a nominal fee of ₹ 1 for 10 mins with ₹ 300 subscription fee for pedal and ₹ 4/10 mins with ₹ 600 subscription fee for electric³¹. (this isn't a smart city project but tender sure roads are proposed to encourage this project)

MoU with ICLEI South Asia

The Nagpur Municipal Corporation has signed an MoU³² with ICLEI South Asia in 2018 to implement the project "Accelerating climate action through the promotion of Urban Low Emission Development Strategies (Urban LEDS II)". The project will be implemented by ICLEI South Asia and UN-Habitat and is supported

by the European Commission. An ICLEI official sits in the NSSCDL office, presumably having a component in smart city projects too.

5.2.3 Public participation and civil society presence

As in other cities, people's involvement and awareness of air quality as an issue remained largely absent. However, civil society presence was found to be quite substantial, with two civil society organisations working on air pollution and monitoring as one of their core issues. One stakeholder view from a civil society representative³³ was that air pollution in Nagpur was the result of it developing at a fast pace. He specified that pollutants like SO₂, NO were well within permissible limits in the city; it was the particulate matter which was above limits. He felt this was an inevitable result of the construction activities which are part and parcel of developing infrastructure in the city like roads, Metro and so on. The two thermal plants in the city and the wind pattern also added to the pollution. He also stated that the monitoring of air quality is unreliable and they have also published a study to that effect recently. Another civil society representative³⁴ felt that air quality was not a people's issue yet. She said that no authorities, neither the NMC nor the NSSCDCL were concerned about the air quality in the city. All the projects described in the smart city proposal for air quality improvement were either in tender stage or not taken off at all. She commented on the fact that before anything else, the NSSCDCL should at least start making sense of the data they receive from the monitors they have installed.

5.2.4 Air Action Plan submitted under NCAP

The Air Action Plan has been prepared and submitted by the Nagpur Municipal Corporation. In the list of actions proposed, the following have been assigned to the NSSCDCL, jointly with other organisations like the RTO, NMC and so on;

- Launch extensive drives against polluting vehicles for ensuring strict compliance
- Launch public awareness campaigns for vehicle emission control through proper vehicle maintenance, minimising use of personal vehicles, lane discipline etc. stopping of engines while idling in intersections- Traffic Engineer, NMC/Smart city Advertise Deptt. NMC MSRTC- NMC buses, display boards at various traffic intersections to be used for the advertisement

The smart city corporation has been entrusted with the task of communication and awareness about air quality. The task seems quite broad based including enforcement of traffic rules, vehicle emission standards as well as behavioural change in terms of minimising personal vehicle usage. It is evident that these two or three tasks mentioned above require strategizing at different levels altogether to achieve the goals mentioned. Whether the smart city corporation or the NMC is equipped to do this is doubtful. Also, in the absence of deadlines, these action items are meaningless and the plan itself quite toothless. A civil society representative³⁵ commented on the plan saying "There is a huge issue with implementation. There is no coordination between stakeholders. The structure that has been suggested by the CPCB for implementation wherein the local bodies are supposed to coordinate and take monthly review doesn't work at all as no stakeholder is actually responding to the local body. The responsibility needs to be shared. Each stakeholder is responsible for implementing their own part. There is no clarity of funds coming in for various works. Due to lack of funds and manpower the implementation of the Air Action Plan has become a big question mark."

A steering committee under the NCAP has been set up in Nagpur. The Municipal Commissioner is heading it with the Police Commissioner, District Collector, Chief Engineer, NMC, Municipal corporation representatives, NEERI, District Health officer, RTO, MPCB Registration officer, etc being the other members of the Committee.

5.3 Nashik

Nashik Municipal Smart City Development Corporation Limited (NMSCDCL) was formed in August 2016.

The area of the city is 264.2 sq km, with a population of 14,86,000.

The Nashik Smart City Proposal is not readily available online. Through a lot of online searches, the proposal was found, but the annexure which was used to populate the database was not to be found. Hence, the table with baseline assessment, proposed project could not be created. This is just another level of the data gap that was consistently found throughout the city.

5.3.1 Air quality monitoring

Nashik has 1 CAAQMS and 4 manual ones installed by MPCB. The draft report of the source apportionment study by NEERI and IIT-B has been received by NMC.

Regarding air quality monitoring, the smart city office revealed that currently one low-cost monitor has been set up on a trial basis, and after observing its performance the proposed 26 such monitors will be set up. There seemed no clarity on what would be done with the data received from these monitors.

5.3.2 Status of proposed projects for air quality improvement

In a brief interview with smart city officials, introduced by CEO Shri Thavil, it was found that on paper a number of projects have been proposed which are related to air quality improvement, such as incineration facilities for cremation, smart roads with cycle tracks and footpaths, a public bicycle system, e-buses as well as air monitors to be set up at 26 locations. When asked if we could get a list of these projects, which were being discussed with us, we were denied access to the information, stating that all this is available on the website. This information is not to be found on any online platforms.

We were able to isolate projects related to air quality from another source³⁶ and have used it to check the actual progress of these projects.

In terms of road projects, only the pilot road (Trimbak Road) has been taken up, and according to external sources³⁷ has been ongoing for almost 2 years now. The smart city official said that this is the pilot project and it is proposed under ABD of the proposal to have 176 such roads in the city. The public bicycle system, has also been started two years back and is functional. Mr Pankaj Agarwal from Hexi, which has set up this PBS in Nashik informed that the Nashik PBS was launched in 2019 with Nashik Smart City. There are 1000 Hexi bikes across 100 dock stations. The response from commuters has been satisfactory and the numbers of users is increasing steadily. He also felt that if there were cycling tracks in the city, there would surely be more users. Unfortunately, the one track that is being made is in progress for over a year (Trimbak Road), so very little has happened in terms of cycling tracks for the city.



Hexi Public Bicycle Stand at the Nashik Municipal Corporation

The following status of projects was found in the Annual Report 2018-19 on the official website of NMSCDCL.

Projects³⁸

Completed Projects

Electric Crematorium:

Project Funding: Smart City Fund

Project Cost: INR 2.33 Cr

The construction of the crematorium was intended to reduce pollution, which is caused due to burning of wood. It is an environment friendly way for cremation of deceased persons.

Public Bike Sharing

Project Funding: PPP

Project Cost: INR 28.23 Cr

The scheme is foreseen to act as a feeder service in areas with high auto ridership by providing last mile connectivity to the residents who commute daily for work, education and recreational activities. Under this initiative 100 bicycle stands with GPS enabled 1000 bicycles are being installed at different locations. Promote eco-friendly mode of transportation, Reduce traffic congestion, Long term positive health outcomes.

Ongoing projects:

Pilot Smart Road:

Project Funding: Smart City Fund

Project Cost: INR 21.72 Cr

The pilot Smart Road stretch is from Trimbak Naka to Ashok Stambh, measuring about 1.1 km. This project is about transforming the chaotic road image to a smart road. Proposed features of the smart road are: uniform standard carriageway width from one junction to another, properly designed footpaths, bicycle lane, road intersection development, infrastructure utility ducts below footpaths, road marking, proper storm water drainage and landscaping to increase overall aesthetics of the road.

Smart Parking:

Project Funding: PPP

Project Cost: INR 79.54 Cr

The ICT based parking management has been proposed for 28 On-street, and 5 Off-Street Public parking spaces. The ICT system will assist in providing real time information about vacant parking slots through the city app. It will also have multiple payment options like smart card, tokens, and e-payment. Modernization of the parking spaces is proposed by providing monitors and cameras for data collection on parking lot capacity and availability.

Upcoming projects

Multi-level Car Parking

Project Funding: PPP

Project Cost: INR 47.12 Cr

Due to high demand of off-street parking in the old city area due to religious places, two locations for multi-level car parking have been identified to cater to the growing demand. Identified parking locations are at Yashwant Mandai and Multi-level car parking near Sita Gumphā.

5.3.3 Civil society presence and public participation

The general perception of the city officials is that Nashik air is clean and pristine; they question its non-attainment status. For this they would like to verify the data of past few years by analyzing the data they gather on their own, through the proposed new monitoring systems³⁹.

This was reiterated by a civil society representative⁴⁰ who felt that many top officials did not feel that air quality was an issue in their cities, even while the AQI showed otherwise. There seems to be a gap in the understanding of air quality at the authority level itself, thereby making any affirmative action unlikely. Foraying into the smart city scope, he said they really don't see the smart city mission bringing in any change in the status quo. In terms of roads, only one pilot road (Ashok Stambh to Trimbak Nagar) was being done since two years and not completed even now. The delay has been due to changing contractors he said. A tender for procuring e-buses was delayed, and the current fleet and functioning of MSRTC buses left much to be desired in terms of service and efficiency.

We asked him about the public bicycle system stations we saw, he said those too were started two years back and were not functional now. There are no cycle tracks in the city, he said. They were not aware of any parking policy or mechanism. They pointed out that there was no involvement of people in the smart city proposal making or even implementation. No civil society was consulted/ involved for any projects and that even between the smart city corporation and Nagpur Municipal Corporation there was no coordination.

5.3.4 Air Action Plan submitted under NCAP

The Nashik Air Action Plan was submitted recently after being rejected four times⁴¹. Lack of clear guidelines on preparing the plan from MPCB and CPCB could very well be one of the contributing factors to this unusual event. It has many action items entrusted to the NMSCDL, as follows;

- **Public awareness campaigns** through EPIC India (Energy Policy Institute at University of Chicago) conducted for air pollution control, vehicle maintenance, minimizing use of personal vehicles, lane discipline etc. -TERI, EPIC, City Colleges, Schools, NMC, Nashik Smart City and Local NGOs - Under Clean Air Project in India (CAPIIndia) of Swiss Agency for Development & Cooperation (SDC) Nashik has been selected as a Non-Attainment city to carry SA/air quality assessment, pilot demonstrations and AWARENESS/CAPACITY BUILDING workshops. EPIC India (Energy Policy Institute at University of Chicago) conducted 2 awareness workshops in Sandip University and more awareness workshops are planned in the city to begin from Nov, 2019 with involvement of Schools, Colleges & Local NGOs.
- **Prevent parking of Vehicles at non-designated** areas through enforcing penalty of Rs 200 for wrong parking and also tow away charges for towing away the vehicle parked on the roadside. Under the Smart City initiative, a Smart parking project is being executed. - RTO & Traffic Police Department, Nashik Smart City - Penalty of Rs 200 for wrong parking and also tow away charges for towing away the vehicle parked on the roadside. Under the Smart City initiative, a Smart parking project is being executed. Total 33 smart parking locations (28 on street, 5 off street) have been identified 21 parking spaces are ready and operational by 1st Nov, 2019. Charges 4 wheeler Rs 10/hour, 2 wheeler Rs 5 / hour. MULTI LEVEL CAR PARKING Rs 16.25 crore, PPP mode (Tender Process). Integrated Traffic Management & Command & Control also being set up.
- Promoting Battery operated vehicles by inviting Request for Proposal (RFP) for battery operated buses infrastructure on gross cost contract basis. - NMC, RTO & Traffic Police Department, Nashik Smart City - Under Smart City project, NMC has invited Request for Proposal (RFP) for battery operated buses infrastructure on gross cost contract basis.
- **Synchronizing Traffic movements/ and to Introduce Intelligent Traffic systems** for Lane Driving by introducing COMMAND & CONTROL ROOM: Around 800 cameras are being installed in the city traffic police regularize traffic violations related to Motor Vehicle Act through CCTVs. And by introducing the Public Bike Sharing Project - RTO & Traffic Police Department, Nashik Smart City - ITMS - DPR in progress. Under the smart city project, COMMAND & CONTROL ROOM (in execution) around 800 cameras are being installed in the city traffic police regularize traffic violations related to Motor Vehicle Act through CCTVs. PUBLIC BIKE SHARING PROJECT (completed)
- **Greening of open areas, gardens, community places, schools and housing societies** by planting and maintaining 11,000+50,000 trees - NMC, Nashik Smart City - Garden department of NMC planted around 11000 trees under AMRUT in 2019-20. "DEVRAI" project executed to plant and maintain the local trees like Pipal and others. 50,000 Trees planted at cost of Rs 6.5 crore, under NDTL 5000 tree plantation in 2 months, Devrai 5000 tree plantation within 4 months, 2000 Bel tree plantation in 1 month, AMRUT 4500 trees to be planted in 2 months
- Proper collection of Horticulture waste and its disposal following composting –cum – gardening approach by carrying out Separate collection mechanism for entire horticulture waste and windrow

composting - NMC, Nashik Smart City - Separate collection mechanism for entire horticulture waste and windrow composting (10-15 T) implemented in the MSW treatment facility Compost Plant near Pandavleni Caves.

- **Banning on burning of agricultural waste and crop residues** and its implementation by carrying out an awareness campaign among the farmers to prevent them from burning of agricultural waste and crop residues - NMC, Nashik Smart City- Awareness program planned among the farmers to prevent them from burning of agricultural waste and crop residues.

From the above action items, Nashik claims to have done two workshops in Sandip University with more planned from November 2019, but this couldn't be corroborated from our other stakeholder interviews in the city. Also, no information about the two workshops held are to be found online. The Environment Officer in the NMC confirmed that the parking management plan, under the Smart City is being implemented at 30 locations, and fines are being levied for vehicles parked in non-designated areas, as well as being towed away in some cases. The public bicycle system mentioned in the action items is also functional. He also informed that a city level committee has been formed under the chairmanship of the Commissioner with NMC, Traffic Police, MPCB, RTO, and other stakeholders. One meeting has taken place; minutes are awaited. The Secretary of this committee is the Regional officer of MPCB.

Specific status of other action items, however has been hard to find out either from official sources or websites.

When asked about the NCAP city action plan, a civil society representative⁴² said that it was hard to get them to do the simplest of things, expecting anything out of the action plan to be done was distant.

5.4 Pune

Pune was one of the first 20 cities to be chosen under the mission. The Pune Smart City Development Corporation Ltd (PSCDCL) was formed as an SPV on 23rd March 2016. The area of the city is 331.3 sq kms with a population of 31,24,000.

In terms of air quality, the smart city proposal specifies the following situation, along with the proposed actions.

Base Scenario 2

Basis of Base Assessment	Input/ Initiative that would move city to Scenario 4	Project Allocation (amount in crores)
Pollution due to Particulate Matter (both, 2.5 and 10) and Nitrogen oxides is significantly higher than the prescribed norm (56, ~90 and 59 as against the benchmark of 40, 60 and 40 respectively)	Scenario 3. As a result of multi-pronged strategy to increase public and NMT share of traffic, Pune aspires to bring down its pollution levels of both, particulate matter and poisonous gases to acceptable levels. Further, stress on creating more open spaces, move to renewables, etc all help Pune becomes city with one of the best air quality in the country. Creation and redesigning of 60kms of footpaths and 42kms of cycle track to be created in the ABB area, supplemented by e-rickshaws and walk to work concept with increased open space will ensure that air quality in the ABB improves significantly - Multi Pronged strategy to beef up public transportation, facilitate NMT through redesign and augmentation of footpaths and cycle tracks and new philosophy of development maximizing open area	100 Electric buses-125, Redesign of streets-189, Footpaths (additional and retrofit)-31, Bicycles-10, Bus stops (revamp 54 stations)-27, Non-motorised street-5, BRT-210, e-rickshaws -1 All of the above are ABD projects

5.4.1 Air quality monitoring

The city has 1 CAAQMS, and 3 manual monitors by PCBs. In addition to this, IITM, which is based in Pune has installed monitors at 10 locations. IITM monitors air quality and other weather parameters and puts out forecasts for 2 days on its mobile app – SAFAR.

Moreover, Pune Smart City has installed 50 low-cost monitors at different locations across the city.

Along with being one of the 10 cities in which NEERI and IIT-B are conducting source apportionment studies, Pune also has two other studies going on. One is an Emission Inventory (EI)⁴³ through SAFAR where they are mapping the pollution causing sources, and the areas where the polluting activities are maximum. This helps establish the most effective mitigation measures, as different pollutants are emitted by different sources, and different sources need different kinds of mitigation steps. The study is near completion and the report is awaited. There is a longer study⁴⁴, which includes a source apportionment (SAS) which looks at individual source types and their contribution to air pollution concentrations, conducted by TERI and SDC in 4 cities, namely Lucknow, Kanpur, Nashik and Pune. Its first phase is expected to be completed by 2023. Pune-based Automotive Research Association of India (ARAI) is participating in this initiative, along with few other agencies.

5.4.2 Status of projects proposed for air quality improvement

Following are the projects completed so far as reported by the SPV;

- Under the e-bus initiative, 150 Electric-Bus (119 deployed) with 25 Midi-9 Mtr. & 125 BRT-12 Mtr plying on the road since February 2019. Outcome includes zero air pollution and less noise. Over 14 lakhs fuel saved substantial reduction in CO₂.
- Under e-rickshaw initiative, PSCDCL proposes to launch Electric-Rickshaw (E-Rickshaw) in Pune city to decrease traffic related pollution. As well as aid first mile – last mile connectivity requirements for travel at low cost for daily commute and serve as an extension of the current public transit network. The introduction of E-Rickshaw shall promote a green and sustainable transportation system to mitigate the increasing issues of pollution and provide paratransit transportation at low cost for the daily commuters.
- Under mobility initiative, as part of Traffic Engineering Intervention, road junctions are getting physically redesigned and the road junctions aligned based on traffic conditions in order to improve travel time & reliability and reduce congestion and thereby reducing the pollution. The first phase of the project comprises interventions at 125 junctions across Pune City. The physical civil intervention to 125 junctions will advance adaptive traffic management by improvement in junction layout, signal locations, pedestrian crossings, traffic signage and road markings, islands, provision for underground utility crossing on all sides in the junction.
- Similarly, under Technology Intervention –Traffic Signal Systems of various types based on location and traffic parameters are being made adaptive. The objective of this intervention is to provide technology that automatically adapts to changes in traffic conditions and manages the traffic system. This intervention will not only facilitate improving travel time and reliability but also reduce traffic congestion and associated fuel consumption levels in Pune. The first phase of the project comprises interventions for 126 junctions across Pune City. This will improve pollution invariably.
- Under the Smart Street lighting initiative, Pune Smart City uses new energy-efficient technologies and design to cut street lighting energy costs by up to 60 percent and reduce greenhouse gas emissions. Higher illumination standards have been maintained on the streets when compared to earlier sodium vapor lighting. The smart lighting-LED retrofitting project is a first of its kind, public-private partnership project. More than 75,000 street lights have been replaced with energy efficient LED lights. All these

street lights are controlled from a central command and control room, which can turn on or dim lights remotely, either manually, or automatically.

The Mobility Initiative under the Pune Smart City proposal focuses on enabling signal synchronisation through junction redesign. However, the guidelines being adhered to are better suited for highways (IRC guidelines), in spite of Pune having its very own Street Design Guidelines⁴⁵. Out of the 125 junctions in the first phase, work has started on 6 junctions, but not one has been completed. The implementation has run into various issues such as lack of coordination with PMC, lack of support from local corporators, lack of understanding of design principles of urban streets and opposition of local citizens to the projects. Parisar has been involved in redesigning three of these junctions, under the smart city proposal. The experience in these interventions reiterated that execution has been marred by lack of coordination between PMC and PSCDCL, a lack of understanding of urban street design guidelines and general resistance to any new, scientific methods of designing urban streets by both the PMC and PSCDCL.

It is evident from the information shared that except for buses and e-rickshaws, there is no clarity on how far other projects have been executed. Applications under the Right to Information were made to the office to learn about the details and status of umbrella terms used such as road projects, footpaths, pedestrian zones and so on. There has been no clarity on where these projects are to be implemented.

5.4.3 Civil society presence and public participation

Pune has a very active civil society network. However, it is worth recording that approaching PSCDCL for official interviews was not an easy job. Same was the case with getting information on projects. Whatever information was received from PSCDCL was incomplete or not available at all. Furthermore, even after repeated attempts to meet the CEO of PSCDCL Ms. Rubal Agarwal (Addl. Commissioner, Pune Municipal Corporation), and also following up with email questionnaires, there was failure to get any response.

Stakeholder interviews with civil society organisations revealed two main things among others - firstly that there was an issue with the way projects regarding air quality and other projects in general were being implemented and secondly, the questioning of the projects and their efficacy in air quality mitigation itself. A civil society representative⁴⁶ could hardly name any projects under the mission in the city which would have a lasting impact on air quality. She rightly questioned whether the PSCDCL or the PMC had thought of how introducing a few electric buses and rickshaws could bring about sustainable air pollution control. When we speak of sustainability, we are thinking of modal shifts in transportation. The smart city proposal has nothing to that effect. Moving to the governance impact of smart cities mission, another civil society representative⁴⁷ said that the PSCDCL, its performance and its coordination with PMC has been disappointing and dysfunctional. Unlike some other cities, PSCDCL has a completely different set up and identity from the PMC. This is evident when the environment officer in the city confesses to have no knowledge of the air quality sensors installed by the smart city corporation. The result has been that very few projects have successfully been completed even after so many years post the mission inauguration. Though low-cost monitors have been put up under the mission, where the data from this goes, what happens to the data is largely unknown and mostly undecided. The PMC does not pick up this data and use it for its reporting (ESR), planning or action.

When asked about the projects proposed in the SCP for AQ improvement and their efficacy, the CSO interviewee responded saying "There are no numbers to say what the impact of these proposed projects would be. Anyone could judge that this isn't enough to tackle air pollution in the long run and that we need to acknowledge that we need different types of data to tackle this issue. It would have helped if the PSCDCL was less territorial in its approach and worked towards the city's need for better monitoring. A good role for the smart city corporations would be to create the institutional set up to analyse available data and formulate actions for mitigating air pollution."

When asked about whether AQ is a citizen driven issue in Pune, an activist⁴⁸ denied saying that it is still a very academically driven, civil society driven issue and citizens are peripherally involved, if at all, at this stage. When asked about what more could have been done under the mission for improving air quality, one respondent felt that the focus needs to be on bringing about a modal shift from private to public transport and on reducing per capita emission. He added that the smart city offices have the capacity to come up with such plans but these haven't been undertaken at all.

There were also some important opinions about making air quality a people's issue. It was observed⁴⁹ that terms like AQI made little sense to citizens, because it may not relate to what they are experiencing on the ground. Localised readings and experiences differ greatly. What AQI shows us is the pollutant profile, but the level of exposure greatly affects how people are perceiving and experiencing air quality. For example, in her office at Nalstop, a civil society activist has fitted an indigenously made, experimental sensor which gives live data of the air quality right there, not the ambient air quality. This kind of localised data should be made available to people so they understand air pollution better. This has a better chance of making air quality a people driven issue.

In another interview⁵⁰, it was recorded that it is important to move from reliance on ambient air quality to ward level, local mapping of pollution. The respondent felt that this will encourage actions based on immediate surroundings and exposure and also help fix some accountability, as the action items will be very specific at the ward level.

5.4.4 Air Action Plan submitted under NCAP

The Pune Air Action Plan has only one set of actions entrusted to the PSCDCL as follows;

- Synchronize Traffic movements /Introduce Intelligent Traffic systems for Lane Driving - Smart City, PMPML, Traffic Police- Camera Surveillance is done by Traffic Police. ITMS, Passenger Information system, GPS tracking of buses is done by PMPML. Smart City is providing a Command Control Centre.

It is clearly mentioned that the only task of the PSCDCL is to provide a Command and Control Centre. It is unclear how exactly this will improve air quality in the absence of any elaboration. The PMC Environment Officer stated that in terms of policy and plans the NCAP city level action plan is very good and touches upon almost all the points needed to improve air quality. He added that implementation, however, is again a complex issue because of the various stakeholders involved. On being asked about the formation of a committee to ensure implementation, he said he was following up on it and it might happen soon.

A civil society representative⁵¹ felt there was much scope for improvement in the plan and that there were two main things in the NCAP that the city could have undertaken under the city action plans - "Firstly, strengthening of the monitoring system itself, which would allow for further analysis and action. And secondly a city level surveillance system. Currently Pune relies entirely on data given by IITM, which is very restricted. It is just an index, limiting any further analysis and hence any further action."

Perception survey of Air Quality in Pune : main findings (box)

A perception survey⁵² carried out by Parisar and CEE in May 2019 showed that 50% of the citizens who responded thought that Pune's air quality met the prescribed NAAQS. The survey indicated that more awareness was required to understand the kinds of health impacts that are caused due to poor air quality.

Regarding the sources of pollution, people perceived traffic emissions and waste burning as two main sources. These are most likely to be the most important sources, though updated emissions inventory/source apportionment studies are not available. Even while source apportionment studies mandated by the government are underway, work needs to be done on both these fronts, without necessarily waiting for the results of the studies. When asked to identify vulnerable populations, most of the respondents correctly identified the most likely to be affected groups in terms of exposure, but efforts need to be made to help the public understand the impacts on young children, and measures to avoid exposure.

In terms of receiving communication on air quality, while a large proportion of respondents said that they are looking at display boards to see air quality, some have opted for receiving updates on apps, as well as through newspapers. Going forward, in order to develop an Air Quality communications programme as is recommended in the NCAP, it would be useful for the city government to promote deployment of multiple communication channels to reach the air quality information to the public.

For an effective implementation of a city action plan, there was considerable interest in multi-stakeholder approaches amongst the respondents, both at the planning as well as the execution stage. It will be important to set up platforms for constructive engagement of the public in better understanding of AQ, for taking protective measures as well as devising mitigation solutions.

Citizen driven AQ advocacy and action

A perception that has come out quite strongly through stakeholder interviews in different cities was that people aren't concerned about air quality. When it comes to prioritising civic issues, air quality wouldn't figure in the first three. Even environment officers of some cities felt air quality in their city was good, despite the contrary numbers, despite being a non-attainment city. It is evident that there is a lack of awareness and communication about the issue⁵³.

In Pune, Hinjewadi Residents' Welfare Association (HIRWA) seems to have taken up the issue seriously. The residents after experiencing the impact of air pollution in the Wakad- Hinjewadi area of the city, decided to proactively monitor air quality and take action to minimise its health impact by taking appropriate measures. This process of monitoring, understanding data and then using it to change behaviour is something that the authorities should ideally undertake. But in the absence of such a mechanism, citizens have taken it to themselves to do this. Though it is an industrial area, the pollution caused here is mainly by garbage burning and not industrial pollution. Although some of the wet garbage is composted and dry waste recycled by residents, much of it gets collected by contractors, and eventually dumped on vacant plots and burnt.

The community members now locate the garbage burning spots and map them on a google sheet. They place complaints with MPCB and have managed to close down a couple of factories which were polluting indiscriminately by burning.

The service roads, highways and farms whose owners are paid to use the land for burning the garbage are the preferred burning grounds. The PMC points to the NHAI when it comes to dealing with garbage on highways, and since it is a garbage issue, the NHAI points back to PMC. The police are generally reluctant to file FIRs for such complaints.

Since Hinjewadi is a major IT hub of Pune, almost 1.5 lakh vehicles frequent the area on a daily basis. The vehicular emissions are also substantial.

At the beginning of 2019, Delhi based Council on Energy, Environment and Water (CEEW) have contributed 5 low-cost monitors to HIRWA which are placed at various locations in the area, including one at a school. The readings are sent out on an online application, and the members also put the AQI on social media platforms like Facebook, Twitter, and other social groups. In this way, the residents are at least aware of the AQ in their immediate surroundings. When air pollution goes beyond a certain limit, the members also know that there is some burning happening close by, thereby prompting them to act accordingly.

Ravindra Sinha of HIRWA said, "As a smart solution to combat air pollution, much more monitoring needs to happen, and a monitor has to be placed in every 5 kms radius. The monitors need to be of standard calibration, and should be maintained well as they are sensitive instruments. In case of garbage burning episodes, if a common dashboard is available to all local bodies authorities giving real time data

and locations, it would be possible to take quick action without waiting for citizens' intervention. Smart Cities can take on CCTV surveillance in identified hotspot areas. Satellite imagery, garbage treatment, maximising public transport are essential to monitor and mitigate air pollution. Display of AQI should be mandatory in all schools, so awareness begins at an early age. Any violating action which affects air quality should be penalised stringently."

In November 2019, the low-cost monitors installed by residents recorded an extremely high pollution level, an AQI of 427, more than New Delhi⁵⁴. These numbers are enough for authorities to sit up and take notice, however not much seems to be happening to improve air quality in the city.

5.5 Thane

Thane was among the first 10 cities from Maharashtra to be selected under the Smart Cities Mission. Thane Smart City Ltd (TSCL) was established in 2016⁵⁵. The area of the city is 147 sq km with a population of 18,41,000. Thane is also the first Indian city to become a Sustainable Development Goals (SDG) City, through a memorandum signed between the Thane Smart City Ltd and the UN Global Compact Network India (GCNI) in May 2019. This collaboration was intended for the development of a Sustainability Framework for the city based on the customized Key Performance Indicators and an amalgamation of international and local know-how and best practices. As per the information on the TMC website, the framework shall serve as a policy tool to support TSCL in collecting and integrating data, and using those data sets to define a vision, set targets, monitor progress, and forecast trends—all while being able to compare themselves with peer cities⁵⁶.

Base Scenario 2

Basis of Base Assessment	Input/ Initiative that would move city to Scenario 4	Project Allocation (amount in crores)
The city carries out 24 hr air quality monitoring. Some interventions have been carried out to curb air pollution however, stringent and more macro level measures are required to reach an advanced stage with respect to this feature. The PCC of TMC carries out 24hr air monitoring through three ambient air-monitoring stations. While SO ₂ and NO _x are within prescribed limits, RSPM levels in Thane are high. Initiatives taken by TMC to curb air pollution: plantation drives, harith janpath, penalty for developers causing dust nuisance during construction works, etc.	Thane aspires to have air quality of the highest standards and carry out regular monitoring of the same by setting by monitoring stations across the city. TMC aspires to curb air and noise pollution by setting up monitoring systems near important junctions, enacting stringent penalties on polluting industries, promoting NMT & implementing various traffic improvement measures that will both - ease congestion and improve air quality.	Pedestrian improvements-23, New suburban station-289, Multi-modal facility-267, Teen haath naka junction improvement-239 All projects above are in the ABD projects

5.5.1 Air quality monitoring

There is one low-cost monitor in Thane City at Teen Hath Naka. Besides this, there are three manual monitoring systems in the city to monitor air quality at Kopri, Naupada and Vartaknagar and 3 continuous monitoring stations are proposed under the NAMP (National Air Quality Monitoring Programme). Live information on air quality is published on display boards at five locations in the city, TMC Pollution Control Cell Application and website of Thane Municipal Corporation. Integrated Command and Control Centre (ICCC) is to be commissioned in December 2019. Once it is commissioned the live information on air quality will be integrated with ICCC in due course of time. For Citizen Outreach for air quality the following mechanism has been adopted:

- Awareness Program
- TMC pollution control cell Application
- Street Plays

No specific information about the 'awareness program' and 'street plays' are to be found online or through stakeholder interviews. The Environment Officer in TMC said that the major reason for air pollution in Thane is vehicles, followed by construction and dust. The officer added that there is not much waste burning happening since they have a fairly efficient waste management system.

5.5.2 Status of projects proposed for air quality improvement

Projects Undertaken that will have positive impact on air quality are as follows, as reported by the TSCL:

- Dust Controller Machine
- Construction and Demolition waste processing
- Management and scientific disposal of e-waste
- Fuel Briquettes from Green Waste
- Thermocol Waste Management
- Hotel Waste to Biogas
- Nirmalya- Collection of flower waste from religious places and converting the same into manure.
- Solar Rooftop Projects
 - 10 MW solar rooftop project
 - 267 Kw school solar rooftop
- Electric Buses
- E-Vehicles
- Rent a Cycle
- Tree Plantation Initiatives
- Green Canopy over footpaths
- Mist Fountain
- Smog free tower
- Pedestrian Improvement
- Inland Water Transport
- Multimodal Transit Hub at Existing Thane Railway Station

The following details of the status of proposed projects has been received from the smart city office.

Sr. No	Project Name	Project Cost in Crores	Location	Milestone Achieved
1	Pedestrian improvement	19.63	M.G Road,Ram Maruti Road, Gokhale Road, Shivaji Path, Dr. Mosse Road etc.	Survey Work Completed, Design Finalized and Execution Work in Progress
2	New suburban station	262.76	Inside the premises of Thane Mental Hospital Near Dnyansadhana College	Preliminary GAD approved, Soil Testing Completed
3	Multi-modal facility	260.85	East of Thane Railway Station platform Number 10	GAD approved, Soil Testing Completed, Mobilization by contractor on site is completed ,Test Pile is in Progress, Traffic Diversion plan is approved and Bus Depot work started
4		239	Teen Hath Naka Junction	Tenders were floated but no bids for the same were received. The DPR for the same is being revised.

As per information received from the Environment Officer⁵⁷ of Thane Municipal Corporation, Thane Municipal Transport has a total of 328 buses - 103 are CNG, 225 on diesel. They have contracted 100 e-buses, and 1 has arrived and is running as of now. The charging station, for both - 2 wheelers as well as 4-wheelers will be managed by TSCL. The Command and Control centre is being developed, under which the traffic signals will be simulated. The Parking Policy is approved but implementation has not happened yet.

In the list of projects proposed for air quality improvement, procurement of smog tower, dust machine controllers are proposed. However, the environment officer of TMC revealed that these have been scrapped. This information was not provided by TSCL, creating confusion.

5.5.3 Civil society presence and public participation

The general impression has been that Thane has been falling behind on project execution and completion. Stakeholder interview with a researcher⁵⁸ revealed that people are totally unaware of what the smart city is actually doing in the city. Even the very basic things were not being looked at, air quality wouldn't even be on their priority list she felt.

5.5.4 Air Action Plan under the NCAP

Thane has submitted the air action plan and is awaiting its approval from the CPCB. Currently it is not available online in the draft format. It was the only city from Maharashtra, along with 19 other cities from the country to get added to the initial list of the 102 non-attainment cities in 2018, owing to increasing pollution levels and existence of a number of highly polluting industries in the city⁵⁹. According to MPCB data, Thane district has the highest number of highly polluted industries in the state.

5.6 Solapur

The Solapur Smart City Development Corporation Ltd was formed as a SPV in 2016. While the following details were found in the annexure of the smart city proposal about base assessment and proposed input to improve air quality, the projects listed did not match with these proposed inputs. Details of actual projects were found from the application made to the Mission Director, rather than in the proposal itself. The area of the city is 180.7 sq kms, with a population of 9,52,000.

Base Scenario 2

Basis of Base Assessment	Input/ Initiative that would move city to Scenario 4	Project Allocation (amount in crores)
Ambient air quality is monitored at 3 locations in the city: WIT Campus, Municipal Corporation campus and Saat Rasta. Average at 3 locations: RSPM = 86 $\mu\text{g}/\text{m}^3$, SPM = 197 $\mu\text{g}/\text{m}^3$, Nox = 38.38 $\mu\text{g}/\text{m}^3$, SO ₂ = 13.52 $\mu\text{g}/\text{m}^3$ [Source: Maharashtra Pollution Control Board website]	Ambient air quality is monitored at various locations but the pollution levels are high and the city wants the air quality to meet compliant levels. Covered street network from edge to edge to control dust pollution. Increase in green cover to improve air quality.	No details on projects found

5.6.1 Air quality monitoring

In Solapur, air quality monitors are installed at 3 locations - Solapur Municipal Corporation (continuous monitoring), Voronoco high school (location Chitale hospital as per MPCB record and monitoring two days in a week) and Walchand Institute of Technology (monitoring two days in a week). Live information on air quality is generated and displayed through an LED screen at one location (Solapur Municipal Corporation). Integration of these monitors are proposed with ICCC. ICCC project is kept on hold by SCDCL due to lack of funds.

5.6.2 Status of projects proposed for air quality improvement

Following is information received from the smart city corporation about projects undertaken which will impact air quality;

Development of green spaces (Hutatma Garden phase 1 & Phase 2, Department Garden, Hoam ground)

- Development of Smart Road from Rang Bhavan chowk to Dr. Babasaheb Ambedkar chowk
- Redesigning of priority roads phase 1 10.8 km
- Development of 4 waste transfer stations
- Procurement of waste collection vehicles
- Procurement of dustbins for households
- Installation of 50 electronic toilets at 25 locations
- Development of street bazar (non-motorized street)
- Development of Laxmi market

No response was received when asked about the current status of these projects. Also, just this list with no linkages to air quality explained makes it difficult to analyse. No explanation was received on asking for the linkages or expected outcome/ impact of these projects on air quality. There is also no dedicated website of the smart city corporation for further details.

City visits confirmed that presently there are 30 diesel buses run by Solapur Municipal Transport, and there are 35 electric buses proposed. For a population of 9,52,000 a meagre fleet of 30 buses is hardly sufficient. [MoHUA norms require a min of 40 buses per lakh population]. It is interesting to note that when the proposal was made and submitted, the city had doubled its fleet from 100 to 200 buses. How it came to 30 buses is incomprehensible.

There is one electric crematorium, and 5 more are to be converted to electric ones.

A consultant at the smart city office mentioned that there was nothing specifically mentioned in terms of monitoring air quality in the Smart City proposal. The city was entirely dependent upon MPCB for monitoring. Only greening of areas like Hutatma Bagh and Department Garden were mentioned as an activity done under Smart City for improving air quality in Solapur so far.

There are only 2 display boards in the city which show various parameters of air and weather, but there is no application or any other means of communicating the air quality to the citizens, and neither any mechanism to communicate any actions to be taken if the pollution increases.

5.6.3 Civil society presence and public participation

No civil society organisations, or activists working on air quality or any linked issue like transport were found in the city. Solapur has been one of the underperforming cities in the mission⁶⁰.

The status of none of the projects is to be found anywhere online or through interactions with officials in the smart city corporation.

5.6.4 Air Action Plan submitted under the NCAP

The Solapur Air Action Plan has the following actions entrusted to its smart city corporation;

- Regular Checking of vehicular emission and issue of pollution under Control Certificate (PUC). RTO/ Smart City/ SMC
- Public awareness campaigns for air pollution control, vehicle maintenance, minimising use of personal vehicles, lane discipline etc. RTO, SMC/Smart city /MSRTC - IEC Agencies are appointed under Smart City for awareness regarding pollution control and ill-effects of climatic change.
- Allocation of designated parking areas to Prevent parking of vehicles at Non-designated areas. SMC/ Smart City - In addition to existing SMC parking facilities, Survey of location for new parking lots work is in progress under Smart City and the master plan will be completed December 2020.
- Widening of roads and improvement of Infrastructure for decongestion of Roads. - PWD / SMC / SMART City/NHAI - The road widening of about 50km in city areas under process and 10km road widening work is completed under SMART City.
- Promoting Battery operated vehicles. -RTO / SMART City/ SMT -
 - 1) Solapur has started implementation of E-Bikes. There are three newly opened showrooms of E-Bikes In solapur.
 - 2) SMC and RTO has started initiating use of E Rickshaws and CNG Vehicles among citizens of the city.
 - 3) Procurement process of 25 E-buses under SMT. The project is awaiting General Body approval.

- Synchronize Traffic movements by Introducing Intelligent CCTV surveillance and automated Traffic Management systems for Lane Driving - DCP traffic/ Smart city -Smart City is working synergistically on modifying Intelligent CCTV surveillance and automated Traffic Management systems in Duffrin Chowk and Shanti Sagar Chowk.
- Maintaining Pothole Free Roads for Free flow Traffic in city - SMC, Smart City solapur, - Constructed pothole free smart road about 10kms under SMART City.
- Designing and Construction of environment friendly roads in SMC - City Engineer, SMC / SMART City - Road Design improvement is a continuous process as per Universal Design Principles and about 10km SMART Environment friendly roads (Roads having green buffer zone, solar systems, paving's, separate walking and cycling tracks) are constructed by SMART City and SMC under these principles.

From information received from the SSCDCL, projects like development of roads, green space development (Hutatma Garden, Department Garden, Hoam ground) will be undertaken by the smart city corporation in Solapur. The described projects in Solapur are largely incomplete, including paid parking areas, environment friendly roads, better management of traffic through ITMS. Deadlines to projects differ, ranging from January 2020 to December 2020.

6 NCAP and Smart Cities Mission Convergence

The National Clean Air Programme was launched by the Government of India to address the issue of urban air pollution. The main intent of this programme is to reduce particulate matter pollution by 20-30% by 2024. This will be achieved by creating public awareness, build capacity for air pollution management and increase the air quality monitoring data for better mitigation. The programme had initially mandated 102 non-attainment cities, which have now increased to 122 to prepare air action plans, which will use these principles of the programme to create a city specific plan to reduce air pollution.

It was also announced by the central government that the NCAP would use the Smart Cities Mission to leverage its goals of reducing air pollution, considering that 43 cities out of the 102 non-attainment cities were also smart cities⁶¹.

Various stakeholder interviews gave the perception that this announcement has been left more on paper than on ground. Considering very little has been done in most cities under the mission, compared to their proposed activities, it might in fact be true that the NCAP Smart Cities convergence is just an idea. A brief analysis of the air action plans of the six cities supports this proposition. Two cities fall out of the analysis; Thane whose air action plan has no approval yet and Aurangabad, whose action plan has not assigned any of the mitigation measures to the smart city corporation. In the remaining four cities, Pune and Nagpur have some mention of the role of the smart city in executing actions for mitigation. The role in Pune is limited to the functionalities being provided by the command control centre.

Nashik and Solapur have a range of activities entrusted to the smart city office for air quality improvement. Public awareness about air pollution is an activity entrusted to smart cities in all the cities. This might be due to the fact that smart cities were about technology and electronic display screens were an item in most smart cities. From our conversation with various stakeholders in different cities, it was found that 'public awareness' was limited to displaying either the AQI, obtained from CPCB, on these boards or very random messages related to traffic and other civic issues. This hardly translates to awareness, considering that AQI is not a concept understood by all, and also that just giving this information in isolation without any recommended actions or the implications of it is a very namesake way of communication. Nashik claims to have done two workshops in Sandip University with more planned from November 2019, but this couldn't be corroborated from our other stakeholder interviews in the city. Also, no information about the two workshops held are to be found online. Nashik has, however, successfully implemented the parking charges and paid parking facilities to some extent. It has also delivered on the public bicycle system mentioned. It is interesting to note here that smaller cities like Nashik and Solapur have initiated paid parking policies, while Pune has a parking policy which has been approved by the Corporation 2 years ago but still hasn't been implemented, despite insistence by the State Government as well as sustained pressure from civic groups as well as the media⁶².

Projects in Solapur are largely incomplete, including paid parking areas, environment friendly roads, better management of traffic through ITMS. Deadlines to projects differ over the months of the year 2020. There is also no uniformity in the action plans submitted by the cities, some cities have deadlines, some don't.

The city level coordination committee mandated to be set up under the NCAP to facilitate execution of the plan has been formed only in two cities of Nashik and Nagpur.

7 Inferences

The intent of this study was to understand the impact of an extensive centrally sponsored scheme like the Smart Cities Mission on air quality in our cities. This single intent uncovered various aspects of both the main issues in it - air quality in our cities and the functioning of the Smart Cities Mission in them and how they impacted each other. From our varied stakeholder interviews in different cities, it was recorded multiple times that air quality in cities is a complex, multi-sectoral issue and its management needs more than superficial fixes. Projects proposed in the smart city proposals of most cities fell short in understanding this nature of the subject.

Sulakshana Mahajan⁶³, Architect and Urban Activist from Thane felt that air quality was hardly ever the focus of the Smart Cities Mission. The Mission struggles to get even the basic infrastructure projects in place, air quality is too complex an issue for them to handle. Priyadarshini Karve⁶⁴ from Pune questions how the projects proposed in the smart city proposals will bring about sustainable changes for better air quality like transportation modal shifts. It is evident that cities are not looking at bringing about sustainable, long term measures under the mission. This is the basic observation, right at the proposal stage, where plans are being conceptualized. Another programmatic issue was the design of the mission. The proposal was to be divided area wise into pan city and area based development. Most projects proposed for air quality mitigation fell under the area based development component, which is limited to a specific area in the city. Air quality being such a complex issue, affected by a number of factors doesn't take very well to this kind of a division. For example, if e-rickshaws are to be introduced in a specific area in the city, how it would impact the air quality of the entire city is worth acknowledging. However, this kind of an in depth analysis is completely missing from the mission framework.

Robust air quality data and monitoring is the first step towards improving air quality. AQ monitoring in Indian cities however, is still lacking in terms of method and quality. Many cities are still using manual methods for monitoring and collecting AQ data instead of continuous monitoring, and even the frequency of manual collection is far below what could be used to scientifically ascertain air quality in an area/ city over a period of time⁶⁵. While setting up this kind of a comprehensive system could have been the perfect 'smart' city project, with its focus on technology and data, cities are left wanting for more of the basic foundation of air quality improvement. In the absence of data and its analysis, plans for mitigation may be ineffective. For example, data on sources of pollutants and the extent of specific pollutants can help to decide critical action for reducing pollution. If pollution from vehicles forms a major share of pollutants, it can be handled on a priority rather than spending efforts and resources on a minor source of pollutants.

However, it has been found that even while not listed directly in the projects, low-cost monitors have been set up in cities like Pune. This perceived discrepancy may have also arisen from the fact that many a times, while preparing the database of smart cities which were also non-attainment cities, it was found that the projects proposed and the actual list of projects did not match. There is also the problem of isolating projects from a group. For example, certain cities have a clubbed component called 'urban mobility'. There is no way then to find out what all this includes, especially in the absence of any kind of direct, official data on projects completed. It has been observed that there are things being done over and apart from what is explicitly mentioned on websites and documents. This is another major issue when it comes to attempting appraisal of the mission, because definite data is uneven, unclear and unreliable.

It is an accepted fact that actions for mitigation of air pollution require a long term to produce effects. The time factor hasn't been accounted for at all in the smart city proposals. This is also an issue with the NCAP, which has been announced as an enabler to mitigate air pollution in convergence with the SCM¹⁰.

In the absence of a deadline, the target becomes meaningless. Another related factor is that there is no reasoning or logic found in the actions proposed and how these will impact air quality. There is no reference to the fact that different types of pollutants are produced by different sources, and how acting on one front can reduce specific pollutants like PM₁₀, PM_{2.5} or SO_x/NO_x in the air. Hence while cities propose e-rickshaws and e-buses and non-motorised transport projects, not one city mentions how this will improve air quality and how that can be quantified against time or the actual air quality itself.

Furthermore, when it came to implementation in most cities, it was found the low-cost monitors had been put up by many smart city corporations, but none could satisfactorily explain what happened with the data received from them. It was observed that a city typically monitors its air quality in 2 ways – while there are Continuous and Manual monitoring systems set up by either the PCBs or corporations, the Smart Cities have opted for low-cost monitors. The justification of installing these monitors is that the traditional real-time air quality monitoring instruments are expensive to install and maintain, resulting in sparse networks, which in turn result in lack of measurement density to develop a good mapping of pollutants and sources. The low-cost monitors play a role to collect this data in real-time.

However, the strongest criticism for the low-cost monitors is that they are non-standardised, and non-calibrated. Hence, comparison of their results with the data of the traditional monitors can show degrees of variations. Government officials relying on the data put out by traditional monitors do not accept the data from these monitors, as the perception is that the low-cost monitors bypass certain protocols and guidelines laid down as monitoring standards. Another issue not with the low-cost monitors bought by the Smart Cities per se, but the functioning is that even if the data is collected by these monitors, there is as of now no city which is using this information in any way. Even the Smart Cities which have installed display boards which show air quality are using the data put out by CPCB, and not by these monitors.

A Smart City, though seen as an independent body, is still under the purview of City Corporation. There is much scope for the low-cost monitors to be used efficiently if the Corporation intervenes and gets them vetted with regard to prescribed monitoring standards and guidelines.

As Sulakshana Mahajan rightly pointed out, monitoring is not the hardest thing to do. The more crucial thing is to be able to use and analyse the data for proactive measures. Sanskriti Menon⁶⁶ (CEE) said in this context that given its focus on data and transparency the mission could have driven the smart city corporations to formulate customised plans based on data from sensors and source apportionment of pollutants. But currently it seems to be haphazardly investing in infrastructure without the capacity to use data.

Smart Cities are expected to conduct public awareness campaigns for air quality improvement as well as establish communication channels. This has largely remained superficial, without any innovation or creativity in making a connection with the citizens over the issue. All cities have relied on electronic displays of AQI and some have created web applications for live air quality updates. Priyadarshini Karve, rightly points out here that very few citizens may actually understand terms like AQI. One might be more interested in the air they are breathing on ground at the place they are in, instead of an ambient air quality index. Cities have been lethargic when it comes to finding out better ways of communication around air quality in general.

It was also surprising to find that no city is even remotely looking at possibilities of air modeling to come up with better responses for air pollution mitigation. The Smart Cities Mission would have been the perfect platform for such a data based, scientific activity, but it remains far from it.

While major strategies and mitigation measures to tackle increasing air pollution in Indian cities continue to get developed and implemented, the government notified a Graded Response Action Plan⁶⁷ (GRAP) for Delhi and NCR region based on a Supreme Court order in December 2016. The plan was prepared and is implemented by the Supreme Court mandated committee, Environment Pollution Control Authority (EPCA) under the Environment (Protection) Act, 1986. It is used as a short-term measure and is to be

executed when the air quality deteriorates to a certain level. The actions to be taken in this period are divided into different categories based on the pollution levels. The actions range from increasing the frequency of mechanized sweeping, sprinkling water on road, introducing lower fares in public transport to encourage off-peak travel, banning of firecrackers, to even stopping all construction activity or shutting of schools if the pollution becomes severe.

Considering that Smart Cities supposed competence lies in data collection and analysis, and technology, and its focus is encouraging citizens' participation as far as possible, a GRAP could have been worked out under the SCM for each city depending on its individual AQ patterns. Along with the monitoring which few of the Smart cities are doing, this data could have been used for informing policy on different aspects, for e.g under what circumstances does the AQ deteriorate drastically, what are the immediate measures the city ought to take, at the governance level, as well as what the citizens can do to minimize exposure. They could have strengthened outreach of this information by developing apps, as well as displaying the information on the VMS boards which are already installed in most of these cities.

A very consistent, disturbing theme throughout this study was the difficulty in getting any kind of information about the mission in all the cities studied. Some cities like Thane and Solapur don't even have an official smart city corporation website. Other cities are better off with websites, but without updated information about projects and other details, rendered quite useless and namesake. In terms of there being no transparency or timeline to the smart city mission, Mahajan stated that there was no time line to anything in the mission, something that is evident in the fact that many cities are struggling to execute projects and spend the money under the mission. There is very little answerability on part of the centre or state when it comes to this state of affairs. JnNURM, in contrast, had periodic assessments of project progress, all of which was open to the public. There is no way for anyone to know where to find any of the details of smart cities projects, nowhere to ask questions about the work done or proposed. Lack of any transparent appraisal mechanism, or even periodic updates on projects is a glaring gap in the mission.

In terms of governance, the formation of SPVs was touted as a way to avoid the slow and convoluted decision-making processes in Corporations and suited for faster decision making and implementation. The smart city corporations, however, have generally lagged behind in project implementation. From stakeholder interviews⁶⁸, it seems that this lag is the result of poor coordination with the respective city Municipal Corporations, lack of support of corporators and general lack of public participation and support for projects. It also seems like coordination of any kind with any other agency has been difficult with the mission. The convergence expected between the smart city mission and the NCAP is also found to be largely on paper than on ground.

The learnings from this study leaves much to be desired, both from the mission in general and in particular with air quality management in cities. It also poses questions on whether centrally sponsored schemes are the best way to handle air quality issues.

8 Endnotes

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9 Appendix

Stakeholder interviews

Stakeholder interview number 1

Stakeholder Name: Pushkal Shivam

Stakeholder Profile: Senior Consultant (Transport and Urban Public Services), ASCDCL

City: Aurangabad

Date: 21st November 2019

He informed that low-cost monitors at 4 locations have been proposed under the SCM. Currently MPCB has 3 manual monitors at 3 locations. and proposes to set up two continuous monitoring stations in the city. CPCB website shows one monitoring station at More Walunj.

As per document viewed in the smart city office, the low-cost monitors, called ESAUR001 has the following features;

- Real time continuous measurement
- Parameters measured:
 - a. Temperature
 - b. Humidity
 - c. CO₂, CO, NO₂, SO₂, O₃, NO, H₂S, VOC, NMHC, NH₃, PM₁₀, PM_{2.5}
 - d. Light
 - e. Noise
 - f. Solar Radiation
 - g. Wind Speed and Direction
 - h. Hail
 - i. Barometric pressure
 - j. Rain

In terms of other projects proposed in the SCP for improving air quality, none related to mobility or road network have been taken up. A public bus system had been started by the office, with a fleet of 100 buses today, but these are regular diesel buses, and not ones running on LPG/ CNG as proposed, Pushkal mentioned that the Aurangabad RTO does not have a procedure in place to give permits for buses running of CNG. So the fact that it was mentioned in the proposal is ironic.

There is mention of e rickshaws in the proposal as well, but Pushkal said that they were being explored only as a means to transport solid waste from the city to the dumping ground and not for transportation itself.

There doesn't seem to be much awareness about air quality in the city, and no organisation working on the issue exists.

Stakeholder interview number 2

Stakeholder Name: Hemant Landage

Stakeholder Profile: Treasurer, Aurangabad First

City: Aurangabad

Date: 21st November 2019

Aurangabad First is a very young organisation, established in 2018, with an intention to expand the work of Marathwada Environmental Care Cluster (MECC). They take up various issues in the city like water, transportation, roads and so on. Their activities also include tree plantation. They seem to be concerned about the increasing temperature in the city, but probably haven't made the connection with air quality.

Regarding smart city, Hemant Landage confessed to not knowing much about what was being done in the city. He informed that there had been no engagement post the initial exercise of engaging with people regarding preferences for smart city projects and creating awareness about the same. He said that currently the smart city corporation is pretty much headless with no one to drive it, and is resting on the shoulders of very young, inexperienced officials.

Stakeholder interview number 3

Stakeholder Name: Kaustav Chatterjee

Stakeholder Profile: Founder, Green Vigil Foundation
(<https://www.facebook.com/GreenVigilFoundation/>)

City: Nagpur

Date: 28th November 2019

Scope of work: Working for ten years in creating awareness about the environment in general – air, noise, water pollution. Activities include planting trees, observing and spreading the message of the earth hour, creating environmental awareness in municipal schools, and coming out with short reports on the same. Engaging with various media

Kaustav said that if one looks at the composition of air pollutants in Nagpur, it is found that all major toxic pollutants like SO₂, NO₂, CO, CO₂ are all under permissible limits. It is only the particulate pollution which is high. And this is expected, as Nagpur is a developing city undergoing big infrastructure changes and growing vertically. History has shown that this kind of pollution is unavoidable in a rapidly growing city. To add to it, the wind patterns in Nagpur are such that they disperse the fly ash and other particulate emissions from two major thermal power plants which are now within the city limits.

Nagpur also faces the issue of waste disposal and management. Out of the 1250 metric tonnes of waste generated every day, only 200 metric tonnes are treated. All else, then is disposed off by burning or through accidental fires, which again add to the pollution.

He commented on the location of the existing air quality monitoring stations, which he points out are located only on one side of the city, thereby giving a very skewed picture of the pollution in the city. The actual data produced by these monitors is also unreliable, according to him, as has been stated by a study by them recently (Lokmat Samachar, 28th November 2019).

Coming to the smart city mission, he felt that there was nothing smart about the way they were functioning because there is nothing to show for it on ground. They have proposed to set up sensors at various locations in the city, which overlap current locations.

When asked about the NCAP, he said all plans exist on paper, but nothing translated in reality.

Stakeholder interview number 4

Stakeholder Name: Pradyumna Sahasrabhojane

Stakeholder Profile: Architect, Conservationist

City: Nagpur

Date: 28th November 2019

As far as he knew, smart cities mission was about going digital and providing integration of different services through it. In relation to the environment, he recalled the inclusion of green building norms in them.

Regarding air quality in the city, he mentions the prime reason of pollution are the thermal power plants located in the city itself, and no longer in the outskirts as had been the case earlier. He mentioned that the capacity of these power plants had been increased manifold in the last couple of years without thinking about its environmental impact. Apart from this, the continuous ongoing construction contributes to the air pollution, such as the Metro, cement concretisation of roads in the city.

Being interested in biodiversity, heritage and the river rejuvenation in the city, he mentioned a very unique point that no plans or projects that come from the top ever think about the city's existing ecosystem. They try to forge their own infrastructural ambitions on cities, thereby making absurd, inefficient cities which aren't being true to themselves. He feels that for a city to flourish, its natural resources must be safeguarded as a non-negotiable condition.

Stakeholder interview number 5

Stakeholder Name: Jagbir Singh, Bharati Jadhav, Shubham Gosavi

Stakeholder Profile: members of CSO Manav Uthhan Manch

City: Nashik

Date: 16th January 2020

The organisation was formed in 2006 with two focus points, environment and education. In the environment, they have focused on plastic pollution and waste burning. It is through the issue of waste burning that they connected with air pollution as an issue.

They worked extensively to report and hence reduce garbage burning cases by facilitating complaints through the Nasik E-connect app and were successful in reducing garbage burning significantly. However, AQI has only worsened since 2006. It means that the authorities have to look for the causes and work proactively. But the issue is that they don't feel pollution is a problem at all, in fact they don't feel Nasik is polluted really. Even as it has been named as the sixth most polluted city in Maharashtra and AQI constantly shows that pollutants are above permissible limits. They also said that the collector Suraj Mandhare, when shown AQI says that the readings are wrong! He also pointed out that this situation is not restricted to the authority level, people too are unaware and unconcerned about the air they are breathing. It isn't a people's issue yet.

In terms of monitoring status, they said currently there is only one monitor, and hence readings might as well be an underestimate than the real pollution. He said that monitors should also be set up in the industrial area to get a balanced reading. They have an application 'Sameer' by CPCB like the SAFAR app.

Foraying into the smart city scope, he said they really don't see the smart city mission bringing in any change in the status quo. No monitors have been set up under it as per their information. When asked specifically about projects, more information was received. In terms of roads, only one pilot road (Ashok Stambh to Trimbak Nagar) was being done since two years and not completed even now. The delay has

been due to changing contractors he said. A tender for procuring e-buses was delayed, and the current fleet and functioning of MSRTC buses left much to be desired in terms of service and efficiency.

We asked him about the public bicycle system stations we saw, he said those too were started two years back and were not functional now. There are no cycle tracks in the city, he said. They were not aware of any parking policy or mechanism. When asked about the NCAP city action plan, they said that it was hard to get them to do the simplest of things, expecting anything out of the action plan to be done was distant. They pointed out that there was no involvement of people in the smart city proposal making or even implementation. No civil society was consulted/ involved for any projects and that even between the smart city corporation and Nashik MC there was no coordination.

Stakeholder interview number 6

Stakeholder Name: Vanjari

Stakeholder Profile: Environment Officer, Nashik Municipal Corporation

City: Nashik

Date: 16th January 2020

Vanjari shared the Nashik City Action Plan submitted by the Corporation and approved by CPCB. He mentioned that Nashik had 1 CAAQMS and 4 manual ones installed by MPCB.

According to him, under the NCAP, the responsibility of checking the vehicular emissions lies with the Traffic department, and that they were imposing fines without PUC check.

The draft report of the source apportionment study by NEERI and IIT- B has been received by NMC. The parking management plan, under the Smart City is being implemented at 30 locations, and fines are being levied for vehicles parked in non-designated areas, as well as being towed away in some cases. A city level committee has been formed under the chairmanship of the Commissioner with NMC, Traffic, MPCB, RTO, and other stakeholders. One meeting has taken place, minutes awaited. The Secretary is the Regional officer of MPCB.

Under ABD, work on infrastructure for pipelines, electricity cables, storm water drains, waste water lines, roads etc has been awarded to B.G Shirke company of Pune. Road widening and flyover works on Pune Nashik highway is ongoing to reduce traffic congestion. Under SC, 150 electric and 200 CNG buses are going to be procured. An integrated traffic management scheme under SC pan city is underway.

Public Bicycle Sharing (PBS) program carried out by SC with cycles from Hero company (Hexi). 1000 cycles and 100 docking stations established. Through CSR, NMC in the process of finalizing air filters at some traffic islands. Currently this proposition is being discussed. Wayu, a web application for air quality information updates has been developed by NEERI. NMC is also imposing fines on open burning of waste in the city. MPCB and NMC are working towards installing 1 or 2 more continuous monitoring stations.

The general perception of the city officials is the Nashik air is clean and pristine. They question why it is a nonattainment city. For this they would like to verify the data of past few years by analyzing the data they gather on their own, through the proposed new monitoring systems. Overall feeling is that once the SC initiatives take off and are implemented, the quality of life will surely be positively impacted.

Stakeholder interview number 7

Stakeholder Name: Leena Buddhhe

Stakeholder Profile: Director, Centre For Sustainable Development

City: Nagpur

Date: 12th March 2020

She said that the AQ in her city is always above the permissible limits, always above 60 . The main source of air pollution being the thermal power plants at Koradi and Khaparkheda , vehicular pollution , dust and waste burning and also construction activities (Metro and Cement roads)

As of now nothing is really being done for Air quality management on ground except for some sporadic activities. Although the air action plan is ready there is no word coming from all the stakeholders on its implementation.

When asked about the projects proposed by NSSCDL for air quality improvement she commented that they are still in the tender stage only ! If brought in it will definitely help improve the air quality. The limitations are only in terms of its implementation - the time it takes to take off. The authorities need to wake up and also look at the actual data that they get from the AQI sensors that they themselves have installed and work around that instead of quoting the AQI readings of MPCB. If technology is their main driver , they need to actually use it well to bring about improved AQI of the city on the whole.

On citizens' involvement in air quality as an issue she felt that till now the people are not really aware about the AQI levels of the city. There has been some awareness through press releases, but because one cannot see air, there needs to be more awareness that needs to be done. We recommend and are also working on conducting public consultation on the air action plan. NEERI has already said that the Air Action Plans that have been prepared should be discussed with the public and their recommendations and suggestions should also be noted. We all know that it takes a long time for the government machinery to implement things and therefore the AAP's should be treated as a dynamic document which will keep changing too.

She commented that there is a huge issue with implementation of the Air Action Plan under NCAP. There is no coordination between stakeholders. The structure that has been suggested by the CPCB for implementation wherein the local bodies are supposed to coordinate and take monthly review doesn't work at all as no stakeholder is actually responding to the local body. The responsibility needs to be shared . Each stakeholder is responsible for implementing their own part. There is no clarity of funds coming in for various works . Due to lack of funds and manpower the implementation of the AAP has become a big question mark.

Stakeholder interview number 8

Stakeholder Name: Mangesh Dighe

Stakeholder Profile: Environment Officer, Pune Municipal Corporation

City: Pune

Date: 9th January 2020

He feels that air quality is an issue which is very complex and involves too many stakeholders to be managed single handedly by one Environment Officer. It is also complex because air may be polluted because of activities not being done in the city itself. He feels that an air quality department is necessary to involve these various stakeholders (eg: solid waste management, energy providers like MNGL etc). In terms of policy and plans he said that the NCAP city level action plan is very good and touches upon almost all the points needed to improve air quality. Implementation, however, is again a complex issue because of the various stakeholders involved. On being asked about the formation of a committee to ensure implementation, he said he was following up on it and it might happen soon.

Regarding Pune's air quality, he doesn't feel it is particularly alarming. Whatever non-attainment cities have been identified have been identified because they are monitored. If all cities and towns and villages are monitored, all of them will come out to be non-attainment areas. In Pune, people are not really worried about air quality. It isn't like Delhi.

Regarding PSCDL, he said he knew nothing of anything they were doing, except that there were 50 low-cost monitors being installed. He felt that PSCDL functioned as a parallel government, and it is a constitutional issue.

He also did not show much faith in the data collected by the SC sensors. He said he cannot rely on data about which he is unsure of its authenticity. He cannot use those figures in his ESR, as they were not ratified by any scientific/ govt body.

Stakeholder interview number 9

Stakeholder Name: Priyadarshini Karve

Stakeholder Profile: CEO, Samuchit Enviro Tech Ltd

City: Pune

Date: 9th January 2020

On being asked about the air quality in Pune, she felt that terms like AQI made little sense to citizens, because it may not relate to what they are experiencing on ground. And localised readings and experiences differ greatly. What AQI shows us is the pollutant profile, but the level of exposure greatly affects how people are perceiving and experiencing air quality. For example, in her office at Nalstop, she has fitted an indigenously made, experimental sensor which gives live data of the air quality right there, not the ambient air quality. This kind of localised data should be made available to people so they understand air pollution better. This has a better chance of making air quality a people driven issue than what is being done now.

We spoke about the solutions proposed in the SCP like e buses and rickshaws, to which she rightly pointed out that such solutions do not necessarily ensure or even touch upon the larger issue of creating a shift from private vehicles to public transport. How effective then are they really in tackling air quality?

On being asked about her general perception of smart city's performance in the city, she literally laughed and said, it would be nice if you could tell me what they have done in the city. Apart from a few mobile/ online applications and some very superficial stuff like road sculptures in ABD, no fundamental/ sustainable change is seen in the city. And the fact that every new project in the city is being seen as a smart city project is also very misleading, for example the Metro. She felt that air quality would have been a perfect issue for smart cities, as it is very data reliant, data driven. As of now, data from various sources may be going to PMC, but what the PMC does with it is the main question.

Regarding governance, she felt that the way the PSCDCL is formed, creates a public private conflict. In this situation, no one can expect coordination between the PMC and PSCDCL, and hence projects suffer.

Stakeholder interview number 10

Stakeholder Name: Ravindra Sinha

Stakeholder Profile: Member Hinjewadi Residents' Welfare Association (HIRWA)

City: Pune

Date: 24th January 2020

Operating in the Gram Panchayat and MIDC area of Hinjewadi, Maan, Marunji area.

Though it is an industrial area, the pollution caused there is mainly by garbage burning and not industrial pollution. Although some of the wet garbage is composted and dry waste recycled by residents, much of it gets collected by contractors, and eventually dumped on vacant plots and burnt.

The community members now locate the garbage burning spots and map them on a google sheet. They place complaints with MPCB and have managed to close down a couple of factories which were polluting indiscriminately by burning.

The service roads, highways and farms whose owners are paid to use the land for burning the garbage are the preferred burning grounds. The PMC points to the NHAI when it comes to dealing with garbage on highways, and since it is a garbage issue, the NHAI points back to PMC. The police are generally reluctant to file FIRs for such complaints.

Since Hinjewadi is a major IT hub of Pune, almost 1.5 lakh vehicles frequent the area on a daily basis. The vehicular emissions are also substantial.

At the beginning of 2019, Delhi based CEEW have contributed 5 low-cost monitors to HIRWA which are placed at various locations in the area, including one at a school. The readings are sent out on an app, and the members also put the AQI on FB, Twitter, and other social groups. This way the residents are at least aware of the AQ in immediate surroundings, and when it goes beyond a certain limit, the members also know that there is some burning happening close by, and become vigilant and take action.

Ravindra Sinha said, “ As a Smart solution to combat air pollution, much more monitoring needs to happen, and a sensor has to be placed in every 5 kms radius. The monitors need to be of standard calibration, and should be maintained well as they are sensitive instruments.

In case of garbage burning episodes, if a common dashboard is available to all local bodies authorities giving real time data and locations, it would be possible to take quick action without waiting for citizens’ intervention.

Smart Cities can take on CCTV surveillance in identified hotspot areas. Satellite imagery, garbage treatment, maximising public transport were essential to monitor and mitigate air pollution. Display of AQI should be mandatory in all schools, so awareness begins at an early age.

Any violating action which affects air quality should be penalised stringently.

Stakeholder interview number 11

Stakeholder Name: Sanskriti Menon, Amarnath Karan

Stakeholder Profile: Programme Director, Scientist, Centre for Environment and Education

City: Pune

Date: 5th March, 2020

When asked about the air quality in Pune Amar started out saying that Pune doesn’t comply with CPCB standards when it comes to air quality. The Air Quality Index, which is increasingly being used to communicate air pollution reflects the ambient air quality, which is a very generalised, averaged out number. It does not reflect the local exposure of pollutants, neither does it look at sources of pollutants. There is a need to look at different sources of air pollution, such as industrial and vehicular among others to understand the real picture of air quality in the city. Indoor pollution is also a neglected aspect of air quality. The standard method of quantifying air pollution is to find out its source, receptors and the level of exposure. This method isn’t being used in the city at all.

We further asked what the city was currently doing for air quality improvement. Amar clarified that air quality and its improvement is a multi-sectoral issue. So things are being done to some extent in different sectors. Major sectors which affect air quality are transport, waste management, construction, agricultural burning. In transportation, PMC has built cycling infrastructure, introduced electric buses and those running on CNG. Many rickshaws have also been converted to CNG from Petrol. Waste management has

also improved, though there is no proper channel for garden waste which ends up being burnt. Landfills around Pune also increase pollution when it isn't processed properly and burnt off. For reducing pollution due to construction activities, guidelines exist but their monitoring and compliance is an issue. Some measures are also taken to reduce road dust.

In terms of plans or policies, the city action plan under NCAP exists. The CPCB had entrusted state pollution boards to prepare these action plans. State boards in turn asked cities to prepare the plans. In the absence of any framework or guidelines on preparation of the plan, these plans remain quite general and lack any targets or deadlines as such. In fact, the first version of the city plan submitted contained only the existing monitoring stations. It was only after CPCB asked MPCB on what actionable items are there in the report that the second version mentioned the addition of two monitoring stations in the city.

Amar went on to say that compared to other cities AQ in Pune is better, owing to the four months of rain received which lowers pollution. Summers are also okay in terms of AQ. It is only in winter that AQI shoots up. There were two main things in the NCAP that the city could have undertaken under the city action plans. Firstly, strengthening of the monitoring system itself, which would allow for further analysis and action. And secondly a city level surveillance system. Currently Pune relies entirely on data given by IITM, which is very restricted. It is just an index, limiting any further analysis and hence any further action.

Moving to the governance impact of smart cities mission, Sanskriti Menon said that the PSCDCL, its performance and its coordination with PMC has been disappointing and dysfunctional. Unlike some other cities, PSCDCL has a completely different set up and identity from the PMC. The result has been that very few projects have successfully been completed even after so many years post the mission. How this affects projects on air quality is that though low-cost monitors have been put up under the mission, where the data from this goes, what happens to the data is largely unknown and mostly undecided. The PMC does not pick up this data and use it for its planning or action.

There are different layers of data when it comes to air quality – there is the pollutant itself and then the impact of climatic conditions, topography of the city and its surrounding activities that affect the exposure. IITM has the capacity to record these layers, but this data is not being made available for further analysis and modelling. When we speak of using data for urban land use planning itself, there are so many possibilities. But at present we are not even using very direct, available data for urban planning, using AQ data is a very far off proposition. It will definitely help, but right now planning is being done very superficially. Current CPCB standards are not as stringent as WHO standards. We don't have exposure studies, and may be ignorant about the actual health impacts, especially beyond the generally known respiratory system impacts, even when the AQI says satisfactory and nothing to worry about!

In terms of governance, one needs to understand that PMC is a major polluter and so are the peripheral areas. But when it comes to jurisdiction, PMC can only act in its area and not necessarily in the peripheral area. The peripheral area also generates a certain kind of pollution which needs to be addressed. But who will address that? A coordination committee was supposed to be formed to bridge this gap, but it hasn't been constituted yet in Pune.

When asked about the projects proposed in the SCP for AQ improvement and their efficacy, she responded saying that there are no numbers to say what the impact of these proposed projects would be. But anyone could judge that this isn't enough to tackle air pollution in the long run. We need to acknowledge that we need different types of data to tackle this issue. It would have helped if the PSCDCL was less territorial in its approach and worked towards the city's need for better monitoring. A good role for the smart city corporations would be to create the institutional set up to analyse available data and formulate actions for mitigating air pollution. While the smart cities are conceptually all about data and transparency, there is also a flipside of making air quality data open for all. As has been said by Dr Ritu Pachure and Dr Beig, air quality data and communication need very tactful handling so as to not create a panic situation among citizens. For example, if air pollution is found to be worse around a school, we

wouldn't want knee jerk reactions from parents and other citizens suggesting flyovers and so on. It would need more study to come up with alternative solutions such as traffic rerouting, probably congestion charging and so on. When asked about whether AQ is a citizen driven issue in Pune, Sanskriti denied saying that it is still a very academically driven, civil society driven issue and citizens are peripherally involved if at all at this stage.

When asked about what more could have been done under the mission for improving air quality, Amar said focus needs to be on bringing about a modal shift from private to public transport and on reducing per capita emission. The smart city offices have the capacity to come up with such plans but these haven't been taken up at all. Also, it is important to move from reliance on ambient air quality to ward level, local mapping of pollution. This will encourage actions based on immediate surroundings and exposure and also help fix some accountability, as the action items will be very specific at the ward level.

Stakeholder interview number 12

Stakeholder Name: Ashish Agarwal

Stakeholder Profile: Consultant, IL&FS

City: Pune

Date: 7th January 2020

He has been a consultant (IL&FS) to PMC for about 12 years now, from the times of JnNURM. When asked about his exact role, he described it as coordination between PMC and Centre for facilitating implementation of centrally funded schemes. Under JnNURM, he was part of the 'Project Implementation Unit' mandated by the JnNURM for smooth implementation of its projects. Then on, he has been retained by the PMC for providing guidance on various things related to centrally funded schemes like AMRUT etc.

He spoke very little on air quality as such, and accepted that that isn't his subject of expertise. He said that for Pune, air quality is not a worrying factor, hence people are not bothered so much by it. He said Pune SCP does not have a direct air quality component.

He commented that the proposal prepared for this mission was prepared with no knowledge of how much funds would be made available. Funds have been a limiting factor in this mission.

'Smart' has become a buzzword, and hence the projects are also just a buzz. It doesn't have a sustainable basis, unlike JnNURM. The projects established under JnNURM like sewage treatment plants, roads etc are being used efficiently even today. The focus of SCM is on ICT. And PMC or PSCDL have no expertise in these.

Before the SPV was formed we provided guidance to PMC to streamline projects. Post SPV our involvement has been very limited and you can see the impact. Projects have suffered, But we do not have any mandate now that the SPV has been formed. The problem has been that the SPV doesn't have the vision with which the proposal was made, hence their whole focus is on issuing tenders etc. But even there they are limited by the availability of funds.

When Kunal Kumar was the CEO, things moved, because he provided the vision. Now, things will start getting on track again with Rubal Agarwal taking charge.

He felt that SPV is the fastest way of getting things done. But it has to be constituted in a way which strengthens its plus points. Look at the Metro SPVs, they do great work. An SPV headed by the Commissioner is more efficient because a Commissioner knows what is going on in the city with respect to many issues. His vision is not restricted. Hence there is no gap in the vision and implementation. In the absence of this, the PSCDL functions in a disconnected way and PMC can't do anything because it has no mandate.

He also felt that projects in mission mode were an efficient way of getting things done, provided the State takes charge and stops being just a postman of the Centre's funds to the cities/ ULBs. Why do states never come up with any schemes for its cities? All expertise is concentrated at the Centre? What about capacity building of ULBs?

When asked about what the city was doing for air quality management, he listed the NCAP city action plan, funding for it, MoU with California based NRDC. ICLEI had also prepared a document for establishing a Solar Energy Cell in Pune, but no funding, hence stalled. PMC routinely prepares the ESR and has some monitors already in place.

On what more could be done, he felt that manpower was a crucial reason why the environment was not a concern for many. We just have one environment officer and what all could he possibly do. We need a proper environment department, wherein this environmental perspective can percolate to all the projects that we undertake. It won't happen otherwise, in the way things are done today.

Stakeholder interview number 13

Stakeholder Name: Persis Taraporewala

Stakeholder Profile: Researcher

City: Pune

Date: 4th March 2020

Persis has been following the Smart Cities Mission since its launch and is skeptical of how any SPV can function without clarity from higher levels of government (regional and or national) about the relation of SPV to the local urban body. In the Pune SPV, currently the CEO is an additional commissioner of the PMC and there may be better engagement between the two bodies, however in the absence of such an overlap, clear and standardised regulation about their relationship is crucial for the success of the Mission.

When asked why the smart cities has not performed well stated that while smart cities were supposed to bring data and transparency to urban development projects, in the Indian context however there is no clarity of what data is being collected, where it resides or how citizens can access it to help improve the functionality of the city. This lack of transparency about data and project implementation has been a problem in the Mission which is striking because previous urban development programmes did upload systematic and regular updates on their website.

Stakeholder interview number 14

Stakeholder Name: Prof. (Dr.) Gufran Beig

Stakeholder Profile: Project Director, SAFAR, Indian Institute of Tropical Meteorology
(Ministry of Earth Sciences, Govt. of India)

City: Pune

Date: 16th January 2020

When asked about what a city can do in terms of air quality, especially under the designation of a Smart City he replied saying that the first and foremost need is to know the status of air quality in that particular city. Often we do not have any information about the levels of air pollution due to lack of proper measurements. Observational networks need to be strengthened. Once we have assessment of air quality, the emission inventory needs to be developed to understand the sources of pollutants required for mitigation planning. Then the next step will be to think about various short, medium and long term objectives. Implementation of existing rules and guidelines in true spirit is lacking. NCAP promises good if implemented properly

Stakeholder interview number 15

Stakeholder Name: Manisha Pradhan

Stakeholder Profile: Environment Officer, Thane Municipal Corporation

City: Thane

Date: 20th February 2020

Pradhan's perception of the major reason of air pollution in Thane is vehicles, followed by Construction and Dust. There is not much waste burning happening since they have a fairly efficient waste management system.

Thane Municipal Transport has a total of 328 buses - 103 are CNG, 225 on diesel. They have contracted 100 e-buses, and 1 has arrived and is running as of now. The charging station, for both - 2 wheelers as well as 4-wheelers will be managed under the smart cities mission.

The Command and Control centre is being developed, under which the traffic signals will be simulated. The Parking Policy is approved but implementation not happening yet.

Thane has 3 manual monitoring stations under the MPCB, and 3 continuous stations are proposed under the NAMP (National Air Quality Monitoring Programme)

There are 5 display boards across the city to inform citizens about AQ,

Apart from these, there is 1 low-cost monitor at an important junction - Teen Hath Naka.

The air quality is communicated to the public through an app called TMC Pollution Control Cell which displays the Air Pollution Index.

There are initiatives mentioned in the update that the Smart City office has given us which says there is a smog tower, dust machine controller either proposed / existing, but according to her, those have been scrapped.

So there is no way of ascertaining what on ground reality is, because data available is not updated and does not reflect on ground situation.

Stakeholder interview number 16

Stakeholder Name: Sulakshana Mahajan

Stakeholder Profile: Researcher, Writer on Urban Issues

City: Thane

Date: 17th February 2020

She has been quite disillusioned by the whole mission itself, calling it by far the most unproductive mission in India. With this impression, air quality is not even on the radar of the mission, she feels. Even the most direct, major portions of the mission are struggling to be executed, air quality is too far fetched to be addressed by the mission.

She feels that air quality monitoring isn't the most difficult task. Buying and installing machines is easy – that will just accumulate a whole junk of data for the authorities. But what the data means, how it is to be analysed and what action is to be taken is totally ignored. The problem is that air quality and its improvement is not a direct target – it has too many factors, spread out across sectors like transport, solid waste management, civil construction and so on. Source apportionment is not really catching up in our cities, without which any data is quite useless for action. Then they come up with short sighted ideas like electric vehicles to offset pollution. How is that even logical if e-vehicles are about 2% of your vehicles, and private vehicles are growing at the rate of 5% annually. It just doesn't make any sense.

In terms of there being no transparency or timeline to the smart city mission, Mahajan stated that there was no time line to anything in the mission, something that is evident in the fact that many cities are struggling to execute projects and spend the money under the mission. There is very little answerability on part of the centre or state when it comes to this state of affairs. JnNURM, for whatever it was, had periodic assessments of project progress, all of which was open to the public. There is no way for anyone to know where to find any of the details of smart cities projects, nowhere to ask questions about the work done or proposed. The smart cities website for Thane doesn't even exist, and little details exist on the TMC website which aren't up to date.

When asked about how the creation of SPV for the mission affects the governance ecosystem, she feels that the real intent of the SPV was to be more independent and hence fast in decision making and execution, which is missing. The SPVs are state controlled, hence there isn't much independence to look for. Here the CEO is a member of TMC, thereby making things difficult. Also, there is no coordination between the SCO and TMC, in fact there are conflicts. Moreover, none of the corporators are really supporting the smart city projects. Without people's support or participation, this whole thing is a bogus project she feels.

Stakeholder interview number 17

Stakeholder Name: Swapnil Solankar

Stakeholder Profile: Environment Officer, Solapur Municipal Corporation

City: Solapur

Date: 6th February 2020

In an interview with Environment Officer, Solapur Municipal Corporation Swapnil Solankar, he shared that the air quality was currently being measured at 2 locations, Solapur Municipal Corporation and WIT campus. There are 2 more CAAQMS proposed and sanctioned, and will be installed in the next 3 months.

Solapur, being a dry city with very little moisture, there is a huge amount of dust that gets scattered in the atmosphere due to winds. It is also a developing city and hence is subjected to a lot of construction activity as well as carriage of construction material by large trucks which add to the dust generation. To cut down the wind factor, the SMC is resorting to greening of areas, and with the help of NGOs, has undertaken plantation drives.

10 Annexure

Letter to Director, Smart Cities Mission for information



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Information requested regarding the implementation of projects related to air quality management in non-attainment smart cities in Maharashtra

General

1. Have Smart Cities developed any action plan to reduce air pollution - short term or long term - especially non-attainment cities (as per National Clean Air Program - NCAP)?
2. What is the trend of air quality in Smart Cities (overall city or the Smart City Area) over the life of the Smart City Mission?
3. Do Smart Cities have a communication channel to inform residents about
 - a. the current and forecasted air quality levels
 - b. actions that citizens can take to avoid exposure
 - c. actions that citizens can / should take to reduce emissions
4. Have Smart Cities developed any version of a GRAP (graded response action plan) - essentially a set of actions to be taken in response to bad air quality (measured or forecasted)?

City-specific

Pune:

1. Periodic assessment reports of Pune sent to the Centre (National Institute of Urban Affairs) for the year 2019
2. Location and number of air quality sensors set up under the mission. Do they generate live information? Please provide location of command center where this data can be found.
3. How is the outreach of the air quality been done for the Smart City citizens?
4. Details of any other projects taken up by PSCDL for air quality improvement
5. Status of following projects from the Pune Smart City proposal in terms of location of projects, money spent and whether completed or in progress;
 - a. BRT
 - b. E-rickshaw100 e-buses
 - c. Revamping of 54 bus stations
 - d. Non-motorised street
 - e. Footpaths
 - f. Street Redesign

Aurangabad:

1. Periodic assessment reports of Aurangabad sent to the Centre (National Institute of Urban Affairs) for the year 2019
2. Details of any other projects taken up for air quality improvement
3. Status of following projects from the Aurangabad Smart City proposal in terms of location of projects, money spent and whether completed or in progress;
 - a. Road Network including cycle tracks in Area Based development Plan
 - b. Smart Mobility in Pan City Proposal

Nagpur:

1. Periodic assessment reports of Nagpur sent to the Centre (National Institute of Urban Affairs) for the year 2019
2. Details of any other projects taken up for air quality improvement
3. Status of following projects from the Nagpur Smart City proposal in terms of location of projects, money spent and whether completed or in progress;
 - a. Project Tender SURE (Road and NMT)
 - b. Move People Initiative (e-buses)
 - c. Smart bus shelters
 - d. e-rickshaws

Solapur:

1. Periodic assessment reports of Solapur sent to the Centre (National Institute of Urban Affairs) for the year 2019
2. Details of projects taken up for air quality improvement

Thane:

1. Periodic assessment reports of Pune sent to the Centre (National Institute of Urban Affairs) for the year 2019
2. Details of projects taken up for air quality improvement
3. Status of following projects from the Thane Smart City proposal in terms of location of projects, money spent and whether completed or in progress;
 - a. Pedestrian improvements
 - b. New suburban station
 - c. Multi-modal facility
 - d. Teen haath naka junction improvement

11 Glossary

AAQMS - Ambient Air Quality Monitoring System

This is also known as the Manual Air Quality Monitoring System. Under this system, the device samples the ambient air, and then after a few days of data collection, it is transferred manually to the center where the data is analyzed. The report is generated manually based on the analytics, and then finally, the data is archived to the server. The process of sample collection, sample transfer to the lab, analysis, data recording, and post-consumption may take up to 2-7 days to complete and get the pollution information of the location.

ABD - Area based development

This kind of development aims at driving economic growth and improving the quality of life of people by enabling local area development and harnessing technology, especially technology that leads to Smart outcomes. Area-based development will transform existing areas (retrofit and redevelop), including slums, into better planned ones, thereby improving liveability of the whole City. It is also proposed that once such a model is established in the selected area, it will be replicated in the whole city.

AQI - Air Quality Index

An index for reporting daily air quality. Based on the measured ambient concentrations of pre-decided pollutants, their corresponding prescribed standards, and likely health impact, a sub-index is calculated for each of these pollutants. The worst sub-index reflects the overall AQI.

CAAQMS - Continuous Ambient Air Quality Monitoring System

A continuous monitoring system comprising sampling, conditioning, and analytical components and software designed to provide direct, real-time, continuous measurements of pollution by analyzing representative sample(s) of air to be monitored.

EI – Emission Inventory

Helps to identify pollution based on the distribution of pollution causing activities in a given area. First these activities are mapped and then zeroed in upon each of these sources to estimate the levels of emissions.

EPCA - Environment Pollution (Prevention and Control) Board

A Supreme Court mandated body tasked with taking various measures to tackle air pollution in the National Capital Region. It was notified in 1998 by the Environment Ministry under the Environment Protection Act, 1986. It is also mandated to enforce Graded Response Action Plan (GRAP) in NCR as per the pollution levels

GRAP - Graded Response Action Plan

Instituted for the Delhi and NCR region, it constitutes short-term measures which are to be executed when the air quality deteriorates to a certain level. The actions to be taken in this period are divided into different categories based on the pollution levels.

NAAQS - National Ambient Air Quality Standards

These are limits set on atmospheric concentration for pollutants that are common in outdoor air, considered harmful to public health and the environment, and that come from numerous and diverse sources. At present, India has set NAAQS on 12 kinds of pollutants.

NAMP - National Air Quality Monitoring Programme

A nationwide program of ambient air quality monitoring by CPCB under which certain pollutants have been identified for regular monitoring at all the locations at which monitors are installed.

NCAP - National Clean Air Programme

Instituted in 2018, a programme that defines actions that must be taken at a national level to improve the air quality management status of the country and reduce concentration of $PM_{2.5}$ and PM_{10} by 20%-30% by 2024 taking 2017 as the base year.

NDTL - Nashik District Tinkering Lab

The Nashik District Tinkering Lab (NDTL) — a joint initiative by Nashik District Administration, Nashik Municipal Corporation (NMC) and Zila Parishad has started functioning and will have a formal launch of the programme soon.

A team of experts had started working on the lab from March 2018 and the work is set to be completed soon. The lab is hosted in the Yashwantrao Chavan Planetarium premises. It is built on the lines of NITI Aayog's Atal Tinkering Lab with an outreach to the whole district.

Nonattainment city

CPCB has identified a list of polluted cities in which the prescribed National Ambient Air Quality Standards (NAAQS) are violated. These cities have been identified based on ambient air quality data obtained (2008-2010) under National Air Quality Monitoring Programme (NAMP).

SAFAR - System of Air Quality and Weather Forecasting And Research

Developed by Indian Institute of Tropical Meteorology, Pune, the SAFAR initiative provides location specific information on air quality in near real time and its forecast 1-3 days in advance in the cities where it is operational. The air quality information has been combined with the early warning system on weather parameters.

SAS - Source Apportionment Studies

A scientific study undertaken to find out what the different sources of pollution are and how much each source contributes to the total pollution.

Urban LEDS - Urban Low Emission Development Strategies

The Urban-LEDS II project addresses integrated low emission and resilient development in more than 60 cities in 8 countries: Brazil, India, Indonesia and South Africa (from Phase I) and countries added in Phase II: Bangladesh, Colombia, Lao PDR and Rwanda. In addition to these countries, 16 European cities will act as source cities and support peer-to-peer exchange and cooperation.

Pan city development

Envisages application of selected Smart Solutions to the existing city-wide infrastructure. Application of Smart Solutions will involve the use of technology, information and data to make infrastructure and services better.

12 Abbreviations

ABB - Aundh Baner Balewadi (Area selected by Pune for its area based development)

AMRUT - Atal Mission for Rejuvenation and Urban Transformation

ASCDCL - Aurangabad Smart City Development Corporation Limited

BRT - Bus Rapid Transit

CAPIndia - Clean Air Project in India

CEE - Centre for Environment Education

CEEW - Council on Energy, Environment and Water

CFSD - Centre for Sustainable Development

COC - Command and Control

CPCB - Central Pollution Control Board

CSIR - Council of Scientific and Industrial Research

DPR - Detailed Project Report

EPIC - Energy Policy Institute at University of Chicago

ESR - Environmental Status Report

GCNI - Global Compact Network India

HIRWA - Hinjewadi Residents' Welfare Association

ICCC - Integrated Command and Control Centre

ICLEI - Local Governments for Sustainability.

ICT- Information Communication Technology

IIT-B Indian Institute of Technology Bombay

IITM - Indian Institute of Tropical Meteorology

ITMS - Intelligent Traffic Management System

JnNURM - Jawaharlal Nehru National Urban Renewal Mission

MoEF&CC - Ministry of Environment and Forests and Climate Change

MoHUA - Ministry of Housing and Urban Affairs

MPCB - Maharashtra Pollution Control Board

MSRTC - Maharashtra State Road Transport Corporation

MSW - Municipal Solid Waste

NEERI - National Environmental Engineering Research Institute

NHAI - National Highways Authority of India

NMC - Nagpur Municipal Corporation

NMSCDCL - Nashik Municipal Smart City Development Corporation Limited

NMT - Non - motorised Transport

NSSCDL - Nagpur Smart and Sustainable City Development Corporation Limited

PBS - Public Bicycle System

PCBs - Pollution Control Boards

PMC - Pune Municipal Corporation

PPP - Private Public Partnership

PSCDCL - Pune Smart City Development Corporation Ltd

RFP - Request for Proposal

SCM - Smart Cities Mission

SCP - Smart City Proposal

SDC - Swiss Agency for Development & Cooperation

SPV - Special Purpose Vehicle

SSCDCL - Solapur Smart City Development Corporation Ltd

TERI - The Energy and Resources Institute

TMC - Thane Municipal Corporation

TPS - Town Planning Scheme

VMS - Variable Messaging Systems



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