Hot Spots Identification and Micro Action Plan for Surat City

1. Introduction

The air qualities in cities are influenced by regional-level activities and meteorological conditions. During certain period in a year, due to high intensity activities and adverse metrological conditions, the air quality deteriorates to such an extreme level that it poses significant health risk. Particularly the elderly people, sick persons, women, and children are worst affected.Air quality is measured through several parameters. To present the air quality in a comprehensive and simple manner, the Central pollution Control Board (CPCB) has developed an Air Quality Index (AQI) that is used across the country. The AQI classifies the air quality in a scale ranging from 'Good' to 'Severe' following a protocol that uses PM_{10}, $PM_{2.5}$, SO_2 and NO_x as the input air quality parameters. Due to intense urban activities, air qualities in urban areas are observed to be falling below 'satisfactory' quality in unfavorable meteorological condition, particularly during winters at a greater frequency. Therefore, an appropriate intervention mechanism has become essential to put a check on further deterioration and to restore air quality including precautionary measure to minimize health risk. Management of air quality involves multiple agencies like, State Pollution Control Board, Forest & Environment Department, District Administration, Urban Local Bodies, Traffic Police, Transport Department and Education Department etc. This document outlines the actions to be taken for different ward level hotspots identified for SMC as a part of the Surat Clean Air Action Plan Project by WRI India.

2. Source Apportionment Study

Surat city is identified as one of the non-attainment cities of Gujarat besides being known as a major industrial hub of the state. According to emissions inventory data, in 2019, the transportation sector contributed about 30%(4.19 kt/year) of $PM_{2.5}$ emissions. The source apportionment study based on the dispersion modelrevealed that the transportation sector contributes about 16% $PM_{2.5}$ in winters and 6% in summers.The receptor model estimation revealed an average seasonal $PM_{2.5}$ contribution of 16% and 5% inwinters and summers, respectively, from the transportation sector

The source apportionment of ambient particulate matter (both $PM_{2.5}$and PM_{10}) was prepared using two different modelling based approaches and develop an air quality management plan based on future projections of source emissions levels to reduce pollutant concentrations in future.

In the city, major sources of PM_{10} emissions are road dust (55%), industry (25%) and transport (12%). For $PM_{2.5}$ emissions, road dust (33%), transport (30%) and industry (27%) are the major contributors. Share of combustion sources is higher in $PM_{2.5}$ as they emit higher shares of fine particulates in comparison to dusty sources like road dust and construction.

Sources of SO_2 emissions are primarily from industry (85%) followed by residential sector (12%). 85% of NOx emissions are contributed by transport sector followed by industries (12%).

3. Methodology

The city level clean air action plan is further broken down at micro-level, i.e., ward level. The micro plan is an area specific plan containing details of local hotspots and their sources of air pollution, measures to be taken to control them, and how these steps would be implemented. The micro plans are necessary because monthly data on pollution levels available with SMC and GPCB from 10 air quality monitoring stations across in Surat show that not only the levels of pollution differ from place to place within the city, but even the nature of pollutants is different. The sector specific micro area plans prepared under the Surat Clean Air Action Plan (SCAP) project indicate the cause-and-effect pattern of these areas of concerns for each sector which have been given weightage in the source apportionment study conducted taking 2019 as the base year. While the sectoral micro-planning and mitigation measures identification is need of the hour, there should be equal focus given to area based micro-plan preparation. This can be done through profiling the range of an area or stretch for the different sectors identified in the source apportionment study and putting very robust physical and administrative mitigation measures which will be peculiar for the hotspot identified within the city.

4. Sectors Identified as Emission Sources

Under the Surat Clean Air Action Plan preparation process, source apportionment study was carried out taking 2019 as the base year and projections were checked for the city of Surat – considering the boundary of 2019 Surat city – for the years 2025 and 2030. The business-as-usual scenario generation, wherein different sectors were attributed with the particulate emissions generation potential ($PM_{2.5}$) was carried out for the major sectors contributing significantly for the deterioration of Surat city's air. Following were the major sources identified in the source apportionment study conducted

1. Road Dust
2. Industry
3. Waste Burning
4. Construction
5. Transportation

5. Detailed Assessment for the sectors

1. Road Dust

To effectively implement mitigation measures for the abatement of road dust resuspension emissions, it is important to have areas identified as 'road dust affected areas' for which micro-level strategies are implemented. These areas can be targeted to understand how many collector road junctions are present. There will be a single measurement unit wherein the highest numbers of junctions showing wards will affect road dust generation in the city of Surat. In addition to this, the parallel measurement can be added of the vicinity of these wards from the river Tapi. A third layer can be added of the presence of green cover in these primarily affected areas. Zones such as core city area – **Chowk, Muglisara, Rander, Udhana, Katargam, Adajan and portions of Athwagate and Piplod** – East, Southwest and West are worst affected due to the heavy traffic movement, typology of the roads and scarce

presence of green cover in these areas. Wards such as **Limbayat** and **Varachha** are having very heavy movement of not only four wheelers but also heavy vehicles making the traffic junctions in these areas prone to road dust re-suspension emissions. The latter ones are having very high density of diamond and textile industries as well, making these areas observing heavy two-wheeler movements.

To counter effect these road dust affected areas, it is important to develop green patches at the arterial and collector road junctions. Green patches would curb NEEs at the junctions which can be added with the wet processes such as fountains and sprinkler systems. To add to these physical measures – permanent ones - 3 hours of restrictions can be imposed – from 12 noon to 3 pm – for the movement of HCVs and buses in these wards on days when the temperature is high. This can be coordinated with the implementation of the Heat and Health Action Plan for Surat city (2016). The reason being, in the high tempered days, dispersion of road dust will be very high due to temperature aggravated charging of the particulate matter.

All dedicated junctions of arterial and sub-arterial in the vicinity of these wards can be provided with dust suppression systems. For the implementation of this step, these wards will be targeted first. Mechanical sweepers dedicated to these wards and dedicated pits to collect road dust will be dug at the common public places. Special training to the sweepers will be provided for the night scrapping in these areas.

1. Industries Sector

Based on assessment done from the data provided by the GPCB, wards such as **Udhana, Pandesara, Ved Road, Bhestan, Sachin and Katargaam** has heavy agglomeration of medium and small industries which are using coal and wood for firing up their processing vessels.The density of industries, especially red category industries are also high in these areas. All these wards are also having access to major routes and one national highway passing in proximity (Sachin) to them making the floating or visiting population vulnerable to emissions from industrial hotspots.

Wards such as **Foolpada, Kapodara and Katargaam** are having Tapi river passing through them. This may generate chances that small textile and chemical processing units will be able to pollute the river waters making the surrounding air not to be treated with the humidity from river waters. This is because the water hyacinth has damaging effect on sequestration effects and chemical pollution would increase the oxygen demand of Tapi river, hindering the pollution sequestration in long run.

The fuel alteration scenario will be helpful in wards which are yet to accommodate more numbers of units since wards such as **Unn, Adajan, Bhimrad and Sarsana along with Amroli-Utran** power generation belt has better road access as well as lesser industrial units' density. This is important for the non-conventional fuel infrastructure development since interventions such as community boilers and processing vessels monitoring equipment installations would need space – finance – behavior agreement. Thus, to focus on fuel alterations, it will be better to have a pilot in the new developing sites.

In addition to above points, it will be important to increase green cover in surrounding areas of the hotspots mentioned in above points. As indicated in assessment, wood is still forming a

major portion of industrial fuel consumption and surrounding area green cover reduction in recent year has been due to illegal cutting of trees for industrial and commercial burning. By increasing green cover, sequestration in the hotspot areas will be ensured.

2. Waste Burning

Micro level plan at ward level was carried out to identify preferable special focus areas. The micro level plan is based on the findings in primary survey, where high waste burning incidence in both summer and winter were found in SMC in the year 2019 and 2020 respectively and can be the primary and preferable focus for implementation of suggested mitigation measures. The identified wards are namely, **TPS - 4, Ashvanikumar Navagam, TPS - 8 Umarwada, Fulpada, Kapadra, Dindoli (52), Bhestan, Pandesara, Udhana, Bamroli, Dindoli part (81), Bamroli (Part).** In above wards some of wards having Industrial areas such as **Bhestan, Pandesara, Udhana, Ashvanikumar Navagam, Kapadra** which seeks special focus since highest burning incidences were observed in these industrial areas.

As mitigation measures, mass awareness campaigns in these areas to discourage community to burn their waste can be carried out. Regular inspection to be carried out by SMC officials to impose fines on waste burning.Involvement of informal waste sector and increase the facility of MRF at decentralized level for MSW management for recyclable resource recovery and prevention from burning.Implementation of Waste to Compost Plant, Organic waste converter for Compostable waste.Every year survey for MSW Burning to analyses the scale of reduction and impact of Mitigation measures of waste burning.Identifying the gaps in waste management system and try to rectify the gaps identified can be taken as the good practice in managing the open burning of waste incidents.

3. Construction Sector

The residential price index of wards situated in south, southwest and towards eastern part of south zone have been significantly higher. Wards such as **Pal, Adajan, Katargam, Piplod and Vesu (area)** are coming up with new construction areas and have been in forefront of passing out new TP schemes in a year.

The city is expanding its economic grasp over her citizens and consumers from other states and cities through providing better opportunities in putting up manufacturing and production businesses in textile, chemical, allied chemicals, and engineering units. This economic expansion is happening in zones such as south, north,and east zone A. One of the significant reasons would be the visiting population of the city as well as the migrants settle in these areas which are hub of commercial activities. Thus, interventions such as off-site community exposure monitoring would work in these areas which are becoming new settlements for commercial and residential activities alike in Surat.

For the intervention such as providing a pilot site for citizens as well as a knowledge group from builders' association and Surat Municipal Corporation, one has to decide a site which is surrounded by high density area or population. The reason being, such sites would be used as a flagship project to enhance technical understanding of knowledge partners (responsible in setting up Central Command Centre) and if would cater a larger set of audience, would be beneficial for the administrative rectification of emissions from construction sites.

Interventions such as providing wet sprinkling machines would be easy to install or operationalize in areas such as **Vesu, Rander and Tunki** which are not only expanding rapidly but also are near to the Tapi river. Their proximity to river would suffice the need of supplying water from the river during high tide days as well as other processes such as treatment of surfaces with water within construction sites, would become easy.Taking reference from above point, construction sites which are present in or near wards such as **Dindoli and Pandesara** (also part of hotspots) can be supplied with the treated water from the tertiary treatment plants owned by SMC and **Pandesara** Industries Association.

4. Transportation Sector

For the uptake of public transport, it is interesting to observe the penetration of public transport services in the SMC region. While the Comprehensive Mobility Plan suggests that public transport coverage is about 87% of the city, these calculations have been arrived at using the Euclidean distances from the transit corridor. The road network measurements from public transit corridors provide more real estimates of coverage. The road network assessment reveals that public transit covers 76% of the SMC region. This essentially indicates that a quarter of the city is not services well by city busses.

While investments must be made for the city, special attention must be preferred to these two zones. Further assessment reveals the following characteristics of the South and Southwest zones which are drastic to improve emissions scenario from the transportation sector. About half of the built-up area in these two zones is residential (South: 44%; Southwest: 51%). The south and southwest zones put together contribute to 1/3rd (33.6%) of the total residential land use in the SMC region.Nearly 70% (68.3%) of all industrial land use is in these two regions with the South particularly contributing to 62%.

Further, a closer look at zones and coverage of public transit as a percentage of built-up area of zones identifies the South and the Southwest zones to be severely underserved. This is exhibited in the table below.

Table 1: Transport Sector - Hotspot Identification - NMT Coverage Calculations

Zone	500 Meter Coverage	Average SMC Coverage
East	85.4%	**75.9%**
North	91.1%	
South	67.6%	
South East	86.4%	
South West	60.5%	
Central	84.8%	
West	76.3%	

2. Concluding Table:

Sr.No.	Sector	Areas (Wards) of Concern	Responsible agencies	Intervention Suggested
1.	Road Dust	Core city area or Densly populated areas - Chowk, Muglisara, Rander, Udhana, Katargam, Adajan and portions of Athwa gate and Piplod along with Varachha and Limbayat	Surat Municipal Corporation	• optimum utilization of road sweeping with augmentation of mechanized sweeping • scientific disposal of dust collected in designated sites/ landfills, • water sprinkling to suppress dust especially after mechanized sweeping, • proper management of roads to ensure potholes-free roads, • laying or repairing roads in a manner which extensively supports mechanized sweeping, • conversion of non-paved roadsides into paved one or into a green area, • greening of central verges, • laying cemented roads over bituminous roads especially in industrial areas
2.	Industries	Udhana, Pandesara, Ved Road, Bhestan, Sachin and Katargaam, Unn, Adajan, Bhimrad and Sarsana along with Amroli-Utran	Gujarat Pollution Control Board, Regional Office	• Regular Inspection by GPCB officials • Promote Energy Efficiency in the Industry Clusters

				• Promote alternate/renewable fuel and discourage Industries to use fossil fuels • Capacity Building and Training to Industry to made them aware of newer and cost-effective technologies • Suggest APCD design and recommend modifications and retrofitting to Industries
3.	Waste Burning	TPS - 4, Ashvanikumar Navagam,, TPS - 8 Umarwada, Fulpada, Kapadra, Dindoli (52), Bhestan, Pandesara, Udhana, Bamroli, Dindoli part (81), Bamroli (Part), Bhestan, Pandesara, Udhana, Ashvanikumar Navagam, Kapadra	Surat Municipal Corporation	• Regular Inspections and imposition of fines by SMC Staff • Mass awareness campaign in the hot spot areas to discourage community to burn waste • Capacity building and training of sanitation staff to spread awareness on waste burning and its effects • Regularise the frequency of waste collection in the area where door to door collection service is poor
4.	Construciton	Pal, Adajan, Kataargam, Piplod and Vesu (area), Rander and Tunki along with Palsana and Pandesara	Surat Municipal Corporation	• Regular inspection of Construction sites by SMC/GPCB to see the dust controlling measure • Awareness programmes for builders and civil engineers to manage construction dust with the help of CREDAI

				• Construction material handling/ transportation of material at sites as per the guidelines
5.	Transportation	All wards in the south and south west zones shall be given priority as areas of concern	Traffic/RTO/SMC	• Road widening at high traffic movement points to ensure smooth flow of traffic • Flyovers to avoid traffic junctions and congestion points • Promote EV in public transport to reduce GHG emissions • Implement EV policy to encourage community to move towards EV. • Remove encroachments and check improper parking on roadsides

Conclusion

The SCAP can be considered as a 'roadmap' to achieve cleaner air in the Surat city. The interventionsproposed to necessitate broad support amongst the diverse stakeholders who have participatedin developing this action plan. Funding for a few of the interventions in the action plan is currentlyavailable, while others will require new public and private investment